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## Continuous Light in Power Plants

In times of emergency in the power plant there is no more awkward predicament than the blotting out of the station lights through the blowing of a fuse or failure of a main generating unit upon which the illumination of the installation depends. Lanterns are the usual recourse in such cases, but in the time while these are being lighted and in the relative darkness which obtains until an important generating unit can be put in service on the station bus-bars, a good deal can happen that might often be forestalled if the plant had some auxiliary means of lighting. The plans for several new power stations equipped exclusively with a. c. apparatus illustrate how the chances of total darkness in such a station can be very largely reduced by a little care in planning the station lighting circuits.

At one of these plants the scheme consists of bringing all the station lighting circuits to a controlling distributing panel supplied with 110-volt alternating current from station transformers and with exciter current as a recourse in case the alternating circuits fail. The important parts of the station are lighted by two sets of lamps; both of these lamp circuits or groups are brought to the panel and fed from opposite sides of a three-wire bus within it. In the panel box are knife switch blades, which enable the exciter circuit to be thrown upon the lamp lines in case the a. c. supply fails. The important duplicated sections are the switchboard, the high-tension switch floor, turbines, basement where the auxiliaries are massed, engine room arcs, and the boiler room stop valves. An ordinary direct-current railway plant cannot, of course, enjoy such a reserve, but it may pay to install a separate small direct-connected unit or local central station service in case offices or shops are close by. The cost of a few lamps on the city supply is a small matter compared with the additional insurance it affords.

## Abuses to Which Electric Railways are Subjected and Their Cure

There seems to be a general disposition on the part of electric railway companies to submit to imposition and abuse of a nature that other semi-public corporations would not tolerate. If a wagon driver through his own carelessness lets the hub of his wagon break through a few of the panels of a newly-painted car and mar the surface of the remaining panels on that side of the car, usually no attempt is made to punish him for his carelessness or to threaten him in regard to future offenses. Cars are also subject to a great deal of abuse by passengers from violation of the anti-spitting ordinance to actual destruction of seats and fittings, but unless there is an infraction of a health law or injury to another passenger no one is punished. Frequently a steam road company regards it as its privilege to hold up the electric cars at crossings just as long as it feels disposed, and on the street their progress is delayed by truck drivers in spite of the incessant sounding of the gong by the impatient motorman. The right to "joint" use of the track by teamsters seems to have been so well established that wagon makers frequently take it upon themselves to make the wheels of their wagons the same gage as the track. The cross-road shelters of interurban lines are not infrequently whittled up, torn down or defaced with pencil marks and verses. In general it seems electric railways get more abuse and stand for more abuse than do other corporations of a similar character.

In some cases this injury is committed because the offender knows that he cannot be detected, but in others, as in highway delays, the offender is known but realizes that he is practically immune from punishment. Is this because the public believes the railway company will accept petty imposition without resentment?

Many railway companies no doubt feel that because they are dependent on the public, both for their receipts and their franchises, it is the best policy to submit to and make the least of what should in reality be regarded as indignities, but this is often permitted to go too far. There is in fact very little reason for electric railway to continue to submit to abuse and if they stood up vigorously for their rights they would no doubt find public sentiment growing in their favor.

One small interurban and city road in the Middle West is doing this. It has gotten a city ordinance passed which prevents steam roads holding the city cars more than a certain interval of time. Frequent arrest of train crews has taught the steam road that in that city at least the electric railways' rights must be respected. A similar policy is being carried out with regard to other abuses. On one occasion the train crews on the interurban line made five arrests in one day. These were largely for such offenses as spitting on the floor and using profane language in the cars. The cross-road stations and the company's property in general are likewise being protected. It is safe to say that a continuation of this policy will soon educate the public to a point where it will have the proper respect for the company's rights and properties.

The company, and the patrons as well, will be gainers in many ways. Cleaner cars, cleaner stations and faster schedules will certainly be appreciated by the patrons, and lessened maintenance expenses will be an additional inducement to the company to continue its policy of self-protection.

## Rolling Stock Depreciation

The more depreciation is studied by operating officials on electric railways the more certain it becomes that money set apart to renew wornout or obsolete equipment must be expended, not in a lump sum as a fixed percentage of the investment, but in separate disbursements applicable to a considerable number of varied replacements. In any given year the total depreciation fund will, of course, be a definite percentage of the capital represented by the equipment, but there is little reason to suppose that this percentage will remain constant on any given system from year to year. These points apply to all parts of the equipment, but may possibly be realized with special force when considered in connection with the question of rolling stock depreciation.

It is a difficult matter to determine when a car has reached a point where it should no longer be operated in electric railway service, looking at the question from the single standpoint of physical deterioration. Only to a limited extent is the electric railway able to shunt veteran pieces of rolling stock upon branch lines or relatively unimportant routes. In the main, a car must compete with the latest and best products of the factory, as long as it continues in street railway service. It is probable that more cars have been retired from service because other types capable of handling a larger traffic—often 30 to 50 per cent more passengers seated—have been developed than because of mere weakness. The rapid changes of the past few years in rolling stock standards on electric railways have dislocated many admirable theories of depreciation, based upon the disintegration of each car as a unit. Managers have found it is often wiser to put the depreciation allowance into the purchase of more modern cars rather than keep the economy of other parts of the system low by the use of obsolete rolling stock. This has complicated the subject. Omitting this aspect from immediate consideration, however, and assuming no change in type, the following two practical queries present themselves: "When does a car reach a point where the repairs upon it are so great that it is cheaper to buy a new one?" and "How can one obtain a reasonable basis for rolling stock depreciation estimates?"

The answer to the first question must of necessity be somewhat elastic. If separate records are kept of the cost of repairs to the different parts it is comparatively easy to determine when it would be cheaper to scrap or sell to a second-hand purchaser a part of the equipment, or the car itself, rather than continue the up-keep, with deterioration growing worse each year. But if lump records are kept of the repairs and renewals of motors, trucks, air brakes, body and controlling equipment, giving the parts of the car no identity on the repair sheets, difficulties increase and it will often seem wiser to retain the car in service for a longer period of time. As each piece wears out finally, it will be replaced by another, so that after ten years the motors may have had several new armatures and field coils, the brake-shoes may have been changed scores of times, the wheels scrapped and replaced perhaps three or four times, the control contacts renewed several times, and the body reinforced by additional pieces in place of broken members. In such a case, the composite car will not be replaced or superseded for many years, unless improvements in the art demand a radical change in type. On a large system there is less liability of a well tried type of cars going out of service completely, even in the face of sweeping changes to secure competitive traffic on certain routes. In plain words, the old cars are good for a vast amount of wear still, and unless they are actually distasteful to the public, it would be unwise to scrap them, or even to dispose of them before they are worn out unless at attractive second-hand prices.

Maintenance figures and life records of individual car parts from the shops are the most reliable indices of depreciation. The cost of repairs is well kept on many electric roads at the present time, but the life expected in different services is far too uncertain. Broader study of the characteristics of different divisions and routes is needed with respect to wear and tear. Averages applying to single parts, such as brake-shoes of known composition, are most helpful, but when the averages of the heterogeneous equipment which make up the complete car are lumped carelessly together for the purpose of securing a constant to apply unchanged year after year on a growing system, the results cannot but be of hazardous accuracy, and the cost of securing the original data is largely thrown away. Depreciation is an ever-present problem; but its action shifts with changes in known conditions. It is a most hopeful sign of the times that the whole subject, vast in its ramifications from decaying franchise valuations to rail-bond crystallization is being analyzed under such varied conditions of operation as are embraced among the electric railways which are properly classed as progressively managed.

## Overhead Construction on the New York, New Haven & Hartford

The recent installation of the electric service on the New York, New Haven & Hartford Railroad adequately completes the reorganization of the terminal work in New York. It has been a long pull, this breaking down of the walls of conservatism and ridding the metropolis of smoking engines, but the time is now come and a review of some of the methods that have led to the result is in order. The system used in this latest work is notable, not only as involving the use of single-phase locomotives, but as departing at last from the third-rail construction which has been in this country the accepted means of current supply when large units are used. Granted the use of high voltage, which is the condition of success in heavy railway work, the third rail becomes progressively less desirable as the voltage increases. At 11,000 volts, the pressure used for distribution on the New York, New Haven & Hartford, overhead construction is a necessity, and the engineers in charge very evidently made up their minds to take no chances in installing it. For high-speed work with an overhead trolley the catenary construction is also necessary. The section of road concerned contains a varying number of tracks and could not well be broken by pole lines, and the result was the exceedingly solid, although costly, bridge construction now familiar to the eyes of travelers to the Eastward.

The description of the system and the reasons for its adoption offered by Mr. McHenry, which we publish this week, will repay careful study. There were many new problems to be solved, and none of them seems to have been forgotten. The double catenary with its triangular trolley wire support is the most characteristic feature of the actual line construction. It certainly should give effective lateral support, and yet one cannot help speculating as to how far this extreme measure was necessary, considering the use of the pantograph sliding trolley. Failure of one catenary cable would leave the line in bad shape for operation so that there is little gain, save in lateral stability. In a sense the line under consideration was a trying one for high voltage distribution, since at some points the conductors are necessarily rather low. For this reason it has been necessary to take unusual precautions in the matter of safety, and certainly no line has been more thoroughly provided with automatic protection and means for cutting out sections upon which trouble occurs. More attention seems to have been paid to factors of safety than is usual in line work, the insulators in particular being subjected to tests that are really adequately severe.

One interesting feature of the installation is the use of three-phase generators and the operation of all of the trains from one leg of the circuit. This is accomplished by connecting all of the trolley wires in multiple for one conductor, using the track as the second, and carrying an auxiliary wire the length of the line for miscellaneous power purposes, as the third conductor of the three-phase system. It will be shown in a later issue that this unbalancing of the phases does not involve any very great loss in generator capacity, even if the power taken from the third conductor is not large, while under the circumstances the output reaches a large percentage of the generator capacity on three-phase operation.

No electric traction system has ever been put in under more strenuous conditions than this, since the terminal requirements of direct-current operation demanded not only motors of very remarkable properties, but a complete duplicate collection and control system. It was wise policy to take no chances with the overhead equipment, making it mechanically as sound and perfect as possible regardless of cost. The event may prove some of the extreme precautions to have been needless, but the error, if any, is on the side of safety, as it should always be in new and important installations. The whole system, in a case like this, would stand risk of unthinking condemnation if there were failure in some really unimportant feature of construction. The railroad is to be congratulated upon having done thoroughly well the task undertaken and upon giving the first great demonstration of high-voltage railroading upon this side of the Atlantic.

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A review of the New Haven electrification as discussed in this issue would not be complete without a reference to the succinct and clear cut article by Mr. McHenry, describing the reasons for the adoption of the 25-cycle 11,000-volt system, and the results which the company expects will follow from its use. At the time when a selection had to be made, the purchase of a few d. c. locomotives to haul the company's trains from Woodlawn to Forty-Second Street would undoubtedly have been the simplest way out of the problem. This would have cared for temporary needs and afforded opportunity for a further development of the single-phase system. Fortunately it was not the plan adopted and the wisdom of the company in making provision for future expansion is being amply demonstrated by the successful operation of the system to-day.

The analysis of the comparative merits of 25 and 15-cycle distribution, and of the advantages of electricity over steam are worthy of careful consideration. Upon the latter point Mr. McHenry sums up the major benefits under three headings, viz: (1) Economical operation of smaller passenger train units; (2) higher speed of freight trains; (3) increase of station capacity. Direct economy over interest and other fixed charges due to electrification may also be expected under favorable conditions, so that while a general change from steam to electricity will involve some sacrifice of invested capital, Mr. McHenry believes that "the transition already in progress will be rapidly extended and applied at all points where congested terminals, high frequency of train service and low cost of power create favorable conditions."

# HEAVY ELECTRIC TRACTION ON THE NEW YORK, NEW HAVEN & HARTFORD RAILROAD

BY E. H. McHENRY, VICE-PRESIDENT

The act of Legislature of May 7, 1903, of the State of New York, providing for the future regulation of the terinals and approaches thereto of the New York & Harlem Railroad in the city of New York, authorized the New York Central & Hudson River Railroad Company and the New York, New Haven & Hartford Railroad Company, lessees of the New York & Harlem Railroad Company "to run their trains by electricity, or by compressed air, or by any motive power other than steam, which does not involve combustion in the motors themselves" through the tunnel and over the tracks more specifically described. The act required that the change of motive power be made on or before July 1, 1908, and provided a penalty of $500 per day on and after that date for failure to comply with its terms. As there was no available form of motive power other than electricity which met the conditions of the act, it accordingly became necessary for the New York Central and New Haven companies to provide the equipment for electricity operating all trains between the Grand Central Station at Forty-Second Street and the prescribed sub-limits within the limits of the city of New York.

The terminal tracks of the New York & Harlem Railroad, between the Grand Central Station and the junction point at Woodlawn, a distance of 12 miles, are jointly leased and operated by both the Central and New Haven companies. The zone of electric operation on the lines of the latter was further extended 21 miles, to Stamford, to include the greater number of its suburban trains.

This feature of joint operation more than all others restricted and narrowed the latitude of choice in the selection of a system of electric traction by the New Haven Company. The Central Company was first in the field, and having previously adopted a system based on the use of continuous-current motors taking current from a third rail, it was obvious that no method inconsistent with such conditions was open to the New Haven Company, and it was thus practically confined to a choice between the continuous current, low-voltage system as adopted by the Central Company and the more recently perfected high-tension single-phase system. The first has been in general use for a number of years, and, as installed by the Central Company, includes the generation of alternating currents at 11,000 volts and 25 cycles, high-tension transmission to sub-stations located approximately 5 miles apart, at which points it is reduced and transformed by static and rotary transformers to low-tension continuous current at 666 volts. This current is supplied to the engine contact shoes through a secondary system of distributing feeders and an inverted third rail of improved type. Continuity and regularity of operation are further insured by a large and most noteworthy installation of storage batteries in each sub-station.

The single-phase system is the latest and most advanced step in the evolution of electric traction, and it was not until 1904 that the first commercial installation on the Indianapolis & Cincinnati Traction Company was operated. With this system electric power may be generated, transmitted and supplied directly to the electric locomotive, substantially at the initial frequency and voltage, without intermediate reductions or transformations of any kind. In effect it duplicates the simplicity of the local street railway operating with continuous currents supplied directly to the motors from the trolley line. It avoids all necessity for the ordinary equipment of static and rotary transformers, storage batteries, low-tension switchboards, and low-tension distributing and contact conductors, while affording the flexibility and economy of high-tension a. c. transmission over long distances.

The single-phase motor, as its name implies, operates with single-phase currents, and its characteristics are essentially identical with those of the more familiar continuous current series motors. Single-phase motors are adapted for operating with either alternating or continuous currents, and this valuable feature makes it possible to design engines which may be operated at will by high-tension alternating currents from an overhead conductor, or low-tension continuous currents from a third rail.

The New Haven Company was one of the earliest pioneers in the field of heavy electric traction, and has operated six of its shorter branch lines by electricity in commercial service for a number of years past, beginning as early as 1895. Three of these lines, aggregating 33 miles in length, were equipped for overhead contact, and the remaining lines, aggregating 39½ miles in length, for a third-rail contact. All lines were operated with 500-volt continuous current motors, supplied from main stations and sub-stations of the familiar type. The third rail was rather primitive in form and without protective devices of any sort. So many fatalities and injuries followed the use of this method of supplying current to the motors that the railroad company was compelled to abandon all third-rail operation in Connecticut and revert to steam service, by a decree of the Superior Court dated June 13, 1906, and it now has no third rail in service, excepting a junction overlap with the New York Central Railroad at Woodlawn. Improved methods of protecting the third rail were available, which would have considerably mitigated the more dangerous features of the earlier installations, but the unfortunate and unsatisfactory experience of the New Haven Railroad Company with this type of construction influenced its decision in favor of the single-phase system, which was finally adopted after a careful and complete investigation of the relative merits and disadvantages of the two methods of construction.

Had the study of the question been limited to the equipment of the terminal section in New York City, considerations of uniformity and expediency would doubtless have influenced the decision in favor of continuous current motors, taking current from a third rail. The New Haven Company, however, recognized the great importance of its decision in its far-reaching effect upon future extensions of electric service to other parts of its system, and the final decision was based upon a study of the subject as a whole rather than upon the solution of the terminal problem only.

The distinguishing characteristic of electric traction as contrasted with that by steam-driven locomotives is in the condition that the motive power is utilized at variable and varying distances from the point of generation, and the selection of a system of transmission best adapted to such conditions, which combines in greatest measure qualities of efficiency, flexibility, simplicity, and lowest first cost, is of paramount importance. A glance at the map of the New Haven Company's system will show that it comprises a network of lines and indicates that its transmission problems must be worked out for areas rather than for linear distances, thus reversing ordinary conditions.

As the area served increases as the square of the radius of transmission from the generating center, and as there may be many circuits in the network which will serve as paths to common points of use, it is evident that ordinary methods of calculation will be geatly modified. Under such conditions the economic radius corresponding to any initial potential will be considerably extended, and the commercial and practical value of high potential transmission will be much increased.

While both methods under consideration included high-tension transmission by alternating current, it was believed that the combination method requiring transforming devices and continuous current motors was less well adapted circuits; the continuity of the overhead conductor is complete, and its position and height may vary within vertical and horizontal limits of 8 ft. and 4 ft., respectively, without losing contact with the collecting shoes on the pantograph frames.

It is yet too early to furnish definite and positive comparisons of cost of the two methods under consideration, but the calculations and experience of the New Haven Railroad Company's engineers indicate that the total cost of a single-phase installation will be much less than that of the continuous current system, and that the higher electrical efficiency, lower fixed charges, maintenance and operating

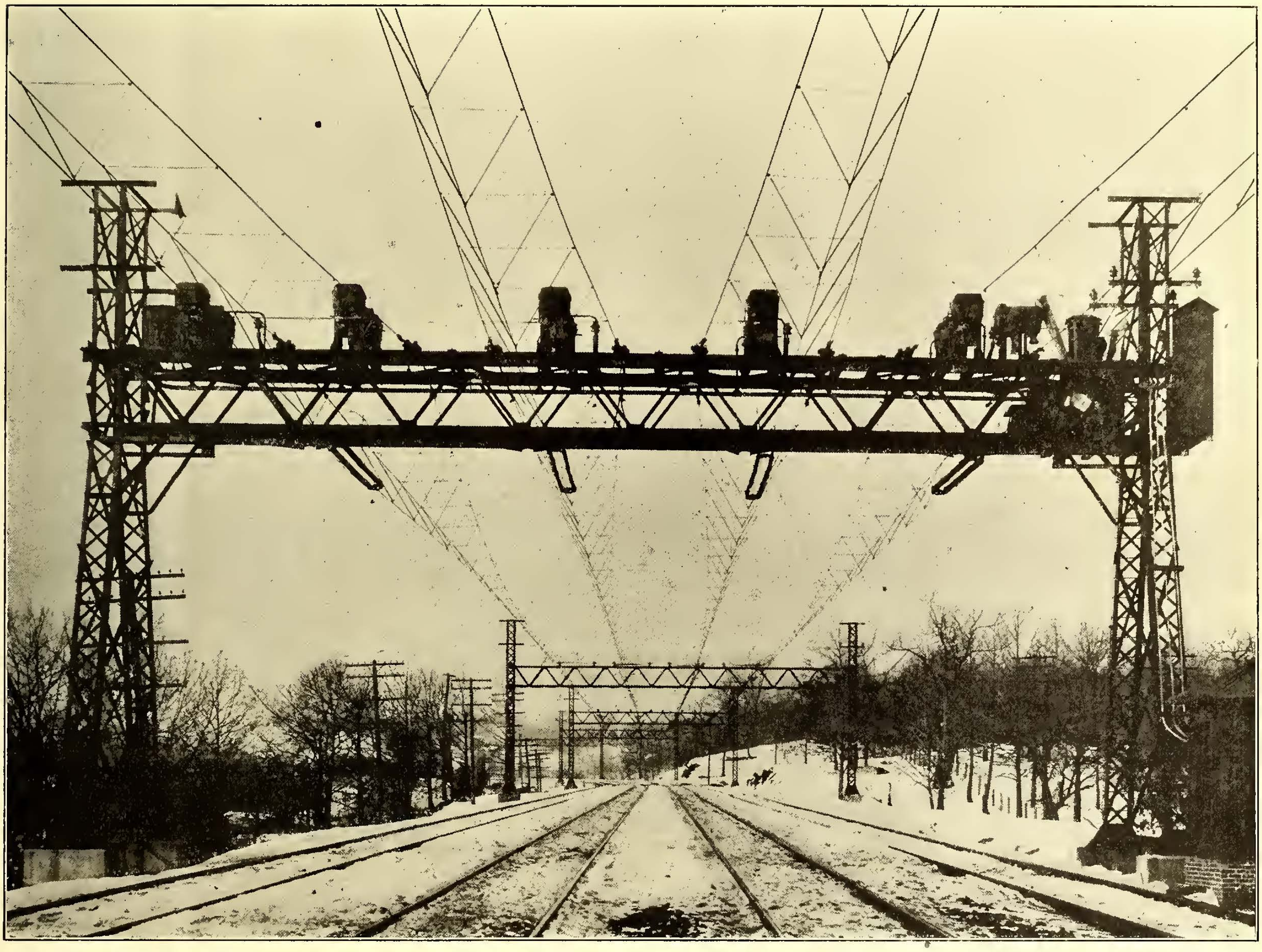


FIG. 1.—ONE OF THE INTERMEDIATE BRIDGES ON THE NEW HAVEN ROAD, SHOWING SEMAPHORE SIGNALS

to the conditions than its simpler single-phase competitor for many reasons. The electrical efficiency of the combination system between power house bus-bars and engine shoes is 75 per cent only, as compared with 95 per cent for the single-phase system, the flexibility of the former is impaired by the limited radius of the secondary low-tension distribution, requiring sub-stations at frequent intervals, and still further by the limitations imposed by the use of a third or conductor rail. The position and height of this rail in its proper relation to the track rail must be rigidly maintained, and the practical margin of permissible variation is measured in fractions of an inch. Moreover, its continuity is broken at switches and crossings by frequent transferrence of the conductor rail to the opposite side of the track or to an overhead position. In contrast, the single-phase system requires no sub-stations or secondary

expenses of the single-phase system all tend to reduce the relative cost of current delivered to the engine shoes in about the same proportion.

The determination of the most economical and desirable frequency and voltage of the transmission system involved the consideration of many factors entering into the problem. The choice of frequency was practically fixed by the manufacturing companies within limits of 15 cycles and 25 cycles, and the comparative merits of these two rates only were considered.

The lower frequency afforded a material reduction in weight, size, and cost of motors, a reduction in conductor losses and induction disturbances, together with an increase in the power factor of the motors. Per contra, its adoption would have materially impaired the commercial value of the system, as a whole, in restricting or preventing its extension for many other uses incidental to railway operation. The standard power and railway frequency in general use is 25 cycles, and as the New Haven Company already owned a number of power houses generating current at this frequency for standard trolley operation, and, in addition, had equipped many of its shops with 25-cycle motors, the adoption of 15 cycles would have required the abandonment of a large amount of standard apparatus, or the interposition of costly and inefficient means of translation. The lighting of stations and other buildings was quite an important factor, as 25 cycles is the lowest frequency at which the carbon filament lamps in general use can be satisfactorily operated. It was also considered desirable to provide for operation in parallel with the 25-cycle generators already adopted by the New York Central Company. The practical effect of a change from 25- to 15-cycle apparatus was thus substantially equivalent to a "break of gage," and under existing conditions it was decided that the practical commercial value of the higher frequency outweighed the more theoretical merits of the lower one.

Various alternatives were considered before fixing the generating and transmission e. m. f. of the system. It was at first proposed to increase the economical radius of transmission to the utmost by generating current at the highest initial voltage for which generators could be safely designed (about 22,000 volts), and to provide sub-stations at suitable intervals, equipped with static transformers for supplying current at 3000 to 6000 volts to secondary contact circuits. As the two motors on each electric locomotive truck are permanently connected in series, current must be supplied at 560 volts through the transformer forming a part of the locomotive's equipment.

It became evident, however, that a great gain in simplicity would result if the intermediate sub-stations and line transformers could be cut out altogether, and further study demonstrated the possibility of effecting this by reducing the initial e. m. f. to 11,000 volts and raising the ratio of the locomotive transformer to correspond. This was carried into effect with a resulting reduction in capital and operating cost, coupled with an increase of electrical efficiency, which proved most gratifying. Incidentally, the difficulties in designing satisfactory collecting devices were greatly diminished.

The difficult and responsible task of determining and analyzing operating conditions and requirements was assigned to Calvert Townley, consulting engineer, and William S. Murray, electrical engineer, of the New Haven Company, to whom, together with their able assistants, credit is due for the design, supervision and successful execution of the many and difficult details of this novel installation.

THE COMMERCIAL ASPECT

A few comments upon the commercial aspects of electric traction may not prove uninteresting, as the natural prejudice of the stockholder in favor of the continued maintenance of dividends must be respected, and the technical expert too frequently neglects this aspect in his scientific ardor for the building of monuments of engineering skill and achievement.

Numerous analyses and comparisons of the comparative costs of electric and steam operation have been published from time to time, which tend to prove that a considerable saving in fuel, engine repairs and other operating expenses may be expected. Under favorable conditions this saving may be large enough to pay interest and other fixed charges upon the additional construction investment and still leave a satisfactory margin to apply on dividends. Under general conditions, however, it is altogether improbable that the saving resulting from the simple substitution of electric for steam power will be sufficient to justify the additional investment and financial risk.

In changing the method of motive power on existing railways, the conditions are by no means so simple as in the construction of new lines, as in the former case a great amount of capital already invested must be sacrificed, and the problems of adaptation to existing conditions are peculiarly severe. In particular, the transition stage in bridging over the gap between steam and electric operation is both expensive and difficult, as the change affects train lighting and heating, telegraph and telephone service, signaling, and track maintenance, for which both temporary and permanent provision must be made. The simultaneous maintenance of facilities and working forces for both steam and electric service within the same limits will be rarely profitable, for the reason that a large proportion of expense incident to both kinds of service is retained, without realizing the full economy of either.

To secure the fullest economy it is necessary at least to extend the new service over the whole length of the existing engine stage or district, and to include both passenger and freight trains, and in this connection it is interesting to note that in the case of the New Haven Company the passenger train mileage forms so large a proportion of the whole that no additional generating and transmission capacity will be needed when electric traction is extended to freight service.

The application of electric traction to heavy railway service will probably be governed by other and more important considerations than its mere relative cost as a motive power under similar conditions, as illustrated in the development of the ordinary trolley service. In this development the commercial value of higher speeds and of increased car capacity is so large that the relative cost of electric versus animal tractive power becomes almost negligible by comparison. Analogous results may be hoped for in the corresponding development of electric traction in heavy railway service, as the new conditions will afford opportunities for at least two radical modifications of existing conditions, quite apart from minor economies.

In steam service the weight and speed of trains are limited by the horse-power capacity of the locomotive, which generates its own power, and there are but few locomotives which can generate sufficient steam to utilize their full cylinder tractive power at speeds in excess of 12 miles an hour. Consequently, any increase of speed beyond certain limits can only be attained by sacrificing train tonnage in a corresponding degree. The division of the train-mile cost by the lesser number of tons increases the ton-mile proportionately.

The high cost of fast freight service is principally due to this effect of a diminishing divisor, while it would seem that electric traction should permit high speeds without sacrificing commercial tonnage, as, with a relatively unlimited source of power at command, the maximum draw bar pull permitted by the motor design may be maintained at all speeds.

The commercial value of high speed in freight and passenger service is so great that the prospect of escaping the present penalties accompanying reduced train capacity becomes doubly interesting.

Hardly less important is the opportunity afforded at the opposite end of the scale, for the economical operation of trains of minimum capacity. The train capacity cannot be reduced without loss below the point where the earnings equal the train-mile cost, and if this cost cannot be reduced proportionately with reduced capacity, the inferior limit of capacity may be uneconomically large. In steam service the irreducible elements entering into the train-mile cost are so large that it is rarely profitable to operate trains earning less than 40 to 50 cents per mile. In contrast, electric service permits an extreme reduction of the train length to single car units, costing to operate but 10 to 15 cents per car-mile. Hence, the frequency of service may be increased and the rates reduced, which in turn will react upon the volume of traffic, with the final result of increasing both gross and net earnings.

It may, therefore, be claimed for electric traction that it will extend the limits of profitable operation of high-speed heavy trains, and also of light trains of low capacity.

Other but relatively minor advantages are possible in the effect upon earnings, due to the elimination of smoke, gases, dust, cinders and heat, the better ventilation of cars, the extension of electric train lighting and heating, and of the effect upon expenses due to the concentration of power production in large and economical power houses, a reduction of engine repairs, an increase of effective engine and train mileage, a more or less complete elimination of engine houses, turn-tables, fuel stations, water tanks, cinder pits, and other operating facilities, the consolidation of power requirements for traction, pumping, operating shops, elevators, and general uses, and the use of current for lighting switch lamps, stations and other buildings.

Finally, the availability and value of real estate and structures at large terminals will be greatly augmented by the possibility of using two or more superimposed track levels, as strikingly exemplified in the plans for new terminals in New York City for the New York Central and the Pennsylvania companies.

A general change from steam to electricity will render unproductive a very large amount of invested capital, and create the necessity for the expenditure of additional amounts still greater, but there is no reason to doubt that the transition already in progress will be rapidly extended and applied to all points where congested terminals, high frequency of train service and low cost of power create favorable conditions.

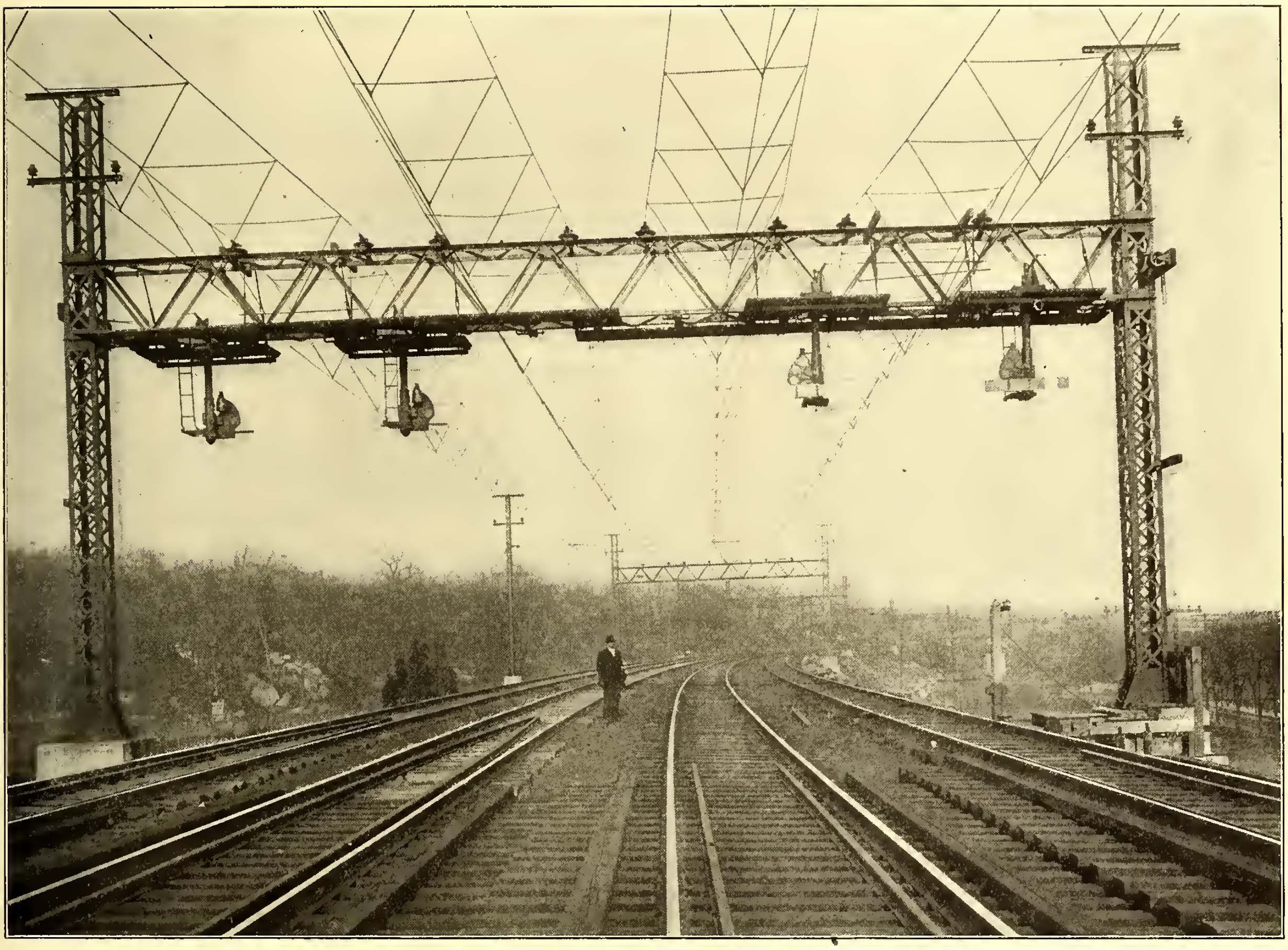


FIG. 2.—ANCHOR BRIDGE NEAR PELHAM STATION, NEW HAVEN RAILROAD

## THE OVERHEAD CONSTRUCTION OF THE NEW HAVEN RAILROAD

The previous article by Mr. McHenry gives the reasons which lead the New Haven Railroad to adopt the single-phase system on its line from Woodlawn to Stamford. It is now proposed to publish a series of articles on the equipment as installed. The first of these articles will treat of the overhead construction.

The electric trains of the New York, New Haven & Hartford Railroad leave the direct-current zone of the New York Central at Woodlawn, N. Y., which is 12.03 miles from the Grand Central Station, and pass onto the alternating-current line of the New York, New Haven & Hartford Railroad, which at present extends as far as Stamford, Conn.

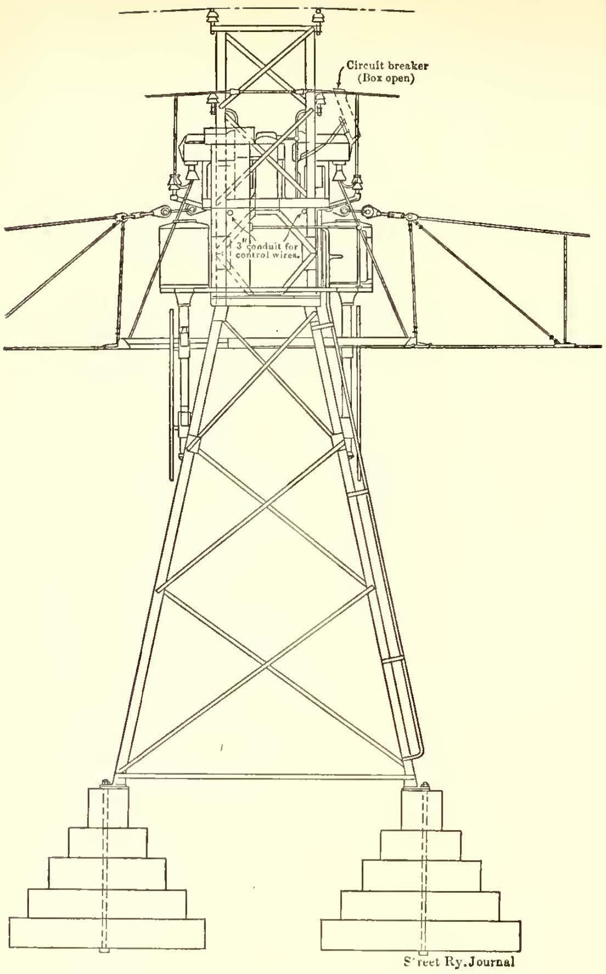



FIG. 3.—END VIEW OF ANCHOR BRIDGE

Stamford is 33.48 miles from the Grand Central Station, and hence 21.45 miles beyond Woodlawn. Upon this section, between Stamford and Woodlawn, as has been stated, 11,000 volts are employed. The catenary construction, as well as the supporting bridges, have been illustrated and briefly described in the STREET RAILWAY JOURNAL on page 558 of April 7, 1906, and 595 of April 14, 1906, when front elevations of the overhead bridges were shown, and on page 546 of March 30, 1907, when an account was given of the method of erecting the bridges. The information given then will not be repeated, but details will be published which were not available at that time.

### OUTLINE OF OVERHEAD SYSTEM

The supporting bridges are of varying lengths, so as to accommodate four, five, six, or as many as twelve tracks, as the local conditions require, and are of two types, anchor bridges which are used only at intervals of about 2 miles, and intermediate bridges. The latter have side posts of square cross-section, and are of comparatively light construction. On the other hand, the anchor bridges have A-shaped posts and are made heavier to withstand the strain of the cables.

The anchor bridges are provided with automatic circuit breakers, by means of which the different sections may be isolated, and, also, the several parallel tracks may be electrically separated from one another in case of accident to any one track. The anchor bridges also carry lightning arresters, shunt transformers for operating the circuit breakers, together with foot walks, hand railings, lamp circuits and the wires and conduit for the auxiliary control circuits.

The working conductors have sufficient capacity for the current, but two auxiliary feeders are carried the entire length of the line from Stamford to Woodlawn. These feeders are connected with the main conductors at each anchor bridge through circuit breakers and provide means for feeding around any one section in case it is cut out of service on account of some accident in that particular section.

Provision is also made on all of the bridges for carrying two separate feeder wires called "power feeders," which are connected to the third phase of the generating system and are used for operating three-phase apparatus at certain intervals along the road. Provision is also made on the bridges for carrying two three-phase circuits, one circuit being supported on the top of each post at the ends of the bridges.

In laying out the bridges for the section from Woodlawn to Stamford, it was found that the sharpest curvature was 3 degs. As this curvature will permit of stringing the trolley wire in straight lines between points of support 150 ft. apart without deviating from the center of the track more

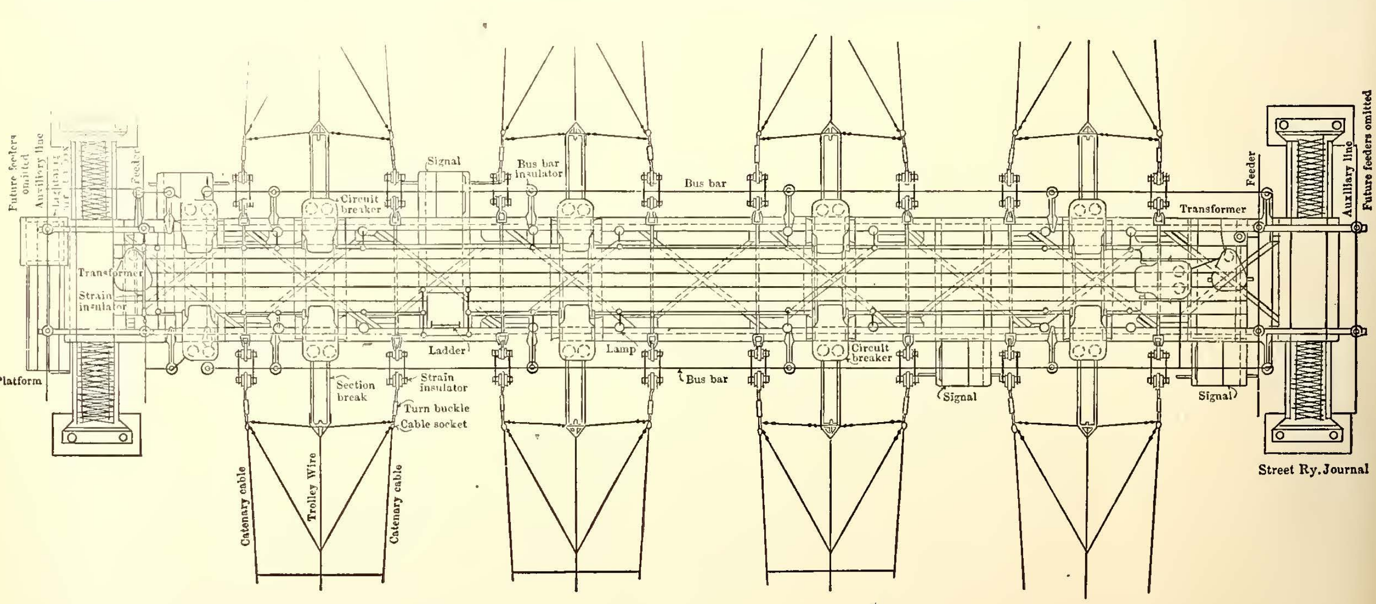
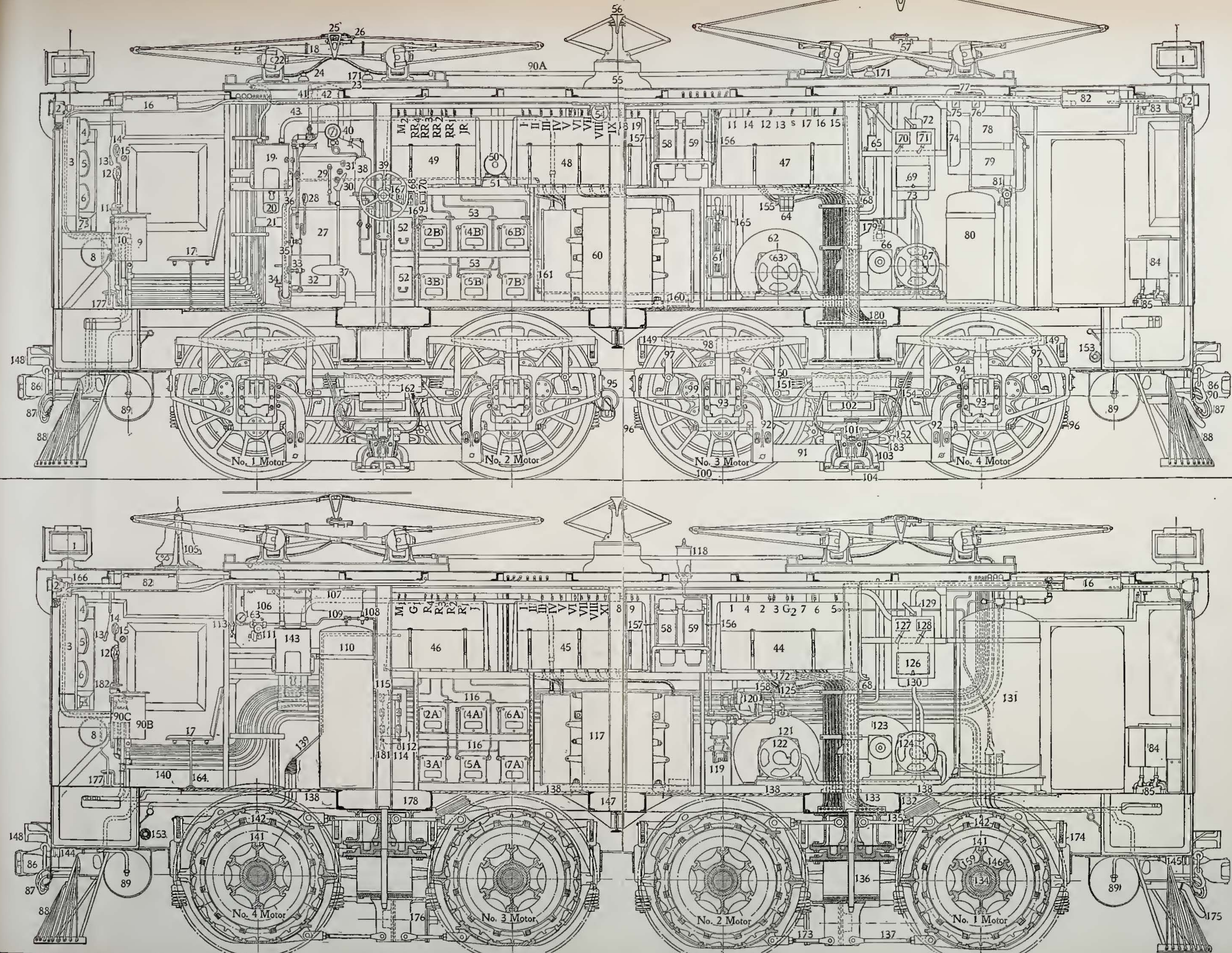



FIG. 4.—PLAN OF ANCHOR BRIDGE




LONGITUDINAL SECTIONS SHOWING CONSTRUCTION AND ARRANGEMENT OF EQUIPMENT OF NEW HAVEN ELECTRIC LOCOMOTIVE

KEY TO LIST OF PARTS

1. Headlight.
2. Train Line Receptacles, Type 444 D-E and F.
3. Instrument Board.
4. Speed Indicator Meter.
5. D. C. Ammeter Motors.
6. A. C. Ammeter Motors.
7. Temperature Indicator Meter.
8. Equalizing Reservoir Air Brake.
9. No. 1 Master Controller.
10. No. 1 Automatic Motorman's Brake Valve.
11. No. 1 Independent Brake Valve.
12. Duplex Gage Main Res. and Train Line.
13. Whistle Handle.
14. Straight Air-Brake Gage.
15. Three-Way Snap Switch in Light Circuit.
16. No. 1 Junction Box, Type 427.
17. Motorman's Seat.
18. No. 1 A. C. Pantograph Trolley.
19. No. 2 Oil Circuit-Breaker.
20. Overload Trip.
21. Oil Tank on Circuit-Breaker.
22. Insulators for Pantograph Trolley.
23. Support for A. C. Trolley.
24. High-Tension Cable from A. C. Trolleys.
25. A. C. Trolley Shoe.
26. A. C. Trolley Lock Cylinder.
27. Steam-Heating Boiler.
28. Gage—Air Pressure on Burner.
29. Water Gage.
30. Drain Cup.
31. Try Cocks.
32. Fire Door.
33. Burner.
34. Gold Car Co. Regulating Valve.
35. Mason Regulating Valve.
36. Steam Line from Boiler.
37. Air Inlet to Fire-Box.
38. Water Feed Regulator.
39. Hand Brake Wheel.
40. Steam Gage.
41. Safety Valve.
42. Stack for Boiler.
43. H. T. Conduit from Oil Switch to Transformer.
44. Switch Group No. 1, Type 259.
45. Switch Group No. 2, Type 251E.
46. Switch Group No. 3, Type 257A.
47. Switch Group No. 4, Type 259.
48. Switch Group No. 6, Type 251E.
49. Switch Group No. 6, Type 257B.
50. Motor Generator Set for Battery Charging.
61. Base for Motor Generator Set.
52. Storage Battery.
53. No. 2 Set of Resistance Grids.
54. A. C. Integrating Wattmeter.
55. Base for D. C. Trolley.
56. D. C. Trolley.
57. No. a A. C. Pantograph Trolley.
58. Preventive Coil, 100 Volts, 250 Amps.
59. Preventive Coil, 60 Volts, 600 Amps.
60. No. 2 Transformer.
61. Main D. C. Switch.
62. No. 2 Blower Motor Fan Casing.
63. No. 2 Blower Motor.
64. Permanent D. C. Field Shunting Grid No. 2.
65. Hand Air Pump for Unlocking A. C. Trolley.
66. No. 2 Air Compressor.
67. No. 2 Air Compressor Motor.
68. Magnet Valves, Type 396-D.
69. No. 2 Fuse Box.
70. Canopy Switch for No. 2 Blower Motor.
71. Canopy Switch for No. 2 Compressor Motor.
72. No. 2 Motor Control Cut-out.
73. No. 2 A. C. D. C. Change-Over Switch.
74. Relay Box.
75. Snap Switch for Cab Lights.
76. Snap Switch for Headlights.
77. S. P., D. T. Switch Light Circuit.
78. Control Reservoir.
79. Cover for Resistance Grid.
80. Oil Tank.
81. Slide Valve Reducing Valve.
82. No. 2 Junction Box, Type 427.
83. Signal Valve.
84. Sand Box.
85. Electro-Pneumatic Sander.
86. Coupler.
87. Hose Couplings.
88. Pilot.
89. Main Air Reservoir.
90. Hook for Safety Chains.
90-A. Cable Connecting A. C. Trolleys.
90-B. No. 2 Master Controller.
90-C. No. 2 Automatic Brake Valve.
91. Third-Rail Shoe Beams.
92. Third-Rail Shoe Bracket.
93. Journal Box.
94. Truck Frames.
95. Magneto for Speed Indicator.
96. Motor Suspension Springs.
97. Spring Hanger.
98. Elliptical Springs.
99. Wheel Pocket Cover.
100. Main Driving Wheel.
101. Third-Rail Shoe Cylinder.
102. Third-Rail Shoe Fuse Box.
103. Main Casting for Third-Rail Shoe.
104. Third-Rail Shoe.
105. Bell
106. A. C., D. C. Change-Over Switch Heater Circuit.
107. Fuse Box, Heater Circuit.
108. Governor Valve for Emergency Control Reservoir.
109. Three-Way Cock Emergency Control Reservoir.
110. Emergency Control Reservoir.
111. Slide Valve, Reducing Valve.
112. Balancing Transformer (Back of S. T. and D. T. Switches).
113. Combined Strainer and Drain Cup.
114. D. T. Switch No. 1 Heater Circuit.
115. S. T. Switch Heater Circuit.
116. No. 1 Set Resistance Grids.
117. No. 1 Transformer.
118. Whistle.
119. Governor—Air Brake.
120. Distributing Valve.
121. No. 1 Blower Motor Fan Casing.
122. No. 1 Blower Motor.
123. No. 1 Air Compressor.
124. No. 1 Air Compressor Motor.
125. Permanent D. C. Field Shunting Grid No. 1.
126. No. 1 Fuse Box.
127. Canopy Switch for No. 1 Blower Motor.
128 Canopy Switch for No. 1 Compressor Motor.
129. No. 1 Motor-Control Cut-out.
130. No. 1 A. C., D. C. Change-Over Switch.
131. Water Tank.
132. Air Connection to Motors.
133. Motor Leads for No. 1 and No. 2 Motors.
134. Axle of Main Driving Wheels.
135. Upper Torque Rod.
136. Center Pin.
137. Lower Torque Rod (long).
138. Trap Doors Over Motors.
139. Heater Circuit Leads.
140. Air-Brake Piping.
141. Motor Armature.
142. Motor Field Frame.
143. No. 1 Oil Circuit-Breaker.
144. Bus Line Socket Heater Circuit, No. 2 End.
145. Bus Line Socket Heater Circuit, No. 1 End.
146. Quill.
147. Tool Box.
148. Bumper Block.
149. Motor Suspension Cradle.
150. Spring Hanger.
161. Equalizer Spring.
152. Brake-Shoe.
153. Steam-Heating Line.
154. Equalizer Bar.
155. Series Transformer for A. C. Ammeter No. 3 and No. 4 Motors.
166. Preventive Coil, 100 Volts, 250 Amps. (back of No. 59).
157. Field Shunting Resistance (back of No. 58).
158. Series Transformer for A. C. Ammeter, No. 1 and No. 2 Motors.
159. Armature Spider.
160. Air Inlet to Transformer.
161. Air Inlet to Resistance Grids.
162. Third-Rail Shoe Leads.
163. Gage—Control Line Pressure.
164. Support for Motorman's Seat.
165. D. C. Wattmeter.
166. Blind Lights.
167. D. P., D. T. Switch for Battery.
168. D. P., D. T. Switch for Battery
169. S. P., S. T. Switch for Motor-Generator Set.
170. Snap Switch for Motor Generator Set.
171. Insulators Supporting A. C. Trolley Cable.
172. Shunt for D. C. Ammeter Motors, No. 1 and No. 2.
173. Lower Torque Rod (short).
174. Motor Suspension Hanger.
176. Steam-Hose Coupling.
176. Brake Cylinder.
177. Foot Push-Button Switches.
178. Air Conduit.
179. Shunt for D. C. Ammeter Motors, No. 3 and No. 4.
180. Motor Leads for No. 3 and No. 4 Motors.
181. D. T. Switch, No. 2 Heater Circuit.
182. Independent Brake Valve No. 2.
183. Third-Rail Shoe Unlock Cylinder.

than 8½ ins. on each side, it was decided to place all bridges a fixed distance of 300 ft. apart, and on curves to provide guy poles to which pull-over wires are attached and secured to the catenary spans (see Fig. 1). By this means a minimum amount of overhead wiring was obtained, and the deviation from the center of the track was maintained within safe limits for use in connection with the sliding pantograph trolleys on the locomotives, the bow of which is 4 ft. long.

### INTERMEDIATE BRIDGES

The general appearance of the standard four-track intermediate bridge is shown in Fig. 1. This illustration shows also signals mounted on the bridge, the semaphore blades being located below the truss so as to afford an unobstructed view. As will be noted, the bridge consists of two supporting side posts and a horizontal truss. Each supporting post is approximately 38 ft. long by 1 ft. 10 ins. square. Each is composed of four 4 in. x 4 in. x 7/16 in. angles secured together by 2¼-in. x ⅜-in. lacing bars.

Each post rests upon a concrete foundation, each containing about 9 cubic yards of concrete. Anchor bolts extend entirely through the concrete foundation and hold the base of the post to the foundation by means of heavy nuts. The cross-truss is attached by means of bolts to the vertical posts, allowing a distance of 23 ft. 4 ins. from the lower side of the truss to the top of the rails. The truss is 4 ft. 6 ins. deep from back to back of the upper and lower chord angles, which latter are placed 1 ft. 10 ins. from back to back. The lacing bars of the upper chord are depressed below the upper surface of the chord angles so that the latter are left free from rivets or other obstructions, thereby affording a ready means for attaching the insulators at any point. The lacing bars of the upper chord consist of flat strap, while the diagonals in the sides and bottom of the truss consist of angles. The upper chord angles are 3½ ins. x 6 ins. x ⅜ in., and the lower are 4 ins. x 3½ ins. x 5/16 in.

The extensions of the side posts above the trusses are utilized for supporting the feeder wires which are carried upon angle-iron cross-arms bolted to the posts. The lower cross-arm carries two insulators, upon the inner one of which is carried the auxiliary feeder. The upper cross-arm is located 5 ft. above the lower one and carries two wires of the three-phase circuit. The third wire of the three-phase circuit is carried upon a vertical angle-iron support.

In the calculation of these bridges very heavy weather conditions were assumed and provision was made for clamping the catenary cables on the intermediate bridges so that they are obliged to partially withstand the longitudinal pull of the latter. It was assumed that the entire system of the bridges and cables might become coated with sleet, and that this coating might be ½ in. in thickness around all surfaces. It was assumed also that the wind pressure on the bridges and the catenary spans might at the same time be as high as 25 lbs. per sq. ft. It was further assumed that the effective area of all round cables would be two-thirds of their projected areas.

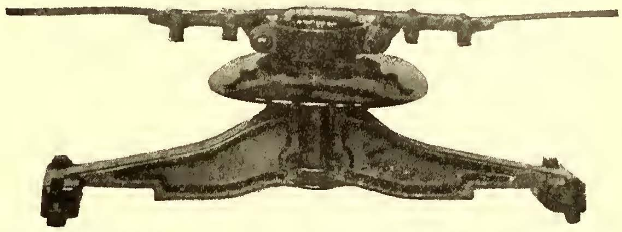


FIG. 6.—MAIN LINE INSULATOR WITH SUPPORTING YOKE

Each catenary cable is clamped to its supporting insulator on every intermediate bridge, and it was assumed that if one pair of cables should be broken, the remaining cables would exert a balancing influence on the bridge. The truss, however, was made strong enough to prevent its buckling under the strain produced by the breakage of any pair of cables.

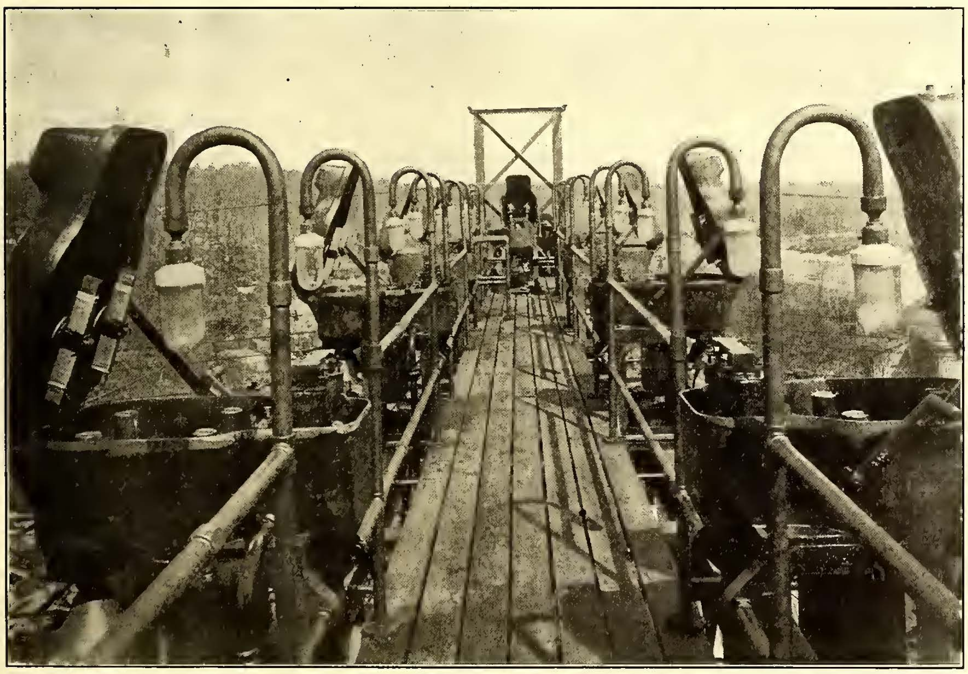


FIG. 5.—VIEW OF PLATFORM ON ANCHOR BRIDGE, SHOWING CIRCUIT BREAKERS ON EITHER SIDE

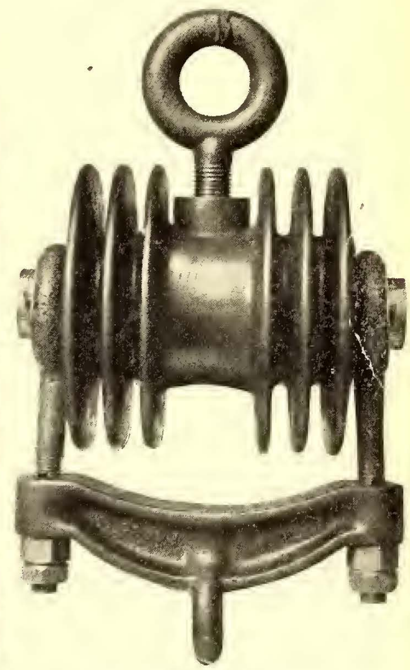


FIG. 7.—STRAIN INSULATOR FOR DEADENING CABLES

### ANCHOR BRIDGES

Anchor bridges of especial heavy construction are placed every 2 miles, and against these bridges the catenary cables are anchored. Fig. 2 gives a view of a standard four-track anchor bridge with the auxiliary apparatus mounted upon it. The four-track anchor bridge consists of two A-shaped posts, each having a spread at the base of 15 ft., and a width at right angles to the track of about 2 ft. The main members of these posts consist of 6-in. x 4-in. x 5/8-in. angles. These posts are also extended above the truss in the manner shown in the illustration for the purpose of carrying the feeder wires. The truss is bolted to the side posts, allowing

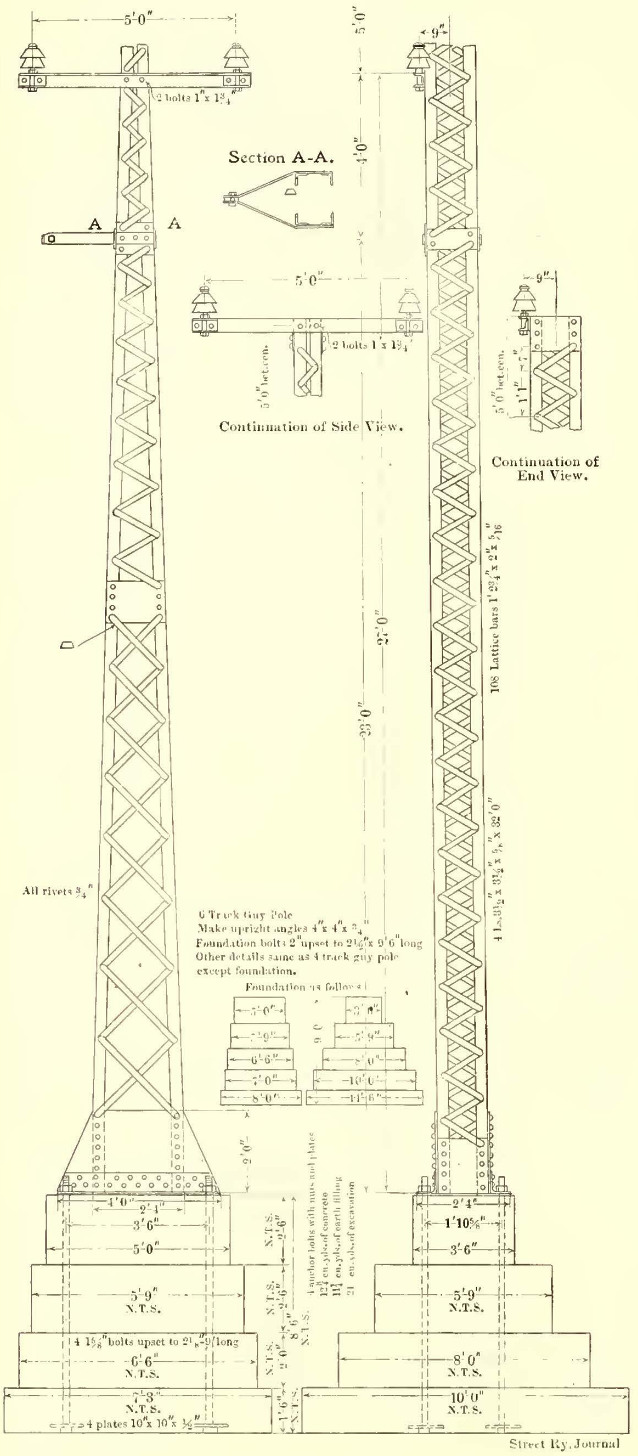



FIG. 8.—DETAILS OF RIGID GUY POLE

a clearance above the rails to the lower side of the truss of 24 ft. 3 ins. The truss is 4 ft. 6 ins. deep by 5 ft. wide between the backs of the chord angles. The upper chords consist of 8 in. x 8 in. x 9/16 in. angles, and the lower chords consist of 4 in. x 3½ in. x 9/16 in. angles.

Fig. 3 represents the side view of the anchor bridge, and Fig. 4 a plan view of the same bridge from which additional details of the construction may be noted. A ladder is provided on one of the posts leading to a small platform at the end of the truss. This platform is provided with a hand rail and carries upon it a box containing an 11,000-volt, low-equivalent lightning arrester. A portal is furnished in the end of the truss, by means of which the attendant may step onto the platform supported upon the lower chord of the truss. From this platform access is provided to the short ladders leading to the signal lanterns, and a second short ladder extending up to another 2-A platform supported upon the upper chord of the truss. This platform, a view along which is given in Fig. 5, is surrounded by a

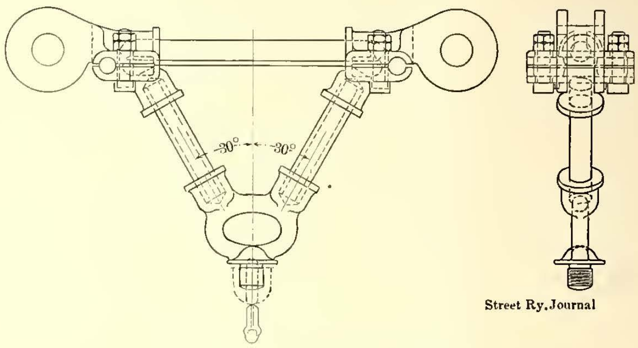



FIG. 10.—PULL-OFF HANGER

hand rail, which is also attached to the iron-supporting frames of the circuit breakers in such a manner that the attendant can in no way come in contact with live parts of

FIG. 11.—INSULATING SEPARATOR

the circuits. At each end of the truss a 5-kw 11,000-volt shunt transformer is provided, one of them being connected directly into a bus-bar which runs around the outside of

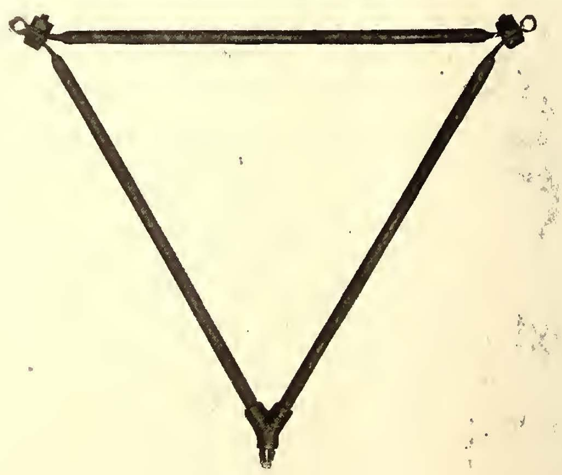


FIG. 12.—TROLLEY HANGER

the circuit breakers and which is supported upon porcelain insulators and bus-bar brackets, secured to the upper chords of the truss. The other transformer is connected directly into one of the "power" feeders. As the "power" feeder is connected to the third phase of the generating system, means are available for operating the switches in case of accident to the trolley section. The four-track anchor bridge is secured to concrete foundation by means of long anchor bolts and nuts. Each post rests upon blocks of concrete, each block containing about twelve cubic yards of concrete.

CATENARY CABLES

Each of the two catenary cables which support the copper trolley conductor consists of an extra high-strength steel cable, 9/16 in. in diameter, consisting of seven strands. This steel has an ultimate strength of about 200,000 lbs. per square inch, and each strand is heavily galvanized. The completed cable has a total strength of 33,800 lbs. These cables are strung between the bridges with a sag at mean temperature of 6 ft. in a standard span of 300 ft. Owing to obstructions at certain places along the right of way, the spacing of the bridges is occasionally varied from the standard distance of 300 ft. In order to allow for this the cable is run out in long lengths and is pulled up to a uniform tension until the sag in the span of 300 ft. is 6 ft. The sag in the other spans is allowed to adjust itself, since the tension is the same. After being pulled up to the proper tension the catenary cables are anchored to the anchor bridges and are clamped to the insulators of the intermediate bridges.

MAIN-LINE INSULATORS

The insulators which support the catenary cables of the intermediate bridges consist of heavy porcelain insulators of the skirt type, which are 15 ins. in diameter and about 7 ins. high. These insulators are cemented upon short lengths of double, extra strong pipe, which in turn is held by means of U-bolts to a cast-iron yoke, bolted to the upper chords of the truss. The catenary cable rests in a groove in the top of the porcelain and is held by means of a malleable-iron clamp fitted with U-bolts and placed one on each side of the insulator. The head of the insulator is conical in shape and is surrounded by means of a split malleable-iron clamp and a lead packing. Fig. 6 represents the main line insulator complete with its supporting yoke.

One feature of the construction to be noted is the arrangement of the clamp and the collar, which is such that in case of the breakage of the messenger cable on one side of the insulator, the pull of the cable on the other side will cause the clamp to swing downwards, thereby lowering the point of application of the pull of the cable. Thus the porcelain is put in compression, and there is no tendency to shear off the top of the porcelain, as is usually the case with porcelain line insulators. Each porcelain is subjected in the shop to a test of 55,000 volts when assembled.

ANCHOR BRIDGE STRAIN INSULATORS

Fig. 7 represents the general appearance of the strain insulators which are used for dead-ending the catenary cables at the anchor bridges. These insulators, which are of special construction, are designed to withstand a shop test of 50,000 volts and a working load of 20,000 lbs. Each consists of a length of 2 in. extra heavy iron pipe, surrounded at its middle point by an iron collar. Outside of this collar a long insulating tube, composed of especially hard and reliable insulating material, is pressed. This tube is surrounded by a second collar into which a bolt is screwed and to which turnbuckle of the catenary cable is attached. The entire surface of the insulating tube and the inner and outside collars are then effectively sealed against moisture by means of a high-grade insulating compound applied by means of hydraulic pressure. The insulator thus made up is supported by means of an iron yoke from cast-iron hooks bolted to the upper chords of the anchor-bridge truss.

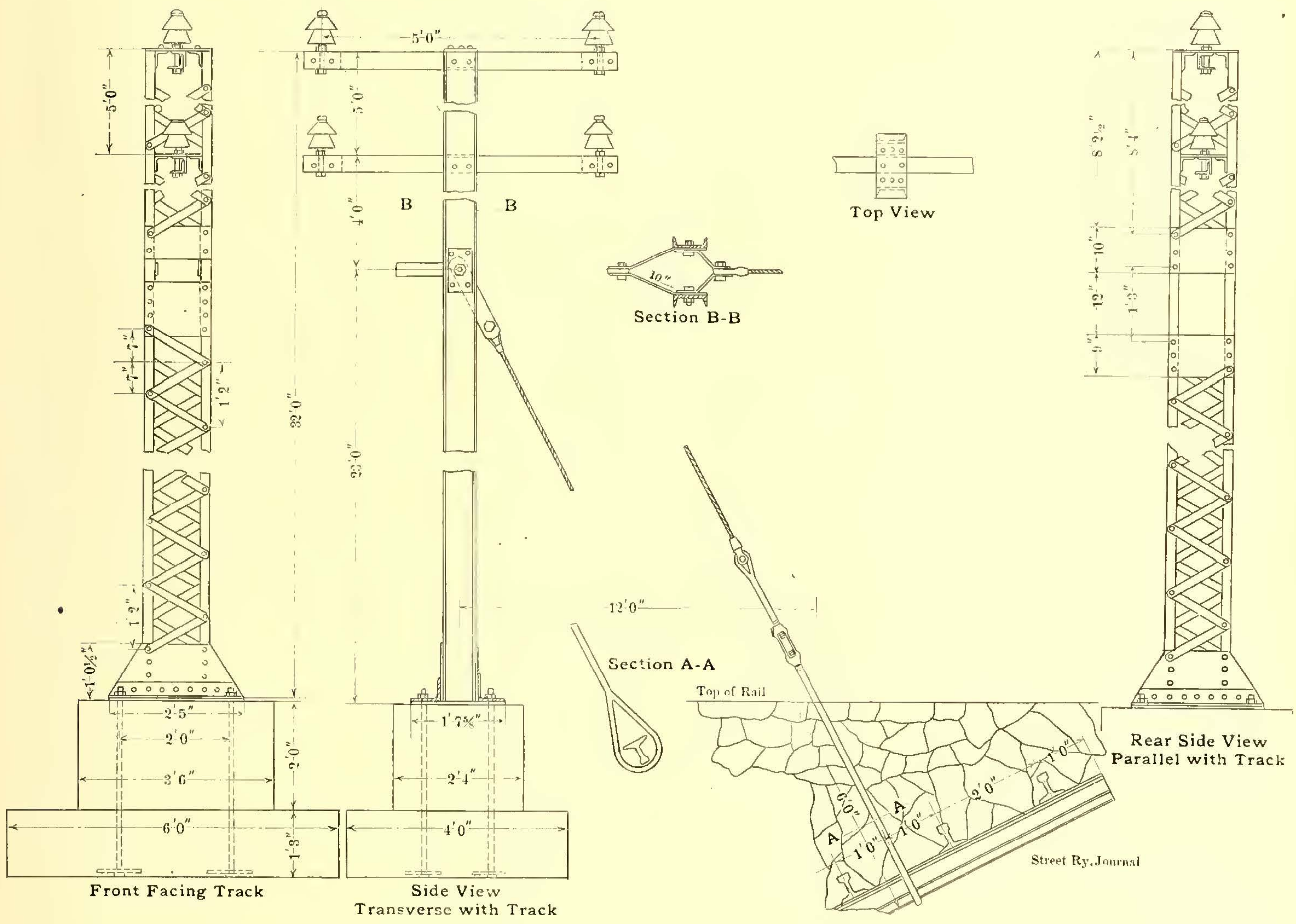



FIG. 9.—DETAILS OF ANCHORED GUY POLE

One of these insulators is provided in each catenary cable at each anchor bridge, thereby electrically dividing the road up into separate sections between the anchor bridge.

GUY POLES

Midway between the supporting bridges and curves a guy pole is located on the outside of the curve. These guy poles are of two types, namely, rigid and anchored, the former being used wherever there is room on the right of way for the anchorage, while the latter is used in places where the width of the right of way is restricted. Fig. 8 represents the rigid pole, and Fig. 9 indicates the type of anchored guy pole. A pole of the latter type is seen in place in Fig. 1.

Heavy strain insulators are attached to the guy poles at the proper height, and pull-over wires are attached to this strain insulator and to the catenary cable and trolley wires of the several tracks.

GUY-POLE STRAIN INSULATOR

This insulator is somewhat similar in appearance to the well known "giant strain," except that it is designed to withstand a test of 50,000 volts, and a mechanical pull of 15,000 lbs. It is made up of steel castings and solid mica insulating cones and is sealed with a high-grade insulating compound. These strain insulators are attached by means of one loop in the guy poles, and the pull-over wires are attached to the other loop.

PULL-OVER HANGER

At the points where the pull-over wires are attached to the catenary span (Fig. 1), a triangular hanger of heavy construction is provided. The character of this hanger, which is indicated by Fig. 10, consists of malleable-iron clamps, which are attached to the two catenary cables, and into which short lengths of heavy pipe are threaded. At the lower end of the triangle is provided a malleable-iron casting, which is threaded into a heavy bronze clamping ear which is attached to the trolley wire. Loops are provided as shown for attaching the pull-over wires in such a manner as to hold the trolley wire directly under the catenary cables.

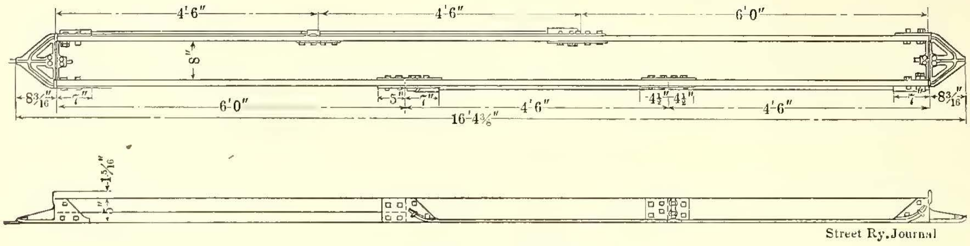
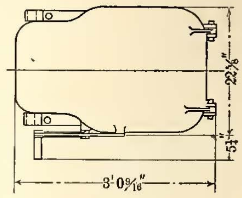



FIG. 13.—SECTION INSULATOR



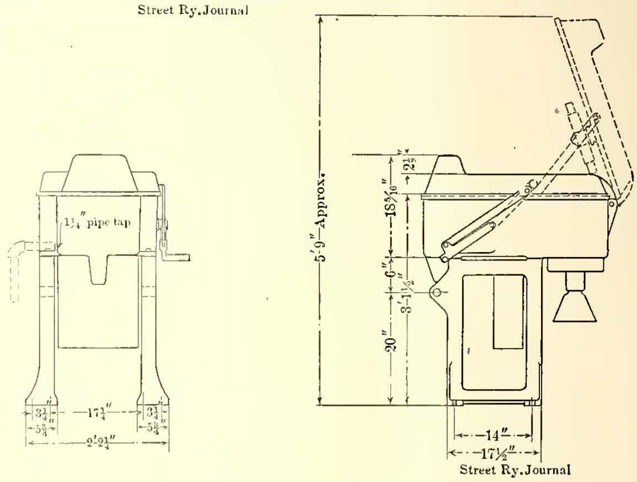



FIG. 14.—OIL CIRCUIT BREAKER FOR BRIDGES

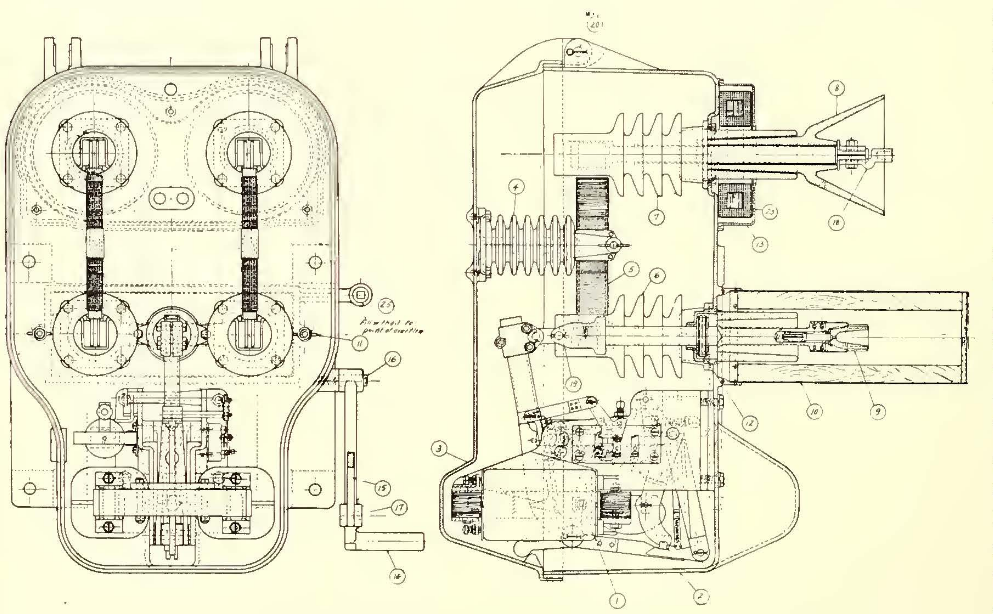


FIG. 15.—DETAILS OF OIL CIRCUIT BREAKER

INSULATING SEPARATORS

In order to enable any one track to be electrically disconnected from any other parallel track when the circuit breakers on the anchor bridges are open, insulating separators are provided in the pull-over wires between the tracks (see Fig. 1.) The appearance of these is shown by Fig. 11. They consist of 5-ft. rods of selected hickory, thoroughly impregnated and fitted at the ends with malleable-iron heads secured to the conical-shaped heads of the rods by means of bolts. Each insulator has an ultimate strength of about 16,000 pounds. At no point in the entire construction is wood relied upon for insulation to ground, and it will be noted that these wooden separators normally have no difference of potential upon them. They are merely provided in case of accident, when it is necessary to isolate one section of track from another. They are, however, subjected to a test of 30,000 volts.

TROLLEY HANGERS

The trolley wire is supported from the catenary cables at

10-ft. intervals by means of triangular trolley hangers of varying lengths. These hangers are so adjusted in length that the trolley wire is maintained in a horizontal position (Figs. 1 and 2), it being 6 ins. below the catenary cables at the middle point of the span. The appearance of a hanger is shown in Fig. 12. It consists of a pair of small drop-forged steel jaws, which engage with the grooves of the trolley wire and are clamped by means of a malleable iron Y, which is screwed down upon the threaded portions of the jaws. The sides of the triangle are then screwed into the Y and are bolted to the messenger cable above. As all of the threads are right handed, it is impossible for the hanger to come loose.

### TROLLEY SECTION BREAK INSULATORS

At each anchor bridge it is necessary to provide an insulator in each trolley wire, and this is accomplished by means of the piece of apparatus shown in Fig. 13. Each consists of two bronze end castings, to which the ends of the trolley wire are bolted. Two parallel sections of impregnated hardwood are fastened to these castings, and to these wooden strips are fastened renewable pieces of trolley wire in such a manner that the ends of these renewable pieces overlap one another in distance along the track, although the two wires are electrically distinct. By this means it is possible for the sliding contact on the locomotive to pass from one section to the next without opening the circuit, thus avoiding all flashing. It will be noted, however, that an effective insulation is provided so that when the circuit breaker on the anchor bridge is open, the two sections will be disconnected. The manner in which this section insulator is installed is clearly shown in the end view of the anchor bridge, Fig. 3. Insulators in place under an anchor bridge are shown in Fig. 2.

### LOW-BRIDGE CONSTRUCTION

This construction consists of a corrugated porcelain spool, mounted on a length of gas pipe, which in turn is supported at each end from a skirt type porcelain insulator of the same design as that used on the intermediate bridges. An insulating support of this character is mounted on each side of the overhead bridge and is located so that it will receive the washing effect of rainwater and be kept clear of soot accumulation.

The messenger cables, where they pass under the bridges, are heavily insulated and are secured to the porcelain spools just described. The trolley wire is suspended from the messenger cables by means of hangers, constructed of impregnated hardwood, so that the trolley wire is isolated from the catenary cables.

A waterproof shield above the cables prevents the accumulation of dirt and water upon them.

### TROLLEY WIRE

The trolley wire consists of standard No. 0000 B. & S. gage grooved copper.

### AUTOMATIC CIRCUIT BREAKERS

Fig. 14 represents in outline the type of circuit breaker which has been developed for this installation, while Fig. 15

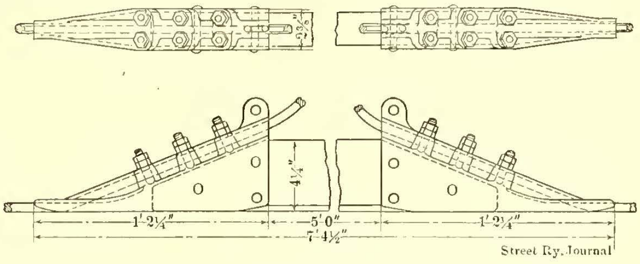



FIG. 17.—SECTION INSULATOR FOR TURNOUTS

gives the details of the device, and Figs. 2 and 5 show the breakers in place on anchor bridges.

The breaker consists of a cast-iron framework adapted to be bolted to channel irons resting upon the upper chords of the anchor bridges. This framework carries an iron box provided with a hinged cover. This cover is arranged to fit tightly in place so as to exclude all rain and snow and be entirely weather-proof. The moving parts of the circuit breaker are contained within this box and are made especially rugged and reliable in their operation. The terminals of the switch are brought out through specially constructed insulators mounted in an overhung portion of the box at the rear (Fig. 15). Upon the tops of insulators are carried knife-switch jaws, and there are corresponding jaws mounted on the upper ends of the circuit breaker contacts. Two switch blades are carried on insulating pillars fastened to the hinged cover of the box in such a manner that when the cover of the box is closed one terminal of the switch is connected to the bus-bar on the anchor bridge and the other is connected to the trolley wire. Arrangements are provided so that if the cover is opened the circuit breaker will be automatically tripped so as to prevent any possibility of the attendant taking hold of live parts.

The circuit breaker is capable of handling 11,000 volts on heavy, short circuit. A tripping coil is provided, together with closing magnets, both of which are operated from a circuit supplied from the small shunt transformers on the

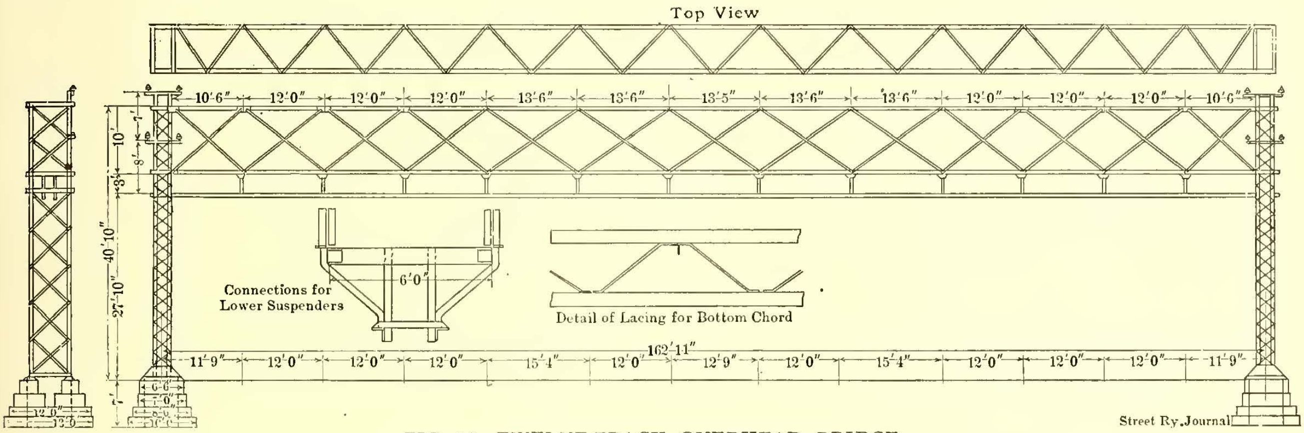



FIG. 16.—TWELVE-TRACK OVERHEAD BRIDGE

anchor bridge. The switch is also arranged to open automatically on overload.

The control wires for the closing magnets and the tripping coils are carried in iron conduit and lead-covered cable to the adjoining signal tower, where a switchboard panel is provided. This panel is fitted with switches so that any circuit breaker may be tripped by hand, or closed by the attendant in the signal tower. There is also a switch by means of which the attendant may connect either of the shunt transformers on the anchor bridge to the control circuit.

AUXILIARY FEEDERS

The auxiliary feeders, which are supported on the inner insulators of the lower bracket arm on the bridges, are looped in to the bus-bars on each alternate anchor bridge. These connections are made through automatic circuit breakers, so that in case of the grounding of the bus-bar structure to any anchor bridge, one of the auxiliary feeders will pass around the grounded bridge to the next section beyond. On each anchor bridge one auxiliary feeder is broken by a strain insulator, and connections are made through circuit breakers to the bus-bar. The other auxiliary feeder is carried directly through, and a single tap connection is made from the feeder through the circuit breaker to the bus-bar. Upon the next bridge these conditions are reversed, so that each auxiliary feeder is divided into 4-mile sections. This arrangement provides a maximum flexibility of control.

YARD CONSTRUCTION

At a number of points along the road, where there are numerous side-tracks, it is necessary to provide extra long bridge supports. Fig. 16 represents one of these long bridges, which is designed to cover twelve tracks. The catenary cable insulators are attached to the lower member of the truss.

TRACK BONDING

Both rails of all tracks are bonded by means of No. 0000 compressed terminal flexible bonds placed around the fishplates.

TURN-OUTS AND CROSS-OVERS

Whenever one track diverges from another a section insulator shown in Fig. 17 is inserted in the trolley wire. Insulators like Fig. 11 are inserted in the catenary cables supporting the diverging wire between parallel tracks. The diverging trolley wire is connected to the main wire by means of a frog of standard design, and in order to prevent the contact shoes on the locomotive from catching, deflector wires are placed in the angle between the trolley wires. These deflectors are carried by yokes scured to the trolley wire and to a yoke at the rods fastened to the catenary hangers. These deflectors are raised at each end so that the collector shoe cannot catch on them. The arrangement is shown in Fig. 18, the details being given in Fig. 19. There being a certain amount of flexibility in the overhead trolley system, when the bow is pressed upward against the contact wire, this wire is raised above the level of the other contact

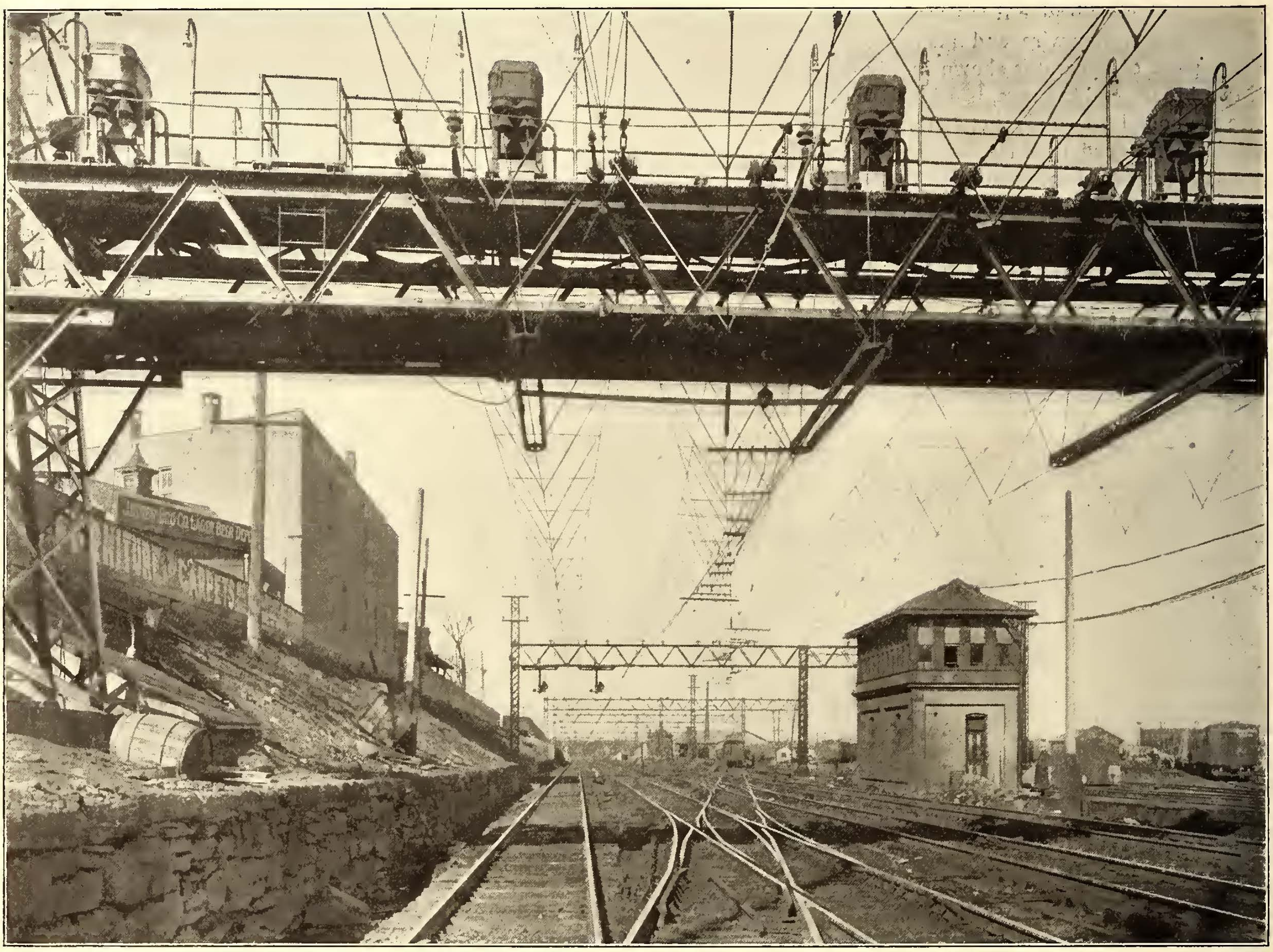


FIG. 18.—DEFLECTOR WIRES IN PLACE BETWEEN THE MAIN TROLLEY AND CROSS-OVER TROLLEY

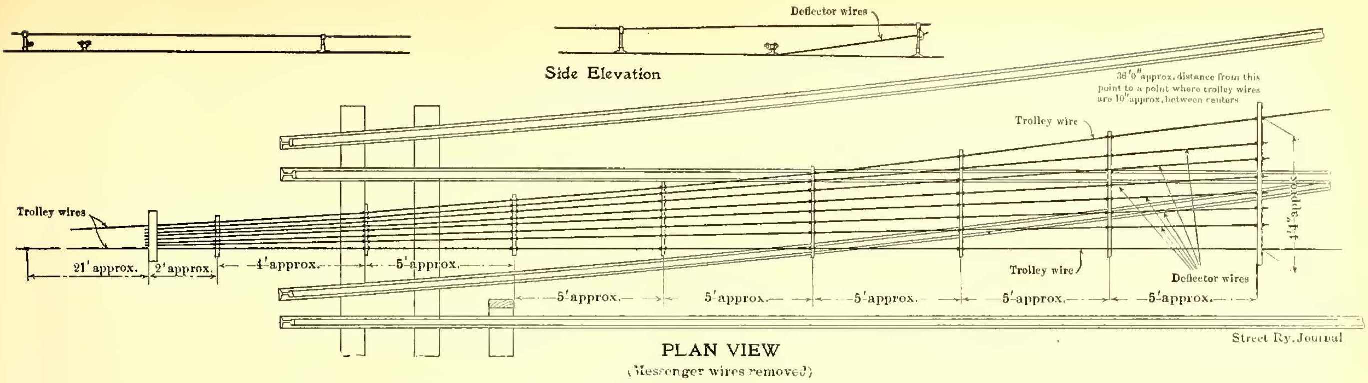



FIG. 19.—OVERHEAD CONSTRUCTION AT TURNOUTS

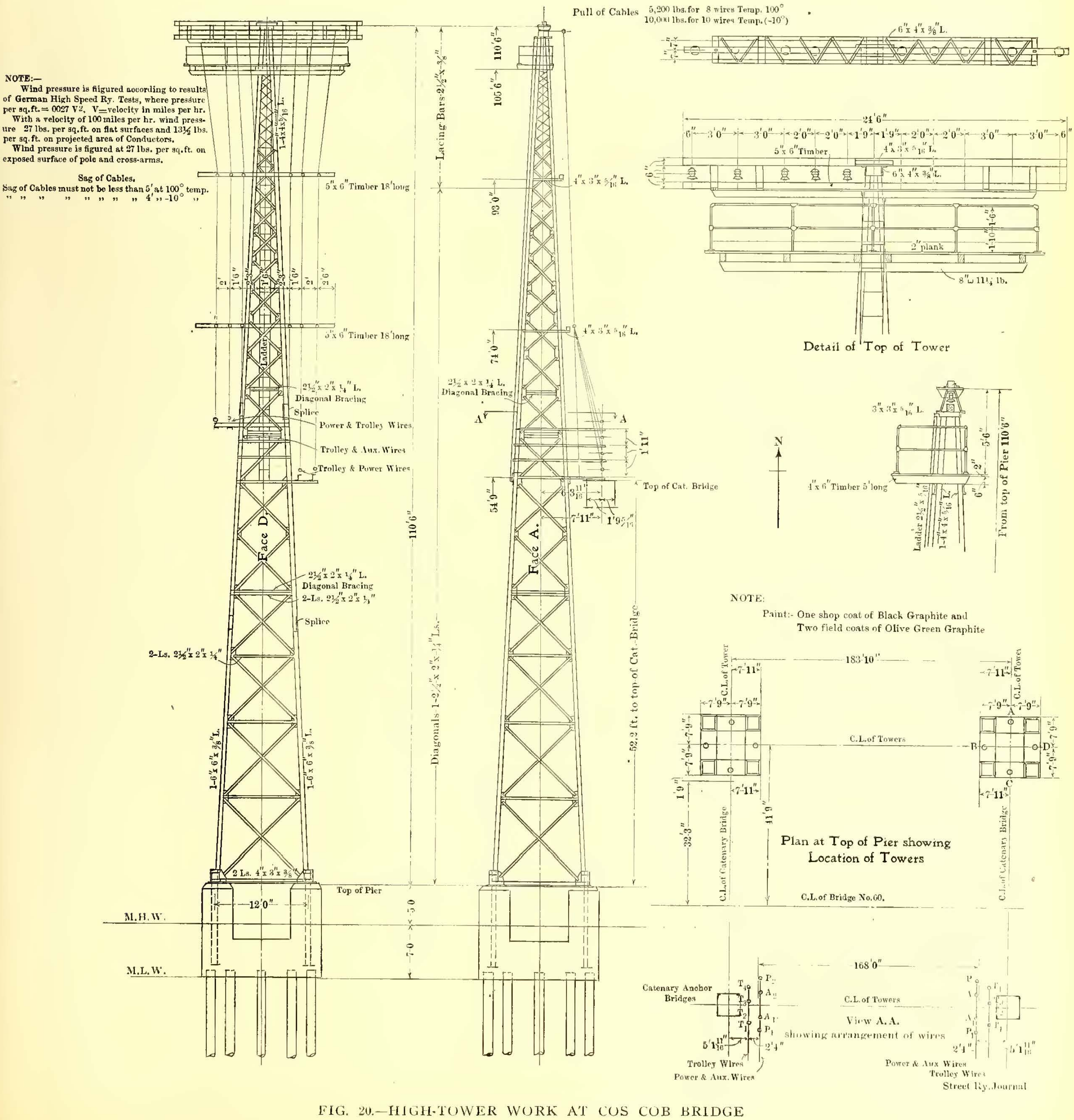



FIG. 20.—HIGH-TOWER WORK AT COS COB BRIDGE

wires in the immediate neighborhood. Thus, certain portions of the short length of trolley wire used to interconnect the two main trolley wires at cross-overs would tend to remain in a plane below that of the active trolley wire as the locomotive passed this point. The deflector wires are designed to tend to cause the cross-over trolleys and the main trolley to be raised partly in unison by decreasing the upward movement of the main trolley and increasing the upward movement of the cross-over trolley. The contact bow of the trolley mechanism on the locomotive is given a certain amount of upward curvature towards the center, so that the bow has no tendency to catch in either the cross-over trolley wires or the intermediate deflector wires.

### DRAW-BRIDGE CONSTRUCTION

An interesting piece of special work is indicated in Fig. 20, which shows side and end views and constructive details of extra high steel towers used at the Cos Cob draw-bridge. These towers enable the transmission and trolley wire circuits to be elevated about 115 ft. above the high-water level when crossing the stream at the point mentioned.

### LOCOMOTIVES

Two longitudinal sections, with key of parts, of the locomotive used are published on the inset between pages 246 and 247. Further details of these machines will appear in an early issue of this paper, together with an account of the power station at Cos Cob, from which the power for the alternating-current section of the line is obtained.

### CONTRACTORS

The contractors for the electric locomotives, catenary construction and turbo-generators used in the power stainto were the Westinghouse Electric & Manufacturing Company, and for the rest of the power house equipment and power station itself, Westinghouse, Church, Kerr & Company.

## NOTES ON THE SYDNEY, NEW SOUTH WALES, GOVERNMENT TRAMWAYS

The street tramways of the State of New South Wales are owned by the Government and operated by a Chief Commissioner for Railways and Tramways, with an Assistant Commissioner for Railways and an Assistant Commissioner for Tramways appointed every seven years to manage both railways and tramways. The tramways are not subject to municipal control or rates.

The tramways were opened in 1879 and were worked by steam motors. In 1886 and 1894 short cable lines were installed. In 1890 the first electric line was equipped, and within the last five years the whole system in Sydney and suburbs has been converted to overhead electric traction. The single track mileage is: Electric, 137; steam, 18. Steam systems are also worked in Newcastle (19 miles) and Broken Hill (6 miles). A number of electric extensions, both on the city and country lines, are about to be put in hand.

All lines are divided into fare sections averaging 2 miles in length, the fare for which is 1 penny. Children under twelve years are carried three sections (say 6 miles) for 1 penny, and on the first inward car each morning, workmen are carried two sections (say 4 miles) for 1 penny. Transfers are not granted. Conductors are provided with a case holding ten different books of tickets, each book holding 250 numbered tickets. A ticket is issued to each passenger on payment of fare, and conductors enter commencing number of tickets on a trip sheet each trip. Officers are employed to check the numbers of passengers' tickets with the conductors' sheets.

The rails used are 83 lbs. girder, and 60 and 80 lbs. "T." The maximum grade is 1 in 8½, the minimum curve 40 ft., and the gage 4 ft. 8½ ins. A considerable portion of the busiest track is "Thermit" welded.

The power plant comprises seven direct-connected G. E. generators, total 7900 kw, driven by seven Allis engines, and one Parsons turbo-generator of 1750 kw. The management has also ordered two 5000-kw Parsons turbo-generators. There are forty-eight Babcock & Wilcock 350-hp boilers with chain-grate stokers. The cost of power production per kw-hour is 0.638d., including interest. Besides the power house there are seven car houses, seven sub-stations and four battery houses, repair shops and a large permanent way depot.

The rolling stock comprises 685 motor cars, fifty-one trailers, forty-two service cars, sixty-eight steam motor cars and seventy-six trailers. The present total is 922, but sixty cars have been ordered to take care of increased business on the present lines and also for several extensions under way. The seating accommodation varies from twenty-six to seventy passengers. The fifty and seventy-seat cars have cross-seats and side doors. A large number of motor cars are run in pairs, and in some cases draw a seventy-seat trailer. Brill and McGuire trucks are used with General Electric and Westinghouse motors. All cars are fitted with power brakes and automatic fenders. The running of the cars is checked by Bundy time recorders, stationed along the routes, and all lines are controlled by a staff and ticket system.

The employees number 4133 and work 8 hours a day for six days a week. The running staff is provided with uniforms free, and the motormen are provided with seats. The daily rates of pay are: Conductors, 6s. 6d. to 7s. 6d.; motormen, 7s. 6d. to 8s. 6d. Conductors are promoted to motormen.

For the year ended June 30, 1906, the number of passengers carried was 145,262,799; the revenue, £851,483; the working expenses, £665,083; the car-miles, 17,734,008, and the consumption of power, 32,315,754 kw-hours.

The general management of the tramways is under T. R. Johnson, Chief Commissioner for Railways and Tramways; D. Kirkcaldie, Assistant Commissioner for Railways, and H. Richardson, Assistant Commissioner for Tramways. The traffic superintendent is John Kneeshaw; electrical engineer, Orlando W. Brain, and permanent way engineer, George R. Cowdery.

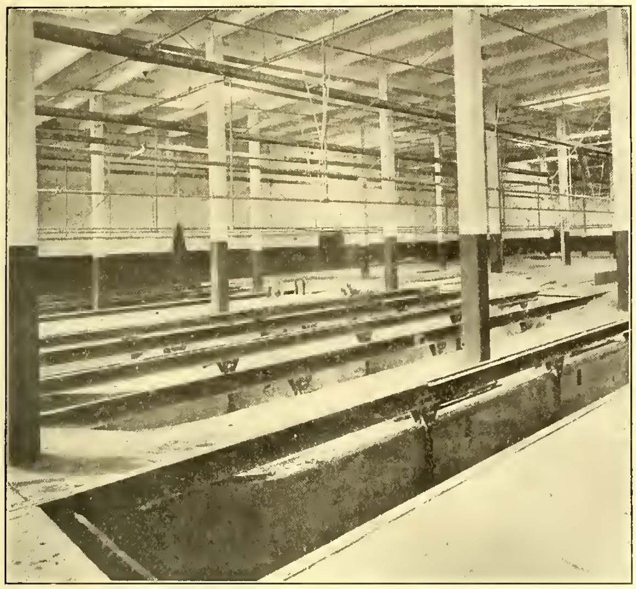
R. J. Fleming, manager of the Toronto Railway Company, recently issued an order which will obviate the future delay of cars on his system by parades and processions, which, it is stated, will be appreciated by the traveling public who have trains to catch or important engagements to fulfil. The order is as follows: "Motormen and conductors are notified that they must at all times bear in mind that the cars have the right of way over all other traffic, and that no traffic, whether vehicular or pedestrian, has any right to stop or impede the proper operations of the cars. * * * The employees are instructed, in the event of any obstruction being offered by anyone in connection with any parade or procession, to secure the names of such persons and witnesses, and make a full report to the office."

## THE EDMONDSON AVENUE CAR HOUSE OF THE UNITED RAILWAY & ELECTRIC COMPANY OF BALTIMORE

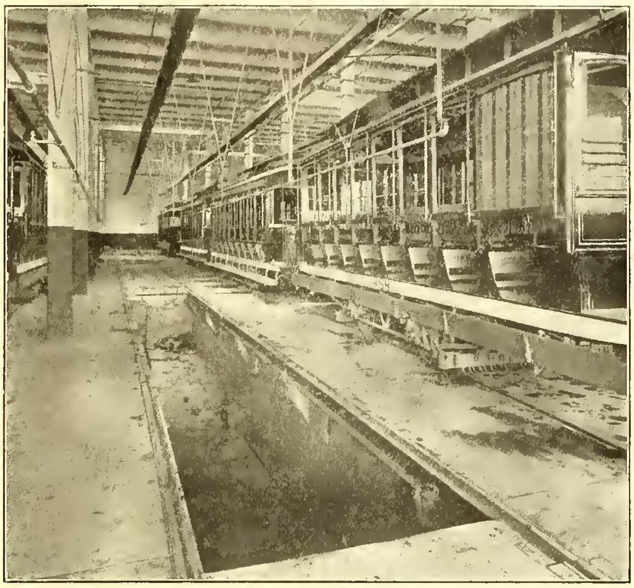
The Street Railway Journal of Feb. 2, 1907, contained plans and a preliminary description of the Edmondson Avenue car house, but as the building is now in service the accompanying outside and inside views may also be found of interest.

The exterior illustration shows the military appearance of the new car house very well. The construction is of round-bar reinforced concrete with wire-glass sash and slag roofing. The floor is also of concrete, but as shown in one of the pit views slag blocks are laid adjacent to the rails to prevent cracking.

As mentioned in the earlier article, the pits in the car house are furnished with either flush or depressed aisles, the latter being preferable for work alongside the trucks, compressor, etc., while the flush aisles are more convenient for armature changing. Both types of pits are clearly shown in the accompanying illustrations.



SOME OF THE DEPRESSED AISLES IN THE EDMONDSON AVENUE CAR HOUSE



TYPE OF FLUSH-AISLE CONSTRUCTION IN THE EDMONDSON AVENUE CAR HOUSE

VIEW OF THE EDMONDSON AVENUE CAR HOUSE OF THE UNITED RAILWAYS & ELECTRIC COMPANY, BALTIMORE, ILLUSTRATING THE MILITARY EXTERIOR

## THE PITTSBURG & BUTLER STREET RAILWAY CO.—II.

BY M. N. BLAKEMORE

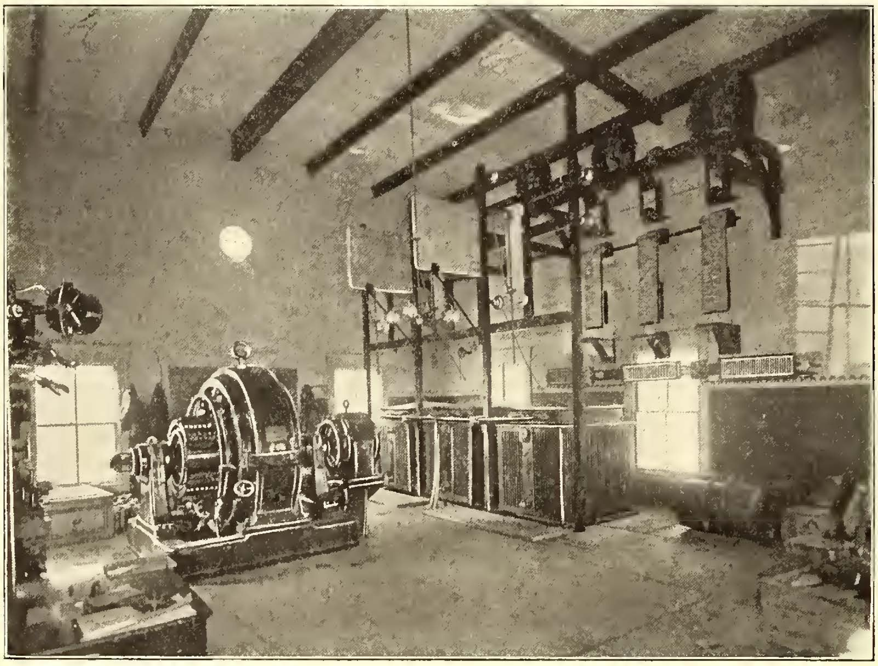
Last week an account was published of the power station of the Pittsburg & Butler Street Railway, lately built and equipped with the single-phase system. A description of the remainder of the equipment follows:

### SUB-STATIONS

At the present time two static transformer stations have been installed approximately 12 miles apart; one at Mars, which is practically the middle of the system, is shown in the illustration, while the other is at Bryant, near the Pittsburg terminus of the road. In the former station there is mounted one 500-kw oil-insulated, self-cooling transformer, having a ratio of 22,000/6600 volts, but at present operated with a secondary voltage of 3300 volts. In the Bryant station there are two such transformers connected in parallel.

The high-tension sides of these transformers are controlled by means of fused circuit breakers separated by marble barriers. Low-equivalent lightning arresters and choke coils effectually protect the high-tension lines from lightning discharges. The low-tension sides of the transformers are controlled by means of oil circuit breakers, the same being mounted upon small blue Vermont marble panels supplied with suitable gas-pipe framework.

The two sub-station buildings are practically identical in construction, with the exception that the one at Bryant, in addition to forming a protection for the static apparatus, also includes a small waiting room. The same style of architecture has been followed in the construction of these sub-stations as is used in the other buildings of the company. The high-tension leads are carried into the sub-stations in the same manner as provided for in the power house.

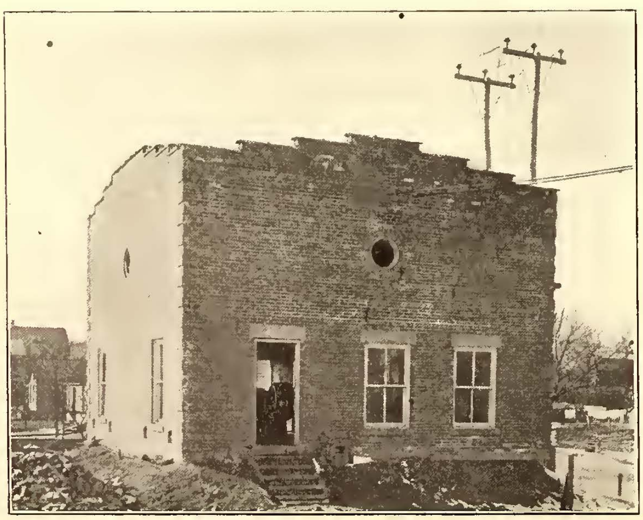


INTERIOR OF BUTLER ROTARY CONVERTER SUB-STATION

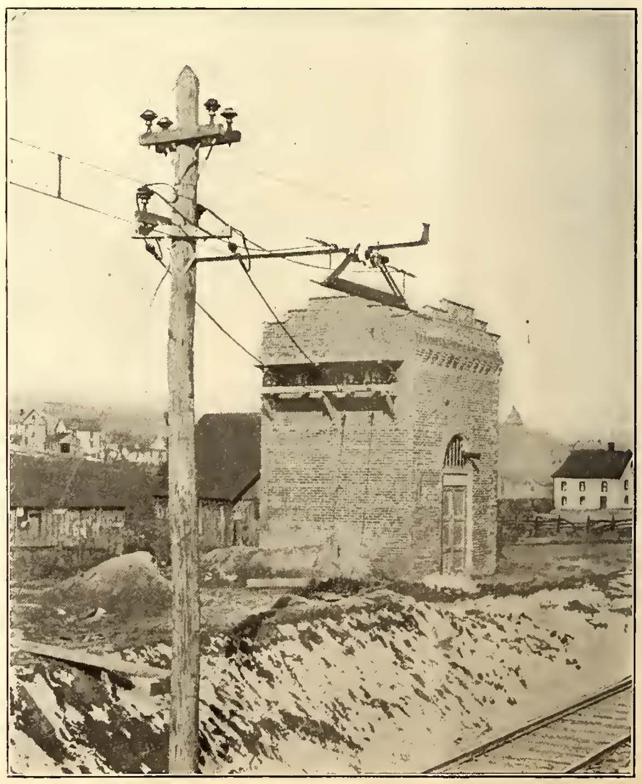
To supply current for the local trolley system in Butler, a rotary converter sub-station has been installed at that place. This station, as shown in the illustrations, includes, in addition to similar high-tension switching and protective apparatus, three 200-kw, 22,000/334-volt transformers. The station also includes one 500-kw, 550-volt direct-current Westinghouse rotary converter, together with a three-panel blue Vermont marble switchboard, which has mounted upon it a full complement of instruments and switches for the control of both the alternating and direct-current sides of the rotary converter, and for two outgoing direct-current feeder circuits. A Wurts tank lightning arrester has been installed to protect the direct-current feeder circuits.

### TRANSMISSION AND TROLLEY LINES

The high-tension circuits are carried from the power house to the transmission lines on Locke insulators mounted on

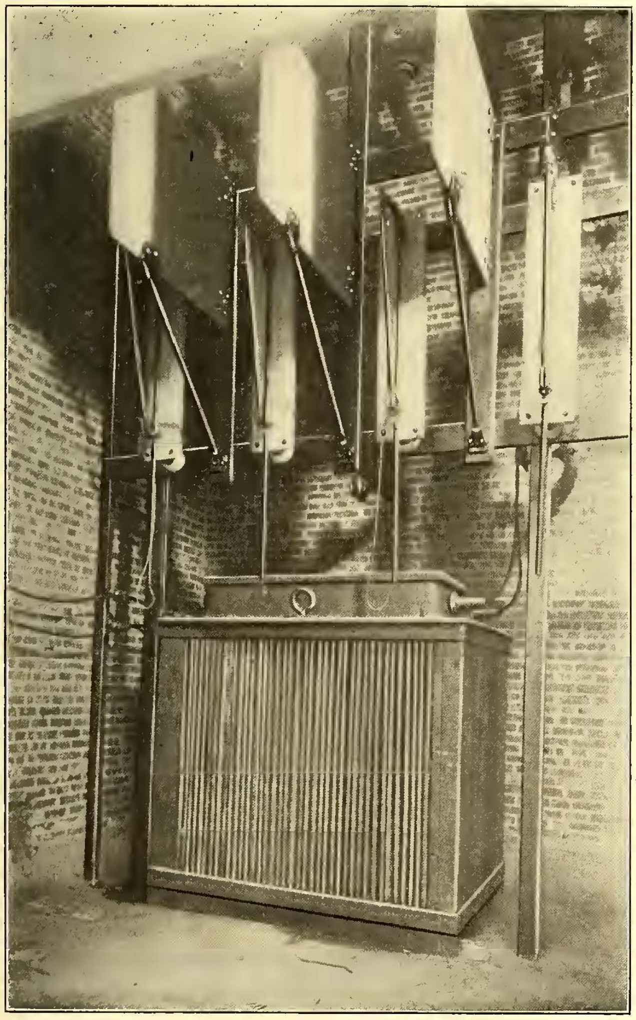


EXTERIOR OF BUTLER ROTARY CONVERTER SUB-STATION



EXTERIOR OF MARS STATIC SUB-STATION

wooden cross-arms securely fastened to two wooden poles, as shown in an engraving in Part I. From a point opposite the power house the transmission lines extend in both directions, the 22,000-volt single-phase line running in one direction and feeding the two static sub-stations at Mars and Bryant, while a three-phase, 22,000-volt feeder extends to Butler for supplying current to the rotary converter at that point. The transmission lines consist of No. 4 hard-drawn bare copper wire, secured to Locke insulators fastened to the tops of the same poles supporting the catenary trolley wires. Wherever the high-tension wires cross telegraph lines or public highways, large wire nettings have



INTERIOR VIEW OF MARS STATIC SUB-STATION

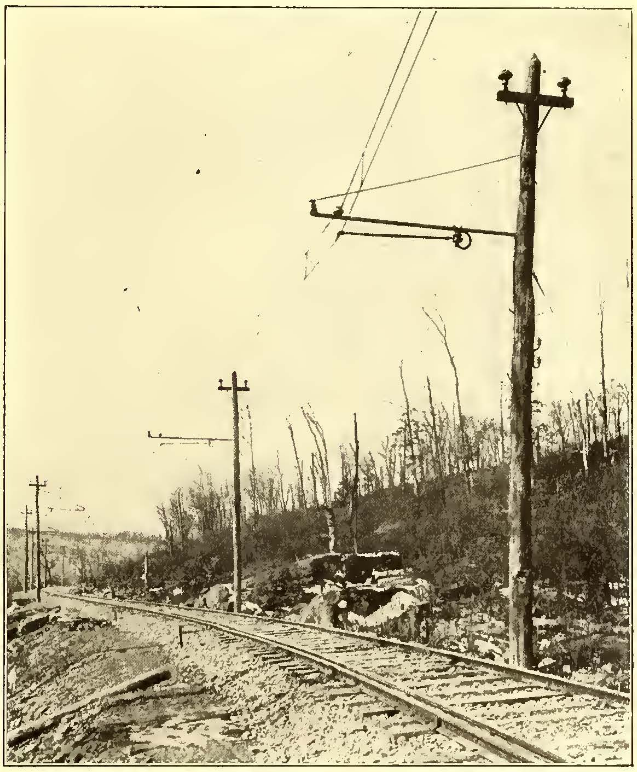
been suspended below them to prevent accidents due to the breakage of the high-tension wires.

The trolley construction is of the single catenary skirt type and has been designed for a pressure of 6600 volts. The trolley is No. 000 grooved wire, and is suspended from a 7/16-in. seven-strand galvanized steel messenger cable by means of galvanized-iron trolley hangers, spaced approximately 10 ft. apart. These hangers consist of short lengths of pipe threaded at one end and flattened and punched at the other. The threaded end engages in a socket which fits over the threaded portion of two drop-forged steel lugs, which engage in the groove of the trolley wire. The punched end of the hanger is secured to the messenger cable by means of a strap-iron clamp bolted to it.

On straight tracks the poles are spaced 120 ft. apart, but on curves this spacing has been reduced in proportion to the degree of curvature. The trolley wire is suspended from standard T-iron bracket arm at an average height of about 19 ft. above the top of the rail. One end of the bracket arm is secured to a 35-ft. chestnut pole by means of iron straps bolted to the bracket and fastened by lag screws to the poles.

SINGLE CATENARY CONSTRUCTION ON TANGENT

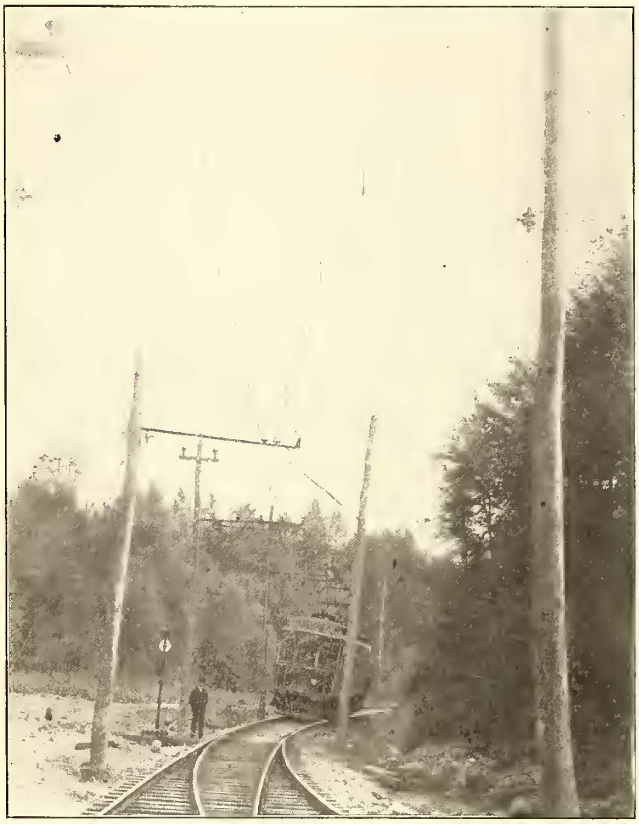
The other end of the bracket is supported by means of a round iron tension rod passing through the pole and secured to the bracket by a malleable iron lug. The messenger cable is supported from these brackets on porcelain main-line insulators which are cemented upon malleable iron supports arranged to clamp upon the T-iron bracket arms. The insulators are placed on the bracket arms in such a manner as to give a gradual staggering of the wire



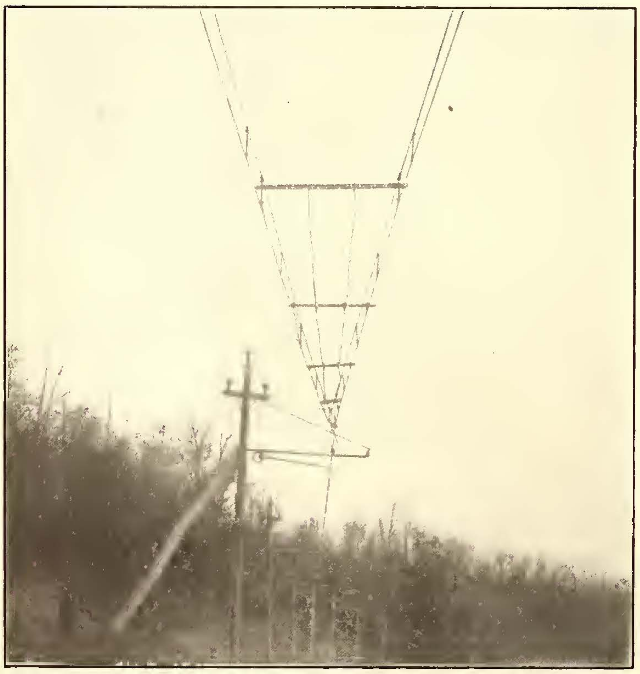
SINGLE CATENARY CONSTRUCTION ON CURVE

from a point 8½ ins. on one side of the center of the track to a point 8½ ins. on the other side at intervals of 1000 ft. or so. This is done to distribute the wear on the sliding contact trolley shoes.

At all points of support on curves, and also at frequent intervals on straight track, a steady strain is used to keep the trolley wire exactly under the messenger cable to prevent swaying owing to the passing of cars. To insure the passing of the sliding contact shoe over turnout switches, a special form of deflector, illustrated on this page, has been provided. This deflector consists of pieces of trolley wire held in place by clamps, the ends of the wires being elevated. The construction is such that the sliding contact trolley shoe is properly diverted from one trolley wire to the other without engaging between the two at the junction of the two wires. At one or two spurs along the road this deflector scheme has been somewhat modified—this is shown in the illustrations—but at regular turnouts the above described method has been followed out.



MODIFIED DEFLECTOR SCHEME AT SPUR

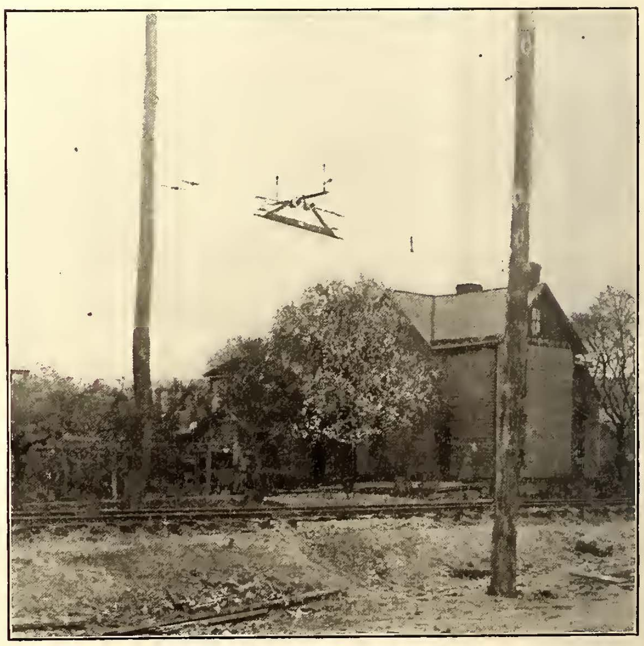


DEFLECTOR SCHEME AT TURNOUT

Section-break insulators are used at several points, and that installed at the Butler end of the single-phase line, where it joins the direct-current feeder of the local traction line is shown in an accompanying illustration. A similar insulator is installed at the Pittsburg terminus of the road. When crossing bridges the trolley wire is suspended by means of bracket arms and insulators secured to steel arches erected upon the bridge structures. The high-tension transmission wires are carried on cross-arms, secured to these same arches. At other points along the line, the high-tension wires are carried on the wooden poles as previously explained. In addition to the high-tension wires, the trolley poles also support the wires for the telephone system used in connection with the dispatching of trains. No trouble has been experienced due to static interference from the single-phase line.

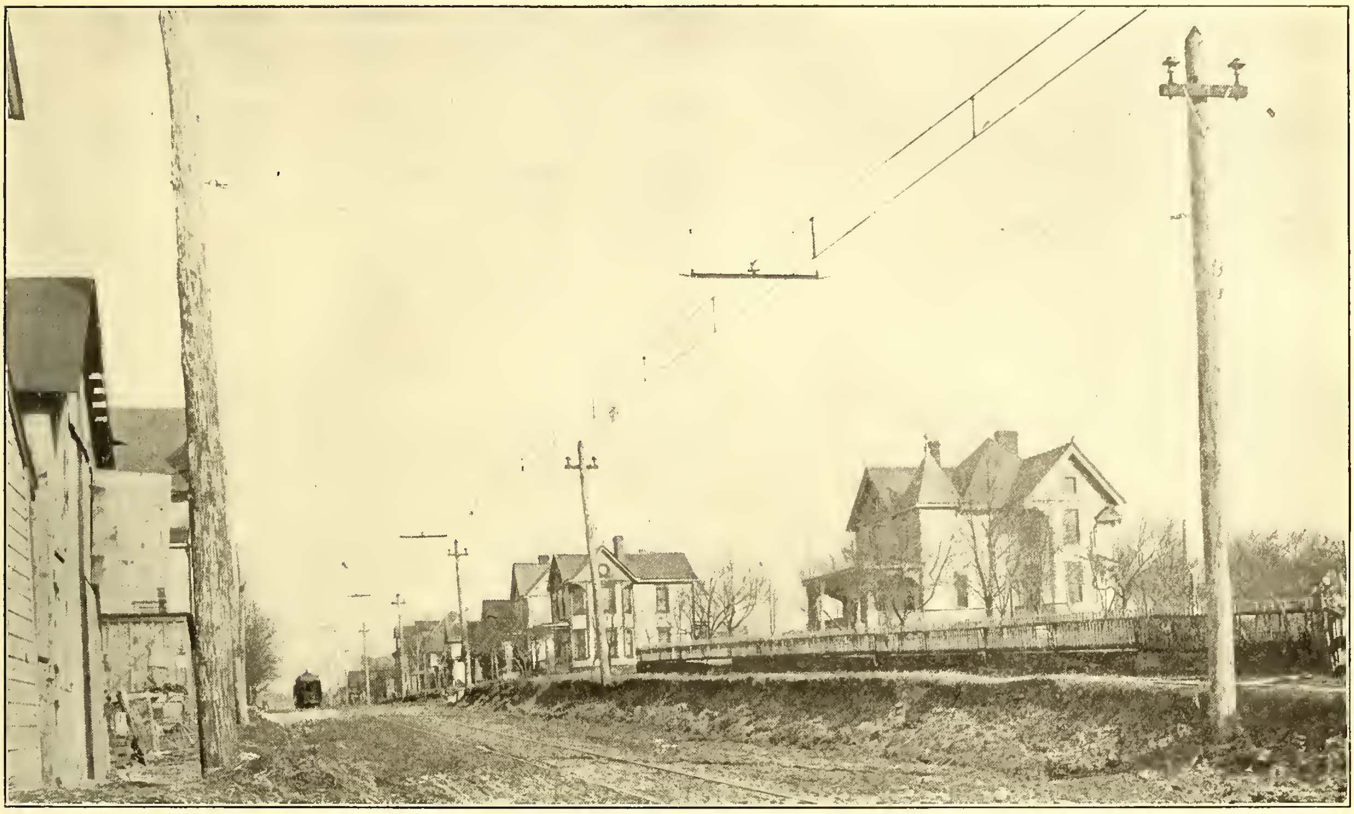
ROADBED AND TRACK

In order to adapt its tracks to those of the Pittsburg Railways Company, over which the entrance into Pittsburg is obtained, a gage of 5 ft. 2½ ins. is employed. A. S. C. E. rails weighing 75 lbs. per yard are laid on 7-in. x 8-in. x 8-ft. chestnut ties on 2-ft. centers. The road is single track, except within the city limits, and is stone ballasted throughout to an average depth of 12 ins. Wherever possible the road has been depressed below public highways, but where it crosses the highways on a level, warning posts are erected. Guard rails are used on all curves which exceed 9 degrees, the guard rails being raised about 1 in. above the running rails by means of blocks inserted under the rails.

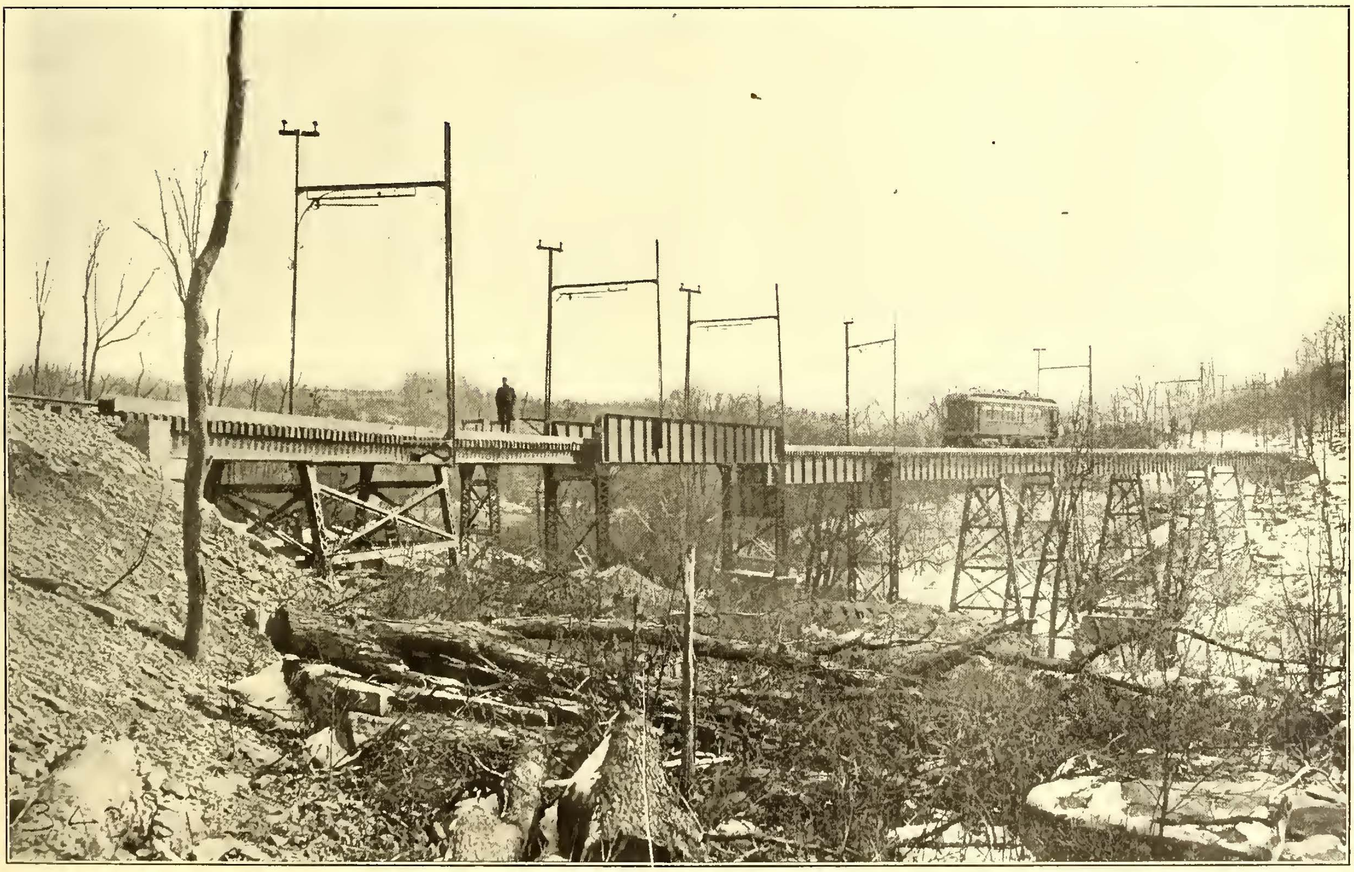


SECTION BREAK AT BUTLER

As stated, the road is exceedingly hilly and contains numerous curves, the grade varying from 3 per cent to 6 per cent, although there is one grade at Etna amounting to 9½ per cent. A considerable portion of the road is over private right of way. In the interurban portion of the road the stops average 2 miles apart, at which locations attrac-



SINGLE CATENARY CONSTRUCTION AT MARS



VIADUCT CROSSING THORN CREEK

tive frame waiting rooms supplied with seats have been erected. One of these is shown on page 260.

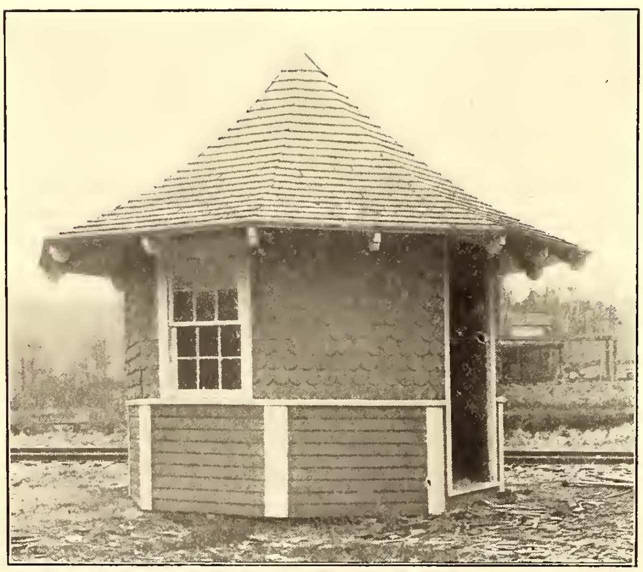
On the entire road there are three steel and concrete bridges, in addition numerous culverts of substantial character. The viaduct over the Baltimore & Ohio Railroad tracks at Bryant is 297 ft. long and is reached from the north by a 5½ per cent grade. In addition to this there is an 8-degree curve at this point. Another bridge crossing the Thorn Creek at Renfrew is 800 ft. long and stands 85

TWO-CAR TRAIN

ft. above the water line. The bridge at Butler, spanning the tracks of the Baltimore & Ohio Railroad at that point, is also of interest as containing one girder 115 ft. long, having a depth of 9 ft. The tracks at this point ascend a grade of 6 per cent, containing a 2-degree curve. The economical abutment construction is noticeable in all of the viaducts as well as the good mechanical appearance of the steel work.

ROLLING-STOCK EQUIPMENT

At present the company is operating ten passenger cars,



TYPICAL WAITING STATION USED ALONG ROUTE

and orders have already been placed for eight additional equipments. The cars were manufactured by the Niles Car & Manufacturing Company, and weigh, complete with electrical equipment, 43 tons. The trucks were supplied by the Standard Motor Truck Company and weigh, each approximately, 17,200 lbs. They are provided with 36-in. rolled steel wheels and 6-in. forged steel axles.

The cars measure 51 ft. 3 ins. long, 8 ft. 1½ ins. wide, and 8 ft. 9½ ins. in the center of the aisles, and have 27-ft. 6-in. truck centers, the wheel base of individual trucks being 6 ft. 8 ins. Particular attention has been paid to make the underframing exceptionally strong to hold the heavy electrical equipment, the under sills being made of 4½-in. x 7¾-in. yellow pine, while the center sills are made up of 6-in. I-beams, with yellow pine fillers. The cars are equipped with Peacock hand brakes and with standard Westinghouse type "SME" air brakes.

Five cars have been provided with a baggage compartment, and all with smoking compartments. The interior of the cars is finished in mahogany, and the ceilings are painted a light green and gold. All of the cars are provided with a lavatory. In addition to side lights, there are three center clusters supplied with holophane globes which are mounted from the ceilings of the cars. The cars are heated by Peter Smith hot-water heaters. In the combination cars the heating apparatus is located in the baggage compartment, while in the straight passenger cars it is located in the motorman's cab.

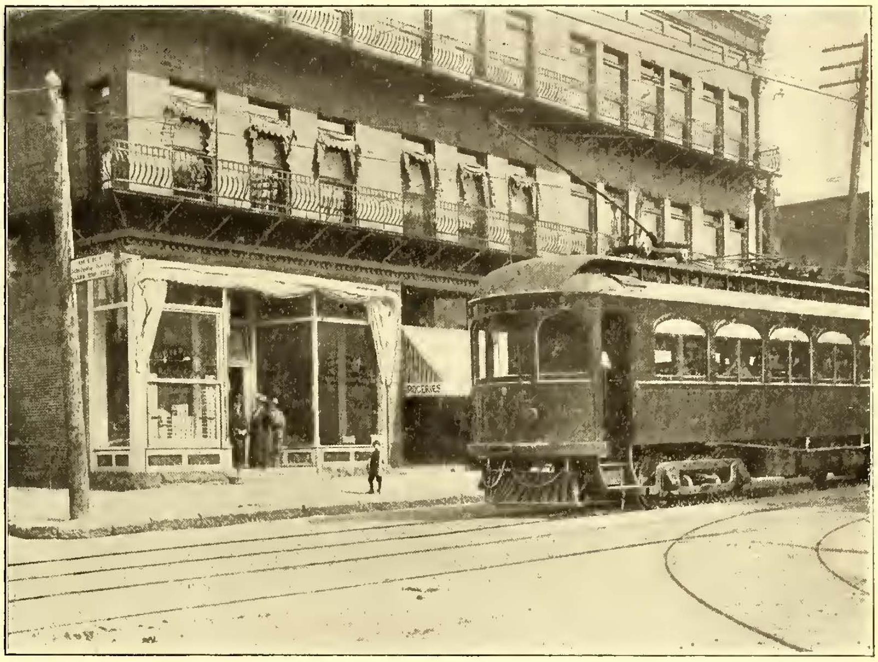
The electrical equipment of each car consists of four 100-hp Westinghouse single-phase motors. The gear ratio


STANDARD CAR—PANTOGRAPH TROLLEY RAISED

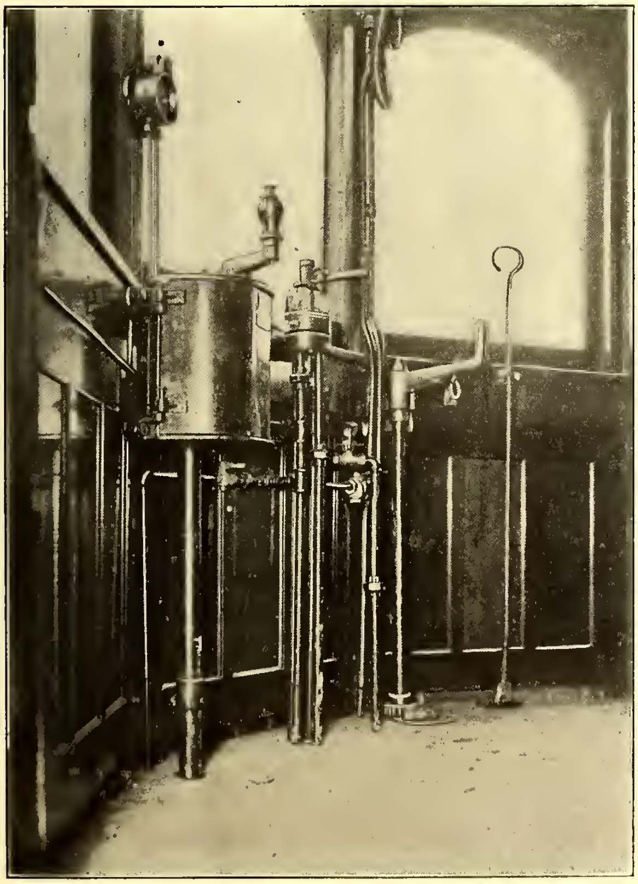
adopted is 19:64. The Westinghouse unit switch system of multiple control, adapted for operation on both alternating and direct currents, is used. The cars are arranged for double-end operation. The motors are operated two in series with two pairs in parallel on a. c. and all four in series on d. c. There is only one running point on d. c.

Each car carries two No. 8 U. S. wheel trolleys for use when operating on direct current, and one pantograph trolley for the collection of the single-phase current. Only one pantograph trolley has been provided, as this type of trolley readily lends itself for operation in either direction. The control of the wheel trolleys is taken care of by means of retrievers mounted on the ends of the platforms, as is the usual practice, whereas the pantograph trolley is controlled entirely by air supplied from the air brake system. The control of this trolley is provided for by means of a suitable valve mounted in the motorman's cab.

In passing from the direct-current section of the line to the alternating current portion it is only necessary to lower the direct-current trolley and raise the pantograph trolley, and in changing from alternating current to direct current, the reverse operation is to be performed. The only other operation necessary is the throwing of a small changeover switch controlling the air-pump motor. This can readily be performed without stopping the car, or even checking its speed. If it is desired to operate the cars in trains, as is contemplated, this can be accomplished by connecting the cars through the train line receptacles by means of seven-point train line jumpers.



BUTLER TERMINUS AND COMPANY'S WAITING ROOM



INTERIOR MOTORMAN'S CAB

Inasmuch as the operating coils for the unit switches receive their current from the main line, means must be provided for testing the motors and operating circuits when the car is not in operation. This is accomplished by the installation of two single-pole, double-throw switches and a testing receptacle, by means of which the motors and control circuits are disconnected from the line and an outside source of power supplied to the car for operating the switches and testing out the circuits.

Especial care has been exercised in the mounting of the apparatus so to distribute it as to equalize the weight on the car body. All car wiring is carefully concealed in loricated conduit, and a sufficient number of junction boxes has been provided at suitable points, which materially cuts down the wiring and facilitates ready access to the connections.

INTERIOR OF COMBINATION BAGGAGE AND PASSENGER COACH

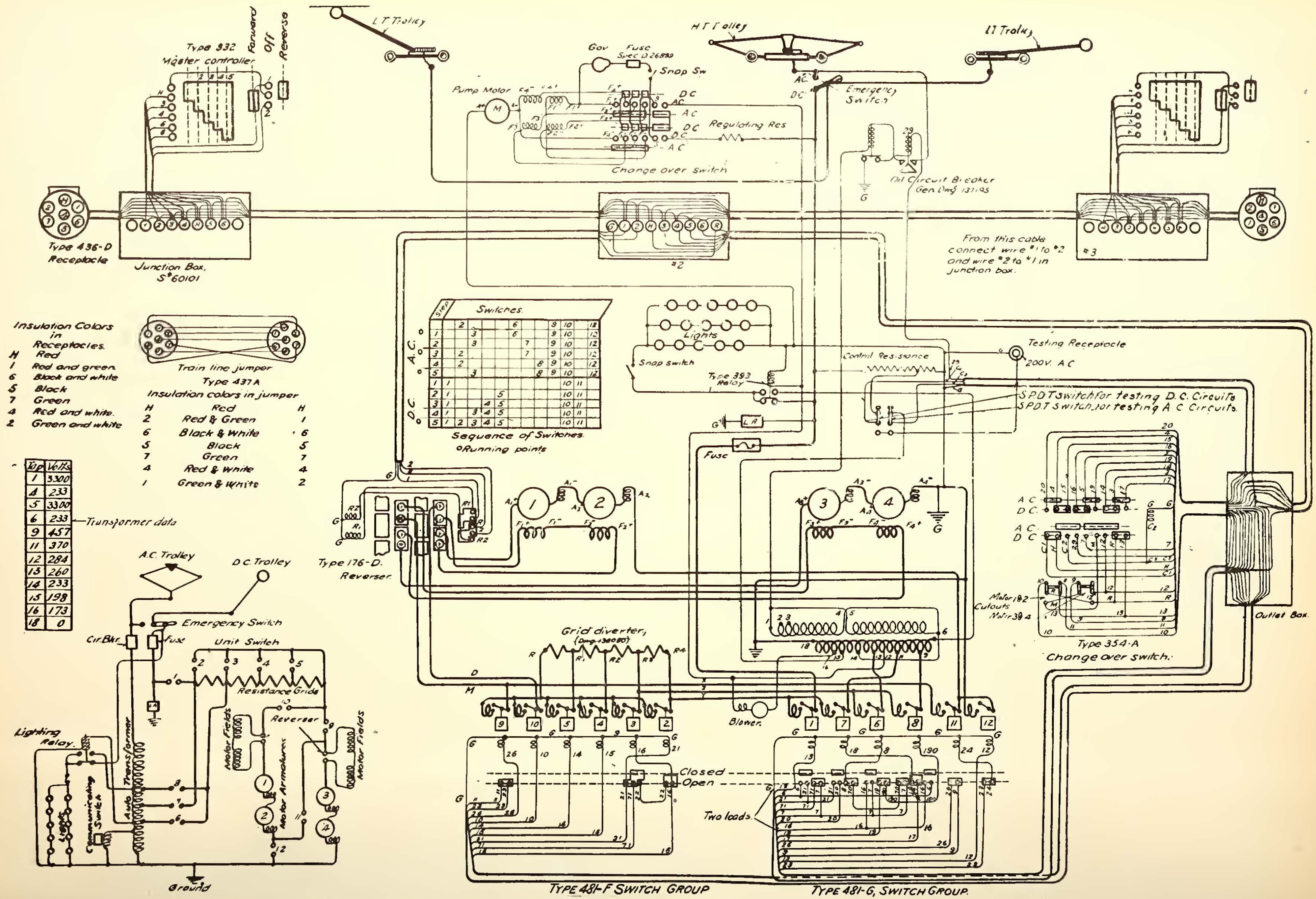


DIAGRAM OF CAR CONNECTIONS

CAR HOUSE AND REPAIR SHOP

A large brick car house and repair shop is located at Mars, near the center of the system. The building measures approximately 181 ft. x 80 ft. and contains four tracks in the car house section, each provided with a pit, and two such tracks in the repair shop.

At the side of this car house, and adjacent to the tracks, there has been built a small brick addition to accommodate the dispatcher's office, and also afford a waiting room for the train crews. The large amount of trackage necessary for such a location has been admirably laid out so that the cars can readily be switched from one track to another with the minimum amount of handling.

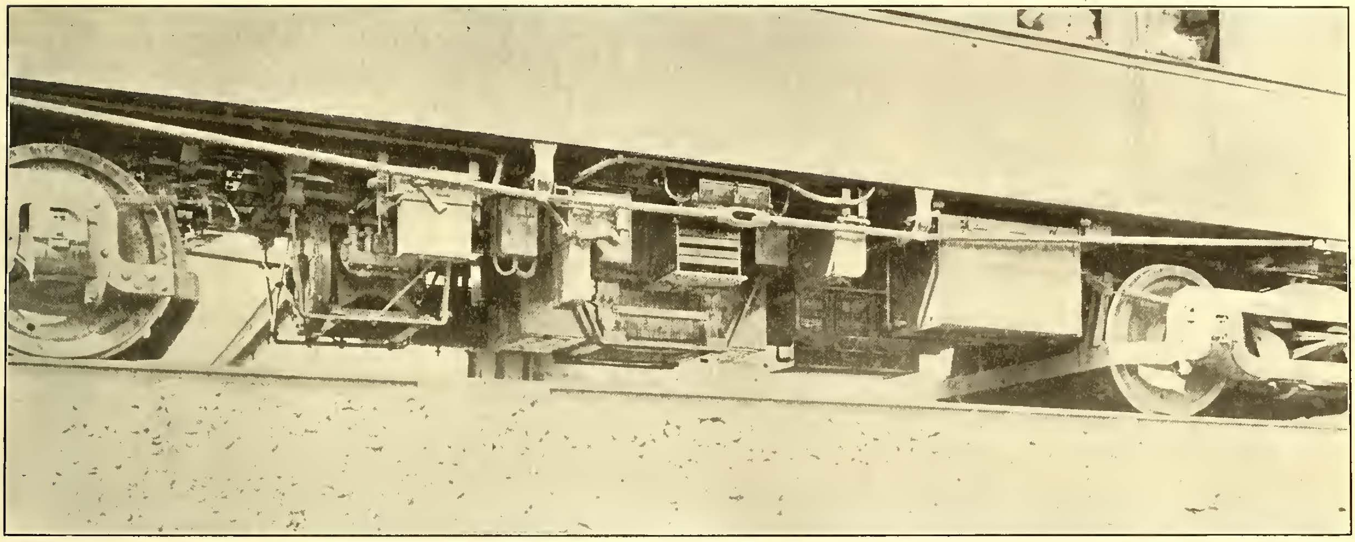
OPERATING FEATURES

The general offices of the company are located at Butler, where there is a large waiting room on the ground floor of their office bulding. This is shown in one of the engravings. At the present time an office is also maintained in Pittsburg, but it is the ultimate intention to direct the entire operation of the road from Butler.

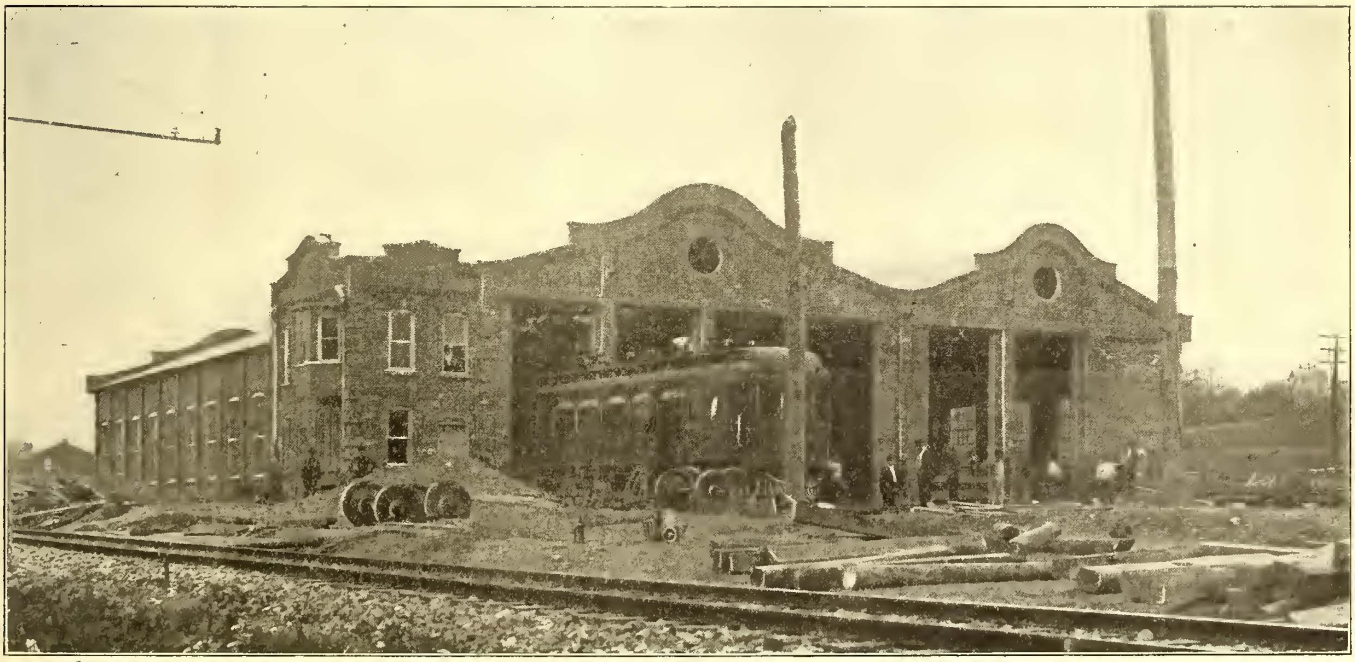
The dispatching of the trains is done by means of the positive order system similar to that employed on steam railroads. The movement of all trains is in direct charge of the chief dispatcher, who is located at Mars. When a car is ready to start on its run, the conductor gets in touch with the dispatcher's office by telephone, receiving his orders in the same manner. These orders are then written in triplicate on forms provided for that purpose, and after that they are repeated to the dispatcher to insure their correctness. He gives one copy of the order to the motorman, retaining the other copy; the third copy is retained in the telephone booth for future record.

At each siding a small telephone booth has been provided and at these points the train crews receive further orders before moving to the next meeting point.

At the present time the company is conducting only a passenger service, but it is proposed in the near future to equip



VIEW OF UNDER SIDE OF CAR, SHOWING CONTROL APPARATUS



CAR HOUSE AT MARS

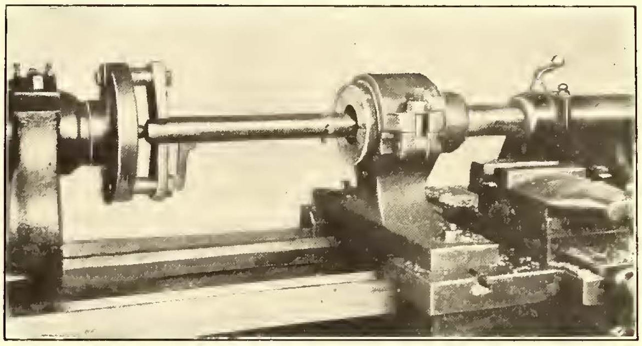
several baggage cars to handle small freight. In addition to the local cars the company intends inaugurating an express service, which will make single trips in about an hour. The regular local cars require about an hour and a half for the same run.

George Heard is the president of the company, and Charles Gibson, Jr., is vice-president, while H. W. Pape—to whose courtesy the greater portion of the information necessary for this article is due—is general manager. C. L. Wilcoxon is general superintendent, and has entire charge of the track and line. L. H. Kidder is general superintendent of motive power and has general supervision over the operating machinery and equipments of the company. The chief train dispatcher is W. M. Kessler, who has C. O. Fry and A. S. Fullerton as assistants.

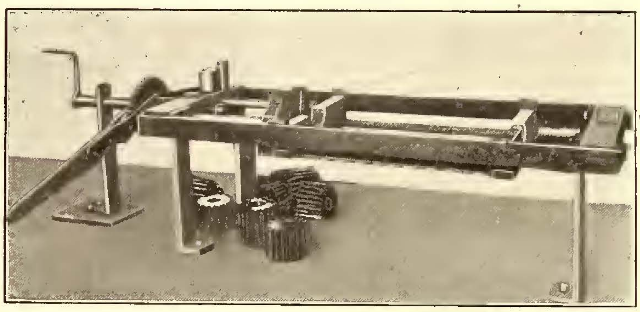
## SOME SHOP KINKS AT LOUISVILLE

### BORING BEARINGS

Usually when babbited bearings are bored in a lathe they are chucked on the lathe spindle. In the shops of the Louisville Railway Company, however, the bearing is clamped in a head attached to the carriage, and the tool is held in a boring bar extending through the bearing. The head in which the bearing is clamped is shimmed up 1/32 in. to bore the bearing this distance off center to allow for wear. Bushings are provided so several sizes of bearings may be bored in one head. This method of boring the bearings has the advantage that the shells may be quickly put in the lathe and no delicate adjustments are required to get them centered.



MACHINE FOR BORING BEARINGS



DEVICE FOR TAKING OFF AND PUSHING ON PINIONS

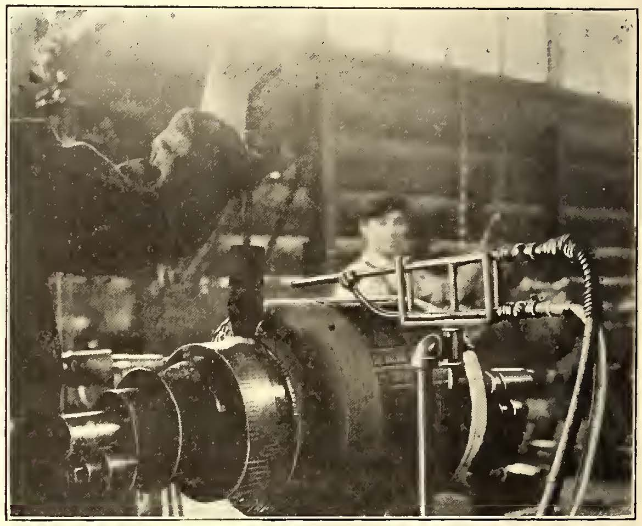
### SOLDERING COMMUTATORS

About one-half hour per armature has been saved in soldering commutators by using a gas flame to heat the soldering iron. The gas lamp employed consists simply of two brass tubes brought together at one end. The other ends have attached to them rubber hose for air, obtained from the compressed air piping system and for illuminating gas. The lamp is held in an adjustable iron pipe frame. In soldering commutators the lamp is placed in such a position that the flames strike the heavy soldering iron so that it is unnecessary to change irons during the work.

### PULLING AND PUTTING ON PINIONS

Pinions are put on and pushed off by means of a single device, which consists of an iron frame provided with a heavy screw operated by a ratchet lever.

When a pinion is to be pushed off the armature is so laid in the cradles that the heavy yoke shown extends over the shaft just behind the pinion. This yoke is supported by heavy bolts from the end bar of the frame which carries the screw. The smaller of the two cylinders shown resting on the end bar, which cylinder has a smaller diameter than the pinion bore is then placed between the end of the shaft and the screw. On tightening the screw the pinion is held by the yoke behind it, while the armature and shaft are pushed toward the rear of the frame.



SOLDERING AN ARMATURE WITH A GAS LAMP

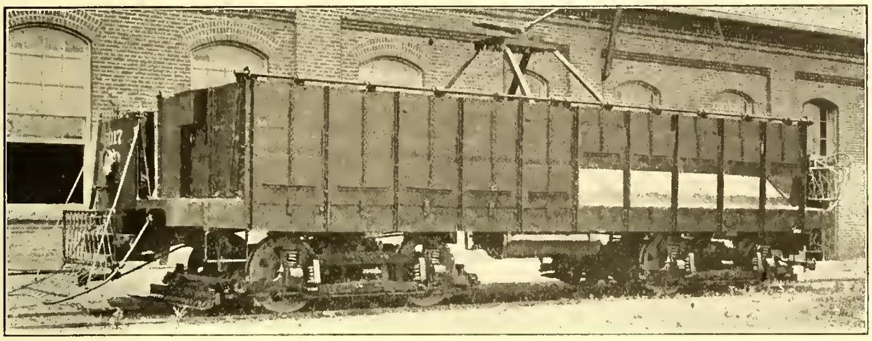
When pinions are to be pushed on, the cylinder shown at the rear of the frame is placed behind the armature shaft to limit its movement, and the hollow cylinder shown resting on the front end frame is placed between the pinion and the screw so the force of the screw is applied to the pinion only.

The device has been found of so much use in the shop that two of them have been built.

The employees of the Toledo Railways & Light Company held their annual field day and outing at the Casino a few days ago. The company furnished free transportation for the men, their families and friends. Arrangements were made so that all the men could attend at some time in the day. The theater was bought outright during the afternoon and evening performances for the men and their friends. Baseball games, a tug-of-war, running races and a number of other amusement features were arranged and proved a success. Entertainment was also provided for the women and children who did not care to witness the athletic features. Prizes were donated by the company for the winners in all the contests. Officers and managers were present to aid in making the afternoon and evening a delightful one for all.

## THE BALTIMORE COAL CAR

The United Railways & Electric Company, of Baltimore, has just completed at its Carroll Park shops a 15-ton side-dump coal car, designed by H. H. Adams, superintendent of shops. This car was built primarily for carrying coal to the company's power station at Bay Shore Park after loading from the fuel hoppers at the Pratt Street station, but at other times it will serve for carrying cinders for fills, etc. As shown in the accompanying drawing, the car is 36 ft. 9 ins. over all and 8 ft. 5⅜ ins. wide. The body itself is 29 ft. long. The floor of the car is inclined to form a steep inverted V to permit quick unloading of the material. The flooring and sides are built of North Carolina pine, but the flooring is reinforced by angle iron, as shown in the plan and section. The sill plates are carried around the ends to form what are practically end braces for the crown pieces. The car is transversely braced by 2-in. hydraulic piping around 1-in. tie-rods and longitudinally braced by inside truss-rods. Both sides of the car are divided into ten sections stiffened by vertical T-irons and each furnished with a 20-in. x 32-½-in. plate steel shutter ¼ in. thick. The shutters at the bottoms of these sections are lifted by chains connected to a shaft running along the side of the car. These shafts are turned from a handle at each end so that the shutters are opened in groups of five; hence two men are required to unload a full side at one time. No obstruction is offered to the rapid egress of the coal except where the truss-rods cross at the end shutters.

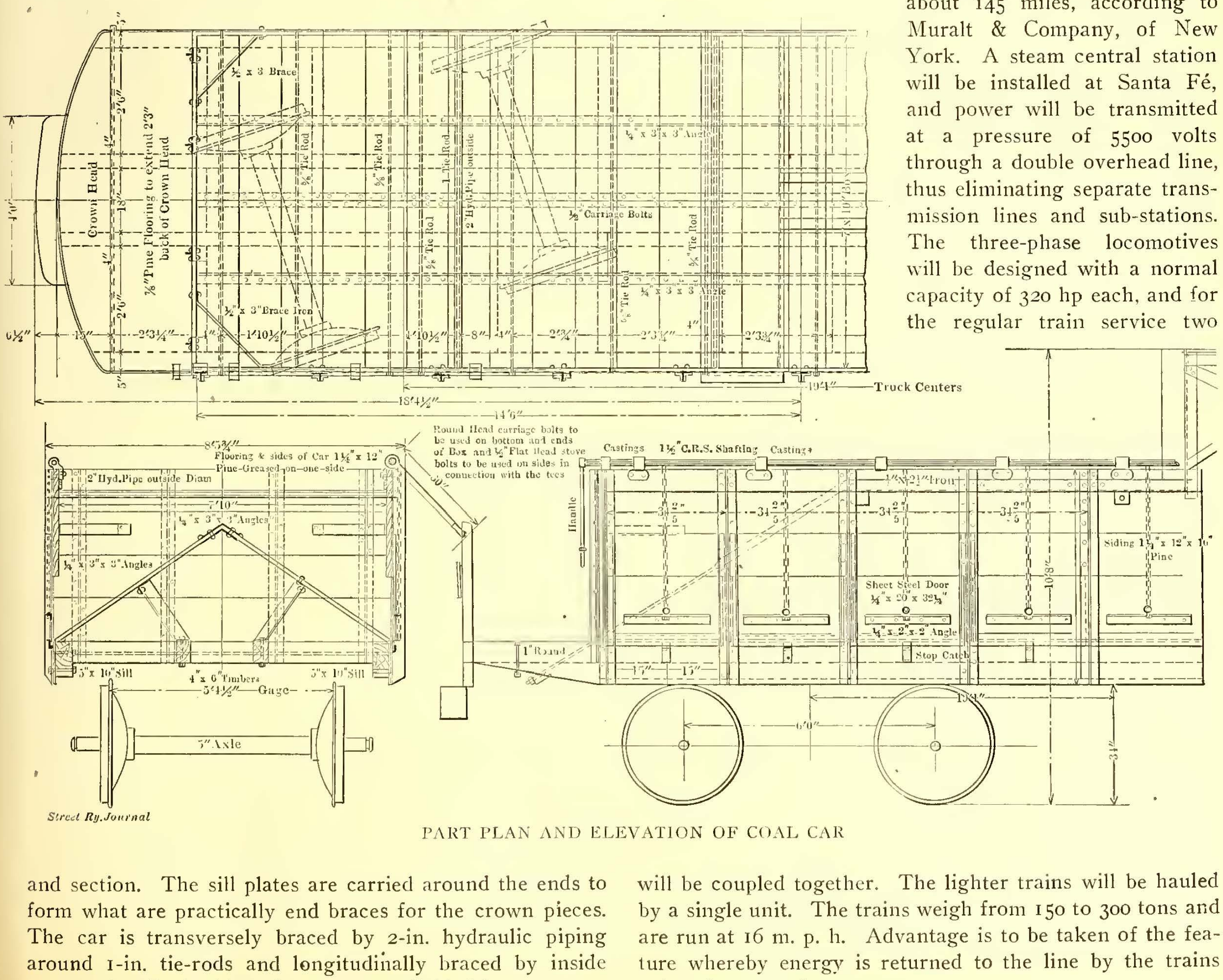


GENERAL APPEARANCE OF CAR WITH SOME OF THE SHUTTERS UP

The car is mounted on two Brill 27 E-1 trucks and carries a complete operating equipment consisting of four 40-hp Westinghouse 101 B motors, K-28 controllers, Westinghouse straight air brakes, Peacock hand brakes, Christopher sand boxes, Van Dorn draw-bars, Baltimore car fenders and U. S. incandescent headlights. All of this equipment is entirely new. The car is furnished with a single trolley stand, the base of which rests on a platform supported on angle braces carried over the sides. The total cost of the car is placed at $4,500.

## ELECTRIFICATION OF SPANISH TRUNK LINE RAILROAD

The three-phase system is to be introduced on a trial stretch of the main line from Linares to Almeria, in Spain, about 145 miles, according to Muralt & Company, of New York. A steam central station will be installed at Santa Fé, and power will be transmitted at a pressure of 5500 volts through a double overhead line, thus eliminating separate transmission lines and sub-stations. The three-phase locomotives will be designed with a normal capacity of 320 hp each, and for the regular train service two will be coupled together. The lighter trains will be hauled by a single unit. The trains weigh from 150 to 300 tons and are run at 16 m. p. h. Advantage is to be taken of the feature whereby energy is returned to the line by the trains going down grade.




PART PLAN AND ELEVATION OF COAL CAR

# CORRESPONDENCE

## LOSS OF RECORDS AT SNOHOMISH, WASH.

Snohomish, Wash., Aug. 6, 1907.

EDITORS STREET RAILWAY JOURNAL:

On Aug. 1, the office of the Snohomish Valley Railway Company, in Snohomish, Wash., was destroyed by fire. The company lost all of its records, books, correspondence, maps, estimates and data, which will require a great deal of extra time and labor to replace, and much of which it will be impossible to renew. Among the losses were the STREET RAILWAY JOURNALS for 1906 and 1907 to date, also the Red Book of Street Railway Investments which was just received and had not been opened, all of which we valued very highly.

To expedite the replacement of our records and the re-establishment of our working data, the Snohomish Valley Railway Company requests all dealers with whom we have had correspondence, and from whom we had received specifications of equipment, or had received special catalogues and prices, to duplicate those specifications, prices and lists without special request, and at their earliest convenience.

The loss of our records, correspondence, specifications and data at this time was very unfortunate, as the company was expecting to commence construction between the first and fifth of August. The date of commencement will now be delayed until the records can be reproduced, which will be at the earliest possible moment. The co-operation of those with whom we have had correspondence, and with whom we were negotiating for equipment and supplies, will be greatly appreciated.

THE SNOHOMISH VALLEY RAILWAY COMPANY,
By Charles A. Barron, Gen. Supt.

[This letter is published so that manufacturers and others who have had correspondence with the Snohomish Valley Railway Company will learn the needs of the company, and will supply duplicate catalogues, quotations, etc.—EDS.]

## WAGES IN PROVIDENCE

Providence, R. I., Aug. 13, 1907.

EDITORS STREET RAILWAY JOURNAL:

In the review of the municipal ownership reports of the National Civic Federation, published in the STREET RAILWAY JOURNAL of July 27, a table is published on page 138, showing the average wages per hour of conductors and motormen in twenty-one of the largest cities in the United States. This table states that the minimum wage in Providence is 18.2 cents, and the maximum rate 22.7 cents per hour. Below is given the rate of wages as paid by the Rhode Island Company (effective April 28, 1907):

| | Cents Per Hour. |
|---|---|
| First year | 20 |
| After first year | 21 |
| After second year | 22 |
| After third year | 23 |
| After fourth year | 24 |
| After fifth year | 25 |

I am calling the above to your attention, believing that you would like to correct same.

A. E. POTTER,
General Manager.

## GALVANIZING LINE MATERIAL

Schenectady, N. Y., July 30, 1907.

EDITORS STREET RAILWAY JOURNAL:

The writer has noted with interest the editorial article in your issue of July 13, relative to the galvanizing of line material. He wishes to take exception, however, to that portion of your article which reads: "The hot dipping process tends to leave shreds of metal on the threads, which must either be cleaned off by a die or tapped before assembly, with the resulting stripping of some of the galvanizing coating." There is no difficulty in obtaining galvanized bolts with even a small diameter where the proper allowance was made for the zinc coating when machining. Just what allowance to make in threading bolts which are to be galvanized has been the subject of considerable study.

In a recent letter to the writer on this subject, William L. Wilcox, of the Wilcox, Crittenden Company, of Middletown, Conn., well known galvanizers, says: "In reference to the galvanizing of heavy material, we shall have to differ from the author in his statement that the hot process leaves shreds of metal on the threads, etc. Possibly some hot galvanizers may have this trouble, but we can furnish the threads thoroughly and cleanly galvanized by the hot process without being obliged to re-cut the threads after galvanizing, and guarantee that the same will stand sulphate of copper test."

This letter is written on the basis of mutual enlightenment rather than criticism, and I trust that the facts which I have given you above will be of interest.

A SUBSCRIBER.

[We are pleased to learn that certain manufacturers have no difficulties of the kind mentioned in the editorial. We said that the hot dipping process "*tends* to leave shreds of metal on the threads," not that it always does so. To indicate that some have found the process troublesome in this respect, we quote the following opinions, among several, which appear in the 1907 Question Box of the National Electric Light Association.—EDS.]

Most engineers demand that articles when galvanized meet what they call "four-immersion test," and to accomplish this the hot galvanizing or dipping process must be used. This method does not leave the coating as clean and smooth as the electrolytic process, but the coating is heavier, therefore, no doubt, is the best for such articles as anchor rods, cross-arm braces, washers, etc. The electrolytic process * * * is best on bolts, lag screws, etc., for the reason that the coating is left clean and smooth, while with the other process spelter is left on the thread, which will be broken off when the nut is screwed on the bolt, and destroys the galvanizing feature of the threaded part of the bolt.

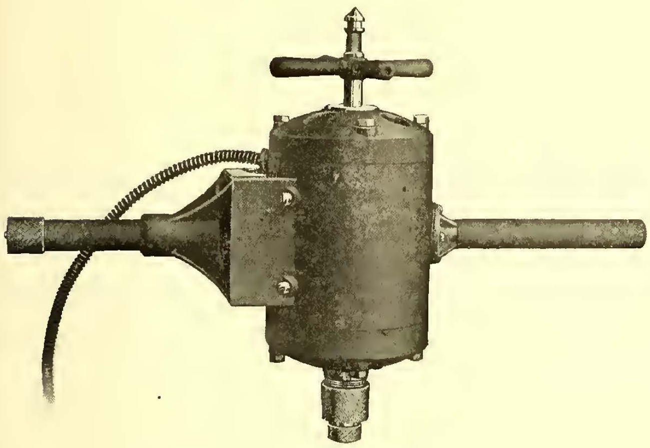
J. S. REESMAN,
North Shore Electric Company, Highland Park, Ill.

Regarding galvanizing of such articles as contain threads, like nuts, bolts, and turnbuckles, where a snug fit is required, my experience has been that the electrolytic process is better, as in the employment of the hot process for this kind of work it is necessary to run over the bolt with a die, or in the case of the nut to retap. This would remove the galvanizing done by the hot process. * * * In the case of coach or wood screws the hot process is better, as it gives us a heavy coating. The hot process would likewise apply better to washers, cross-arm braces, and anchor or ground rods, because the zinc is thicker.

H. FREDERIC FRASSE, Purchasing Agent
Edison Electric Illuminating Company, Brooklyn, N. Y.

## AN ELECTRIC DRILL FOR HEAVY WORK

An electric drill especially designed for heavy drilling and reaming has been placed on the market by the Van Dorn Electric & Manufacturing Company, of Cleveland. In this drill the motors are of the enclosed type, ventilated by means of holes in the top and bottom heads and in the



ELECTRIC DRILL FOR HEAVY WORK

sides of the machine, air being drawn in through the ventilating holes and forced out through the vent holes in the side. The drills are made in four different sizes, Nos. 0, 1, 2 and 3, and are wound for 110 and 220 volts, direct current. The No. 0 machine is equipped with a Jacobs chuck, taking in sizes from 0 to 5/16 drill. The Nos. 1, 2 and 3 machines are equipped with standard Morse taper sockets, according to these numbers, taking in the drills that fit these sockets. The upper and lower thrust are ball bearings. All other bearings are of phosphor bronze. The gearing and all other gearing parts are made of machine steel case-hardened. A movement of a quarter turn of a knurled ring starts or stops the machine, so it is at all times under instant control of the operator. Each machine is equipped with an armored cable grounded to the machine.

## EXCESSIVE SPRINKLING IN DETROIT

The question of track sprinkling in Detroit has assumed a serious aspect. Despite the fact that the Detroit United Railway Company has nine sprinkling cars in constant use on its lines, each with a capacity of 42,084 gals. of water a day, making some 378,756 gals. as the total for all the cars, the city administration still insist that the company sprinkle its tracks more frequently. This the company considers unfair, as it says unmistakable evidence is at hand of injury already done to the track because the streets are kept wet almost constantly, the watering being in the nature of a constant rainfall. The water, it has been discovered, runs down the side of the rail under the pavement and ruins the concrete wherever it is cracked. Mr. Kerwin, the superintendent of tracks of the company, says he believes that water underneath the concrete causes it to crack in cold weather. He estimates that the continual sprinkling of tracks costs the company about $100,000 a year, as it ruins more than 2 miles of double track each year, the foundation never being dry during the summer. There are several places in Detroit where, according to Mr. Kerwin, the rails are churning up and down in a pool of water all the time, in this way bringing the clay from underneath the concrete to the surface of the pavement. In consequence the rail and concrete sink into the mud. The mileage covered by the sprinklers is 52.85 miles of single track, and 52.54 miles of double track.

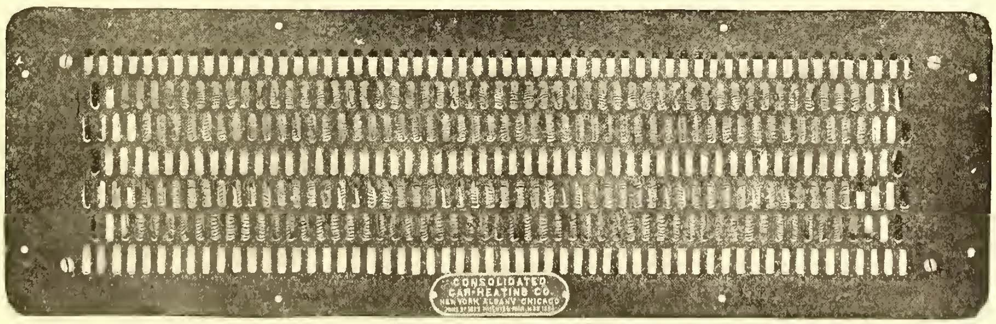
## A NEW ELECTRIC HEATER

A new electric heater of the panel type has recently been developed by the Consolidated Car Heating Company, of New York. In this heater the company's standard coil construction is used, and the heater is fitted with a steel back, with a circulating air space between the back and asbestos lining, preventing the loss of heat back of the seats. The heater ends are made with openings for metal conduit and are fitted with double clamps for holding the conduit. In some cases each alternate heater is fitted with long lead wires, which somewhat simplify the labor of equipping, as it is only necessary to screw the heaters in position, slip the conduit over the lead wires, which can be held by the double clamps, and then remove the backs of one-half the heaters in order to make connections to the binding posts.

The front of the heater is of heavy steel with openings sufficient for thorough ventilation, but made somewhat narrower than standard openings, to prevent the placing of umbrellas or canes in contact with the heater coils. This heater is meeting with great favor and has recently been adopted by the following large companies: Interborough Rapid Transit, Manhattan elevated division, number of equipments 200, number of heaters 4400; subway division, number of equipments 50, number of heaters 1300; New York City Railway, number of equipments 195, number of heaters 3120; Hudson Companies, number of equipments 50; number of heaters 900.

Similar heaters have recently been adopted by the following companies:

Chicago City Railway, number of equipments 300, number

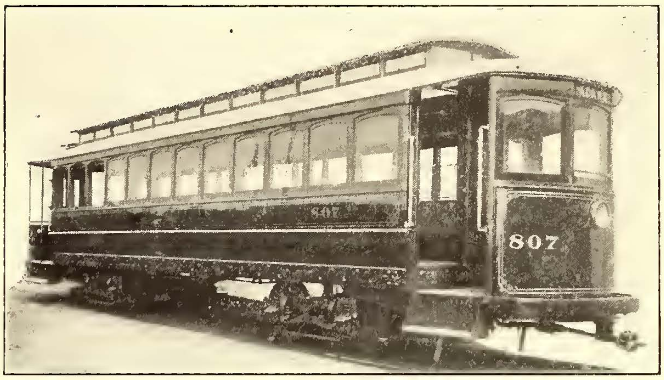



NEW PANEL HEATER

of heaters 6000; Brooklyn Rapid Transit, number of equipments 100, number of heaters 600; Consolidated Railway of New Haven, number of equipments 103, number of heaters 1142; International Railway of Buffalo, number of equipments 49; number of heaters 980; Boston Elevated Railway, number of equipments 29, number of heaters 174.

## INTERESTING CARS FOR PEORIA

The fourteen cars shipped recently by the American Car Company to Peoria contain a number of interesting features. They are "single-enders" equipped with double doors at the rear end with the "Detroit" style of platform. The door at the front end is of the Brill accelerator type.



NEW CAR FOR PEORIA

These cars will be run in trains. Longitudinal seats are furnished—a somewhat unusual specification for large double-truck cars of this type. The chief dimensions are as follows: Length over end panels, 32 ft.; over crown pieces, 43 ft. 2½ ins.; width over sill plates, 7 ft. 4 ins.; over posts at belt, 7 ft. 10 ins.; height from track to under side of sills, 32 9/16 ins. The bottom framing is unusually substantial and includes 8-in. x ¾-in. sill plates placed on the outside of the sills, under trusses anchored at the body bolsters, short struts under the needle beam, trusses and inside truss rods shouldered high upon the posts, the side sills of long leaf yellow pine are 4 ins. x 7¾ ins.; center sills, 4 ins. x 4¼ ins.; end sills, 4¾ ins. x 7¾ ins. The platform timbers are reinforced with angle-iron and are additionally strengthened, and at the same time protected by angle-iron bumpers of patented type. The sill plates are brought around the end sills and heavily bolted through corner brackets on the insides of the sills, a form of construction which gives great resisting power against cornerwise strains. The trucks are of the No. 27-G1 type having solid forged side frames. The wheel base of the trucks is 4 ft. 6 ins. Each car carries four motors of 40-hp capacity each.

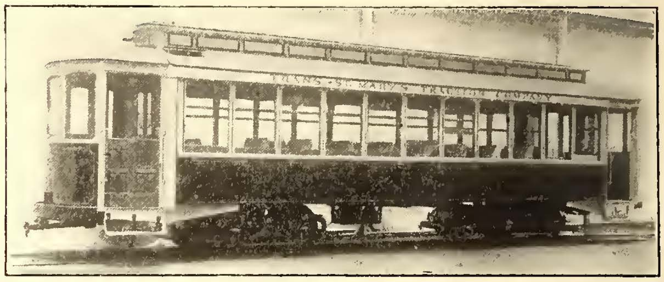
## EXPRESS COMPANY EXTENDS ITS ELECTRIC BUSINESS

The United States Express Company is negotiating with the Toledo & Indiana Railway Company for the right to operate over its lines. This company is also making arrangements with all the electric railways that parallel the Lake Shore & Michigan Southern, so far as possible, in order to retain its local business. At present it is operating over the Detroit United, Detroit, Monroe & Toledo Short Line, and Toledo & Western. A temporary arrangement has also been made with the roads on which the Electric Package Company operates.

## SEMI-CONVERTIBLE CARS FOR THE MICHIGAN SOO

The semi-convertible car has found a new field in the country of the Soo. A number of these cars are now on their way to the Trans-St. Mary's Traction Company, of Saulte Ste Marie, Mich., one of a number of subsidiary companies controlled by the Lake Superior corporation. Another subsidiary company, the International Transit Company, operates the railway system on the Canadian side of the Soo, and also owns and operates the ferry line between the two Soos. The cars of the Trans-St. Mary Company make close connection with the ferry steamers at the ferry dock, and the Canadian company does likewise, so travel to any point in either of the two towns is convenient.

The normal population of the Michigan Soo is in the neighborhood of 12,000, but in the summer months when navigation is heaviest and the throng of tourists and summer visitors arrives, eager to view the Canadian and American ship canals, the rapids and the water power and manufacturing plants, the population is greatly increased. It was chiefly to take care of this annual invasion of visitors that the new semi-convertible cars were ordered.



EXTERIOR OF SOO CAR

The trackage of the Michigan Soo system is at present 8½ miles, the most recent addition being the line of Algonquin, the busy suburb west of Sault Ste Marie, on the St. Mary's River above the rapids. The service between these points will be especially benefited by the new equipment.

The electrical system on both the American and Canadian side is d. c. overhead trolley, with power furnished by the Michigan Lake Superior Company to the Trans-St. Mary's Traction Company, and by the Lake Superior Power Company to the International Transit Company, both subsidiary to the Lake Superior corporation.

The illustration shows a typical straight-sided cemi-convertible car of the J. G. Brill Company. The chief dimensions are as follows: Length over end panels, 30 ft. 8 ins.; over crown pieces, 40 ft. 1 in.; width over sills, including sheathing, 8 ft. 4 ins.; size of side sills, 4 ins. x 7¾ ins.; end sills, 5¼ x 6⅞ ins.; sill plates, 12 ins. x ⅜ in. The equipment is standard, including Brill seats and numerous specialties, such as angle-iron bumper, radial draw bar, etc. The 27-G1 trucks with 4-ft. wheel base are used. Each car is equipped with four 40-hp motors.

INTERIOR OF SOO CAR

## FINANCIAL INTELLIGENCE

Wall Street, Aug. 14, 1907.

### The Money Market

Increased strength characterized the local money market in all its branches during the week. The demand for money for stock market purposes was materially lessened by the heavy liquidation and severe declines in values on the Stock Exchange, but the inquiry from mercantile and other sources continued brisk, and resulted in rates for practically all classes of accommodations making new high records for the year. Day to day money loaned at 6 and at 3 per cent, the average rate being about 4 per cent. Money for sixty days, which was obtainable a week ago at 5½ per cent, was in demand at 6 per cent, while other maturities up to six months commanded the full legal rate of 6 per cent and commissions, bringing the total charge to the borrower up to 6½ and 7 per cent, the latter figure prevailing for six months loans. Even at the advanced rate the supply of money for fixed periods was comparatively small, and came principally from trust companies and outside sources. The local banks were practically out of the market, there being a disposition on the part of the New York banks to prepare for the extraordinary demands soon to be made upon them. Currency shipments to the West and South for crop-moving purposes are already under way and are likely to develop larger proportions from now on. In addition preparations must be made for the $15,000,000 payment on account of the new Southern Pacific stock due this week, and for similar payments falling due in the near future. The present condition of the money market was reflected during the week by the partial failure of the City of New York to sell an issue of stocks and bonds. Out of a total of $15,000,000 4 per cent securities offered about $3,000,000 were disposed of. The bids were generally for small amounts. and there was an absence of offers from the large banking and bond houses which, under ordinary conditions, would have been willing to take the entire amount at better prices than were realized. Another feature of the present situation is the attitude of foreign bankers. Usually at this time of the year when money rates work firm, considerable amounts of foreign capital become available, but so far this season offerings from that source have been extremely light, there being a disposition on the part of foreign bankers to refrain from making advances with the same degree of liberality as in previous years. Foreign exchange, however, continues to display a drooping tendency, rates being now well below the gold export point, and the belief prevails in banking circles that the outflow of the precious metal is about over for the year. The situation at the principal European centers has not changed materially during the week. The liquidation in the securities market at London carried the price of Consols down to the lowest yet recorded, and there was heavy selling of American securities. The demand for gold continued active, the Bank of England securing about one-half of the gold arriving in London from the Cape, the balance going to Continental centers. Private discounts at London have also hardened, and there was some talk of an advance in the official bank rate in the near future.

At the close of the week the local market ruled decidedly firm. Reports from Washington are to the effect that the Secretary of the Treasury will relieve the situation by placing Government funds in the banks should such assistance become necessary.

The bank statement published on last Saturday revealed a decrease in cash of $5,312,100, or somewhat larger than was indicated by the preliminary report of the currency movements. Loans decreased $16,497,400, and as there was a decrease in deposits of $22,397,800, the reserve required was $5,599,450 less than in the preceding week. Deducting from the latter amount the loss in cash the surplus reserve was increased by $287,350. The total surplus was $7,760,550, as compared with $8,271,525 in the corresponding week of last year, $12,846,800 in 1905, $57,731,475 in 1904, $21,563,575 in 1903, $7,126,600 in 1902, $20,952,950 in 1901 and $28,125,950 in 1900.

### The Stock Market

Conditions in the stock market have been going from bad to worse during the past week, and the wonder is that the further tremendous shrinkage in values was not attended by failures, if not actually by panic. On several occasions there appeared to be danger of the uninterrupted and heavy liquidation developing such a condition, but the placing of supporting orders at the proper time undoubtedly averted such an undesirable event. However, such buying power as was in evidence on occasions was by no means sufficient to stem the tide of falling values, and prices for all classes of stocks crumbled until in very many cases they not only went below those reached in March last, but also touched the lowest points since the memorable Northern Pacific panic in 1901. For a time after the first wave of liquidation broke out about a fortnight ago the higher grade railway and industrial securities withstood the pressure remarkably well, and only yielded moderately in sympathy. Latterly, however, all the so-called gilt edged issues have displayed equal, if not greater, depression than the lower grade stocks, and such ordinarily desirable securities as Standard Oil, American Tobacco, Great Northern preferred, New York Central, Pennsylvania, St. Paul and Union Pacific have fallen to prices which in most instances net the investor an excess of the rate of interest now current in the money market. The demoralization in the market was attributed to the uneasiness over the attitude of the Federal Government toward corporations; the increasing tension in the money market; the lower prices for copper metal, and the strike of the telegraphers here and at many large cities throughout the country. The foreign political and monetary situation has again been unsettled, with the result that the price of British Consols has dropped to the lowest point on record. Other factors in the situation included reports of a moderate recession in business, particularly in the copper metal trade, while the Government crop report was looked upon rather unfavorably, except in the case of corn. It is felt that there will in all probability be considerable improvement in all our principal cereals between now and harvest, and that the railroads will in consequence have ample tonnage and experience to let up in their present prosperity, which is one of the strongest underlying factors in the situation, and one which in the end is bound to have its influence on values.

The feature of the week in the local traction group which, of course, gave way in company with all kinds of securities, was the severe shrinkage in the market price of the Interborough-Metropolitan 4½ per cent bonds, which at one time sold as low as 53, comparing with 74¼, the high figure of the previous week, and 82 the price at which they sold in January last. The shares of the Interborough-Metropolitan also fell to new low records, the preferred reaching a point at which 17 per cent would be yielded to the investor, assuming, of course, that the 5 per cent dividend is to be continued. There were no special developments in connection with the other local traction properties, if the continued record-breaking earnings of the Brooklyn Rapid Transit be excepted. Nevertheless, all these shares exhibited sympathetic weakness.

### Philadelphia

Trading was heaviest in Philadelphia Rapid Transit, the price of which was forced down to 16⅝, the lowest recorded for some time, but subsequently there was a fractional recovery. In other issues the volume of business was comparatively small, but prices generally suffered to a greater or less extent. Consolidated Traction, which for some time past has ruled around 72½ and 73, dropped to 70, and United Companies of New Jersey lost 2 points to 245. Philadelphia Traction ran off from 94½ to 93, and Philadelphia Company common lost a point to 39. Union Traction declined from 57 to 56. Fairmount Park Transportation sold at 9 and American Railways at 48.

### Chicago

Further progress was made during the week in clearing up the local traction situation. The amended plan of reorganization of the Chicago Union Traction Company was announced, and it is generally believed will be accepted by a majority of those interested. The order turning over the properties on the West and North Sides to the Chicago Railways Company, which is to operate them under a lease, has been signed by Judge Grosscup. An application for an appeal from the order has been made in behalf of the first mortgage bondholders of the North Chicago Railway, and the date for the hearing has been set for Aug. 19. Trading in the local tractions, however, was very quiet. Metropolitan Elevated sold at 22 and South Side Elevated went at 80. Northwestern Elevated common brought 21½, and the preferred stock 60¾.

### Other Traction Securities

There were no important developments in the traction issues at Baltimore, trading for the most being confined to small amounts, at slightly lower prices. United Railway common was about the only issue to display any degree of activity, several thousand shares of the stock selling at 12½. United Railway 4s declined from 87⅛ to 86½, and the incomes sold at 52. The funding 5s brought 79 and 79¼. Washington City & Suburban 5s changed hands at 100, and Norfolk Railway & Light 5s sold at 95. The Boston market for tractions was quiet and irregular. Massachusetts Electric common held steady at 14, but the preferred fell from 56 to 54. Boston Suburban preferred advanced from 50 to 52 on light purchases, and Boston & Worcester sold at 20½ and 20¼. Boston Elevated held at 134. West End common sold at 88, and transactions in the preferred were made at 101½ and 101.

But little trading has been done in traction on the Cleveland Stock Exchange the past week. A few small blocks of Cleveland Electric changed hands at 49½, while there was some activity in Aurora, Elgin & Chicago common at 32½. Lake Shore Electric common remains at 10, with a few small sales at that figure.

### Security Quotations

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

| | Aug. 7 | Aug. 14 |
|---|---|---|
| American Railways | 48 | 47 |
| Boston Elevated | 134 | 131 |
| Brooklyn Rapid Transit | 50¾ | 42 |
| Chicago City | — | 160 |
| Chicago Union Traction (common) certificates | — | — |
| Chicago Union Traction (preferred) certificates | — | — |
| Cleveland Electric | 49¾ | 49½ |
| Consolidated Traction of New Jersey | 70 | 69 |
| Detroit United | — | 62 |
| Interborough-Metropolitan | 13 | 8⅞ |
| Interborough-Metropolitan (preferred) | 38¼ | 26½ |
| International Traction (common) | 45 | 45 |
| International Traction (preferred), 4s | a67 | a67 |
| Manhattan Railway | 130 | 115 |
| Massachusetts Elec. Cos. (common) | 14 | 12½ |
| Massachusetts Elec. Cos. (preferred) | 54½ | 52 |
| Metropolitan Elevated, Chicago (common) | 22 | 21½ |
| Metropolitan Elevated, Chicago (preferred) | 63 | 63 |
| Metropolitan Street | a91 | a70 |
| North American | 66 | 55 |
| North Jersey Street Railway | 40 | 40 |
| Philadelphia Company (common) | 40 | 38 |
| Philadelphia Rapid Transit | 19 | 17¼ |
| Philadelphia Traction | 93 | 92½ |
| Public Service Corporation certificates | 65 | 65 |
| Public Service Corporation 5 per cent notes | 92 | 92 |
| South Side Elevated (Chicago) | 80 | 80 |
| Third Avenue | 90 | 75 |
| Twin City, Minneapolis (common) | 88 | 86 |
| Union Traction (Philadelphia) | 57 | 56 |

a Asked.

### Metals

The "Iron Age" says that foundrymen, large and small, seem to persist in the policy of keeping out of the market, and even the large smelters are buying only from week to week for prompt delivery. They are encouraged in their course by constantly lower prices in some sections. In steelmaking irons interest centers entirely on basic iron, which is weaker. There has been no further buying of steel by the leading interests since last week. While steel works and rolling mills have assurance of full work for the balance of the year, and while they are crowded now, it is undeniable that on the whole new orders are coming in at a considerably reduced rate, so that the winter may find a slackening of operations necessary.

The deadlock between copper producers and consumers continues. Very little copper is being sold, but as yet there has been no lowering of prices by the large producing interests.

## B. R. T. EARNINGS FOR YEAR ENDED JUNE 30, 1907

The Brooklyn Rapid Transit Company's full income account for the year ended June 30, 1907, as reported to the Public Service Commission (subject to change) compares as follows:

| | 1907 | 1906 |
|---|---|---|
| Gross receipts | $19,381,587 | $18,473,328 |
| Operating expenses | 11,465,705 | 10,441,377 |
| Net earnings | $7,915,882 | $8,031,951 |
| Other income | 555,166 | 323,936 |
| Total income | $8,471,048 | $8,355,887 |
| Fixed charges | 6,026,386 | 5,612,934 |
| Surplus | $2,444,662 | $2,742,953 |
| Special appropriations | 442,064 | 580,343 |
| Surplus | $2,002,598 | $2,162,610 |

Surplus after special appropriations is equal to 4.45 per cent on the $45,000,000 capital stock.

Elsewhere in this issue brief mention is made to these figures as bearing on the hearings now in progress in New York.

## REPORT OF THE RUTLAND RAILWAY, LIGHT & POWER COMPANY FOR YEAR

The Rutland Railway, Light & Power Company, of Rutland, Vt., has just issued a statement of its earnings covering the year ended June 30, 1907. As compared with the previous year it shows as follows:

| | 1907 | 1906 |
|---|---|---|
| RAILWAY COMPANY | | |
| Gross receipts | $105,744 | $96,847 |
| Operating expenses | 55,747 | 55,884 |
| Net earnings | $49,997 | $40,963 |
| GAS COMPANY | | |
| Gross receipts | $33,034 | $29,306 |
| Operating expenses | 22,745 | 20,539 |
| Net earnings | $10,289 | $8,767 |
| POWER COMPANY | | |
| Gross receipts | $27,220 | *$3,789 |
| Operating expenses | 10,070 | 2,261 |
| Net earnings | $17,150 | $1,528 |
| *Three months. | | |
| RUTLAND CITY ELECTRIC COMPANY | | |
| Gross receipts | $63,394 | $57,320 |
| Operating expenses | 44,368 | 39,535 |
| Net earnings | $19,026 | $17,785 |
| TOTAL, ALL COMPANIES | | |
| Gross receipts | $229,392 | $187,262 |
| Operating expenses | 132,930 | 118,220 |
| Net earnings | $96,462 | $69,042 |

The electrical equipment promised for January, 1907, has just been received and installed, and will enable the company to make use of water power entirely for the operation of the electric light plant. The properties at Rutland were described in the STREET RAILWAY JOURNAL for Nov. 24, 1906.

## THE TRANSIT INQUIRY IN NEW YORK

The inquiry into the methods of management of the Interborough Metropolitan Company was continued by the Public Service Commission, with Wm. M. Ivins as special counsel, on Thursday and Friday of last week, after which an adjournment was taken until Wednesday, Aug. 14, when the inquiry into the Brooklyn Rapid Transit Company was begun. Mr. Hedley, general manager of the Interborough Company, was the witness on Thursday, while on Friday, both Mr. Hedley and Mr. Bryan, of the Interborough Company, were called upon for details of management of the subway and elevated lines with which the Commission felt itself concerned. The question of disorder on the elevated lines was again brought up on Thursday. Mr. Hedley said the company maintains a secret service corps to suppress the rowdy, and that five or six arrests a day result from the work of these men. Still, cases continue of assaults upon passengers. Mr. Hedley reiterated the statement he made last week to the effect that he knew of no way to prevent such occurrences unless the company were allowed to put special policemen on the station platforms. During the hearing the fact was brought out that the original charter of the Manhattan Railroad Company contains a provision that during certain hours passengers who are not provided with seats shall not be compelled to pay any fare. Mr. Hedley points out that it would be quite impossible for physical reasons to live up to any such provision. Of course this was plain to the Commission beforehand, and the object sought in continuing the inquiry along these lines is impossible to conjecture. Other subjects considered on Thursday were the facilities at the 155th Street station on the Ninth Avenue elevated, and the training received by employees of the subway in the handling of emergency tools.

On Friday Mr. Hedley was again called to the stand, and questioned as to the means provided for meeting the provisions of the contract for operating the subway insofar as they concerned minor details. It seems that one of these details concerned the supplying of drinking water at stations to patrons of the subway. No public fountain is maintained at each station, but the ticket booth is equipped with a cooler, and the instructions to the agents are to comply with requests of patrons for water. In this way the general inconvenience is overcome, which would result from having a public fountain generally available where it would be at the mercy of those maliciously inclined and might be easily converted into a source of considerable annoyance to a majority of passengers. Questioned regarding the strength of the elevated railroad, Mr. Hedley said it was systematically inspected, and that there was absolutely no cause for alarm as to its physical condition. The question of protection from accident afforded passengers in the subway resulted in a brief review by Mr. Hedley of the safety appliances especially provided with this end in view. In reply to a question by Mr. Ivins as to why the overhead system was not used in the subway, Mr. Hedley said it was impracticable, because of insufficient clearance. President Bryan, of the Interborough Company, in replying to questions regarding the tunnel under construction under the East River between Forty-Second Street and Long Island City, said that it would be operated as a shuttle service, with a 3-cent fare. Figures obtained from Mr. Bryan showed that there were 137,919,632 passengers carried during the year ended June 30, 1906, and 166,363,611 passengers carried during the year ended June 30, 1907.

On Wednesday the Commission turned its attention to the Brooklyn Rapid Transit Company. President E. W. Winter was the official witness, but most of the questions about financial matters were answered by Col. T. S. Williams, vice-president, by whose testimony the foundation was laid for questions relating to the garbage contract and its developments as a factor in Brooklyn Rapid Transit finance. It appeared that H. Milton Kennedy in 1902 made his arrangements with the city on the basis of 17 cents per car mile, and with the Brooklyn Heights Railway Company on the agreement that he should furnish his own cars. But by July 30, 1903, the American Railway Traffic Company had been incorporated in New Jersey with a capital of $1,000,000, Mr. Kennedy, C. I. Taylor and J. Haviland Tompkins being named as the incorporators, and to this concern Mr. Kennedy assigned his contract. That was on Sept 2. The same day 9995 shares of the Railway Traffic Company stock were assigned to the Transit Development Company, leaving five shares to qualify directors, and eventually the Brooklyn Rapid Transit paid the Transit Development Company $500,000 cash for its $500,000 capital. Mr. Ivins put in a number of exhibits showing the corporate development of the present Brooklyn Rapid Transit Company with its seventy constituents. Among these was one showing the amount of securities of each of the important subsidiaries owned by the Brooklyn Rapid Transit, as contrasted with that which is in the hands of the public. At the hearing the results of the operations of the company for the year ended June 30, 1907, became known. The company showed gross earnings of $19,381,587 and net earnings of $7,915,704. The total income was $8,471,048, and fixed charges, including interest, rentals, and guaranteed dividends $6,026,886, making the net income of $2,444,661 and the surplus $2,002,598, after $442,063 special appropriations had been deducted. The fixed charges included interest on bonds of $2,772,771, and on certificates of indebtedness of $1,305,160.

The Public Service Commission has adopted a set of rules, formulated by its counsel, covering the form of application to be made by any railroad company for an extension of its line within the jurisdiction of the Commission. The Commission has instructed its counsel to formulate sets of rules covering also the application by companies for issues of securities of any kind.

## PROGRESS ON THE CHICAGO, LAKE SHORE & SOUTH BEND ROAD

Satisfactory progress is being made in the construction of the Chicago, Lake Shore & South Bend Railway, one of the most important interurban electric railway lines now building in the United States. The road will extend from Kensington, on the outskirts of Chicago, where connection will be made with the Illinois Central Railroad for operation into Chicago, to Hammond, Gary, Dunne Park, Michigan City and South Bend, a distance of about 30 miles. With the completion of this road and the link between Warsau and Peru, Indiana, by the Winona Interurban Railway Company, Chicago will have trolley connection with the network of interurban lines in Indiana and Ohio.

A mile of track in South Bend has been completed, and the track for 16 miles west, also the pole line has been completed. The company has purchased a gravel pit adjacent to its line and is now ballasting the portion of the track constructed. From the end of the present track through to Michigan City, a distance of 18 miles, the grading will be finished within the next thirty days, when track laying will be begun on this section from both the east and west end, also the erection of poles. The track is now laid two-thirds distance through Michigan City and will be completed within a few days.

From the western limits of Michigan City, 12 miles west to Dunne Park, the grading has been completed and the laying of track and erecting of poles will be begun soon in Michigan City. The grading is progressing from Dunne Park on to Gary and all contracts have been let. Two miles of track are laid in Gary and the poles erected.

The abutments for overhead crossings west of Gary over the Wabash, Pennsylvania and Elgin, Joliet & Eastern Railways are nearing completion and the bridges will be erected as soon as the construction work on the piers is completed. The bridge across the Calumet River, 610 ft. in length, has been completed, and the grading between Gary and Indiana Harbor will be completed within two weeks, when track laying and erection of poles will immediately follow.

Private right-of-way has been purchased across the city of Hammond to the State line. The grading and filling between Kensington and through to a point at the Little Calumet River has been completed and track-laying will be begun soon.

All the foundation walls for the power house and the engine, generator and boiler foundations have been completed. The stack, which is of Custodis pattern and is to be 210 ft. high, has been completed to the height of 150 ft. All apparatus to be installed in the power house has been contracted for, and the cement blocks for constructing the walls of the power house are upon the ground.

Within thirty days the company will install a force of men at South Bend and begin the overhead single catenary construction.

## PROGRESS ON THE W., B. & A.—SERVICE PROMISED FOR NOV. 1

Officials of the Washington, Baltimore & Annapolis Railway Company have announced that train service on the line between Washington and Baltimore will be inaugurated Nov. 1. Construction work on this road was begun in April of last year. The grading has been practically completed and 20 miles of double track are now laid.

The road will be 42 miles long, and is being built as a high-speed line, the maximum curvature of the main line being 1 per cent, and the maximum grade 2 per cent. The construction work is of the highest class, the bridges being of concrete, and the track across them ballasted with stone. The same kind of construction is used in the overhead crossings of public and steam roads, there being no grade crossings. In some places the electric line will pass underneath the other roads.

The total cost of construction will be in the neighborhood of $6,000,000, of which about $1,250,000 will be required for the 4½ miles of terminal lines and approaches to Baltimore. Engineering work of the most costly character was necessary for the latter, there being heavy fills and stretches of masonry incline necessary to cross railroads and secure an entrance satisfactory to the company and the city.

The car equipment will be in keeping with the excellence of the road, the intention being to operate on a 15-minute schedule, and make the distance between Washington and Baltimore in 72 minutes. Both express and local trains will be provided, and a first-class freight service will be maintained. The cars will be fitted with four 125-hp motors, and geared to 75 miles an hour. The block signal system will be used.

Entrance to Washington from Chesapeake Junction will be made over the line of the Washington Railway & Electric Company, the cars running to the Treasury Department, in the center of the city. The power house will be located at Hyattsville, and the yards and repair shops at Naval Academy Junction.

A handsome depot will be erected in the business district of Baltimore. It will be two stories high, with basement. The ground floor will be used for ticket offices and waiting rooms for passengers, and the second floor for the general offices of the company. The basement will serve for freight and express purposes.

The system of lines that will ultimately be operated by the Bishop-Sherwin syndicate comprises the Washington, Baltimore & Annapolis, 42 miles; the Annapolis, Baltimore & Washington, 21 miles, which is now being operated as a steam road between Naval Academy Junction and Annapolis, and the Washington, Berwyn & Laurel, 9 miles long, and operating between Laurel and Washington. The Annapolis, Baltimore & Washington is now being electrified. The system will serve about 1,000,000 persons when completed.

## AFFAIRS IN CHICAGO

In the case of the application of the Chicago Railways Company to take over the properties of the Union Traction Company, Judge Peter S. Grosscup, of the United States Circuit Court, has announced that he would turn the properties over to the Railways Company. The purpose intended was plainly announced. It was to keep the Union Traction properties together and make it possible to operate them under the ordinance which the city has granted to the Chicago Railways Company. The form the order will take has been indicated pretty clearly. It will be a lease of the Union Traction properties to the Chicago Railways Company—not a sale or even an "operating agreement." The position of the court is that it is in as absolute possession of the different properties as if it was a private and individual owner; that its obligation is to do with them what in the best judgment will best conserve them for the benefit of the legal owners and the creditors. The position the company is in is a peculiar one. It owns no right of way worth talking about, and what few franchises it has left are dying fast. It is operating by sufferance of the city to meet a public demand. The city has offered it a franchise if it would comply with certain conditions. If it does not it must go out of existence. To meet those conditions the securities of the properties must be scaled down, the Chicago Railways Company organized, and the properties turned over to it.

Briefly, the features of the changes in the traction plan follow:

The bond issue is to have 4 per cent for the first five years and 4½ per cent after that.

Holders of West and North Chicago Railways, the underlying companies, are to get more debentures and less bonds. They will get $100 in bonds. They were offered $200 previously. The division of participation certificates is to be made 16 per cent to the West division, 7 per cent to the North division, and 2 per cent to the Chicago Passenger Railway.

North Chicago stock referred to in page 12 of the original plan as $499,800 is changed to $449,820.

West division stock originally mentioned as $1,249,200 is changed to $449,680.

Collateral mortgage 3 per cent bonds series "A" are changed from $6,617,200 to $5,867,200. Total junior collateral and reserve consolidated mortgage 4 per cent bonds are changed from $17,800,000 to $16,900,000.

Four per cent sinking fund debentures are changed from $3,995,425 to $4,801,200.

The issue of participation certificates of series "A" is changed from $12,250,000 to $13,250,000.

A suit by a stockholder of the Chicago City Railway Company to defeat the carrying out of the traction-settlement ordinances has been started by the filing in the Superior Court of a petition for mandamus to compel the company's officers to show their books. The petition was filed by E. N. Zoline as attorney for C. H. Venner, of New York. Mr. Venner is owner of 200 shares of stock in the company, according to Mr. Zoline. It is admitted by Mr. Zoline that the object of inspection is to furnish material for an attack on the traction-settlement ordinance and the recent issue of bonds by the company to carry out the ordinance provisions.

On Aug. 12 Judge Grosscup signed and entered the order turning over the North and West Side lines to the Chicago Railways Company, in accordance with the reorganization plan. Notice that an appeal would be taken from the order was given by the Merchants Loan & Trust Company, trustees for first mortgage bonds.

## THE CLEVELAND SITUATION

Traction matters have been quiet in Cleveland the past week. The work of taking evidence before a notary public has been continued by the Cleveland Electric, and some very good material has been secured to be used in the trial of the cases that are now pending in court. Some of the persons from whom consents were secured by the policemen and city officials for the low fare companies testified that they were coerced into giving them, while, on the other hand, some stated that they gave them voluntarily.

Attorneys for the Cleveland Electric state that they have found five defects in the ordinance passed by Council last week, giving the Forest City Railway Company a re-enacted franchise over all the routes on which it has heretofore received grants. In brief, they are as follows:

1. That the ordinance was not submitted to the committee on ordinances before its passage, as provided by the rules of the Council.

2. That at its three readings, the ordinance was read only by title, although the intent of the law is to compel its reading in full each time.

3. That the third reading and final passage came within 16 hours of the second reading, this being held to be a clear violation of the State law requiring that each reading be on a separate day. The word day in the petition will be construed to mean 24 hours and not merely a calendar day.

4. That no consents were filed by the Forest City Railway Company in connection with the new ordinance, although their possession and filing is plainly mandatory.

A little four-page publication devoted to the interests of the employees of the Shreveport Traction & Light Company, of Shreveport, La., has just been issued. It contains besides news of the men, jottings of local interest and a few puns. Under the caption, We all know, some good advice is given the public in kindly spirit.

## NEW SECRETARY OF THE CANADIAN STREET RAILWAY ASSOCIATION

At the annual meeting of the association held at Windsor, Ont., June 14 and 15, Allan H. Royce declined re-election to the secretary-treasurership, and the election of a secretary-treasurer was left to the executive committee. At a meeting of the committee held in Ottawa on July 31, Acton Burrows was unanimously elected to the position. Under the constitution of the association, its office is to be at the place where the secretary-treasurer resides. Mr. Burrows' address is 33 Melinda Street, Toronto, Ont.

## A PRETENTIOUS WESTERN PROJECT

For the purpose of building an electric railway between Minneapolis, Minn., and the gulf, a company has been chartered with $50,000,000 capital stock under the name of the Minneapolis, Kansas City & Gulf Railway Company, with headquarters at Minneapolis. The proposed route is via Des Moines, Kansas City, Wichita, Guthrie, Oklahoma City, Dallas, Waco, Houston and Galveston, with branch lines connecting Topeka, Omaha, St. Joseph and Lawrence, Kan. The main line, as routed, runs direct from Minneapolis and St. Paul to Des Moines, Ia., thence to Kansas City and to Wichita via Ottawa, Kan. From Wichita south it will pass through Ponca City, Guthrie and Oklahoma City to Dallas, thence south to Galveston, where connection will be made with gulf steamship lines. The stock of the company is in the hands of the Northern Securities Company of Minneapolis, which is acting as the fiscal agent for the company. C. B. Holmes, former president of the Chicago City Railway, is chairman of the board of directors.

## MORE NEW HAVEN EXTENSIONS RUMORED

The presence of Charles H. Mellen, president of the New York, New Haven & Hartford Railroad Company, in Troy, N. Y., Friday, Aug. 9, lent credence to the rumor that has been current for some time to the effect that the Consolidated, the holding company of the New Haven Railroad, is about to extend its electric railway properties. The right of way has been secured to Troy from Hoosick Falls, the present terminal of the electric railway system. Mr. Mellen, with H. W. Ely, counsel for the New Haven Railroad, visited Bennington, Vt., in company with several railroad men from New Haven. The New Haven line already runs to Bennington, and it is now said to be the purpose to extend it through Manchester and Poultney to Rutland, where it may connect with the Fairhaven system. Such a line would penetrate a section of Vermont and Eastern New York that is populous and prosperous. Work on the line to this city will, it is said, begin inside of a year.

## PHILADELPHIA & EASTERN REORGANIZED

The Philadelphia & Eastern Railway Company was reorganized Aug. 8. The officers elected are: David P. Ayars, of Wilkes-Barre, president; Joseph S. Ransom, of Philadelphia, secretary and treasurer; David P. Ayars, of Wilkes-Barre; A. H. Sickler, of Philadelphia; W. J. Lescure, of Harrisburg; A. E. Pendergast, of Trenton; Henry B. Rush, of Lancaster; A. C. Patterson, of Philadelphia, directors.

The road was purchased from the trustee some time ago at public sale, for $100,000, subject to $825,000 indebtedness, by a committee representing the bondholders, who, by putting up more money for this purpose, will get in on the new issue of the bonds and stocks.

The road will hereafter be in charge of an executive committee under the name of the Philadelphia & Easton Electric Railway Company, operating 32 miles of road from Doylestown to Easton, connecting with the Philadelphia Rapid Transit at the Doylestown end, and with the Northampton Traction Company and the Easton Traction Company at Easton, giving a direct line between Philadelphia and Portland, 6 miles from the Delaware Water Gap.

After the issue of new stock and bonds has raised sufficient funds the company expects to make improvements, including the straightening of the line under the right of eminent domain and improving the service for passengers and freight, the latter having provided a profitable business for the road in the past.

## STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED JULY 30, 1907

861,269. Cross-Tie Construction; Albert Cottom, Chillicothe, Iowa. App. filed March 29, 1907. Spaced bearing blocks connected to each other transversely and longitudinally, and means for fastening the rails thereto.

861,313. Car Construction; Allen E. Ostrander, Paterson, N. J. App. filed March 21, 1907. A longitudinal car sill consisting of a pressed metal web plate, provided at its upper edge with an integral laterally projecting flange, and L-shaped members secured to the lower edge portion of the web plate, said plate being interposed between the vertical legs or flanges of said members.

861,325. Device for Cleaning Overhead Trolley Wires; John L. Snitker and Wilmer S. Carl, Cincinnati, Ohio. App. filed Aug. 29, 1906. An elastic hook for engagement with the trolley conductor is mounted on the upper end of the trolley pole in such a way as to strip the ice from the conductor in advance of the wheel.

861,384. Metallic Cushion Tie; Stewart McCahon and Alexander McCahon, St. Joseph, Mo. App. filed Dec. 15, 1906. Metallic cones to which the rails are secured by cushion springs.

861,391. Steel Underframe for Cars; Herman C. Priebe, Blue Island, Ill. App. filed Dec. 28, 1906. Details of construction.

861,429.. Safety Stop; Henry H. Brockhuis and Andrew Buettner, Cincinnati, Ohio. App. filed April 15, 1907. An emergency brake consisting of a block or shoe adapted to be lowered upon the track rail, and upon which the car wheel runs.

861,491. Railway Spike; Ole C. Abrahamson, Minneapolis, Minn. App. filed March 4, 1907. The spikes are provided with projecting shoulders slightly below the head, and a tie-plate is provided having perforations for the reception of the spike and its shoulder, said tie-plate being adapted to be moved so that portions thereof will engage the shoulders.

861,547. Metallic Railway Tie; John G. Snyder, Altoona, Pa. App. filed Oct. 24, 1906. Comprises a casing or shell open at the bottom with the edges of the sides turned inwardly and upwardly to form springs, and means for securing the rail to the tie.

861,548. Metallic Railway Tie; John G. Snyder, Altoona, Pa. App. filed Oct. 24, 1906. Means for securing rails to a metallic tie, consisting of a series of openings extending obliquely across the crown of the tie, a clamp to engage the rail movable diagonally across the crown of the tie, a finger of the clamp to register with the openings and means for securing the clamp to the tie.

861,556. Brake-Shoe; James S. Thompson, Chicago, Ill. App. filed Dec. 12, 1906. A brake-shoe having a plurality of curved surfaces on its wearing face to render it adaptable to wheels of different diameters.

861,588. Automatic Fluid Brake; Thomas Gunderson, McIntosh, Minn. App. filed Jan. 21, 1907. Provides a mechanism which will automatically supply fluid to the ordinary fluid brake cylinder whenever there is a reduction of pressure in the main pipe, due to the breaking of connection between any two cars.

861,590. Automatic Railway Switch; Horace H. Hayes, Gardiner, Maine. App. filed Feb. 21, 1907. Details of a switch adapted to be unlocked, thrown and locked again by a passing train.

861,064. Railway Brake; John B. O'Donnell, Kansas City, Mo. App. filed May 10, 1907. The object of this invention is to make the movements of the parts in applying the brakes to the wheels as slight as possible, thereby diminishing the travel of the pistons in the air cylinders and economizing the compressed air.

861,617. Third Rail Ice-Cutting and Cleaning Machine for Electric Railways; George A. Spice, Chicago, Ill. App. filed April 6, 1906. A cutter wheel provided with teeth disposed spirally thereon is rotated by sprocket and chain connection with the car axle.

861,644. Metallic Railway Tie; Robert Fagan, Loami, Ill. App. filed May 8, 1907. A tie having enlarged hollow end portions, a rail engaging tongue secured upon each end portion, and a spring rail fastener straddling and secured to each end portion of the tie.

861,700. Street Car; Albert H. Bates, Cleveland, Ohio. App. filed Sept. 12, 1903. A longitudinal seat on one side of the car, an aisle and a series of transverse seats between the aisle and the other side of the car.

861,715. Electric Indicator for Trains; Harry G. Dyer, Gloucester, N. J. App. filed Feb. 11, 1907. A plurality of special trolleys or conductors are laid alongside the usual track rails and are adapted to establish various alarm and signal circuits within the locomotive cab.

861,717. Splicing Sleeve; Harry Frankel, New York, N. Y. App. filed March 14, 1907. The end of the trolley conductor is placed in a sleeve having a split conical end which is bound upon the conductor by a threaded bushing.

861,759. Railroad Signaling Device; Elmer G. McGath, Lancaster, Ohio. App. filed April 11, 1907. An arm is positioned in the path of the train by an electric circuit connection from the semaphore signal and is adapted to close a local alarm circuit within the locomotive cab.

861,760. Roller Side Bearing for Railway Cars; John F. O'Connor, Chicago, Ill. App. filed March 25, 1907. The upper and lower bearing surfaces are provided with a toother rack and the rollers are provided with gear teeth..

861,772. Signal Controlling Mechanism; Valentine I. Smart, Chicago, Ill. App. filed July 13, 1906. Provides means by which signals at different stations are controlled by two or more operators located at different points so that the operator at one station cannot give a safety signal except with the co-operation of the operator at the succeeding station.

861,845. Rail Brace for Railway Rails; Harry Hemphill, Sarver, Pa. App. filed May 18, 1907. Provides a combined brace for bracing the rails of a track transversely and fishplates for securing the rails together longitudinally.

861,878. Metallic Tie and Rail Fastener; Robert M. McKinney, Dravosburg, Pa. App. filed Jan. 11, 1907. Relates to means for fastening rails of hollow metallic ties.

861,878. Metallic Tie and Rail Fastener; Robert M. McKinney, Dravosburg, Pa. App. filed Feb. 1, 1907. See above patent.

861,892. Car Fender; Joseph A. Poirer, Woonsocket, R. I. App. filed April 1, 1907. Means for normally maintaining the fender in an elevated position, automatic means for maintaining the same in depressed position, and adjustable collars carried by the shaft on which the fender for regulating the normal position thereof.

861,956. Trolley Pole Attachment; Patrick F. Duross, New York, N. Y. App. filed Dec. 22, 1905. A specially constructed cup or funnel with a laterally extending spout, said cup being attached to the trolley cord so as to keep rain water from running down the cord and inconveniencing the operator.

861,958. Electric Signal; Martin A. Ewing and Joseph H. Ewing, Gallatin, Tenn. App. filed Jan. 12, 1906. A depending lever on the locomotive is engaged by a magnetically positioned train-stop arm to blow the whistle in the locomotive in case a signal is disregarded.

861,969. Railway Tie; Michael A.. Glynn, Habana, Cuba. App. filed Dec. 5, 1906. Details of construction.

862,068. Automatic Train Pipe Coupling; Jean B. Genin, St. Albans, Vt. App. filed Sept. 22, 1906. The object of this invention is to substitute metal parts for the usual rubber parts wherever ppossible.

862,068. Automatic Train Pipe Coupling; Jean B. Genin, St. Albans, Vt. App. filed Sept. 22, 1906. The object of this invention is to substitute metal parts for the usual rubber parts wherever possible.

862,068. Metallic Tie and Rail Fastener; William A. Maitland, Sharon, Pa. App. filed April 30, 1907. A tie of the I-beam construction having a rail chair slidable thereon and adapted to be bolted thereto.

862,103. Railway Tie; Thomas W. Pitts, Tampa, Fla. App. filed March 6, 1907. A reinforced concrete tie having wooden blocks set therein to which the rails are spiked.

12,677, Air Brake Apparatus; Charles E. Turner, Rochester, N. Y. App. filed June 26, 1905. The combination of an engineer's valve, a brake cylinder and its triple valve, piping connecting these parts, brake control valve mechanism independent of the engineer's valve, and piping connecting the same to the brake cylinder and to the triple valve exhaust port, said brake control valve mechanism being arranged to open the triple valve exhaust port to the atmosphere, or to close the same, and to open the brake cylinder to the atmosphere.

## PERSONAL MENTION

J. W. ANDERSON has resigned as superintendent of the Worcester & Southbridge Street Railway Company. Mr. Anderson was appointed to the position from which he has just resigned April 1, being promoted from the superintendency of the Blackstone Valley Street Railway.

MR. WILLIAM E. MITCHELL, formerly with the Sao Paulo Tramway, Light & Power Company, has accepted a position as electrical engineer of the Bahia Tramway, Light & Power Company, of Bahia, Brazil, which has taken over the old Siemens & Halske electric tramway, and is completely renovating and extending this system.

MR. R. A. DYER, assistant manager of the Rochester, Syracuse & Eastern Railroad, will add to his duties those of superintendent of the Auburn & Syracuse Railroad. Mr. Dyer succeeds Mr. R. P. Stevens, of Auburn, who, as recently announced in the Street Railway Journal, assumes the presidency of the Lehigh Valley Transit Company.

MR. KEMMANN, city engineer of Berlin and engineer of the Elevated and Underground Railway Company of that city, and Mr. Paul Wittig, general manager of that company, are on a visit to this country. Their purpose is to investigate the development of subways and underground electric railways here, particularly the latest methods of construction, as their company has some important extensions under contemplation. They are planning to visit New York, Brooklyn, Boston, Philadelphia, Buffalo and Chicago.

MR. JOHN C. OSTRUP, M. Am. Soc. C. E., has been appointed to fill the chair of structural engineering at the Stevens Institute of Technology, Hoboken, N. J. Prof. Ostrup is a graduate of the Polytechnic School in Copenhagen, and later took a post graduate course at the Chicago Engineering School, and has had a large and varied experience in important work extending over seventeen years. He was for five years in charge of the office work and design of the Lake Street, the Northwestern and the Union Elevated Railroads of Chicago during their construction, and afterwards designing engineer of the Boston Elevated Railroad during its building. Upon its completion he went into private practice for four years and has since for the past two years designed many important structures and bridges for the American Bridge Company in New York.

MR. G. B. DUSINBERRE, M. E., formerly sales manager of the Cleveland office of the Westinghouse Electric & Manufacturing Company, has established himself as a consulting engineer with offices in the Electric Building, Cleveland. Mr. Dusinberre will make a specialty of plans and specifications for electric railways, lighting plants, power transmission and industrial plants, and will also act in an advisory capacity, reporting on existing or proposed electric railways and other properties and in a consulting capacity in regard to improvements to existing plants and to bettering their methods of management. Mr. Dusinberre's experience has extended to various branches of the electrical field, his work with the Westinghouse Company especially fitting him to express an authoritative opinion in regard to electric railway and light problems, which he will make a specialty.

MR. J. BECKETT RUSSELL, auditor and local secretary and treasurer of the Manila Electric Railway & Light Company, of Manila, P. I., and its allied companies, the Manila Suburban Railways Company; La Electricista; Union Truck Company, and the Compania de Tranvias de las Filipinas, is at present in New York on a visit to the head office of his company, 43 Exchange Place and Wall Street. Mr. Russell was for some time connected with the Stone & Webster syndicate on their Eastern and Far West properties but associated himself with the J. G. White Company during the construction period in Manila and has been resident there for the past three years. This electrical property is America's most distant one, and a visit to this city means a complete circuit of the globe, a fact of which Mr. Russell took advantage, coming home by way of India, Egypt and Europe. He returns in a few weeks via Canada, Japan and China.