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Of this issue of the Street Railway Journal 10,000 *copies are printed. Total circulation for* 1907 *to date,* 190,050 *copies, an average of* 8263 *copies per week.*

"Surprise Tests" in Train Operation

In train operation an excellent plan for maintaining the efficiency of the service is the occasional use of "surprise" tests to discover whether or not trainmen and others are obeying the rules regarding train operation and signals. According to press reports during the year 1906, on one steam road 1,625 such tests were made, and the records show there was not a single failure to obey the signals, and in only sixteen cases were the rules not absolutely followed. The strict observance of rules is probably in a measure due to the fact that when the tests were inaugurated on this road several years ago ten engineers were discharged from the service and several others were dealt with severely.

In some instances the managements of electric railway companies seem to presume that rules with regard to dispatching and train operation will be lived up to without any attention on the part of the management. Presumption, however, is never as good as knowledge. "Spotters" are detailed to watch conductors, and it might be to the advantage of every company to inaugurate a system of spotting or of "surprise tests" to assure care and obedience on the part of the trainmen. The system need not be secret to the extent that the men know nothing of it. On the contrary, it might be better to let them understand that such spotters are on the road, and that these tests are likely to occur at any time. The fact that there is chance of being caught at any time would do much to keep them on their guard, and the more open the company is about it, the less the men will feel that advantage is being taken of them.

Electrified Steam Road Practice

The articles published a year or more ago in this paper, and generally in the technical press, describing the power stations, locomotives and cars which the New York Central has adopted in its electric zone, attracted wide attention, but in many respects the details of operation of a large electrified trunk line, like that possessed by this company are of more interest than its methods of construction and of more practical value to the operator. This is particularly true in regard to its repair shop practice, because of the experience of the company's engineers along these lines, and its financial ability to carry out plans of the largest magnitude.

Our article on this subject shows that the company is planning to concentrate the greater part of its maintenance work at its Harmon shops, although an inspection shed will be also maintained at North White Plains and the existing West Albany shops will be called upon to take care of any work involving a large amount of reconstruction. A study of the plans also reveals the liberal scale upon which all the departments have been laid out. In this respect the company has had an advantage over most city electric systems, where the high cost of real estate handicaps the engineer-architect in the design of a plant of this kind. The possibility at Harmon of duplicating the plant along its present lines on land already owned by the company may prove of great advantage in preserving the orderly arrangement of the departments as the capacity of the shops is increased. The same liberal treatment of all details is found not only in the space accorded each department but

in the thorough manner in which the entire building—but especially the pits—are heated and lighted, and in the precautions adopted for fire protection, a matter which has only recently been considered of paramount importance.

Another feature in harmony with those already described and also worthy of special comment is the practice of the company in providing duplicate apparatus in the form of trucks, rheostats, etc., for rapid installation on the cars. While this involves considerable additional investment, it is the policy of the company that it is better and cheaper in the long run to maintain this extra equipment rather than to keep a car out of service during the time that would be necessary to repair it.

In the handling of equipment in its machine shop the company has adopted the telpher system rather than the practice of installing one or more heavy cranes. The telpher extends across the end of the inspection shed of the car house and of the machine shop, and then continues down through the center of the latter. I-beam switches reach to every machine tool from which heavy parts may have to be handled. This allows the use of a dozen or so telpher carriages in different parts of the shops and avoids the necessity of the heavy beam construction requisite with the traveling crane.

Another example of New York Central electric railway practice is described in the account of the electrified section of the West Shore Railroad between Utica and Syracuse, which constitutes the leading article in this issue. We believe that it was Mr. Wilgus who first advanced the suggestion—this was in 1903, in his testimony before the Royal Commission on London Traffic—that trunk line and trolley line service could be combined so that city cars could pick up passengers at any point on the city streets, carry them to the trunk line and there convey them without change of cars over electrified tracks in multiple-unit or single cars to their destination. This plan has also received the able advocacy of President Mellen of the New Haven road, and will be exemplified on a considerable scale on the new electrified West Shore Railroad. The problems leading up to the equipment of this line and the selection of the electric system adopted are discussed at considerable length in the article referred to and the equipment finally selected is described in detail. The existing conditions favored the adoption of the under-running third-rail system, although a number of modifications were made from the practice followed in the New York zone, and the cars, of course, are entirely different. The official opening of this system this month will be an important mile-stone in the history of electric traction.

The installation is of interest not only to the railroad manager but to the transmission engineer as well, owing to the use of 60,000-volt potential. The advance in this branch of electrical engineering has been more rapid perhaps than in any other. It was less than ten years ago that the use of 11,000 volts on the Buffalo-Niagara Falls transmission line was considered a great achievement under Eastern climatic conditions. From this to 60,000 volts has been an enormous stride, but the practical success of the lines in use and the improved methods of handling this potential, developed on both the Hudson River Electric Power Company's lines and the Niagara power transmission to Syracuse, indicate that modern electrical engineering has made the economical distribution of power half way across New York State a possibility, and that the construction of other lines of this voltage will not now be long delayed.

Electric Locomotive Economy

Two main sources of economy characterize the electric locomotive as compared with its steam-driven rival: The saving in power consumption and the reduction of maintenance expenses which may be positively expected with good handling. The benefits of a higher tractive effort in proportion to the weight of the machine, more rapid acceleration, a wider opportunity for coasting, and operation at from 80 to 90 per cent efficiency at all loads and conditions of weather, with no consumption of current when standing idle, all accrue toward better and more economical service. If test figures mean anything, when obtained by duplicating commercial runs, it is fair to expect that the maintenance cost of the electric locomotive per mile operated will seldom exceed one-third that of the steam machine, and may in favorable cases reach but one-sixth the upkeep of the latter.

A third source of long run economy in the electric locomotive is quite often overlooked in the broader considerations of service improvement which have guided transportation engineers in the electrification of steam railroads. It has been well appreciated that the electric locomotive is a simpler machine than its competitor of the boiler, fire box, valve gearing, cylinder and driving mechanism, but certain fundamental characteristics which insure a highly efficient working unit throughout the entire life and development of the motor-driven outfit have not as yet become fully recognized.

It is only within the past seventeen years that steam locomotive experts have come to appreciate in a scientific way the general conditions of efficiency in their engines as modified by changes in detail design. The influence of boiler tube length upon the rate of fuel consumption on the grates, the effect of varying draft intensities upon the coal pile in the tender, the best steam pressures for simple and compound cylinders, the effect of steam quality upon performance and efficiency, influence of superheating and results of varied valve adjustments—these and other points have only begun to be studied in relation to the types of locomotives now being delivered to the railroads from the shops of the makers. Splendid work has been done in the locomotive testing laboratories in the way of answering questions of the foregoing character when directed upon single machines, but a vast amount of experiment remains to be carried through before the determination of the best design for a given set of operating conditions can be promptly made.

With the electric locomotive the problem of economy appears simpler, and although opinion differs as to the relative advantages of direct and alternating current for heavy railroad service, the conditions of operation in the locomotive itself are in no sense as variable as in the steam machine. Questions of quality do not concern the electric current in the sense that steam is superheated or dry saturated; quality of fuel and water do not impose restrictions upon the service at special places on the line; valve adjustments and draft problems are not present, and, in short, the details of design which mean so much in the efficient operation of the steam locomotive are paralleled scarcely at all in corre-

sponding features of the electric locomotive. Given a motor with a predetermined efficiency curve and sufficient capacity to handle the specified traffic without an excessive temperature rise in the windings, economical operation follows as a matter of course if due regard is paid to coasting. In other words, the arrangement of the conductors in the slots, the number of commutator segments selected, the use of the compensating pole, the dimensions of the brushes, cross section of the lead wires, dimensions of the magnetic circuit and similar points of vital interest to the designing engineer in the factory, make very little difference in the operating results as respects efficiency and maintenance, for a motor of given output and service capacity. The line potential must be well supported by the power plant for economical service, and in this respect a fair comparison is possible with the effect of low steam pressure in the older type of locomotive, but in the main there is a wider range of detail to be settled in the design of the steam locomotive for economical operation and the securing of a given efficiency in fuel consumption is less certain than in the case of the electric motor outfit.

The latter starts its career in fast and heavy railway service with a high efficiency and a substantial certainty that this efficiency will be continually realized in practice. It is a machine to be counted on, and questions of driving wheel diameter, type of control, wheel base, mounting and ventilation are not likely to modify the present efficiency for the worse. The actual decreased cost of power is an incidental reason in the main arguments in favor of electrification, but in terms of dollars and cents it is by no means insignificant. The independence of the electric locomotive in the conditions limiting the steam machine is certain to be the cause of greatly reduced expenses as electrified service increases.

Steel Passenger Cars

It does not take much perspicacity to see that the steel car, both for passenger and freight service, has come and has come to stay, at least for certain classes of service. The development of the steel car has taken some time and much hard work, but the wonder is that it has been so long delayed. Years ago when metal carlines first put in an appearance there were a few advocates of an all-steel car who were persistent, but they were ahead of their time. That the American steel car has, as yet, settled down to a fixed or typical method of construction is doubtful because there are too many ways to be tried before any final standard can be adopted, and the cases where steel cars have been put into service in any large numbers are still too few and of too recent date to make it possible to put one's finger on any one design and say this is the best.

Undoubtedly electric traction, especially in connection with underground roads, has had a potent influence in the introduction and design of these cars, although the practice of the Pennsylvania and Southern railroads, not to mention some others which have tried steel passenger cars, shows that their use is not confined to subterranean or subaqueous transportation.

Within the short period during which builders have been experimenting with this type of car a large number of designs have been brought out, and, while for tunnel work the question of non-inflammability has been the controlling one, the avowed purpose of the designer has also been to make a stronger and a stiffer car than if built of wood for a corresponding service. In the majority of cases this end has been attained.

In the cars of the Pennsylvania and Hudson companies, the strength of the car and its fireproof qualities have been brought prominently to the front. In fact, with the Pennsylvania car, the possibility of the structure being brought into a rough and tumble scuffle with the titanic forces resulting from collisions and derailments, has evidently been given great weight, and the car is calculated to be of sufficient strength to roll down an embankment without, as we say in specifications, showing any crack or flaw. With the Hudson car, the strength has not been carried to the same limits, as the trains are lighter and the speeds lower, but great vertical stiffness has been obtained by means of deep plates over the windows that are thus made to serve as stiffeners for the top chord of the side frame truss, as well as gussets for the side posts.

In both of these cars it will be found that the girders and plates are riveted together with a solidity that bespeaks well in advance for their durability in service. One of the troubles of the earlier designs was that they were put up with an air of apologetic timidity. It was as though they were unwelcome visitors who wished to ingratiate themselves because of the lightness and airiness of the structure. This was a mistake, and it is probable that a number of designs that have not been successful would have been so had heavier materials been used and the same general scheme of construction been retained. The fact that this was done in the case of pressed steel gondola cars, by which ample strength was provided for any contingency, probably explains the wide popularity of that form of construction. It is interesting to note, also, that in both the Hudson and Pennsylvania designs it has been possible to secure an exceedingly shallow floor construction with a strength far above that ordinarily used with wood. With the whole of the side framing built into the form of a vertical truss, the lower member, being in tension, need not be so heavy as where it alone sustains the whole of the load, and has the upper framing simply built on top of it. Coming now to the floor framing, we find that in the Pennsylvania car a center sill of the box type has been used that is quite capable of sustaining all end thrusts, while the upper works are so substantially fastened that there is no danger of their being wiped away or telescoped by an adjacent car mounting the platform. This use of a center sill to carry the weight of the car body has frequently been suggested, but it is extremely interesting to see the way in which it has been worked out, particularly for a car designed to carry motors on the axles.

We have swung away from the notion that it is necessary to imitate the wood in the construction of a steel car, and with such notable examples as these two coming to the support of those already in service it is well within bounds to expect a still more rapid increase in the adoption of this form of construction, where conditions make it desirable, than has obtained in the past.

WEST SHORE ELECTRIFICATION BETWEEN UTICA AND SYRACUSE

The electrical equipment of the West Shore Railroad which is now complete between Utica and Syracuse differs radically in purpose from that undertaken on the Long Island, West Jersey & Seashore, New York Central or New Haven roads. The work has been vigorously carried on during the past year, and the official opening of the line with electrical operation will occur June 15. To understand the reasons for the adoption of the methods followed in this important undertaking, a review of the railway situation in Central New York State is necessary.

TYPICAL CONSTRUCTION ON TANGENTS, LOOKING EAST ALONG A THREE-TRACK SECTION

Up to within two years ago the electric and steam transportation lines from Albany to Buffalo belonged to separate interests. The steam lines carried all the through passengers and freight and the electrics were extending their interurban branches, making vigorous efforts to parallel the steam lines to secure local and semi-express business. Through the ownership of the West Shore Railroad by the New York Central & Hudson River Railroad Company, the latter owned practically six steam railroad tracks between Albany at the east end of the State and Buffalo at the extreme westerly end. Of these two roads, the New York Central main line conducted, of course, the greater part of the business. Its four tracks, well ballasted and kept in excellent condition for high-speed service, and its frequent trains, made it the dominating transportation factor in Central New York. The West Shore Railroad, with its two tracks, was given over largely to freight, although two or three through trains were run each way daily between New York and Buffalo, and this passenger service was supplemented by a few local trains and coaches attached to milk trains. The two roads, however, served practically the same territory. For the greater part of the distance across the State they are not more than 12 miles apart and in many places are in close proximity.

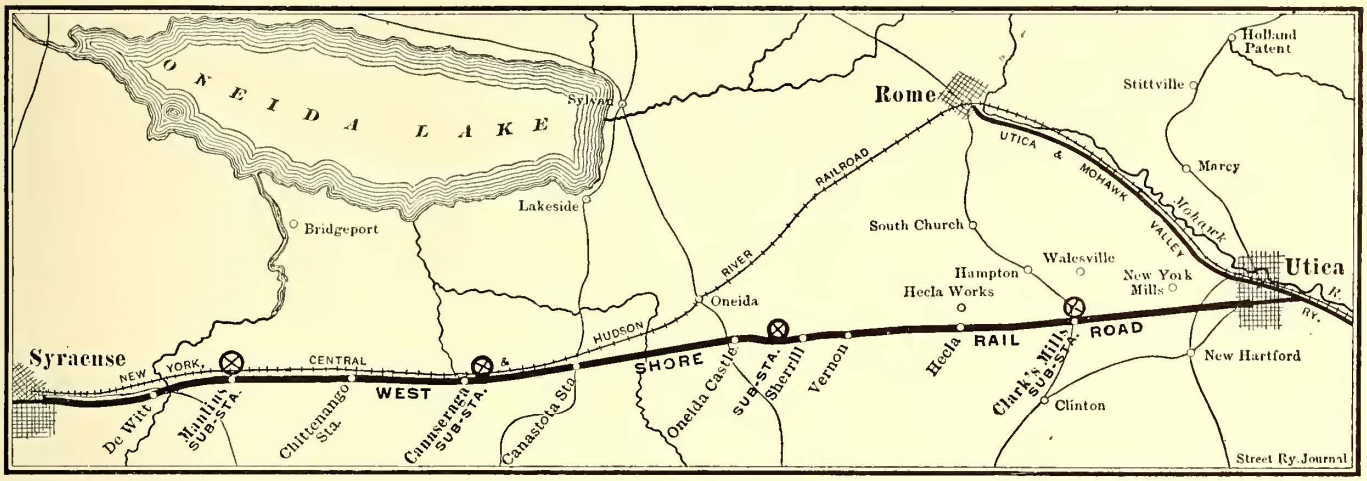
The first high-speed interurban electric railway in New York State was that connecting Buffalo and Niagara Falls, built in 1897-98. The success of this road in attracting passengers from the parallel steam railroad between Buffalo and Niagara Falls naturally attracted the attention of electric railway builders to the possibilities of interurban electric construction in the rich central district of New York State. Electric roads reaching out 20, 30 and 40 miles were projected and built from Schenectady, Utica, Syracuse, Rochester and other cities. At first they reached in a north or south direction, but were soon built to parallel the New York Central tracks. Extensions and purchases gradually threw several of the more important of these lines, as well as the two large city systems of Utica and Syracuse, into the hands of the Andrews-Stanley syndicate, of Cleveland,

Ohio. Active efforts then began to close the electric railway gaps between Buffalo and Albany.

At this juncture, the New York Central Railroad, recognizing the evils of competition, as well as the tremendous benefit which each interest could be to the other if they were united, started upon its policy of the absorption of the principal electric lines in Central New York. The properties of the Andrews-Stanley syndicate, consisting of the Utica & Mohawk Valley Railway, connecting Little Falls, Utica, Rome and Clinton, and the Syracuse Rapid Transit Company were first taken over. The value of the experience of Mr. Andrews and his associates was recognized by the New York Central interest in the selection of Mr. Andrews to take charge of this work. Subsequently control was secured by the New York Central of the Rochester Railway & Light Company and the Rochester & Eastern Rapid Railway, and, in conjunction with the Delaware & Hudson Railroad Company, of the systems in the cities of Schenectady and Albany.

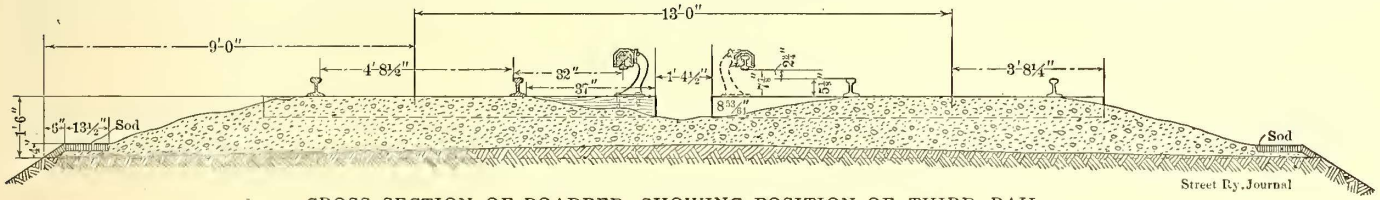
Having now a free hand to develop every means of transportation is this rich and populous district, Mr. Andrews and his associates turned their attention to the task of uniting the several isolated electric systems in the territory in their charge. A consideration of the situation led to the belief that the greatest pressing need for direct connection was between Utica and Syracuse. In fact, before the consolidation of interests an electric interurban line had been projected between the two cities by the owners of the electric lines, and considerable grading had been done in pursuance of this plan.

A glance at the accompanying map will best show the situation presented here. The main tracks of the New York Central Railroad depart from the direct line between Utica and Syracuse and sweep by a long curve to the north through Rome. The West Shore retains the general easterly and westerly direction by a route 7 miles shorter than that of the New York Central and extending through a well-populated and rich territory. Among the towns traversed are Oneida, 9000 population; Vernon, 3000 population, and Canastota, 5000 population. The distance between the two cities is a little over 44 miles, but under the West Shore schedule extremely scanty passenger transportation facilities were provided. With the exception of two trains with sleepers passing over the line at night and of practically no use to the contiguous or terminal population in Utica and Syracuse, there were only two trains each way a day. Here, then, was the logical place to apply electricity.



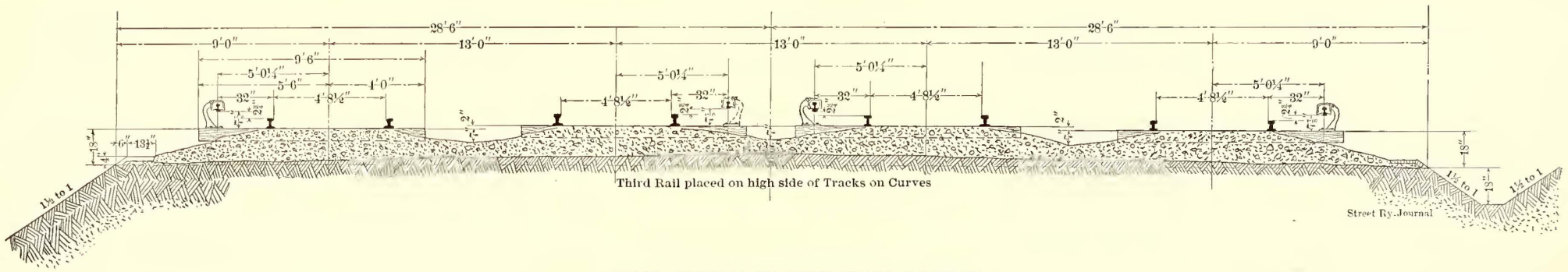
MAP OF TERRITORY BETWEEN UTICA AND SYRACUSE, SHOWING WEST SHORE AND NEW YORK CENTRAL TRACKS

The Oneida Railway, a corporation operating a trolley system in the city of Oneida, is the corporation to which the task of electrically connecting the two cities was entrusted. The next step was the mutual adoption of an agreement between the Oneida Railway Company and the New York Central Company under which the former agreed to lease the tracks of the West Shore Railroad between Utica and Syracuse, equip them for electrical operation and conduct the passenger business between these two points. The New York Central, on its part, consented to abandon the West Shore local trains on these tracks, but reserved the right to continue its through steam trains and to haul freight over the section by steam locomotives. The section of the West Shore included in this agreement runs from the westerly city line of the city limits of Utica to the easterly limits of the city of Syracuse, and at that time consisted of a double track. This track has been increased by the addition of 14 more miles in the form of third and fourth tracks, to accommodate the three classes of service which it is proposed to run. At the same time, the track was relaid throughout with 80-lb. A. S. C. E. rails. Altogether, of the 43.940 miles of route, 30.515 are laid with two tracks, 8.843 miles with three tracks, and 4.582 with four tracks, making a total mileage of 105.887.

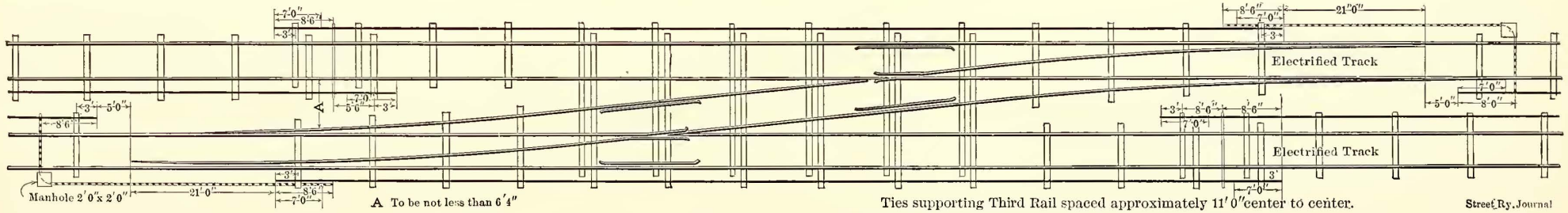


CROSS SECTION OF ROADBED, SHOWING POSITION OF THIRD RAIL

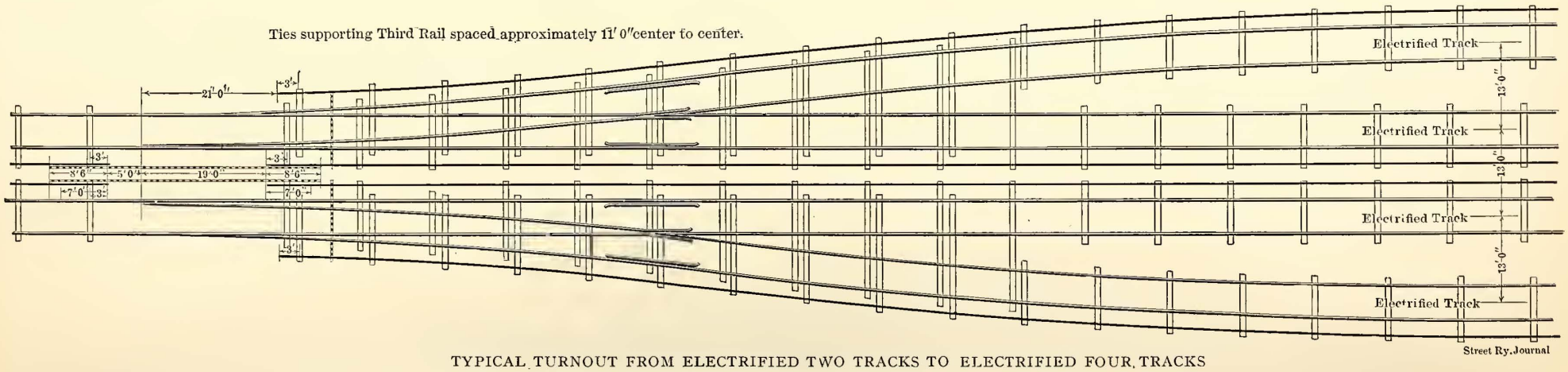
It is proposed to give three classes of service over the West Shore tracks between Syracuse and Utica. First, there will be the fast limited electric cars or trains which will run hourly between the two cities and will make two stops only, completing the run in one hour and twenty-eight min-



CROSS SECTION OF FOUR-TRACK ROADBED

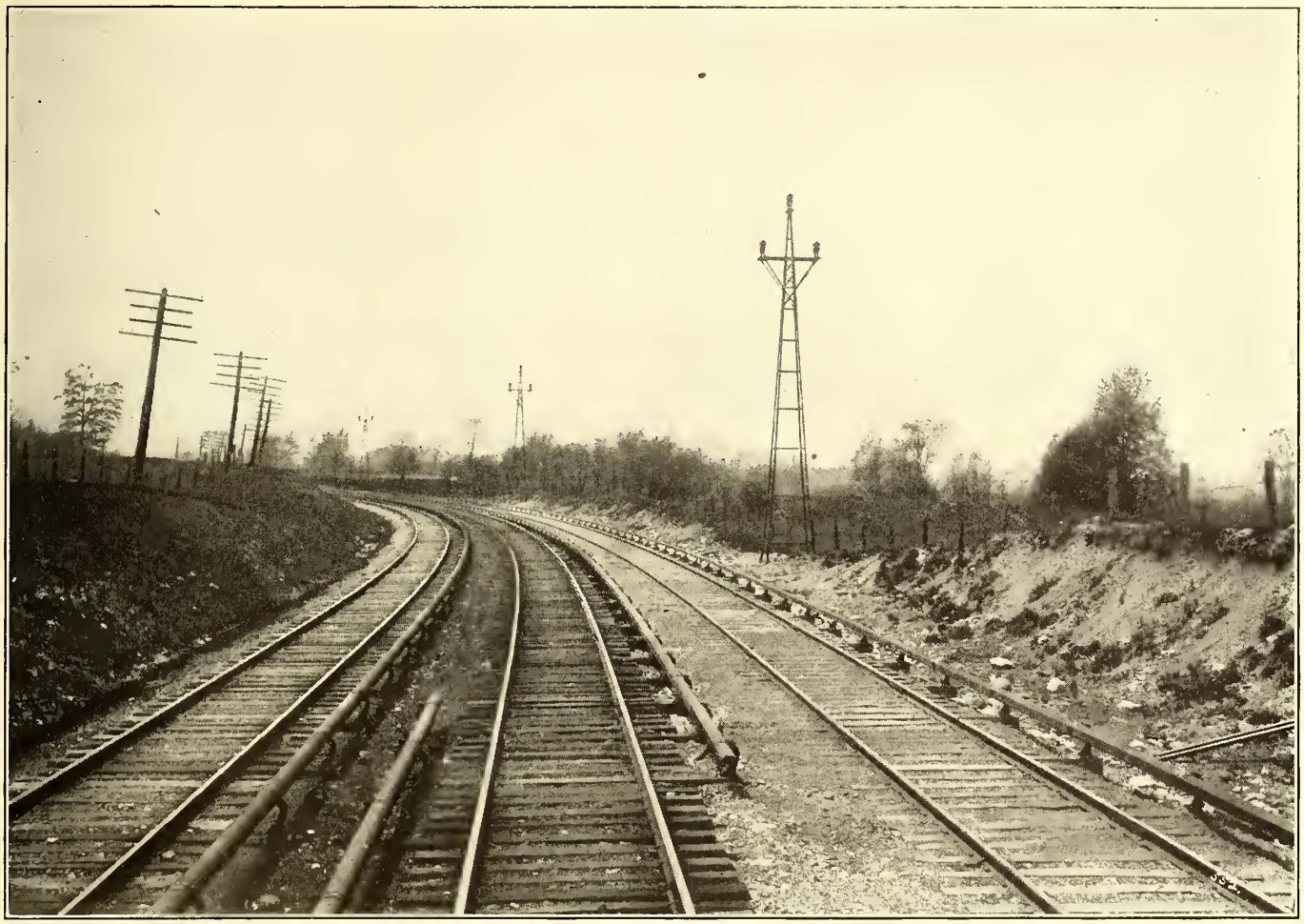


CROSS-OVER, WITH THIRD RAILS BETWEEN CONNECTED TRACKS



TYPICAL TURNOUT FROM ELECTRIFIED TWO TRACKS TO ELECTRIFIED FOUR TRACKS

utes. Twenty-eight minutes of this time will be taken on the local system at each end and one hour for the run between the two cities. Second, there will be the local trains or cars which are scheduled to make 24 miles per hour, and which will complete the run in one hour and fifty-eight minutes. This service will be run hourly and the cars will make frequent stops, at every highway if necessary. Third, there will be the steam service. To provide for passing the fast-moving units around the slower trains, a third track has been laid between Clark's Mills and Vernon, a distance of 8½ miles. This middle track has crossover connections with both outside tracks and will be used jointly by both



TYPICAL THIRD-RAIL CONSTRUCTION ON THREE-TRACK SECTIONS AT CURVES

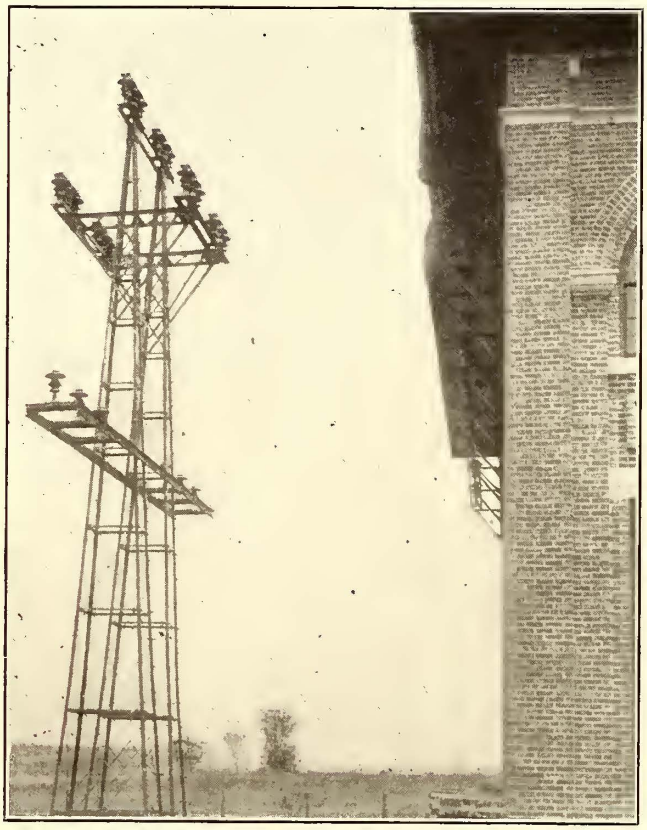
east-bound and west-bound traffic, to expedite the movement of all trains. It will be under the control of switchmen located in interlocking switch towers to insure safety and dispatch in the handling of train movements under all conditions. In addition, between Oneida and Canastota, a distance of about 5½ miles, a fourth track has been laid, as there are water stations and freight yards in this section and it is necessary to provide four tracks to pass the electric units around the freight trains that may be held up in the yards or at watering stations. The outside tracks will be used for the local trains.

SELECTION OF THE ELECTRIC SYSTEM

With a 600-volt trolley system at each end of the line, it became a serious question to the management of the Oneida Railway Company whether to adopt for the interurban sections the single-phase system with bridge or pole catenary overhead construction or direct current with overhead or third-rail distribution. The decision between direct and alternating current had to be made two years ago, and while the initial cost was an important consideration, it did not necessarily control the situation. It is interesting to note, however, that the combined cost of overhead bridges and motor equipment with the single-phase system just about balanced the cost of rotary-converter sub-station and motor equipment with 600-volt direct current. This was as far as the estimates were carried, so far as these two systems were concerned. Under these circumstances, the fact that the single-phase system at that time (June, 1905) was comparatively new and untried, and that the electrification was being done over leased tracks, confirmed the engineers of the company in their decision to adopt direct current.

Direct current having been selected, the question then lay between the overhead catenary construction and the third rail. The former had been used by the Oneida Railway Company for equipping a 3-mile section of the West Shore Railroad near Herkimer, as described in the Street Railway Journal for Dec. 16, 1905. The estimates showed, however, that as between these two systems the third rail was considerably cheaper. Moreover, the character of the investment required was entirely different. With the overhead catenary construction the amount of copper necessary for feeders and trolley wire would have been in the neighborhood of 1,250,000 lbs. With the third-rail system, the greater part of the investment would be in steel rail, which could be more easily utilized elsewhere if necessary. Again, at the time that a selection had to be made between

third-rail and overhead construction, that is, in February, 1906, copper had recently risen greatly in price, and this fact and the difficulty of getting deliveries on feed wire were important factors in making a decision. Other considerations were the possibility of using electric locomotives on the section in question when the third rail would be more desirable and the less interference of the third rail with the steam trains. It was also found that if a third rail was installed the saving made in first cost over the overhead system would be sufficient at the end of five years to take the third rail up and put in an overhead system;



DOUBLE HIGH-TENSION TOWER AT REAR OF SUB-STATION, SHOWING METHOD OF TAPING OFF AND ENTERING BUILDING

also that if the use of the third rail was continued the saving at the end of ten years would be sufficient to cover the investment, so that then the single-phase system could be installed, if it should be considered desirable, without involving any "scrap loss" on the old equipment. The electrical features of the new line will now be considered.

POWER TRANSMISSION LINES

Power for the operation of the line is purchased from the Hudson River Electric Power Company, which owns the hydraulic power plants at Spiers Falls and Mechanicsville. This company is now extending its transmission line from its water-power plants to Utica, and expects soon to be able to deliver electric power to those points at 60,000 volts.

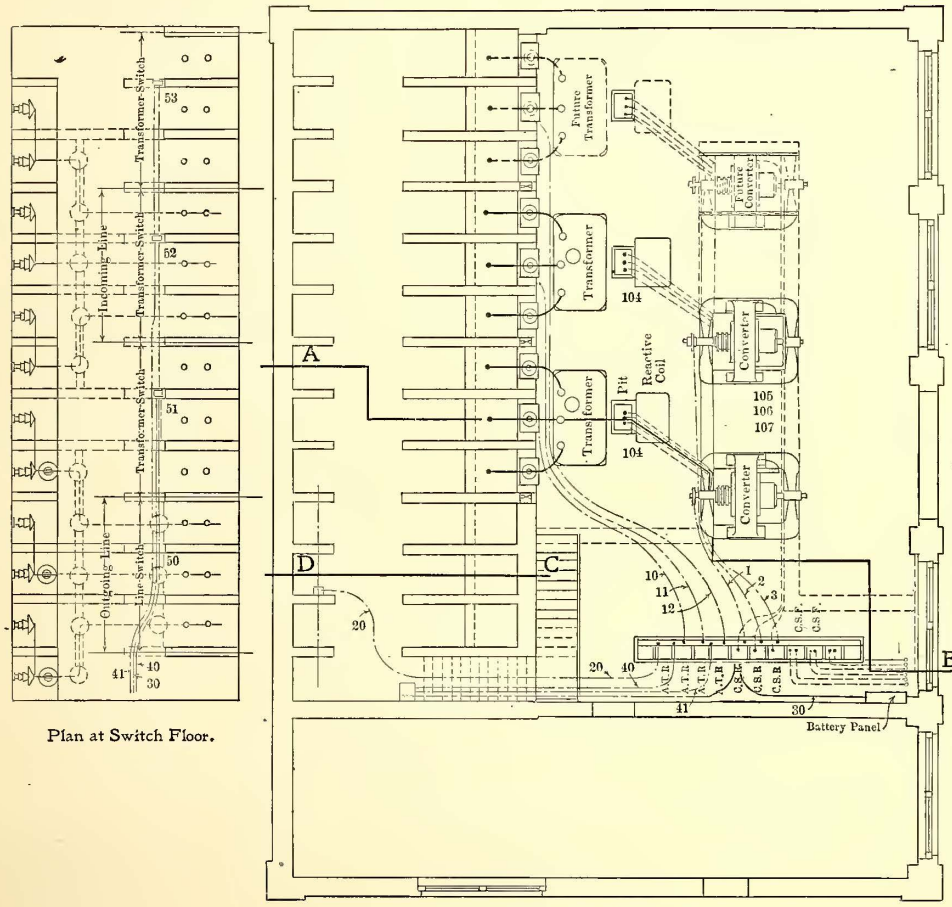
Pending the completion of these transmission lines, and to fulfil contracts which it had taken for power in the district around Utica, the Hudson River Electric Power Company has recently erected a temporary steam plant in that city. This station is equipped with steam turbines and is delivering power to the Oneida Railway Company at 60,000 volts, three-phase, and 40 cycles for its West Shore work. The contract of the Power Company provides that it shall deliver this power to the transmission circuit of the railway company, which commences at the Clark's Mills sub-station, which is that nearest Utica. The power company's transmission line for this distance of 4½ miles is constructed on a private right of way adjoining the West Shore tracks and is carried on two-circuit steel towers, spaced approximately 550 ft. apart. At Clark's Mills the current is taken by the Oneida Railway Company and is conducted to the three other sub-stations over its own transmission line, which is also built on the private right of way of the West Shore Railroad. For serving the entire section between Utica and Syracuse, about 44 miles, there are four sub-stations, as follows: No. 1, at Clark's Mills; No. 2, located 1½ miles west of Vernon; No. 3, located 1 mile west of Canastota, and No. 4, located at Manlius Center. The distance between the sub-stations averages approximately 10¾ miles. The transmission line is continuous; that is to say, it is carried into each sub-station and is there tapped to the bus-bar through disconnecting switches, then passes to the next sub-station.

The transmission towers used on the Oneida Company's transmission line were illustrated on page 76 of the Street Railway Journal for July 13, 1906, and differ from those employed on the Power Company's line. They consist essentially of a square latticed structure composed of four angles, 3-in. x 3-in. x 5/16-in., carried down 5 ft. to reinforced concrete footings under each pier, measuring 5 ft. x 3 ft. x 10 ins. The distance between towers is 480 ft. These towers are figured for a side pressure of the wind of 1¼ lbs. per lineal foot of cable, which is based on a wind pressure of 30 lbs. per foot on a flat surface, or 15 lbs. per ft. on a round surface, acting upon the cable covered with a thickness of sleet equal to its own diameter. The maximum pull allowable on a single cross-arm tower is 1000 lbs. for each cable, the ties being designed to break at this tension. The cross-arms of towers at dead ends carry three insulators for each cable and are designed to resist the maximum calculated pull due to the assumed conditions of load and sag.

The heights of the towers are arranged to provide a minimum clearance of 10 ft. over buildings and over such wires as may be crossed by the line. At points where the transmission line makes an angle the towers are provided with enough insulators so that the cables do not make an angle of over 7½ degs. at any insulator.

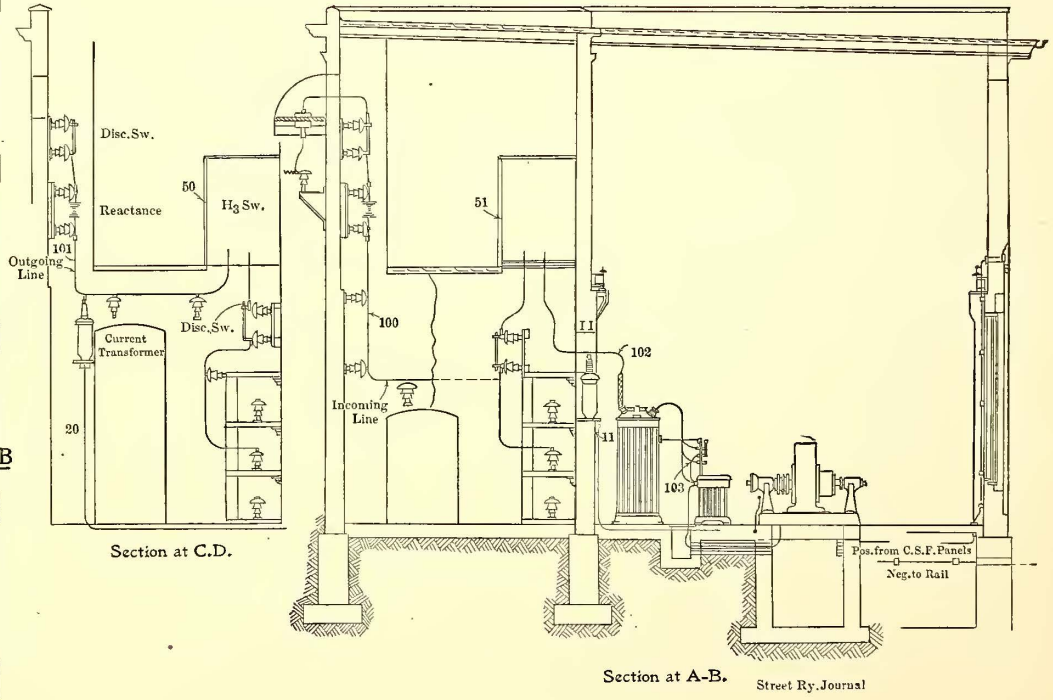
The insulators are of porcelain, were supplied by R. Thomas, Sons & Company, of Lisbon, Ohio, and are placed at the corners of a 7-ft. triangle. They are carried on malleable iron pins 18 ins. high, which are designed to withstand a strain of 2000 lbs. applied in any direction at the top of the insulator. These pins are attached to the apex of the tower or the cross-arm with four ⅝-in. bolts and are cemented into the insulators at the factory.

A No. 0, seven-strand, hard-drawn copper cable is used for each conductor. This cable is strung on the towers with a sag of 12 ft. for a 480-ft. span, at 32 degs. F. This sag corresponds to a normal tension of 300 lbs. in the cable. Where the span varies from this length the sag is shortened or lengthened so as to keep the tension in the cable practically constant. Where heavy strains occur, necessitating a double cross-arm, the cable, instead of resting on insulators, is attached to an equalizing saddle to distribute the load equally over several insulators. These saddles are so designed that in case one insulator should be defective it may be removed and another substituted without removing the cable from the saddle. The use of lightning arresters is confined to the sub-stations themselves.



Plan at Switch Floor.

FLOOR PLAN



Section at C.D.

Section at A-B.

PLAN AND CROSS-SECTION OF SUB-STATION, SHOWING WIRING

List of Conduits and Wires.

CONDUIT NUMBER	WHERE USED
1-2-3	Speed limit switch to C.S.R. panel
10-11-12	Current transformer to A.T.R. panel
20	Current transformer to A.T.F. panel
30	Battery panel to oil switch operating bus
40	Switch board to oil switch junction box
41	Switch board to oil switch junction box
50-51-52-53	Riser from junction box to oil switch motor

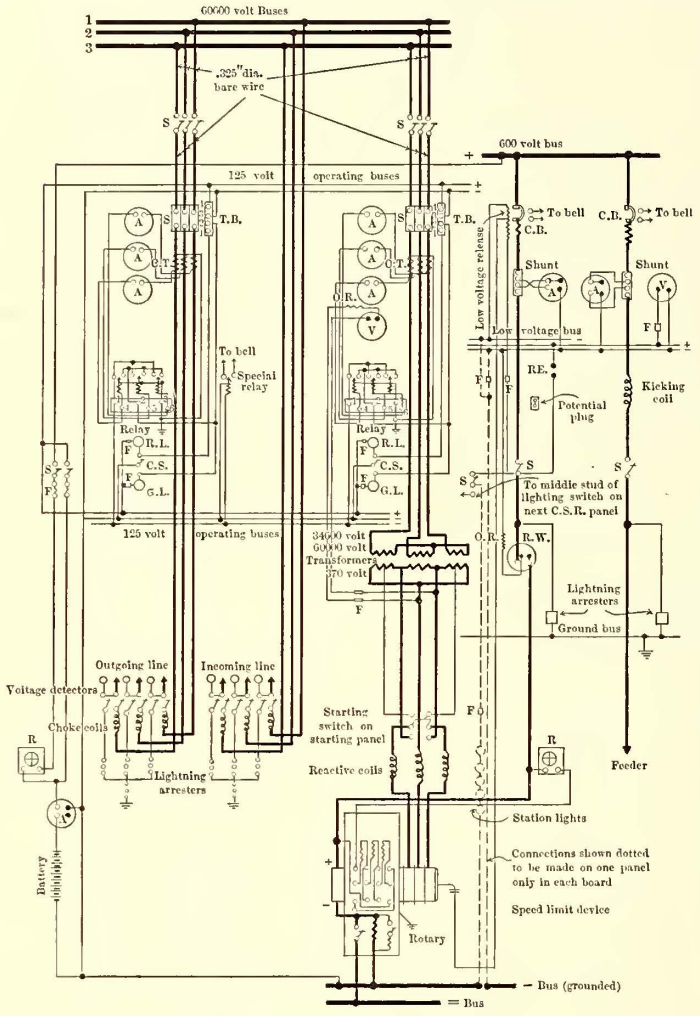
Cables Supported on Racks, Insulators etc.

NUMBER	WHERE USED
100	Incoming line
101	Outgoing line
102	Oil switch to transformer
103	Transformer to starting panel
104	Transformer to rotary
105	Rotary positive to C.S.R. panel
106	Rotary equalizer
107	Rotary negative
108	Rotary field
109	Bus compartment

SUB-STATIONS

The four sub-stations previously mentioned are of similar design. They are of brick with litholite trimmings, concrete roof and concrete floors. They are divided into two main compartments, at the rear the high-tension room, and in front the converter room.

This being one of the first 60,000-volt installations in this



Key to Symbols used on Wirings.

A.	Ammeter	C.T.	Current transformer
V.	Voltmeter	P.T.	Potential transformer
R.W.	Recording wattmeter D.C.	S.	Switch
S.R.W.	Single-phase recording wattmeter	C.B.	Circuit breaker
B.R.W.	Balanced 3-phase recording wattmeter	R.E.	Receptacle
P.R.W.	Poly-phase recording wattmeter	R.	Rheostat
S.I.W.	Single-phase indicating wattmeter	D.R.	Discharge resistance
B.I.W.	Balanced 3-phase indicating wattmeter.	O.R.	Ohmic resistance
P.I.W.	Poly-phase indicating wattmeter	I.R.	Inductive resistance
S.I.	Synchronism Indicator	F.	Fuse L. Lamp
R.L.	Red lamp G.L. Green lamp	C.S.	Controlling switch
T.B.	Terminal block for connections		Street Ry. Journal

SWITCHBOARD WIRING AT SUB-STATION

section of the country, extreme care has been taken to give the necessary clearances on the high-tension side. The lay-out in general is a typical General Electric layout, the high-tension line entering the under side of a protecting hood at the rear of the building and thence passing through circular openings 3 ft. in diameter in the wall of the building to the disconnecting switches and onto the bus compartments.

The high-tension room is two stories in height, the floor being carried only to the face of the barrier walls, which run 3 ft. apart and 3 ft. in depth, up and down the rear wall. This provides a number of cells or compartments, open from top to bottom, which are used for the installation of the lightning arresters and bus-bars. The second floor, extending through the room, permits an operator to handle the disconnecting switches, which are located at the top of these compartments. Against the forward wall on the second floor of this high-tension room are built similar barriers forming cells in which are installed the high-tension oil switches. Three of these cells are required for each switch, one leg being in each. These switches are General Electric type H, motor operated, the mechanism being placed at the top of the barrier. There are three of these in each station except the last, one controlling each of the two machines and one the out-going high-tension line. These switches are operated from the switchboard in the converter room. On the first floor of this high-tension room and immediately under the oil switch compartment and running transversely through these barrier walls supporting the oil switches there are three compartments, 3 ft. square, one above the other, and extending the length of the room. These are the bus compartments proper and carry the high-tension line through the station. It is from these buses that taps are made and carried up to the oil switches. This room is separated from the converter room by fire doors, and the second floor is reached by an iron stairway.

In the converter room are the transformers, rotaries and switchboard. Each transformer stands in front of its respective oil switch and the connections from each pass through openings 3 ft. square in the brick wall in which is inserted a pane of glass with a suitable hole for the passage of the wire. All of the high-tension wires, as far as the transformer terminals, are of bare copper wire. In recesses provided for the purpose under the openings in the wall where the high-tension line passes through to the transformers are located the current transformers. In the converter room are two units consisting of one 330-kw, 60,000:370-volt, oil-cooled tansformer, Y connected on the primary side and delta connected on the secondary side, and one 300-kw, 370-volt a. c. and 600-volt d. c. rotary converter. Between the transformer and the rotary stands the reactance which is used for starting the rotary converters. This is the General Electric Company's latest method of starting rotary converters without synchronizing.

The switchboard consists of the necessary a. c. and d. c. rotary converter panels, an outgoing high-tension line panel containing ammeters and voltmeter, storage battery panel and the necessary d. c. feeder panels.

The d. c. feeder panels are connected to the third rail at the station by means of rubber and lead-covered cable, as will be described later, each track being independently fed each way from the sub-station; that is, on a two-track section there would be four feeder panels. Auxiliary feeders will not be necessary for the service contemplated. A storage battery is located in the subway and is used in operating the oil switches.

The converter room is provided with a heater system, which is located in the west end of the building in an entirely separate room along with the toilet, lavatory conveniences and storage room for supplies. The building is of fireproof construction throughout.

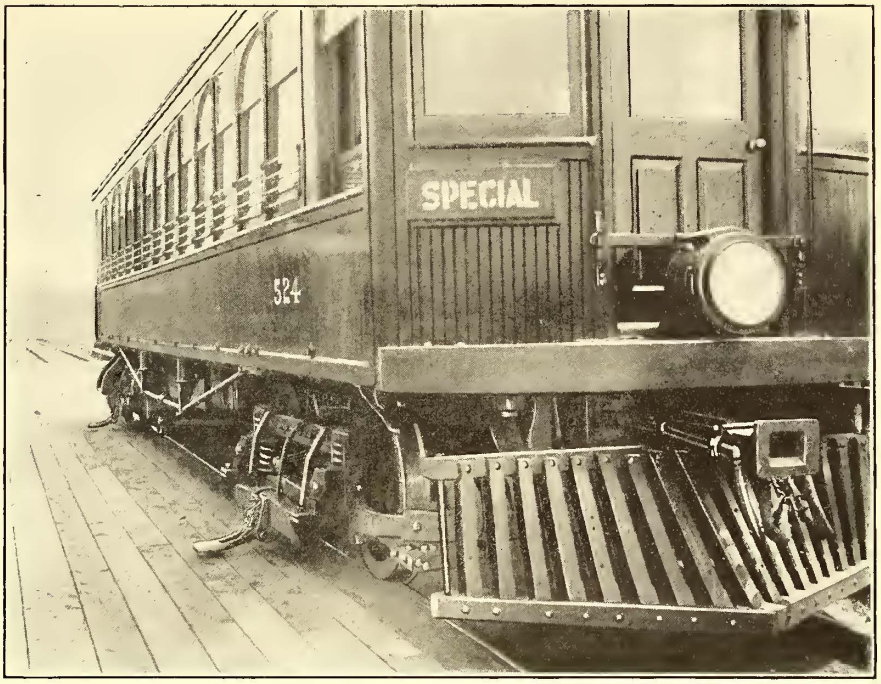
THIRD RAIL

The third rail is of the bull-headed or double-headed type, of the same section as that adopted in the New York City zone of the New York Central Railroad, and is adapted for under-running contact. It weighs 70 lbs. per yard, and was supplied in 33-ft. lengths by the Lackawanna Steel Company, but as the density of traffic did not require unusual

electrical conductivity, a special composition to secure low resistance was not used, as in the New York Central work. The composition is, in fact, that used in the standard 70 to 80-lb. rails rolled by the Lackawanna Steel Company, and consists of carbon 0.45 to 0.55; phosphorous, not over 0.10; silicon, not over 0.20, and manganese, not over 0.75 to 1.05. This gives a resistance of 0.0494 ohms per mile; in other words, the conductivity of the rail is equivalent to 1,023,000 circ. mils of copper. This conductivity is sufficiently large so that no auxiliary d. c. feeders are required.

The joints in the third rail are made by ordinary two-bolt splice bars with bolts ⅞-in. in diameter. The center line of the rail is carried 32 ins. outside of the gage line of the track and its lower surface is 2¾ ins. above the top of the running rail. These dimensions compare with those of the New York Central and the Long Island Railroads, as shown in the table below.

The Long Island Railroad dimensions have also been employed on the West Jersey & Seashore Railway. The clearance on the West Shore differs from that of either of the others mentioned, but was adopted after a study of the traffic passing over the road. It will permit the passage of all of the cars belonging to the New York Central system and all foreign cars except a very limited type of coal cars with low truss rods. Electric locomotives and motor cars designed for use on the Central tracks can also be run over the West Shore tracks without changing the position of the third-rail shoe.

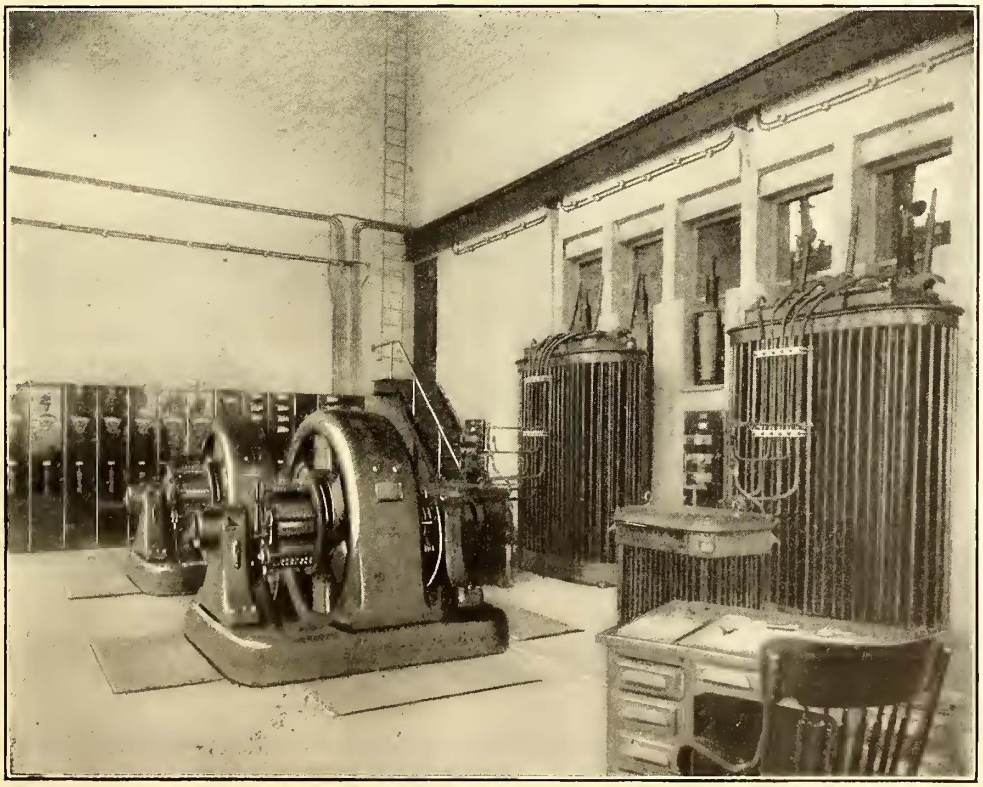


CAR AT STATION PLATFORM, SHOWING POSITION OF SHOES

The third rail is normally located between the tracks on tangents and on the high side of the track on curves.

Road	Type	Height of Wearing Surface Above Top of Track Rail	Horizontal Distance Between Center of Third Rail and Gage Line
Oneida Railway.....	Under-contact	2¾ inches	32 inches
New York Central..	Under-contact	2¾ inches	28¼ inches
Long Island.....	Over-contact	3½ inches	27½ inches*

* 26 inches from gage line to gage line



INTERIOR OF SUB-STATION NO. 2

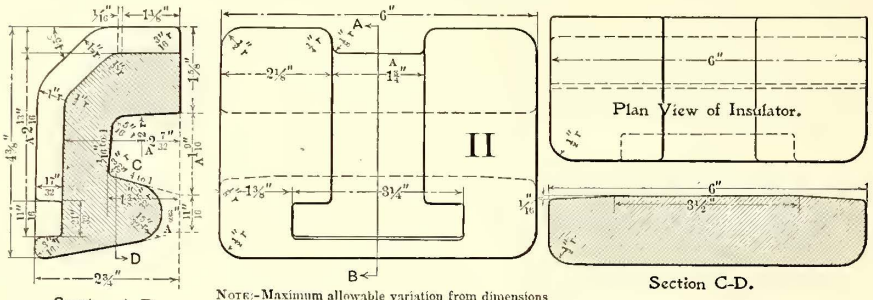
BRACKETS

The brackets for supporting the third rail on the straight track are located 10 ft. apart, or on every fifth tie. They are of tough gray cast iron, and are of the same pattern as on the New York Central construction. The specifications require that sample pieces, 1 in. square, cast from the same heat of metal in sand molds, shall be capable of sustaining on a clear span of 12 ins. of central load not less than 2500 lbs., and shall deflect 0.15 in. before rupture.

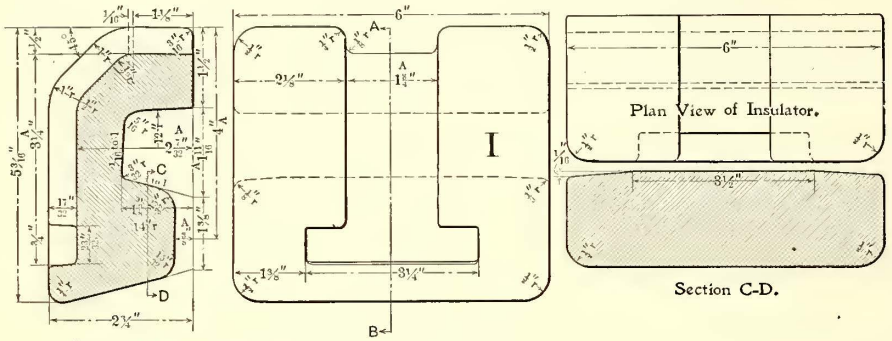
They are held to the tie by three-lag screws 4½ ins. long and ¾ in. in diameter. A templet, found of great convenience in boring holes in the ties for the third-rail brackets, is illustrated on page 1006. It consists of a ⅛-in. wrought-iron plate reinforced with 1-in. pine, and is provided with a bracket 4 ins. wide which fits over the top of the running rail.

INSULATORS

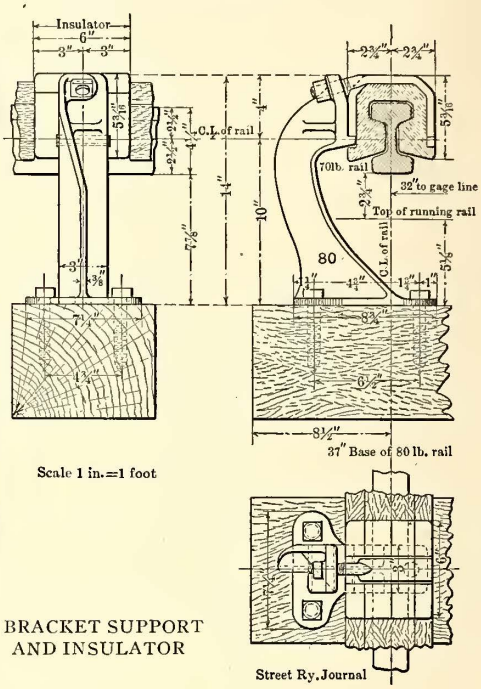
The insulators used for holding the third rail in the brackets were supplied by the Ohio Brass Company and are of semi-porcelain. Two sizes are used, one for holding the rail at the inclines where a shallower insulating block is required, the other for supporting the rail at other points. The insulators are required to pass the following tests: (a) Resistance. After immersion in water for seventy-two hours and the surface wiped dry, the insulation resistance of all insulators, measured from hook bolt slot to rail slot, shall be not less than 10 megohms. When subject to a precipitation of three-quarters of an inch of water per minute, the insulator resistance, measured as before, shall be not less than 0.2 megohms. (b) Compression Test. With pressure uniformly distributed applied, the in-



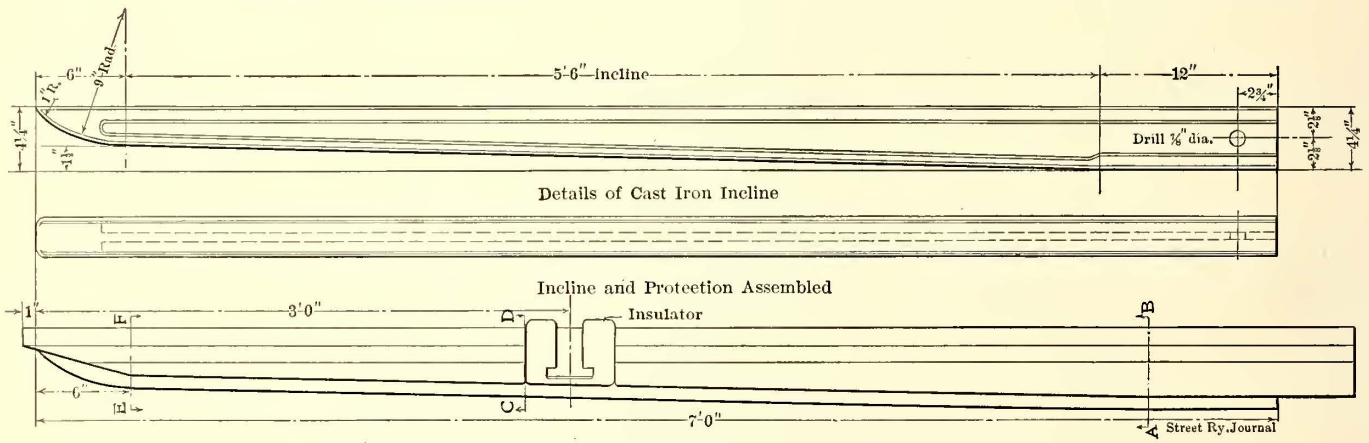
INSULATING BLOCK FOR INCLINE



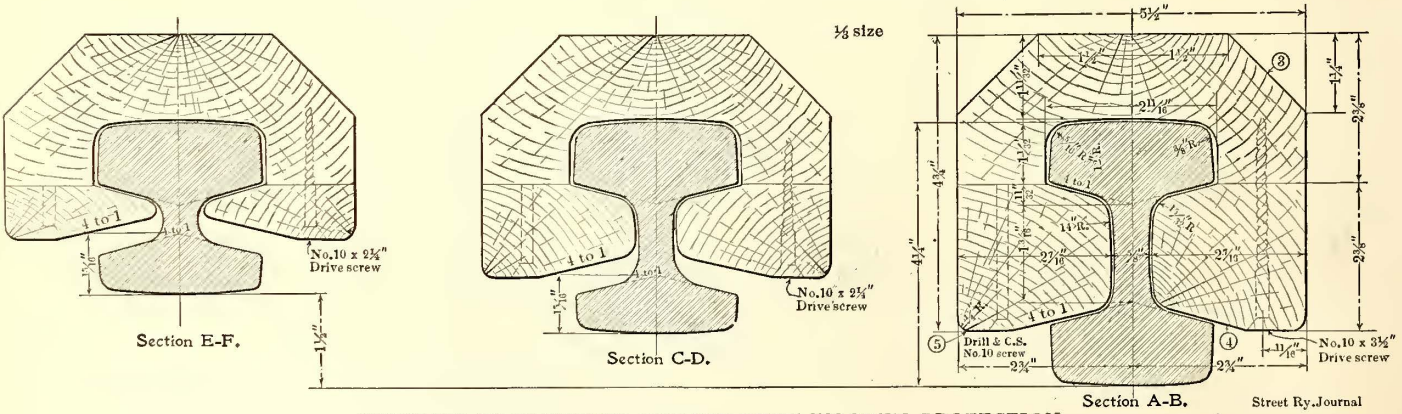
INSULATING BLOCK FOR THIRD RAIL



BRACKET SUPPORT AND INSULATOR

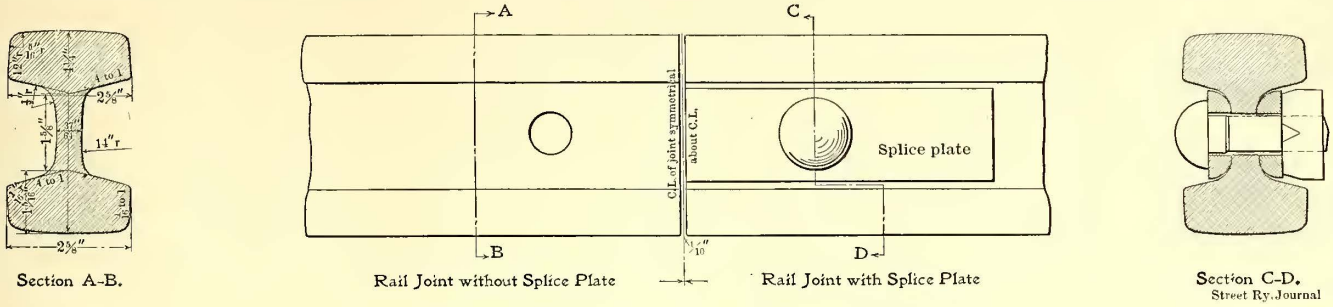


DETAILS OF CAST-IRON INCLINE WITH WOODEN PROTECTION



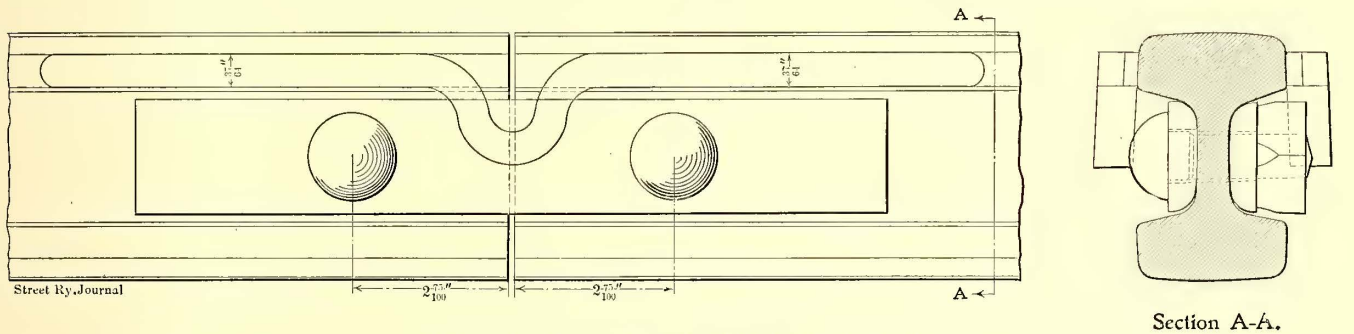
SECTIONS OF CAST-IRON INCLINE WITH WOODEN PROTECTION

sulators shall be capable of withstanding at least 85,000 lbs. for type I. insulator, or that used everywhere except at inclines, and at least 70,000 lbs. for type II. insulator, or that used at inclines, without showing any indications of fracture. (c) Tensile Strength Test. All insulators shall be capable of withstanding a tensile stress of not less than 1400 lbs. without showing any indications of failure. (d) Impact



DIMENSIONS OF THIRD RAIL AND THIRD-RAIL JOINT

Test. Two per cent of each lot of insulators shall be subject to impact tests consisting of successive blows of a ¾-lb. weight in a form of a spherical steel ball dropped 30 ins. Insulators not showing signs of fracture after one hundred blows shall be rated as 100. Other insulators shall be rated at the number of blows respectively on which they develop fracture. The average of these ratings shall not fall below twenty-five blows for the type I. insulator and a proportionate number for the type II. Each insulator is held to its bracket by the forged steel hook bolt which passes around the insulator and through a lug on the top of the bracket, as shown in the section.



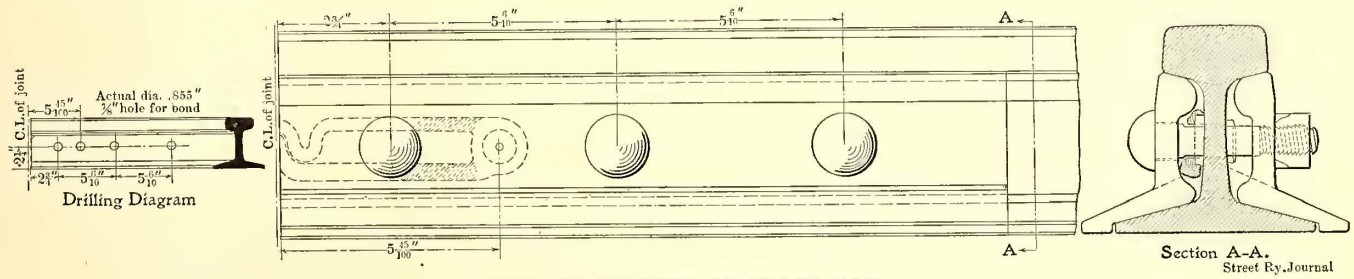
THIRD-RAIL JOINT AFTER ADDITION OF BOND

INSULATING BLOCKS

A great deal of study was put upon the proper material for the insulating block. To secure good insulation through vitrification is necessary, but a thoroughly vitrified block is brittle, a condition incompatible with that required on third-rail construction. To secure the necessary combination of mechanical strength and electrical insulation, the manufacturers made an extended study of combinations of different clay and porcelain mixtures, as well as various methods of drying and burning the pieces. It was found that those employed with pieces of certain sizes and shapes were unsuitable under other conditions of material, also that the chances for cracking and deformation increased as the pieces became large and heavy and of irregular section. This required variations in the mixture. The resultant of these processes is termed "semi-porcelain."

SPACING AT JOINTS

In laying the third rail a space of about ¼ in. is left at each joint for expansion and contraction. The exact distance allowed depends upon the temperature at the time the work is done and is determined by the employment of a removable shim, which is placed between the ends of the rails when they are being put in place. The thickness of the shim used varies with the temperature during which the work is done, according to the scale shown on page 1006.

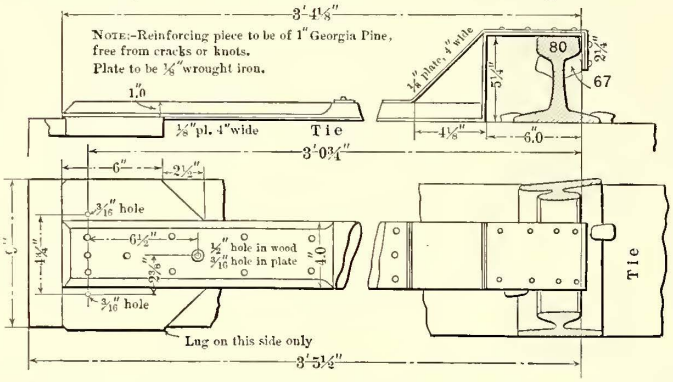


BOND ON RUNNING OR TRACK RAIL

INCLINES

The inclines are of gray cast iron of the same quality as that specified for the third-rail brackets, and are attached to the third rail by standard two-bolt splice plates. The standard incline used whenever the shoes have to take the

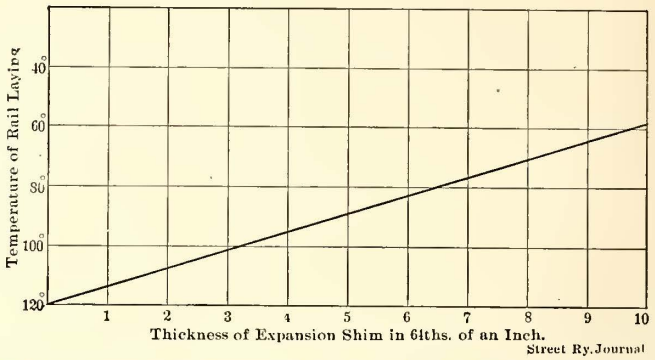
incline at high speed is 7 ft. in length, of which 1 ft. at the junction with the straight rail has a horizontal under-running surface. As the curved portion at the end of the incline takes up 6 ins., the length of inclined wearing surface is 5 ft. 6 ins. The difference of 1½ ins. in height between the ends of this surface gives the incline a pitch of 1 in 44. The inclines are supported by one insulator and bracket, as shown.



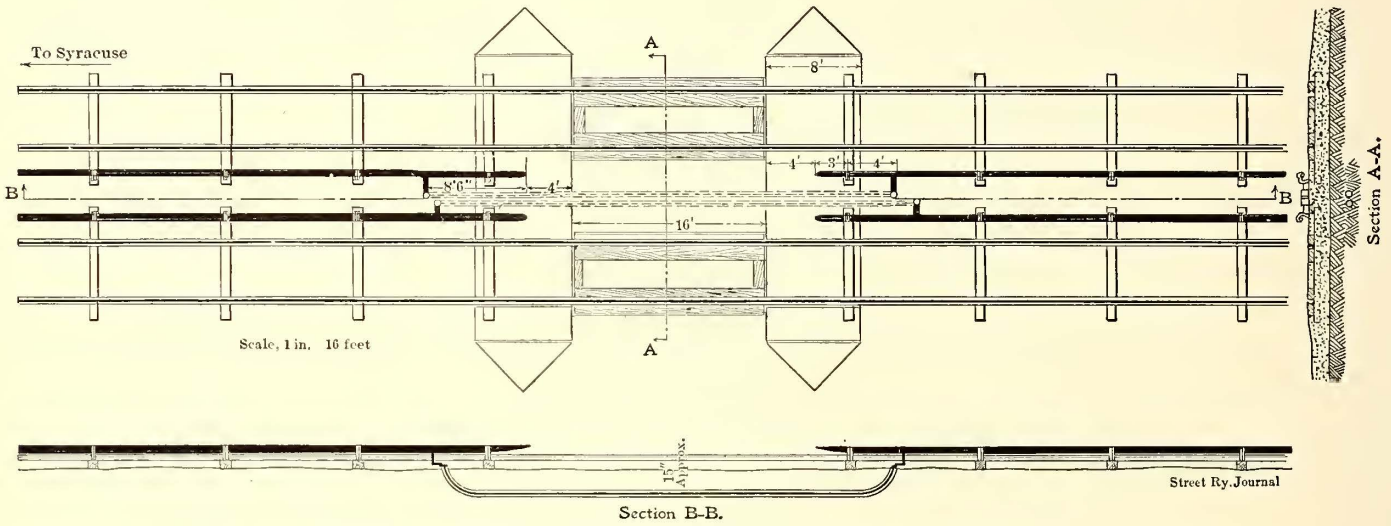
TEMPLATE FOR BORING HOLES IN TIES FOR THIRD-RAIL BRACKETS

PROTECTIVE COVERING

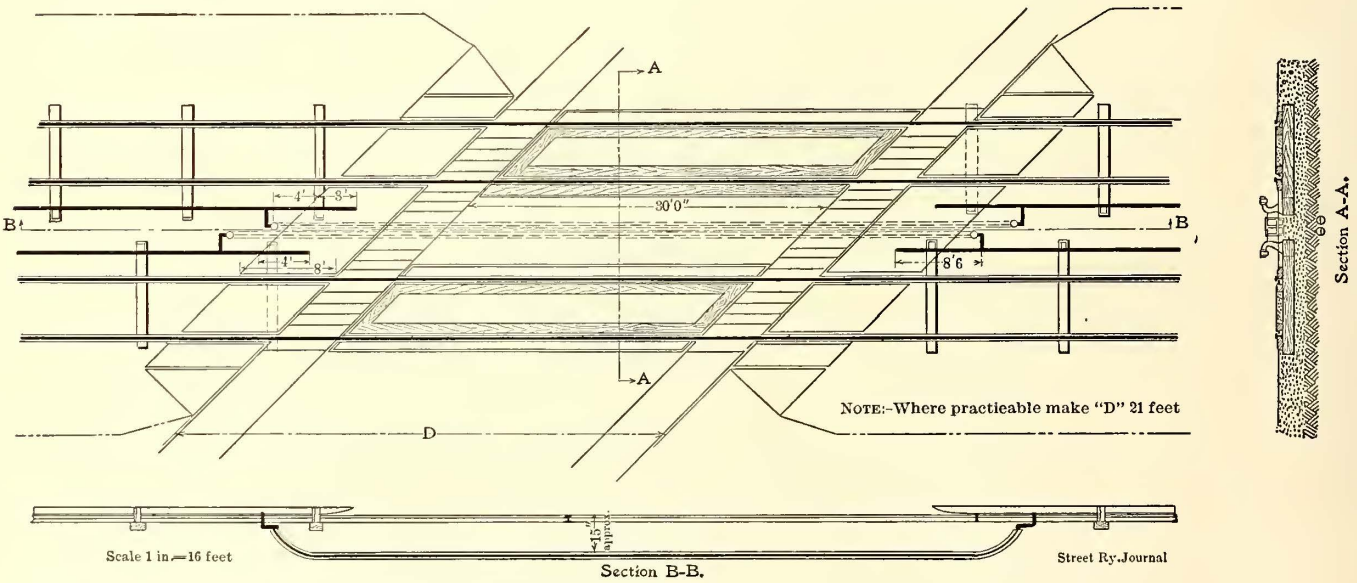
Two types of protective covering are used, as on the New York Central, viz., a three-part wooden covering which was originally adopted, and a single-piece fiber covering which was manufactured by the Indurated Fiber Company, and is considered preferable. Fiber covering is used between New York Mills and Clark's Mills, and would have been employed throughout if a sufficient quantity could have



CURVE SHOWING THICKNESS OF EXPANSION SHIM USED IN INSTALLING THIRD RAIL



ARRANGEMENT OF THIRD RAIL AND DUCTS AT MAXIMUM FARM CROSSING, WITH CATTLE GUARDS



PLAN OF TRACKS AT STANDARD 30-FT. HIGHWAY CROSSING, WITH SIDE WALKS

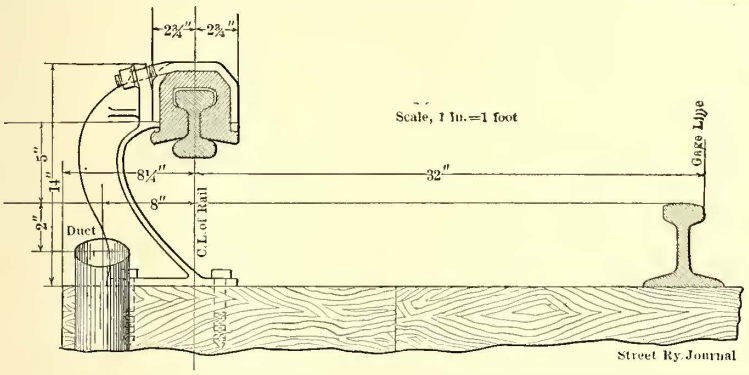
been secured in time for use on the entire installation.

WOODEN SHEATHING

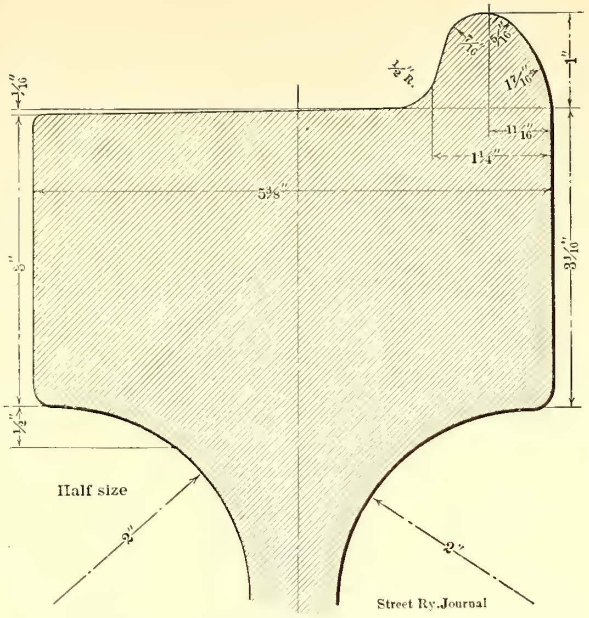
The wooden sheathing is of long-leaf yellow pine in three parts, top and two bases held together by No. 10 3½-in. diamond-pointed drive screws. It is not treated with any preservative except a coat of ordinary paint applied to the outside of the cover before being placed on the rail.

FIBER SHEATHING

The indurated fiber sheathing is molded for straight track in sections 43½ ins. long, so that it takes three sections to cover the third rail between brackets. The joints on straight track are covered by a 2½-in. lap joint of the same material. At the bonds a wider section of covering is used, as illustrated on page 573 of the STREET RAILWAY JOURNAL for Oct. 13, 1906, and also in Fig. 3 on page 909 of the issue for May 25, 1907. This arrangement allows the fiber covering to cover the bond and joint. The specifications

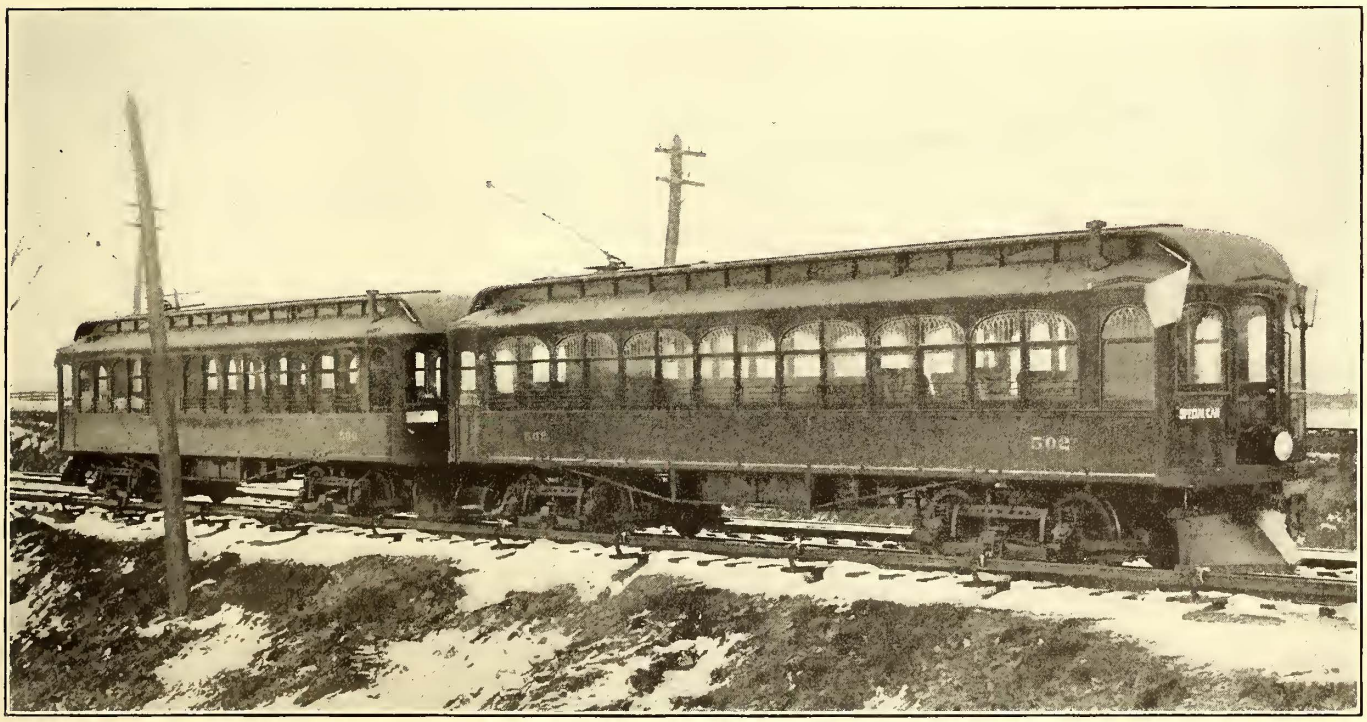


SECTION SHOWING POSITION OF THIRD RAIL AND DUCT



STANDARD TIRE SECTION OF 37-IN. ROLLED STEEL WHEEL

are 15 ins. in length over all and are soldered to the rail, one on each side of the upper head, and have a very large contact surface per terminal. There have also been installed on a portion of this line about 3000 Ohio Brass Company's ribbon soldered bonds and about 7000 American Steel & Wire Company's twin terminal bonds. These bonds are of 500,000-circ.-mil capacity each, and are installed two per joint on the upper head of the third rail. The wood



MULTIPLE-UNIT TRAIN CONSTRUCTED FOR ELECTRIFIED WEST SHORE TRACKS

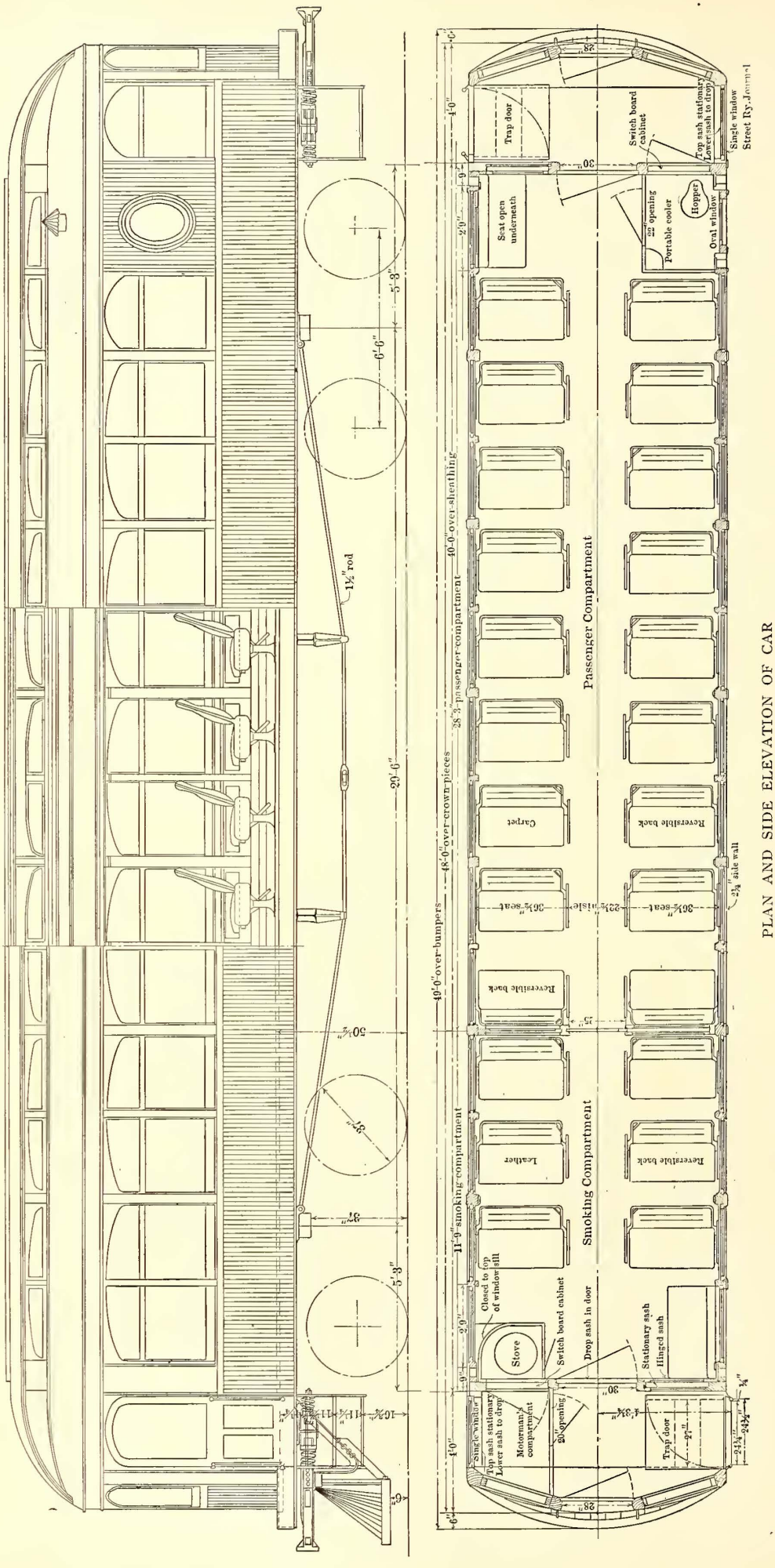
for the fiber insulation require that it shall stand an insulation test of 5000 volts before breakdown.

THIRD-RAIL BONDS

The majority of the bonds on the third rail are the John A. Roebling's Sons Company's ribbon bond. These bonds cover is cut away at all joints, so as to allow the cover to go over the bond. The fiber cover has an enlarged section at these joints which allows for completely covering the bond.

RUNNING RAIL BONDS

The running rail is bonded with the Ohio Brass Com-



PLAN AND SIDE ELEVATION OF CAR

pany's 11-in compressed terminal bond, placed under the fish-plate. There is one of these at each joint, and each bond is of No. 0000 capacity. The track is cross-bonded only at special work. Both rails are available for use for the return circuit.

CONNECTIONS TO THIRD RAIL AND THIRD-RAIL JUMPERS

The connection between the d. c. bus-bars in the various sub-stations and the third-rail system is made through several cables of 1,000,000-circ.-mil capacity, carried in iron ducts 3 ins. in diameter. The cable is insulated with 3/32-in. rubber and is lead encased. The end of this duct at the track is brought up to 2 ins. below the top of the track rail or 2½ ins. above the surface of the tie. Where both third rails are on the inside of the track care is taken to separate the track terminii of the ducts for the east and westbound tracks by several feet.

The cable, after emerging from the duct, terminates in a T with twisted arms, commonly known as a ram's horn or pig's tail, to each terminal of which is attached a solid terminal for bolting and soldering to the rail. Great care is taken to insulate and protect the cable at the point at which it emerges from the duct by taping and painting with insulating and waterproof paint. The ends of the duct are also plugged with oakum around the cable to keep dirt from entering the duct and to prevent any movement within it of the cable.

The third-rail jumpers used to secure continuous electrical connection between the sections of the third rail are of 1,000,000-circ.-mil capacity and have the same form of ram's horn terminals as the leads from the station to the third rail. Diagrams of the layout at different typical crossings are presented on page 1006 and show two of the different arrangements adopted. The

longest gap between sections of third rail is 108 ft., while the distance between shoes of a single car is 29 ft. 6 ins.

At the sub-station end, the connections to the east and west-bound tracks are carried to separate panels on the switchboard so that electrically the east and west-bound tracks are kept entirely distinct except through the bus-bars. In this way an interruption on one track has no effect on the other. The panels in each sub-station connecting with each track, however, are in parallel, and no section switches are used. In one or two instances, where there are long sidings equipped with the third rail, as at Clark Mills, an extra panel has been added to the switchboard to supply the current for this section.

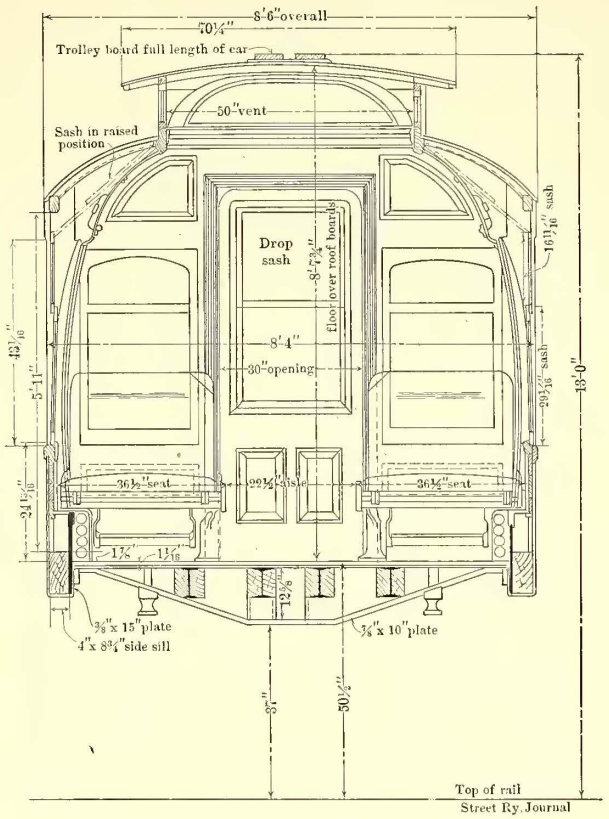
CARS

As the cars are to operate over the city system in both Utica and Syracuse, a different type was adopted than if they were to use the West Shore tracks exclusively. The main dimensions follow: Length over end panels, 40 ft.; over crown pieces and vestibules, 48 ft.; width over sills, including sheathing, 8 ft. 4 ins.; size of side sills, 4 ins. x 8¾ ins.; end sills, 6 ins. x 8 ins.; sill plates, ⅜ in. x 15 ins.; thickness of corner posts, 4½ ins.; thickness of side posts, 2¾ ins. and 4¾ ins.; centers of posts, 2 ft. 9 ins.

INTERIOR OF WEST SHORE CAR

The bottom framing consists of two intermediate and two center sills composed of 6-in. I-beams extending under the vestibules, with malleable iron caps and supports for main truss rods; the latter are 1½ ins. in diameter. The interiors are of inlaid mahogany, which includes the doors; the ceilings are full Empire decorated. The floor is covered with interlocking elastic tile, while a rubber mat is furnished for each vestibule. Storm sash are furnished for the side windows, which replace window guards in winter. The cars are equipped with twenty-four reversible and two stationary plush seats with high backs and head rolls. Each car is also fitted with a toilet lined with "Mettile."

The truck used is the Brill No. 27 E-2, with a wheel-base of 6 ft. 6 ins.; the wheel diameter is 37 ins.; the axle diameter 5½ ins. and 6 ins. The wheel tread is 4 ins. wide and the depth of the flange is 1 in., to allow the cars to operate over the city systems in Utica and Syracuse.



FRONT ELEVATION OF WEST SHORE CAR

Each car is equipped with four G. E. 73 motors with Sprague-General Electric multiple-unit control. Westinghouse automatic air brakes with graduated release and Peter Smith hot water heaters are used.

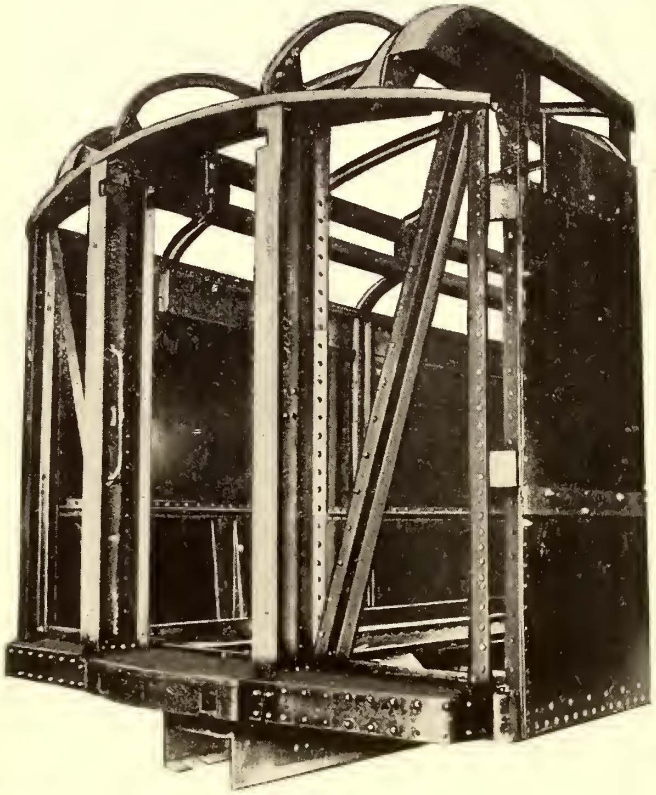
ENGINEERING

The installation of the electrical equipment of the line has been conducted by the engineering force of the Oneida Railway Company, of which C. Loomis Allen is vice-president and general manager, W. J. Harvie is electrical engineer, and M. J. French, Jr., is engineer of maintenance of way.

Official notice has been given that the fast Fort Wayne-Wabash-Indianapolis service over the Fort Wayne & Wabash Valley line will remain. Originally it was the intention of the company to change the routeing of the big cars, but this will not be done. It has been the popular belief that with the opening of the new Logansport-Lafayette extension of the Fort Wayne & Wabash Valley Traction Company, when limited service will be established between Fort Wayne and Lafayette, the limited line between Fort Wayne and Indianapolis would be discarded. Original plans of the two companies did not contemplate the retention of the Fort Wayne-Indianapolis limiteds. It was the intention to have the Fort Wayne-Lafayette cars merely connect at Peru with Indianapolis cars between Peru and Indianapolis. The traffic on the limited cars has grown to such an extent that it was deemed unwise to discontinue it.

STEEL PASSENGER CARS FOR THE PENNSYLVANIA RAILROAD

The Pennsylvania Railroad Company has ordered the construction this year of 200 all-steel cars for its passenger equipment. Great interest attaches to these cars from the fact that the company was one of the pioneers in a design of steel cars. When steel cars were proposed for the New



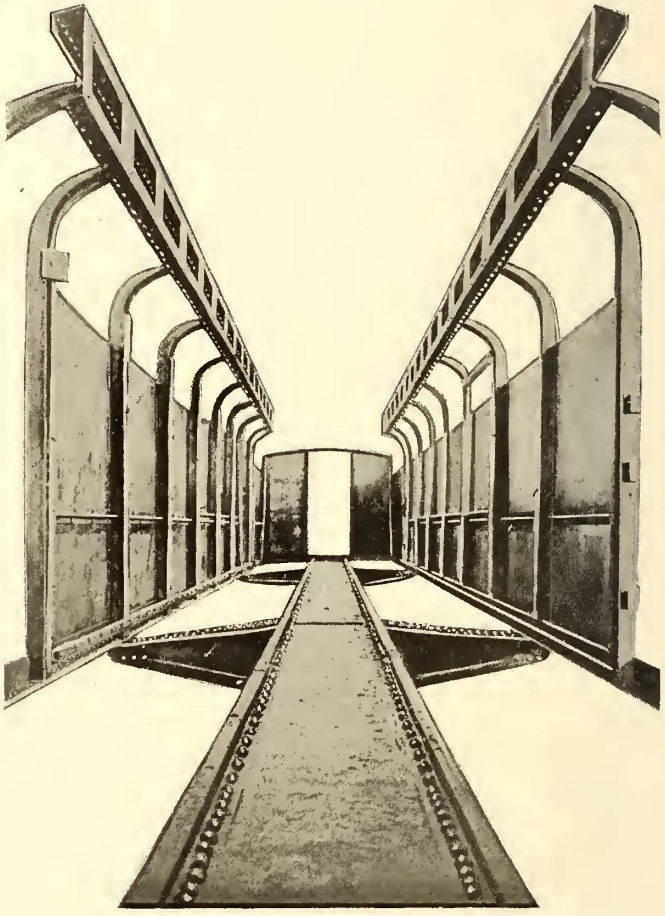
END FRAMING OF PENNSYLVANIA STEEL MAIL CAR, SHOWING TYPE OF CENTER SILL USED IN PASSENGER COACH

York Subway none of the car builders in the country was in a position to furnish them, so that the first steel car for the subway was built in 1902 at the Altoona shops of the Pennsylvania Railroad Company. The company has gone further in the direction of the use of steel than has hitherto been attempted, and the order now placed is the largest yet given by any steam road for this class of equipment. The company, as will be described later, is constructing steel cars both for suburban use, where provision is made for the application of motors, and also for through passenger service. The Pennsylvania's policy in this respect is the result of a long period of inquiry and experiment in which the late President Cassatt took an active part. After several cars had been built the president appointed a committee of motive power officials to make a thorough report on the design to be adopted, and the orders just placed are in accordance with the recommendations of that committee. The growing scarcity of suitable timber and its rapidly increasing price have played an important part in the development of the steel car, whose cost is not so very much greater than a wooden car. Moreover, it is expected that a steel car will not only be non-combustible, but will show a lower maintenance cost.

Two standard types of steel passenger equipment have been adopted: (1) for through trains drawn by a steam or electric locomotive, and comprised of mail, baggage, sleeping, dining or day coaches, and (2) a lighter and shorter car for suburban trains to be drawn by a locomotive or propelled by motors upon the truck axles. The dimensions of these cars follow:

	Length.	Weight.	Trucks.
Passenger	70 feet 5¾ inches	113,500	4-wheel
Mail	71 feet 10⅜ inches	91,000	4-wheel
Baggage and express	60 feet 10⅜ inches	91,000	4-wheel
Special baggage and express	70 feet	120,000	6-wheel
Passenger and baggage	71 feet 1 inch	130,000	6-wheel
Dining	71 feet 11¾ inches	140,000	6-wheel
Suburban passenger	54 feet 4 inches	75,000	4-wheel
Suburban passenger and baggage	(Same as suburban	passenger.)	

In the design of framing for steel cars two general types have been developed. In one the center sill is made strong enough to resist the end loads developed by pulling and buffing, in addition to the transverse loads due to the weight of underframe, superstructure and loading. In the other type the plate girders formed by the sides of the car beneath the windows are relied upon to carry the transverse load due to the weight of the underframe, superstructure and loading. The center sill in the latter type is usually rather light, being designed to resist the end loads developed



UNDERFRAME AND SIDE POSTS OF PENNSYLVANIA STEEL MAIL CAR, SHOWING TYPE OF CENTER SILL AND CROSS BEARERS USED IN PASSENGER COACH

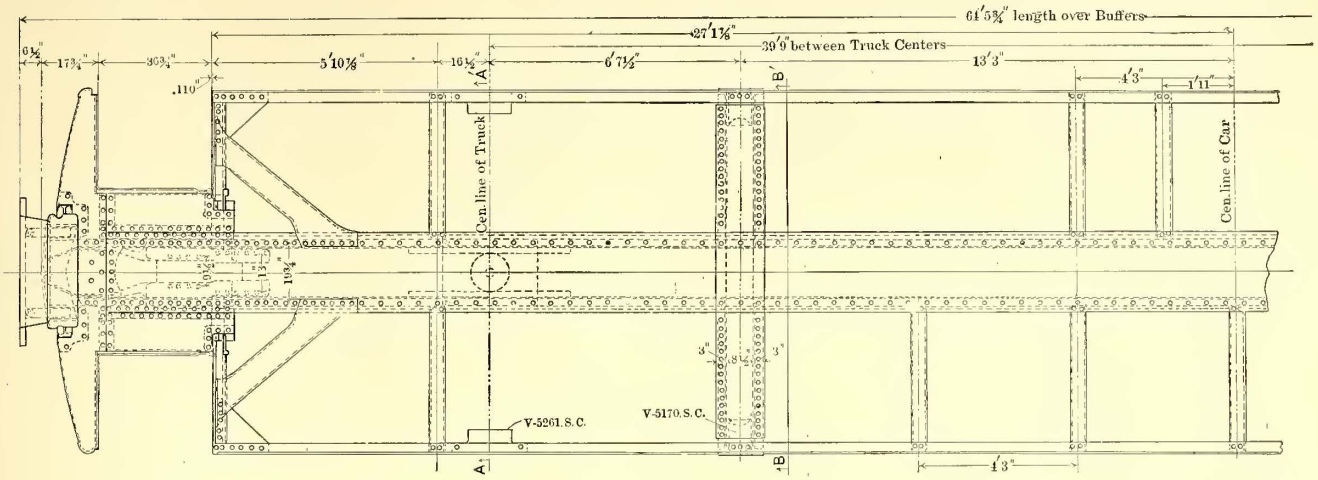
by ordinary pulling and light buffing. This type of framing follows the general form used in wooden cars where the transverse loads are carried by wooden trusses within the sides of the car reinforced by truss rods beneath the side sills.

By careful calculation, it has been found that when the loads due to pulling and buffing are less than 100,000 lbs. the weight and cost of a car frame of either type will be practically the same. Where loads due to pulling and

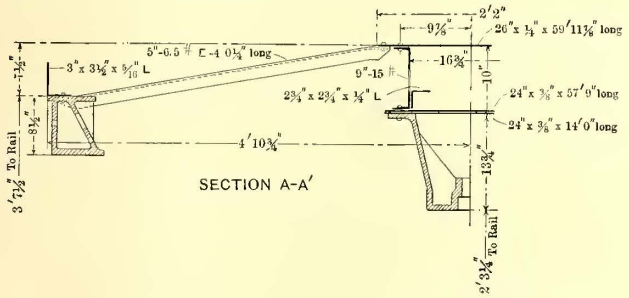
buffing exceed 100,000 lbs., the framing for the type, where the sides carry the loads, increases considerably in weight For the center sill type, the loads due to pulling and buffing may equal the assumed value of 400,000 lbs. without a material increase in weight.

For through train service subjected to heavy buffing and pulling, the center sill type of frame has been selected. It has also been used in designs for suburban type equipment, as it has been found that, with a modified form of center sill, sufficient room for motors can be provided between the underframe and track.

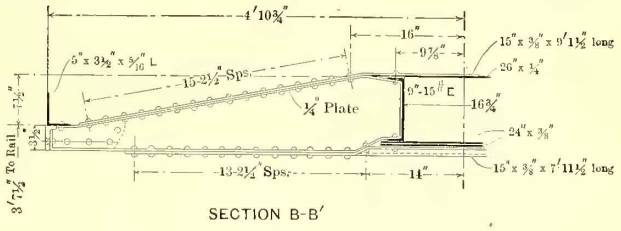
The height from the track to the center of coupler is determined by law, and the height to the top of the floor is practically regulated by custom. The center of the drawbar is, therefore, fixed at about 17 ins. below the floor. The suburban car has a height from top of rail to underside of frame of 41 ins. to admit the application of electric motors. The total height of this car above the rails is 13 ft., to permit the installation of a trolley. Other data follow:



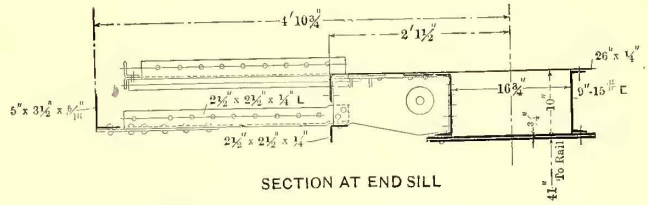
HALF PLAN OF FLOOR FRAMING



HALF SECTION THROUGH BOLSTER



HALF SECTION THROUGH CROSS BEARER



HALF SECTION AT END SILL

	Standard Wooden Passenger Coach 53 Feet Long.	Heavy Type Steel Passenger Coach 70 Feet Long.	Suburban Steel Passenger Coach 54 Feet Long.
Number of passengers	62	88	72
Car weight, pounds	91,000	*113,500	†75,000
Car weight per passenger, pounds	1,470	1,290	1,042
Area central sill at middle of car, square inches	152	50	24 32
Area centre sill at center plate of car, square inches	152	50	33.32
Stress in center sills due to 150,000 pounds compression on draft gear and 250,000 on buffer, pounds per square inch	10,850	11,000	18,500
Comparative value of center sills, per cent	25	100	60

*Estimated weight (including 6,000 lb. storage battery).
†Estimated weight

As the suburban car is of most interest to our readers, and as it follows largely the general arrangement of the heavy equipment except that it is shorter and lighter, the description will be confined to it.

The center sill is a continuous box girder formed of two 9-in., 15-lb. channels spaced 16¾ ins. apart and extending the entire length of the car from buffer to buffer. The channels have one 26-in. x ¼-in. cover plate on top and one 24-in. x ⅜-in. plate on the bottom extending the entire length of the car. In addition, there is an auxiliary ⅜-in. bottom plate 14 ft. in length at each end. The entire load is carried on the center sills, and the side sills are made part of the body by the construction.

The side sills are 5 ins. x 3½ ins. x 15/16 in. angles and are connected to the center sill by two end sills, two cross bearers and fourteen intermediate struts, seven on each side of the car. The end sills are built up of 2½-in. x 2½-in. x ¼-in. angles connected to the center and side sills, as shown, and with the outside sheathing plate acting as the web.

In addition to the use of a center sill, the most novel feature of the car is the fact that the body is supported by cross bearers instead of the usual body bolster. There are two of these bearers, which are set back from the truck center a distance of 6 ft. 7½ ins. They are composed, as shown in the section B-B', of triangular plates flanged about the edges and riveted at the ends through the top and bottom flanges of the channels composing the center sill. Opposite cross bearers are joined by cover plates, which pass over the top and under the bottom of each sill.

Each side sill is also held in line by the struts shown, which are of 5-in., 6½-lb. channels riveted to the center sill and side sills. These struts do not transmit any vertical load from the side sills to the center sills. Cast steel side bearings for engaging the trucks are secured to the side sill in line with the center plates. Pressed sheet steel posts, spaced 8 ft. 6 ins. centers, support the superstructure. They are of channel section and the edges are flanged out and riveted to the inside sheathing forming a box section. Their lower ends are securely riveted to the outside sills and their upper ends are tapered down and bent inward forming lower deck carlines. At their upper ends these posts are riveted to the plate carrying the deck sash. The lower edge of this plate is bent out beneath the ends of the posts and forms a continuous beam of angle section running the entire length of the superstructure.

Between the main posts are shorter intermediate posts, which extend only from the window sill to the plate carrying the deck sash. They are of light channel section with edges flanged for riveting to the outside sheathing, forming thereby a box section.

Upper deck carlines are of sheet steel pressed to channel section with edges flanged out for riveting to the 0.090-in. steel roof-plate. Ends of the carlines are riveted to the plate carrying the deck sash. The upper edge of this plate is bent outward and down, forming a continuous beam of channel section, to which the edge of the roof-plate is riveted. Malleable iron braces unite the end of each post and its corresponding carline.

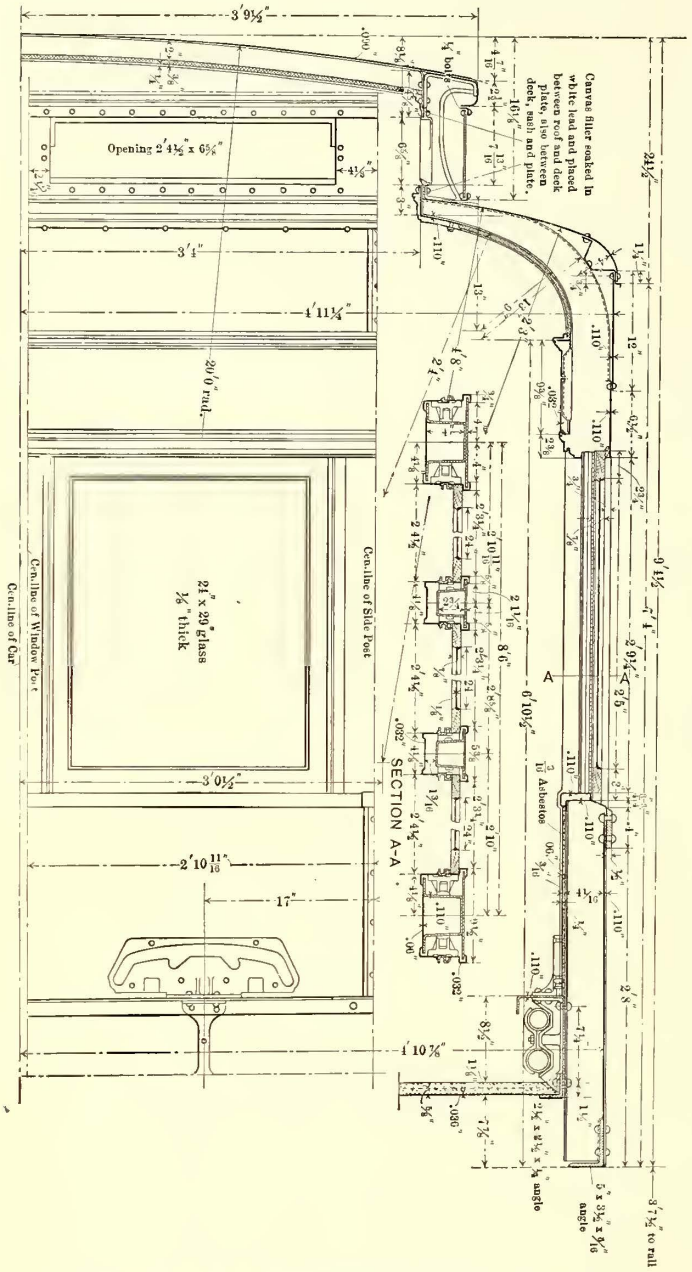
Outside sheathing is of 0.110-in. steel, and the course below the belt rail is riveted to the outside sill and vertically to each post.

Headlining for the upper and lower decks is of composite board secured to the carlines and posts with metal strips. Below the belt rail the inside sheathing is of 1/16-in. steel, to the unexposed face of which 3/16-in. asbestos is cemented.

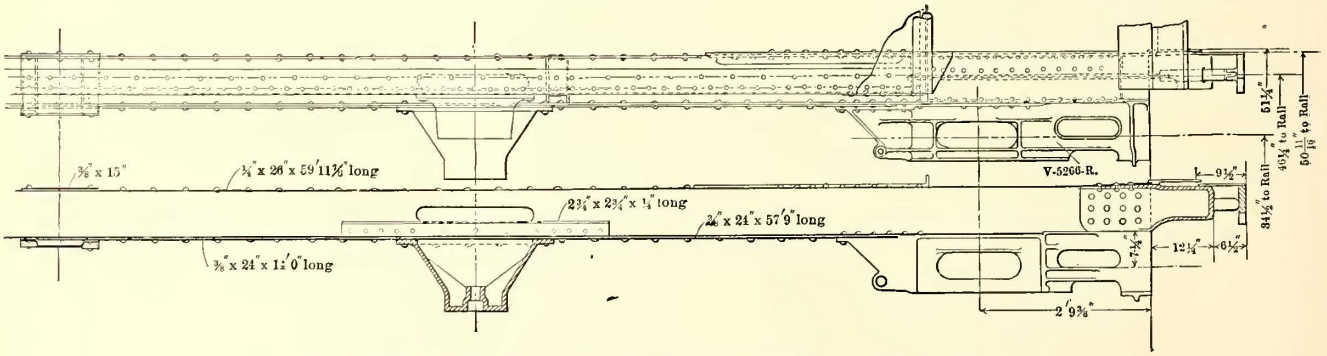
Bulkheads and remaining parts of the inside lining are of 1/16-in. sheet steel. Moldings, closely resembling those used in wooden construction, are pressed from steel and their use adds greatly to the artistic appearance of the interior. Through care in design it has been possible almost wholly to eliminate machine screws from the construction, and it is believed that economy in both construction and maintenance has been secured thereby.

Window sash are of wood and slide in a formed steel frame. Steel sash have been successfully built, but after careful consideration, wooden sash were deemed preferable. Malleable castings riveted to the posts support the window frames. These castings are machined by jig, after riveting in place, so that the frames will be true and parallel regardless of any slight irregularity in location of the posts. Window stops, which also form ways for the curtains, are of extruded bronze. Deck sash are of malleable iron.

The floor is formed by corrugated steel plates, which are supported by the center sill and upon longitudinal angles secured to the side posts. These corrugated plates are covered to a maximum depth of 1⅛ ins. with a plastic surface filling, composed largely of cement.



HALF CROSS SECTION, SHOWING ALSO SECTION OF POSTS

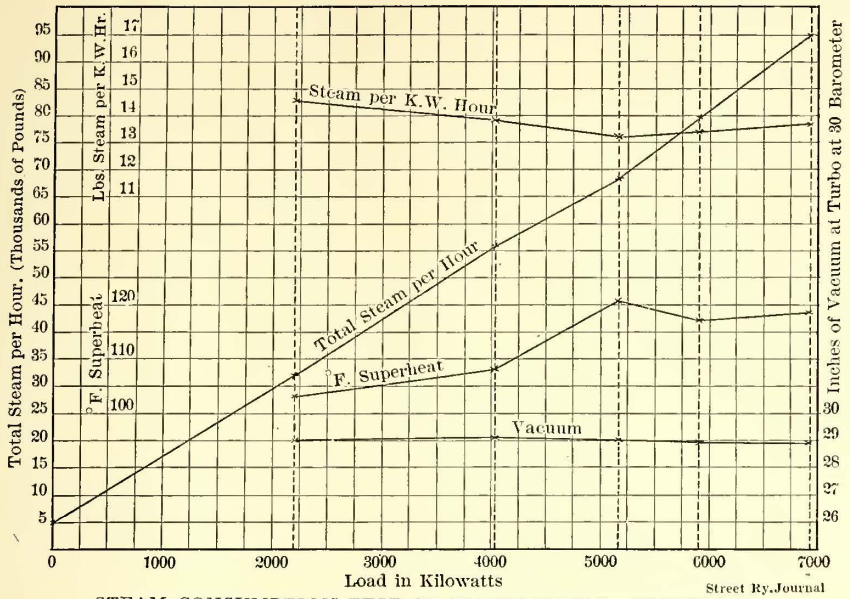


SIDE ELEVATION AND LONGITUDINAL SECTION OF CENTER SILL

EFFICIENCY TEST ON 3500-KW TURBINE

On Feb. 17, 1907, Chas. H. Merz, of Newcastle and London, conducted a series of tests of a 3500-kw Parsons turbo-alternator built by C. A. Parsons & Co., of Newcastle, and in use at the Carville power station at Wallsend-on-Tyne. The results of these tests have just been made public. Seven tests were made as follows: (1) no load (non-excited) of ½-hour duration; (2) no load (excited) of ½-hour duration; (3) 2000 kw load of 1 hour duration; (4) 4000 kw load of 1½ hours' duration; (5) 6000 kw load of 1½ hours' duration; (6) 7000 kw load of ½-hour duration; (7) 5000 kw load of 1 hour duration. The loads were kept as nearly constant as possible throughout by means of the exciter field rheostat.

STEAM CONSUMPTION TEST OF 3500 K.W. TURBO. PLOTTED FROM ACTUAL READINGS.



STEAM CONSUMPTION TEST OF 3500-KW TURBO. PLOTTED FROM ACTUAL READINGS

The weight of condensed steam was measured by the company's tank and weighbridge, which had on the day previous to the test been calibrated in the presence of the government inspector of weights and measures and certified as correct. The vacuum was measured at the turbine exhaust chamber by a mercury column. Steam temperature and pressure were taken at the turbine stop valve. The speed was taken by tachometer. In the final consumption results only the actual output of the generator has been taken into account, no deduction being made for any auxiliaries. The field current of the exciter was supplied from an entirely independent source, but apart from this the machine provided its own excitation. The neutral point of the generator windings was disconnected from earth, and the three phases were loaded by means of a water resistance.

The output of the machine was measured by a special wattmeter and by the switchboard integrating wattmeter. The same meter was used for tests 1, 2, 3, 4, 5, and 6; for test No. 7 a meter having a rather higher speed was used. The current was measured by a special ammeter connected to the same current transformer as the special wattmeters and by the switchboard ammeter. These instruments were connected in different phases, giving the balance of load between phases. An ammeter was also placed in the exciting circuit. The switchboard voltmeter, indicating wattmeter and power factor meter were in circuit, and were read every five minutes to check the accuracy of the wattmeter.

The special instruments and the switchboard integrating wattmeter were all carefully calibrated both before and after the test, and corrections were made in the measured output in accordance with the mean of the observed errors at the before and after calibrations. A summary sheet of results appears herewith. Consumption and load variation curves, which have been plotted from actual readings, are also shown.

To verify the steam consumption at the most economical load, a further test, consisting of three hours' run at a load of 5000 kw. was held on Feb. 23, under the same conditions as before. The figures obtained are shown in the table as test No. 8 and corroborate the previous tests, the slightly poorer results being due to the less superheat. The meter used on this occasion was the same meter which had been used for the 5000 kw test on Feb. 17. The same switchboard instruments were also in circuit.

RESULTS OF TEST

TEST No.	Duration (Hours).	Mean Calibrated K.W.	Steam. Pressure.	Steam. Temperature at Turbo. °F.	Steam. Superheat °F.	Speed R.P.M.	At Turbo Exhaust. Vacuum at 30″ Brm.	Water. Total Condensed Lbs.	Water. Lbs. per Hour.	Water. Lbs. per K.W. Hour.
1.....	½	No load not excited.	180	460	80	1,200	28.875	1,835	3,670	.....
2.....	½	No load excited.	211	453.3	61	1,200	28.95	2,603	5,206	.....
3.....	1	2192.87	202.4	492.1	103	1,200	29.036	31,836	31,836	14.517
4.....	1½	4045.14	197.4	495	108	1,200	29.066	83,972	55,981.3	13.839
5.....	1½	5901.	195.8	503.2	117	1,200	28.95	119,182	79,454.6	13.464
6.....	½	6921.8	198.4	505.5	118.5	1,200	28.765	47,390	94,780	13.692
7.....	1	5164 07	199.9	508.5	120.5	1,200	29.039	68,180	68,180	13.189
8.....	3	5059.38	194.5	477.9	92	1,200	29.195	203,559	67,853	13.411

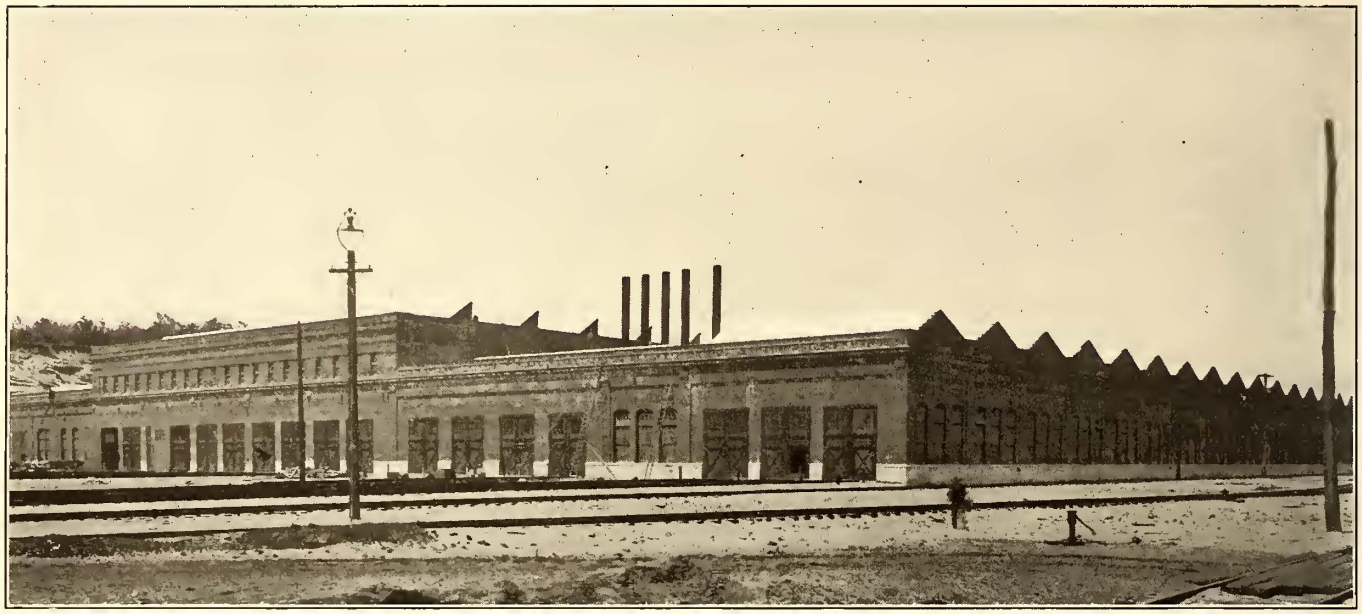
The results, 13.189 lbs. per kw-hour, are certainly very gratifying, as are as well the high efficiencies maintained over large ranges of output.

TRANSPORTATION AT THE JAMESTOWN EXPOSITION

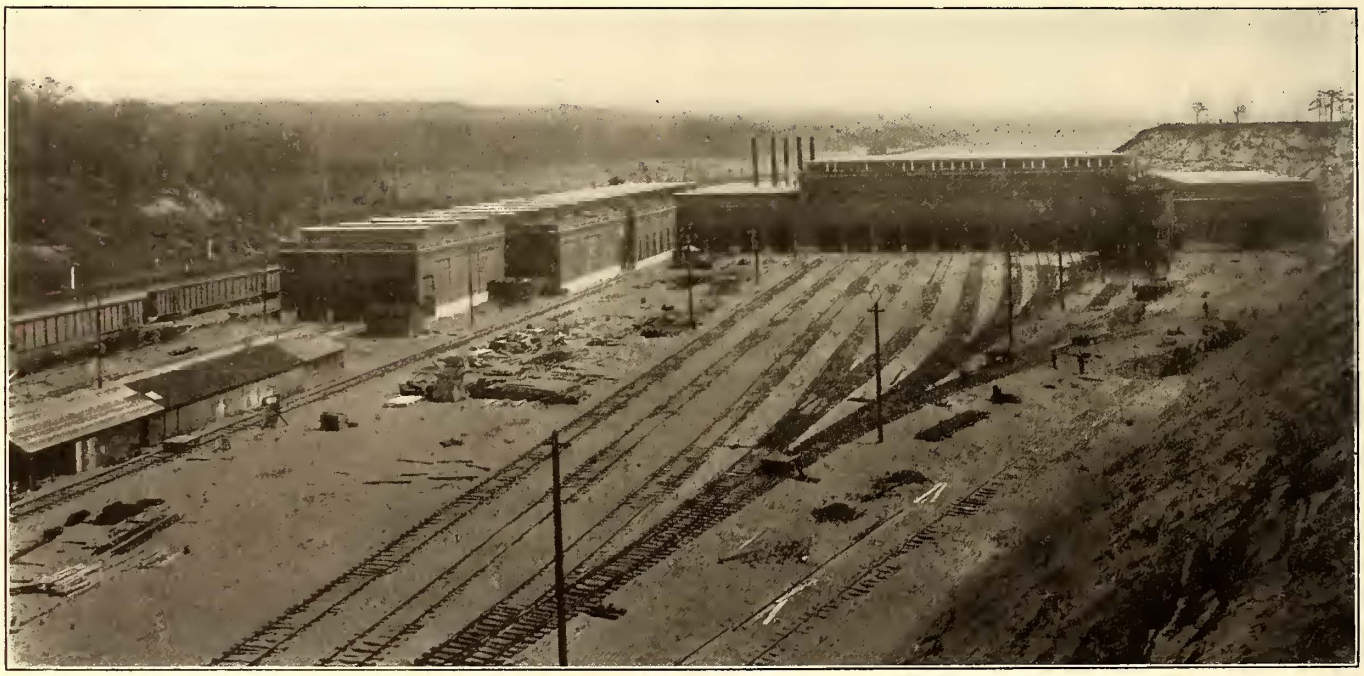
The Newport News & Old Point Comfort Railway & Electric Company has just published an attractive pamphlet relating to the Jamestown Exposition and the part taken by that company in transportation about the Exposition. A number of excellent maps and half-tones, engravings illustrative of objects of interest in the neighborhood, make the situation clear to the reader. The cover is attractively printed in colors and shows a bird's-eye view of the Exposition grounds. The Newport News & Old Point Railway connects the two places of that name on the eastern shore of Hampton Roads, and both of these cities are connected by ferry with the Jamestown Exposition.

THE ELECTRICAL MAINTENANCE PLANTS OF THE NEW YORK CENTRAL & HUDSON RIVER RAILROAD COMPANY

The maintenance structures built by the New York Central to care for the rolling stock used in the New York electric zone offer the first opportunity to describe the shop construction of an electrified steam railroad. The entire work was designed and constructed under the general supervision of William J. Wilgus, vice-president of the railroad company, the organization having in charge the details of the work being Edwin B. Katte, chief engineer of electric traction; G. A. Harwood, chief engineer of electric zone improvements; C. H. Quereau, superintendent of electric equipment; L. H. Byam, engineer of company forces, and Carl Schwartz, engineer of power stations. With the running of the very first electric train, temporary inspection facilities had been provided at Highbridge and Wakefield, on the Hudson River and Harlem divisions, respectively, but some time before work had been started on the permanent maintenance quarters. The latter are now completed, and comprise two installations—one at Harmon and the other at North White Plains. The second plant is practically for inspection only, while the first includes a large machine shop and other facilities for thoroughly overhauling motor cars and electric locomotives.



GENERAL VIEW OF THE HARMON SHOPS, LOOKING NORTH, WITH THE INSPECTION SHED IN THE FOREGROUND

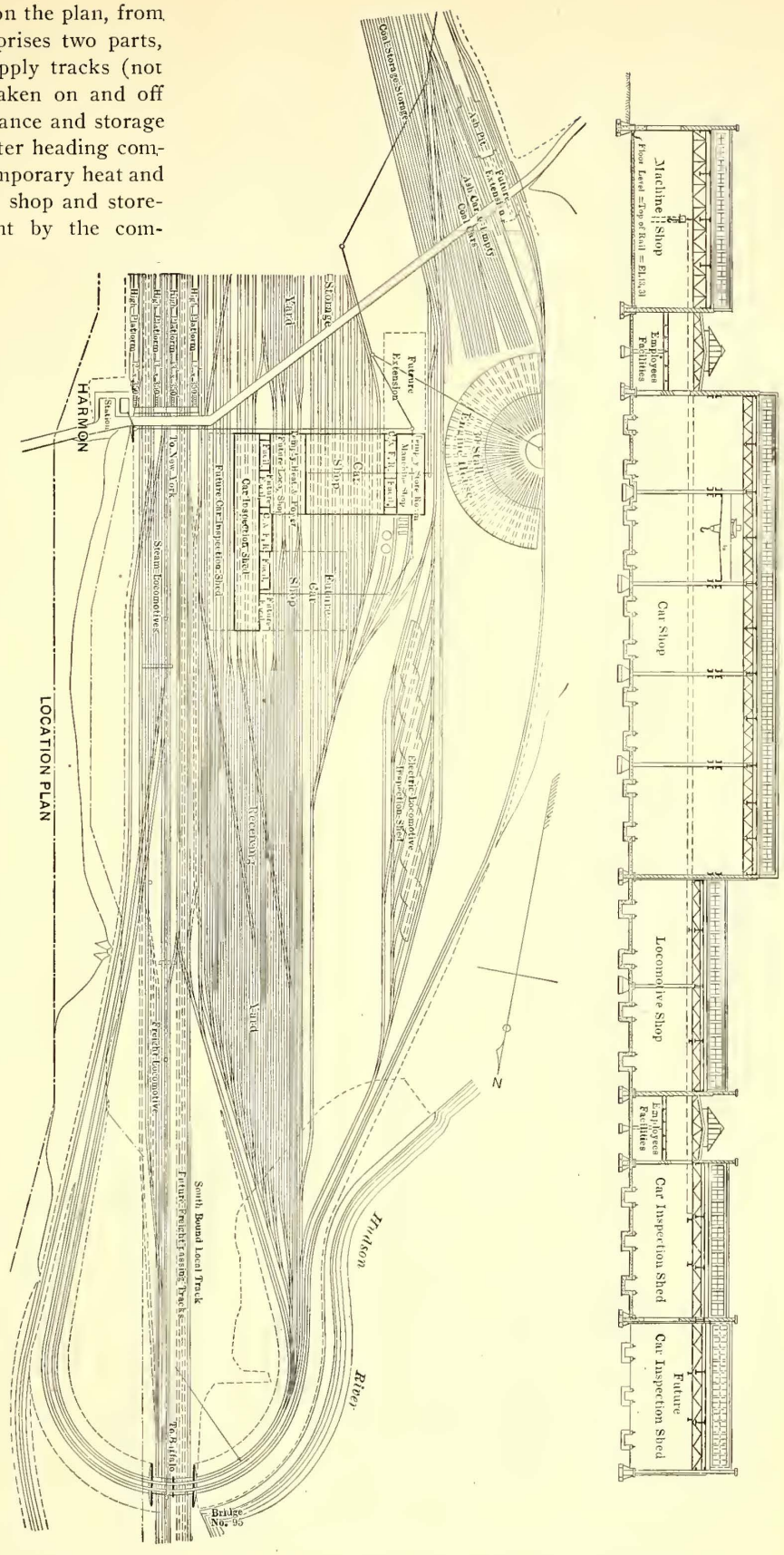


GENERAL VIEW OF THE HARMON SHOPS, LOOKING SOUTH

THE HARMON PLANT

The Harmon plant is erected on excavated ground along the Hudson River 33 miles from the Grand Central Station, or about ¾ mile below Croton, which marks the terminal of the electric zone on this division. The general arrange-

ment of the buildings and tracks is shown on the plan, from which it will be seen that the layout comprises two parts, namely, a thirty-stall engine house and supply tracks (not as yet built) for the steam locomotives taken on and off at Croton, and a general electrical maintenance and storage plant. The structures coming under the latter heading comprise a three-track car inspection shed, a temporary heat and power plant, a ten-track car shop, machine shop and storeroom. The property owned at this point by the company is so extensive that the most liberal provisions could be made for the enlargement of all the electrical facilities without affecting regular work in the first structures in any way. The same freedom in space permitted a track layout that is entirely free from dead-ends, a feature which is especially advantageous in the case of the suburban rolling stock which consists of multiple-unit equipment.



GENERAL PLAN OF THE HARMON INSTALLATION, WITH ELEVATION ON THE SOUTHERN SIDE

LOCATION PLAN

The car inspection building is located parallel to the main line just far enough away to allow the later construction of a duplicate structure. It is 448 ft. long, 56 ft. wide, and of brick construction resting on concrete piers and a concrete sub-base carried 4 ft. to 5 ft. above grade. Concrete is also used for the floors and pits.

The roof is of the saw-tooth type carried on steel framing. The lights are operated from the floor by wheel and chain. There are also numerous windows on the eastern side, with sliding sash below and swinging sash above. Wherever the sun strikes the glass the ribbed type is used, so that the light is evenly diffused and without shadows. The excellent illumination thus offered is enhanced by the interior painting, which is white with dark green wainscot for 6 ft. above the floor and around the doors and windows.

In general, the constructional features for the rest of the installation are the same, except that dome skylights are used on the flat roofs of the intermediate two-story "facilities" buildings. It may also be added that the roof structure in the machine shop is of sufficient strength to carry not only the telpher run mentioned later, but also 5000 lbs. suspended at any point.

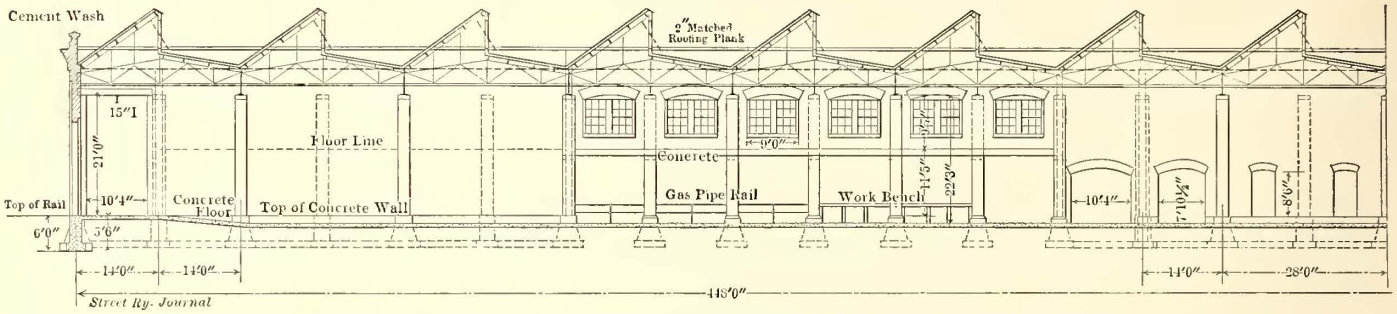
It will be noted from the main plan that adjacent to the inspection shed, but really forming a part of that structure, are three so-called facilities rooms—the southern room for a storeroom and minor tools for the inspection shed; the middle provided with toilet and washing arrangements for the car house men, and the third for the blower and coil apparatus which supplies heat chiefly to the inspection shed. The blower room is only one story high, but the other rooms are two stories in height, the upper floor being used for offices and locker rooms.

Beyond these facilities rooms and separated from it by a 12-in. brick wall is a section 79 ft. wide and 182 ft. long, now used for a power and heating plant, but eventually to be used as an electric locomotive shop. The remainder of the installation comprises a 176-ft. x 182-ft. car shop with ten tracks, another facility room, a blower room, a blacksmith shop, employees' quarters, offices, etc., and a machine shop. The latter is now 66 ft. wide and 134 ft. long,

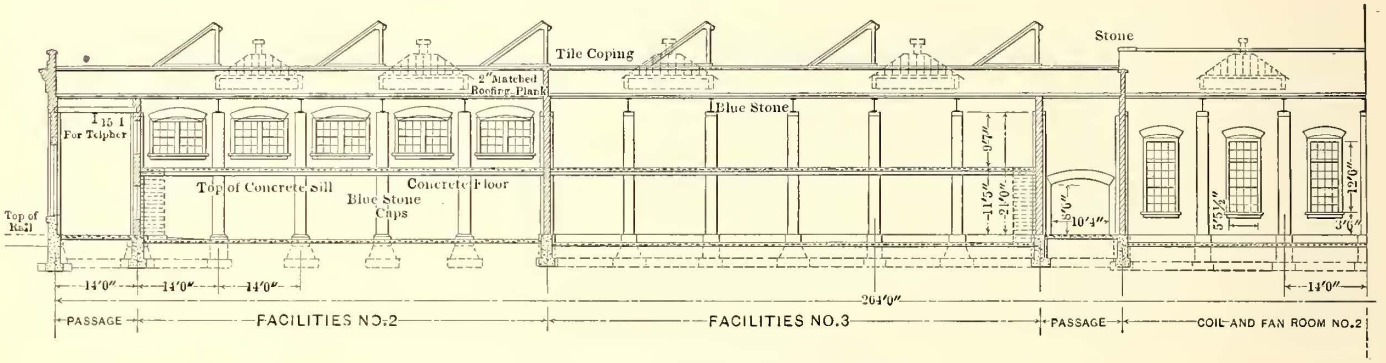
a space of 48 ft. x 66 ft. being occupied by a temporary storeroom.

DRAINAGE

The drainage problem has been carefully worked out for the entire installation, but as the system for the inspection away from the pits with a slope of ⅛ in. per foot to center drains placed every 23 ft. The water thus collected is discharged by wrought-iron pipes to one of the side valleys in the bottom of the adjoining pit and thence through gratings under the center of the pit floor to the 9-in. transverse



SECTION THROUGH THE INSPECTION SHED AT HARMON, LOOKING WEST



SECTION THROUGH THE FACILITIES ROOMS

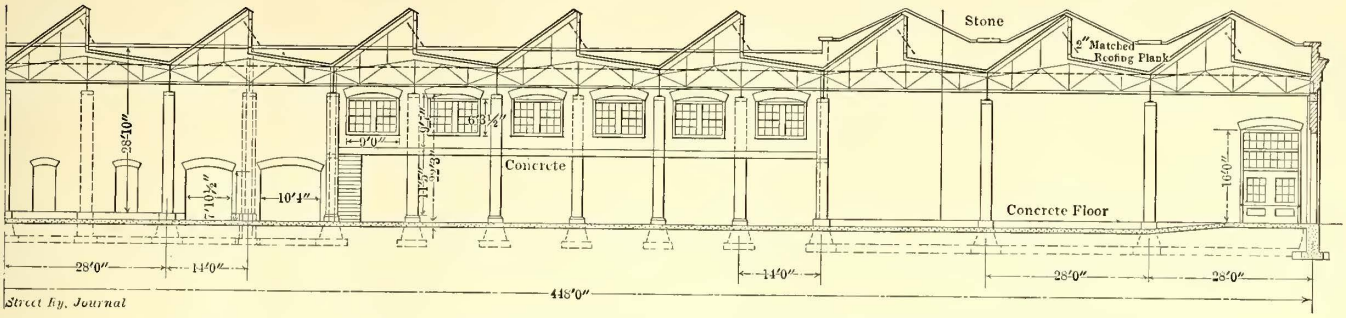
INTERIOR VIEW OF THE HARMON INSPECTION SHED, SHOWNG THE POSITION OF THE FACILITIES ROOMS

shed is typical of the rest, only this portion of the work need be described. The roof is drained by separate inside 4-in galvanized iron leaders, which are carried down the piers to cast-iron soil pipes extending 8 ft. above floors, which in turn drain to the sewers below. The floors are pitched sewers. The longitudinal sewers between the transverse or main sewers are 6 in. diameter, The sewer piping is furnished with stoppers at the points where extensions are to be made.

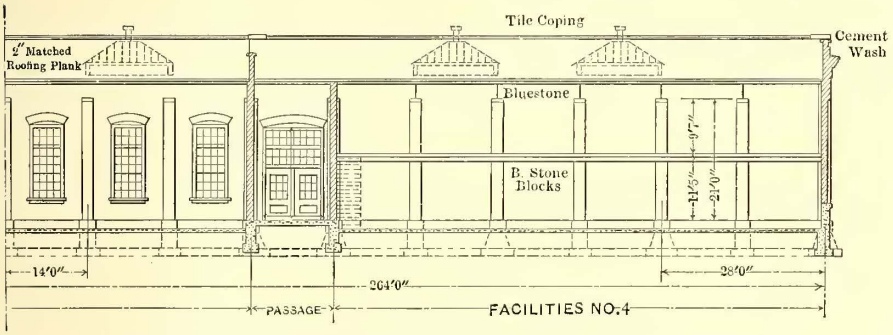
It will be noted upon examining a cross section of a pit

that the center of the pit floor is the highest, and, therefore, the dryest point, all water being carried away to the side gutters at once. The center floor drain between the pits serves as a hold for ladders placed against the cars, while the two-way pitch thus obtained is of further advantage since it reduces the angle necessary for rapid drainage, and as the water does not flow toward the pits, but from them, the discharge pipe need not be placed directly under the stringers, but can empty over the pit gutters far below the base of the track support.

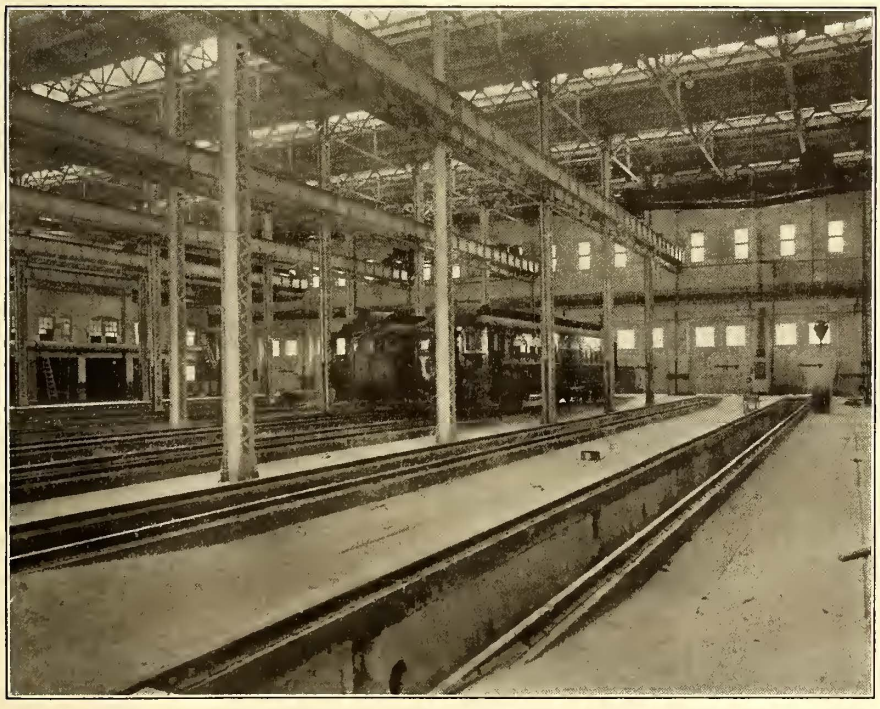
The water supply for the entire installation is the same as that now supplying the Croton terminal, the pipe line having been extended to Harmon. It discharges into two 5000-gal. tanks which serve as reservoirs. Ample fire protection is provided by 4-in. diameter outside fire hydrants and inside hose reels hung from the piers at convenient intervals.



SECTION THROUGH THE INSPECTION SHED AT HARMON, LOOKING WEST—(CONTINUED)



SECTION THROUGH THE FACILITIES ROOMS—(CONTINUED)



A VIEW IN THE CAR SHOP, SHOWING THE PIT-HEATING DUCTS AND RECESSES FOR THE LIGHTS

In connection with these hose reels there is installed an underwriter's type fire pump in the power plant. There are to be also eight standpipes and ladders to the roof outside the building. Fire extinguishers and pails are placed throughout.

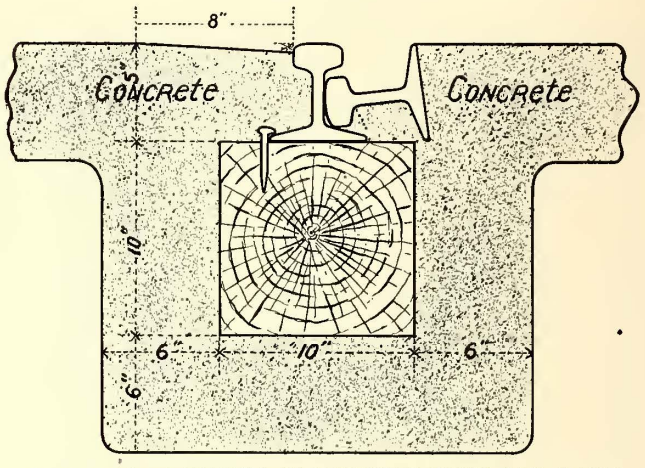
PIT AND TRACK CONSTRUCTION

The inspection shed contains three pits spaced 16 ft. centers, 4 ft. 2 ins. wide and 420 ft, long. Including the steps at each end, they are constructed entirely of concrete except over the main heating conduit where the bottom of the pit walls is reinforced with 5-ft. to 6-ft. lengths of old T-rails. The compressed air pipe line supplied from a compressor in the power plant is carried along the track between the ball and the base of the pit rail with outlets every 20 ft. The compressed air sent through this line will be used for air brake testing, cleaning motors, etc. The lighting conduits are carried in the wall on the opposite side. Iron conduit boxes for the lamps are placed every 10 ft., with a separate connection for extension lights for inspection.

The pit tracks are of 80-lb., 5⅛-in. rail, and are carried on 10-in. x 10-in. yellow pine stringers bolted to the concrete. An interesting feature of the floor construction in this connection is that alongside the rails three 4-in. x 8-in. yellow pine planks are laid in the concrete flush with the rest of the floor to secure a good jack base. This will also enable the men to work alongside a truck without knee-pillows and will eliminate the electric shocks possible from current leakage through damp concrete.

Where the floor of the inspection shed or car shop is level with the top of the rail the flangeway, instead of being formed by concrete and angle irons, is made by inclining old rails against the base and web of the running rails, after the manner shown on page 1018. While this method is more

expensive than the other, it insures a permanent flangeway, because bolts, nuts or other loose pieces cannot injure it when pressed against the side by over-running wheels. Another interesting point in the track construction is that on the inner side of the rail the floor is sloped for 8 ins. at an angle large enough to permit the head of the rail to project ⅜ in. thus making the head of the rail



METHOD OF FORMING FLANGEWAY WITH OLD RAILS

take the brunt of passing traffic and saving the concrete from chipping. The flangeway in the maple floor of the machine shop is also formed by inclined rails.

The pits in the car shop are similar in every particular to those described for the inspection shed.

POWER AND LIGHTING PLANT

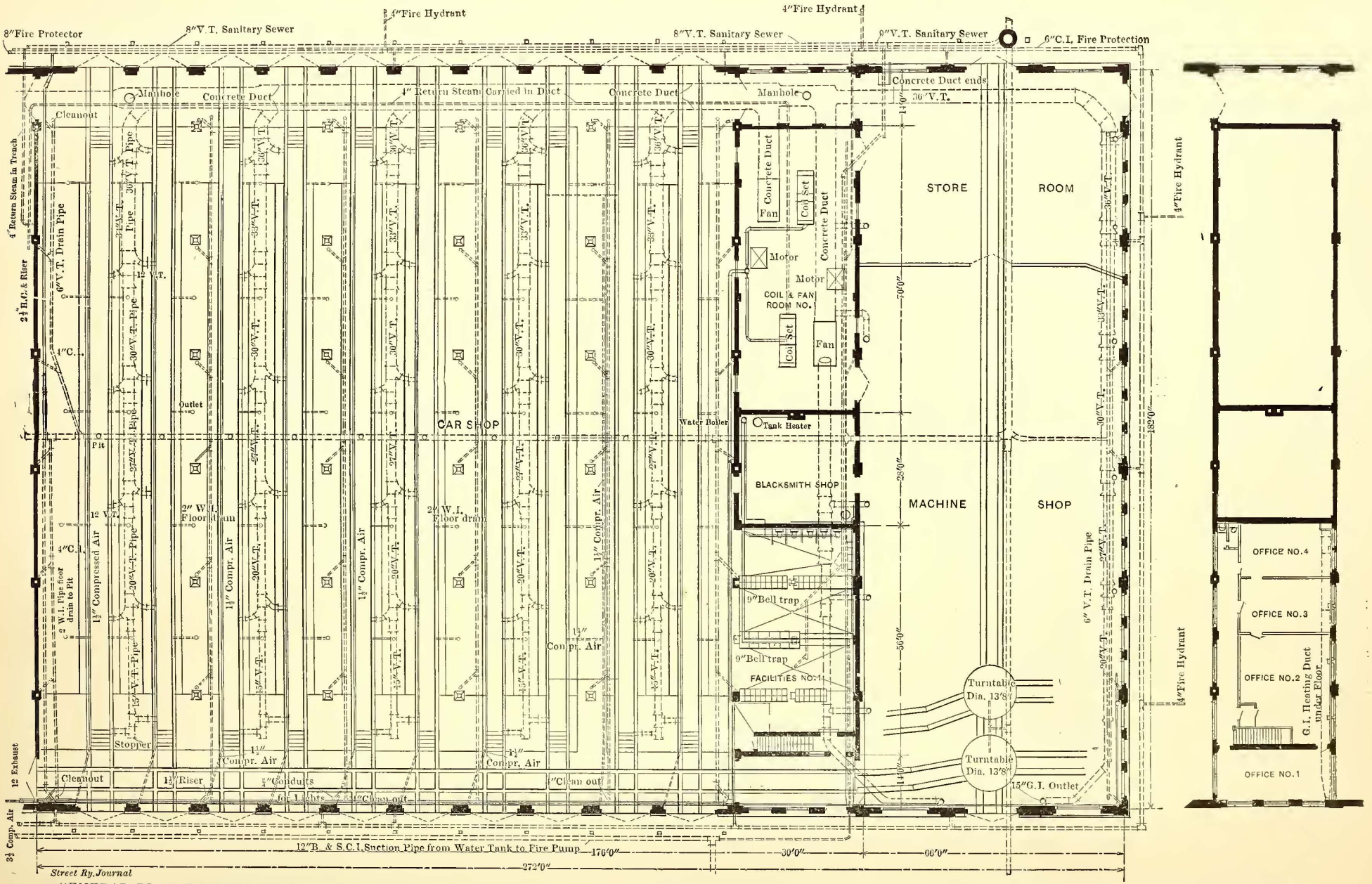
Reference to the general plan will show that between facilities room No. 3 and the car house there is installed the temporary heat and power plant previously mentioned. It was necessary to install some immediate means for generating power, as the electrified section will not extend to this point until later.

The steam generators consist of five 150-hp locomotive type boilers operated to give a pressure of 120 lbs. per square inch. There is also a 6-in. x 4-in. x 6-in. feed-pump and a 750-hp open type feed-water heater. Non-condensing engines are used. These comprise two vertical engines each direct connected to a 150-kw, 220-volt, 225-r. p. m. compound-wound generator and one vertical engine direct connected to a 100-kw., 440-volt., 275-r. p. m. generator. The low-voltage sets will take care of the lighting and machine tools and the higher voltage will be used for shifting cars in the car house and inspection shed and for testing out electrical apparatus on the cars. The entire installation is neatly laid out and isolated from the other departments by a corrugated metal partition. Coal is brought in and ashes removed on a temporary track leading to the southern storage yard.

The temporary station contains the main switchboard, consisting of generator and feeder panels. The negative side of the 440-volt circuit is connected to the running rails.

There is also located in the west portion of the building a distributing switchboard which consists of two sections, one for feeders connected to lighting and constant motor loads and the other for feeders connected to fluctuating motor loads. The switches throughout the building con-

GENERAL PLAN OF THE HARMON INSTALLATION, SHOWING THE RELATIVE LOCATION OF THE PRESENT STRUCTURES AND THE FUTURE EXTENSIONS

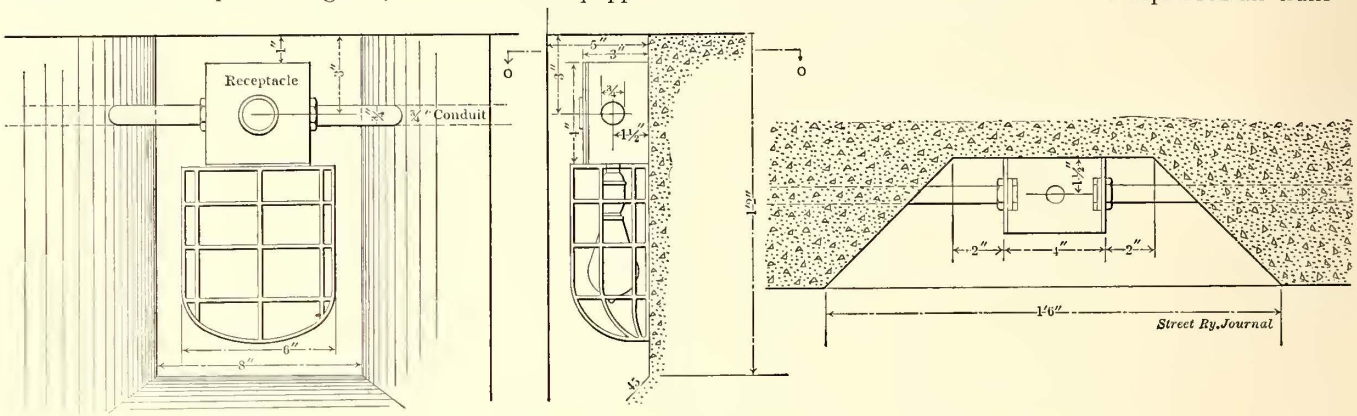


GENERAL PLAN OF HEATING AND DRAINAGE SYSTEM IN THE CAR HOUSE, SECOND SET OF FACILITIES ROOMS, MACHINE SHOP AND STOREROOM AT HARMON

trolling the crane motors, light, etc., are mounted in nearby slate-lined cabinets.

LIGHTING

There are about seventy inside arc lamps installed. Those in the machine shop are of the concentric diffuser type and lower shade with opal inner globe; the others are equipped with inverted concentric diffusers with opal inner and clear closed base outer globe. There are twenty-eight outside arc lamps. Incandescent lamps are used for the pits, offices, storeroom, blower rooms, and for individual lights in the machine shop.

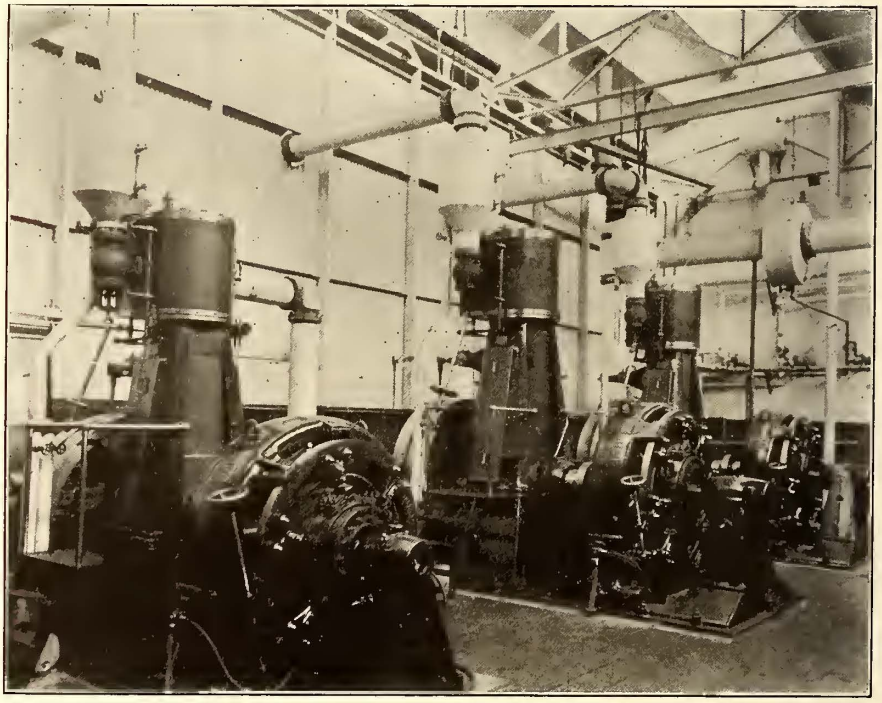


DETAIL OF PIT LIGHTING IN THE HARMON AND NORTH WHITE PLAINS INSTALLATIONS

THE HEATING SYSTEM

The indirect method of heating is used throughout the entire installation. The heated air is taken from two coil and fan rooms, No. 1 adjacent to the machine shop and containing two Buffalo fan blowers, and No. 2 nearest the inspection shed with a third unit of like type. The exhaust steam is supplied to the fan rooms from a 16-in. header from the power station. This header divides into two 12-in. lines running to the separate coil and fan rooms. The fan blowers are all 10 ft. diameter by 5 ft. width, and are three-quarters enclosed. Each is operated at 160 to 170 r. p. m. by a 35-hp Westinghouse 220-volt, constant speed motor running at 935 r. p. m., temperature variations of the heated air being secured by regulating the steam supply to the coils. The minimum capacity of each fan is about 72,000 cu. ft. of air per minute at a pressure of 1 oz. per square inch at the fan outlet. The heating coils are in a sheet iron housing supported and braced by angle iron framing. The coils are arranged so any section may be removed without disturbing the others. They are placed in sets of two, each giving 1990 sq. ft. of heating surface. The total volume of space to be heated is now 3,000,000 cu. ft., but the whole hot air system has been designed to care for the ultimate capacity of the plant, which then will have a capacity of approximately 5,300,000 cu. ft. The heating system has been designed on the assumption of three changes of air an hour being used, two of these being air returned from the shops and one being fresh air to maintain a temperature of 65 degs. F. in zero weather. The blower rooms are provided with metal louvers, which are adjusted for the required amount of returned air necessary under prevailing weather conditions.

The main duct is carried right through the east wall to permit extension of the system when a duplicate inspection shed is built. It will be noted that this main duct also serves for the compressed air transmission and the lighting conduits. Thirty-inch tile pipes between car pits run in both directions from this conduit and have 16-in. openings into pits at regular intervals. The plan shows that the pit branches on one side are also carried through the walls and furnished with stoppers, thus providing easy extension to a future pit. All ducts have the concrete floor which is over them reinforced with 3-in. x 8-in. mesh wire cloth.



AN INSIDE VIEW OF THE TEMPORARY STEAM PLANT AT HARMON, ENCLOSED WITH CORRUGATED METAL PARTITIONS

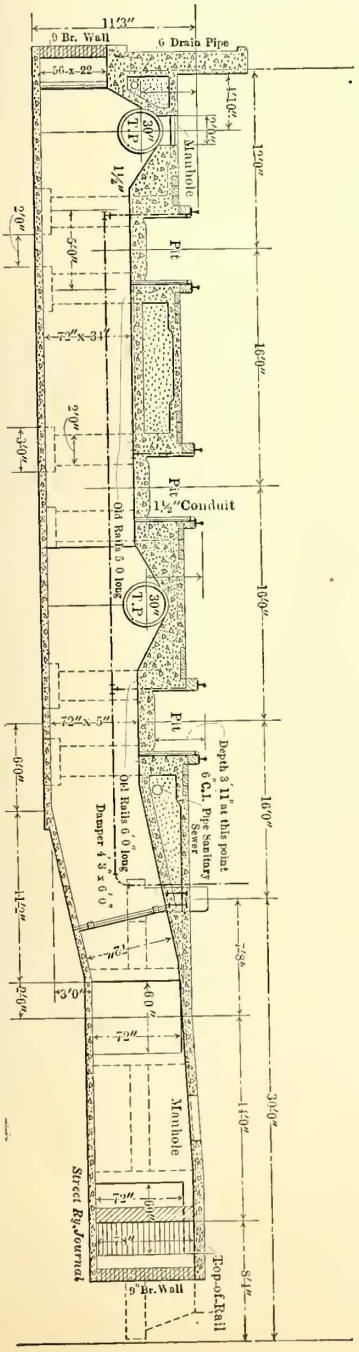
It will be seen from the layout that, in general, all of the heating ducts are so laid out as to reduce friction to a minimum. The heat entering the pits through the outlets is, of course, regulated at will by the use of dampers. It is hardly necessary to point out the many advantageous features of the indirect method of pit heating, such as its comfort, cleanliness, low maintenance cost, etc.

The machine shop and storeroom are heated by air sent

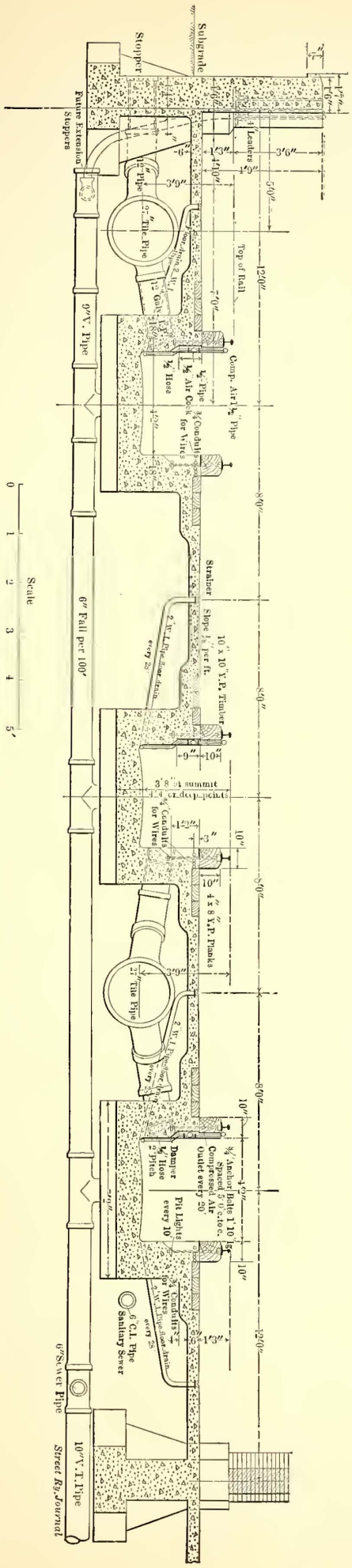
through fourteen damper-controlled outlets of galvanized iron. These, as shown on page 1022, are of the divided type, and each outlet is turned 90 degs., so the branches are parallel to the wall. The same drawing shows that they are placed only 15 ins. above the floor line, thus making certain that the lower part of the structure is warmed before the heated air ascends.

The car shop is heated from coil and fan room No. 1, as appears from the plan on page 1019. The trunk line is a concrete duct at the southern end, which is tapped between every other pair of pits.

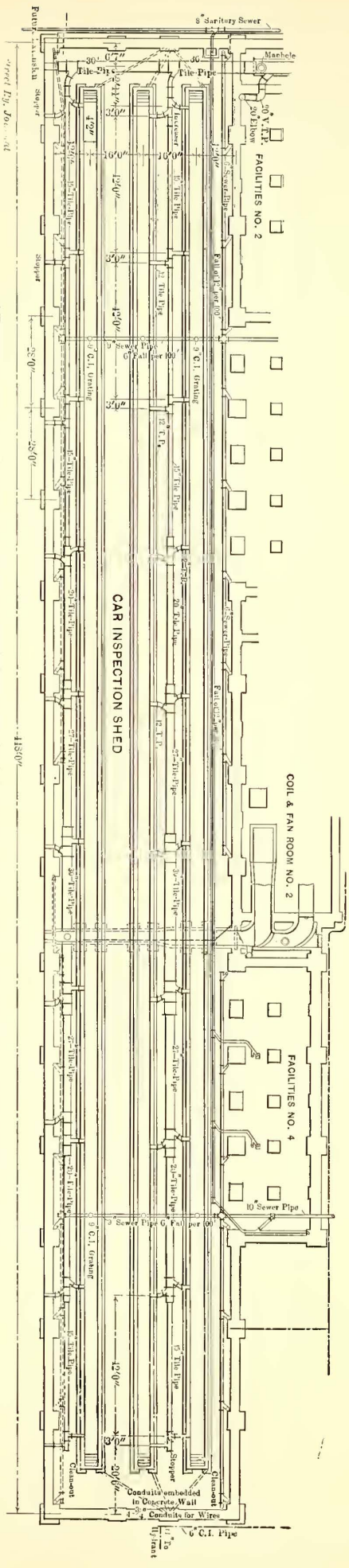
A portion of the heat supplied by No. 1 is carried through a vitrified tile pipe across the southern and then along the entire western wall of



FLOOR SECTION, TAKEN OVER THE MAIN HEATING CONDUIT



STANDARD CROSS-SECTION OF HARMON INSPECTION SHED FLOOR



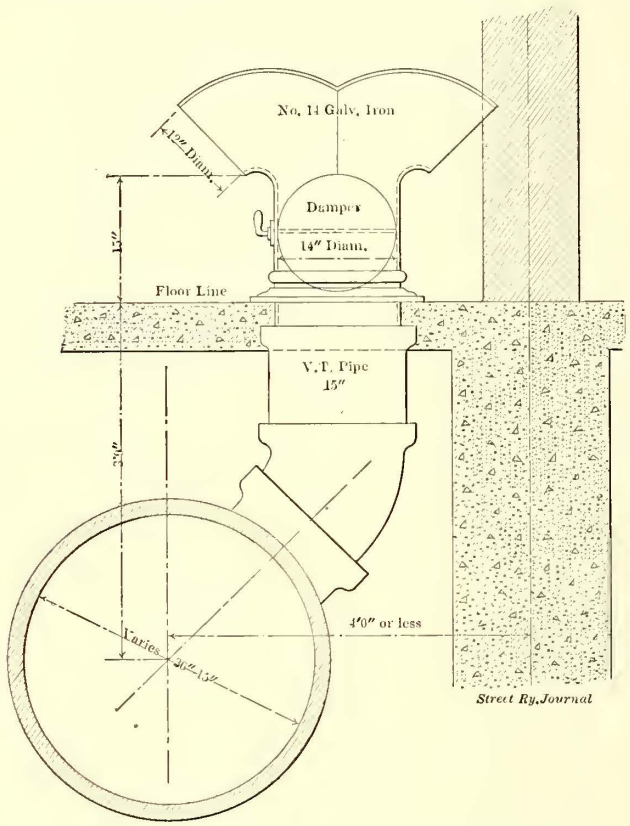
GENERAL PLAN OF PITS IN THE HARMON INSPECTION SHED, SHOWING THE HEATING CONNECTIONS, ETC.

the storeroom and machine shop to galvanized iron outlets. The same fan will also force heated air through another duct carried through the blacksmith shop and facilities room No. 1, thus saving space for machine foundations.

HOISTS AND CRANES

The car shop installation, as a whole, is well served in the transportation of smaller parts by a 5-ton Sprague telpher, which has a travel of 536 ft. on runway located along the southern wall of the inspection shed, car shop and through the center of the storeroom and machine shop.

The telpher was installed to give ready communcation between the inspection shed, heating shop and machine shop. Its run enables material to be delivered directly to the tracks in the inspection shed and car shop, as well as to a large number of the tools in the



STANDARD HEAT OUTLET, SHOWING ITS CONNECTION TO THE DUCT, AND LIGHT ABOVE THE FLOOR

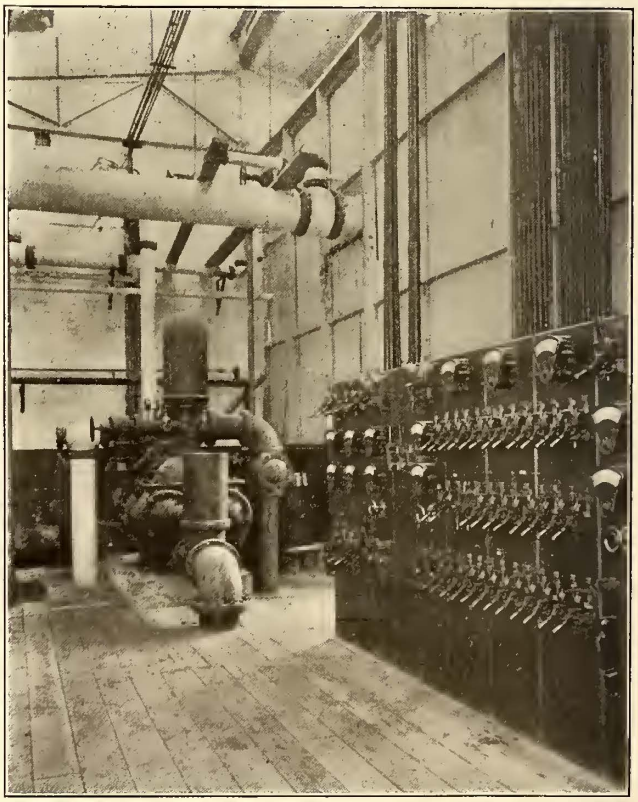
machine shop. Any machine that requires the service of a mechanical hoist has a 2-ton individual electric hoist leading to the telpher. An overhead traveling crane would have added greatly to the cost of the building walls, and it would have been very expensive to have a machine spanning fully 60 ft., which would have been the case if columns were to be avoided. At the same time, there is no delay in taking work to such machines as are concerned with the handling of the heavy parts since individual hoists make it unnecessary to wait until some other machine has been served.

Three bays of the car shop are each equipped with an 18-ton Box single-trolley traveling crane. Each crane has a total lift of 30 ft., a runway of 175 ft., and a maximum capacity of 22½ tons. Runways are also installed in the remaining bays for the accommodation of future cranes. These machines are operated from the floor by ropes instead of having a man in a housing on each crane or controlling all the cranes from a switchboard. Aside from the hand control, there is an automatic mechanical safety brake which controls the load at all times except when the motor is revolved by power in the lowering direction. There is

ALONG THE TELPHER TRACK WHERE IT TURNS INTO THE MACHINE SHOP ON THE LEFT

also provided an automatic electric brake so connected to the circuit as to operate only when the motor stops and current fails from any cause whatever.

In the locomotive shop now used for the power station



THE SWITCHBOARD IN THE TEMPORARY POWER STATION AT HARMON, WITH THE FIRE PUMP IN THE BACKGROUND

no cranes will be installed, but instead there will be a drop pit so that trucks and drivers can be lowered and taken through the wall to the adjoining car shop, where they will be handled by cranes therein.

THE SECOND SET OF FACILITIES ROOMS

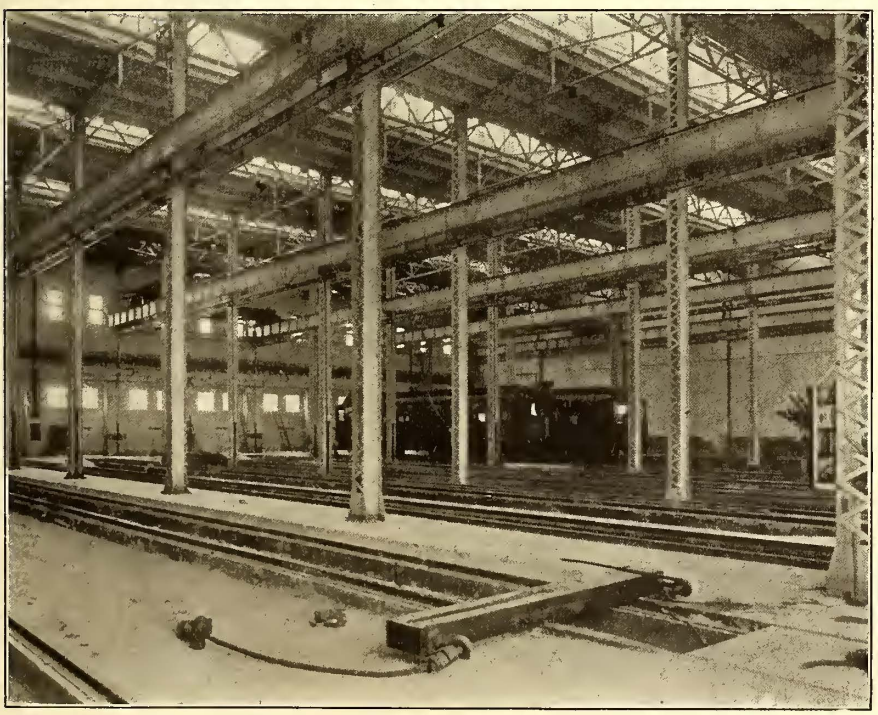
Aside from the blower room already noted, the section between the machine and car shops contains a blacksmith shop and offices. The rooms of the shop superintendent are located on the second floor, to give him an unobstructed view of both shops.

The blacksmith shop contains one hammer operated by compressed air, two forges and an emery wheel. The latter is placed there to avoid unnecessary dust in the machine shop.

THE MACHINE SHOP

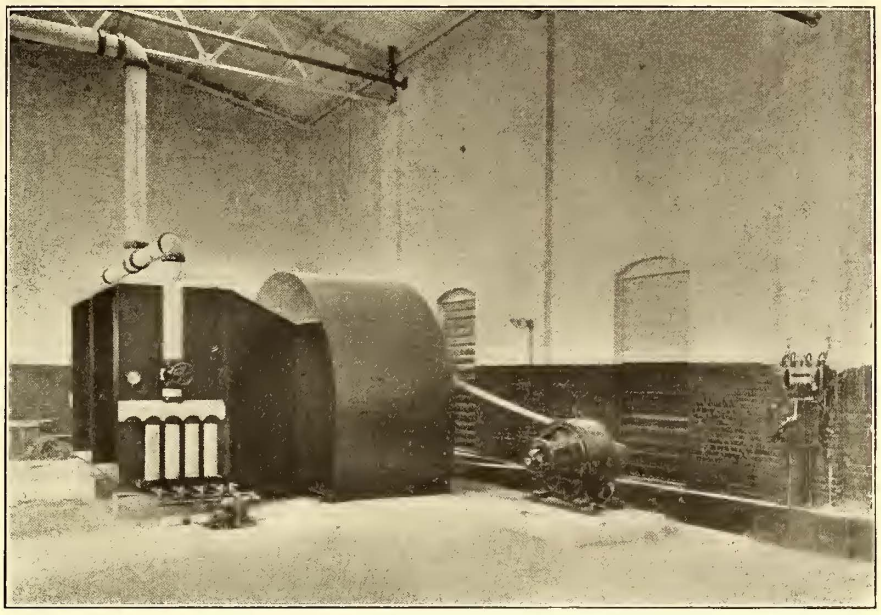
The machine shop at present occupies a space 66 ft. wide and 134 ft. long, which latter can be extended to 182 ft. by taking the space at the south now employed as a storeroom. The floor is made up of a top layer on 1⅛-in. maple over 3-in. hemlock placed on 6-in. tar concrete, but the tools are mounted on concrete piers. It is believed that the tar concrete not only will give an excellent foundation for the floor, but will also prevent any moisture getting in from underneath the planking and thus gradually rotting the wood. A wooden floor is also held to be easier for walking than an all-concrete floor for shop purposes.

The shop is furnished with a large variety of tools, some driven by single motors and others from line shafting. Their relative location and name is shown on the plan and key on page 1024. It will be seen from the range of the tools that while considerable maintenance work will be done at Harmon, such heavy repair work as would be due to collisions or other severe accidents involving car body injuries and truck breakage will be cared for at West Albany.



IN THE CAR SHOP AT HARMON

The northern end of the machine shop contains two 15-ft. 2-in. diameter turn-tables with track connections from both ends of the shop. Trucks or wheels brought in on these tables from one track can be shifted around to the nearby tools and taken along the other track running through the car shop at right angles to the pits.



THE HARMON BLOWER ROOM ADJACENT TO THE INSPECTION SHED, SHOWING THE LOCATION OF LOUVERS

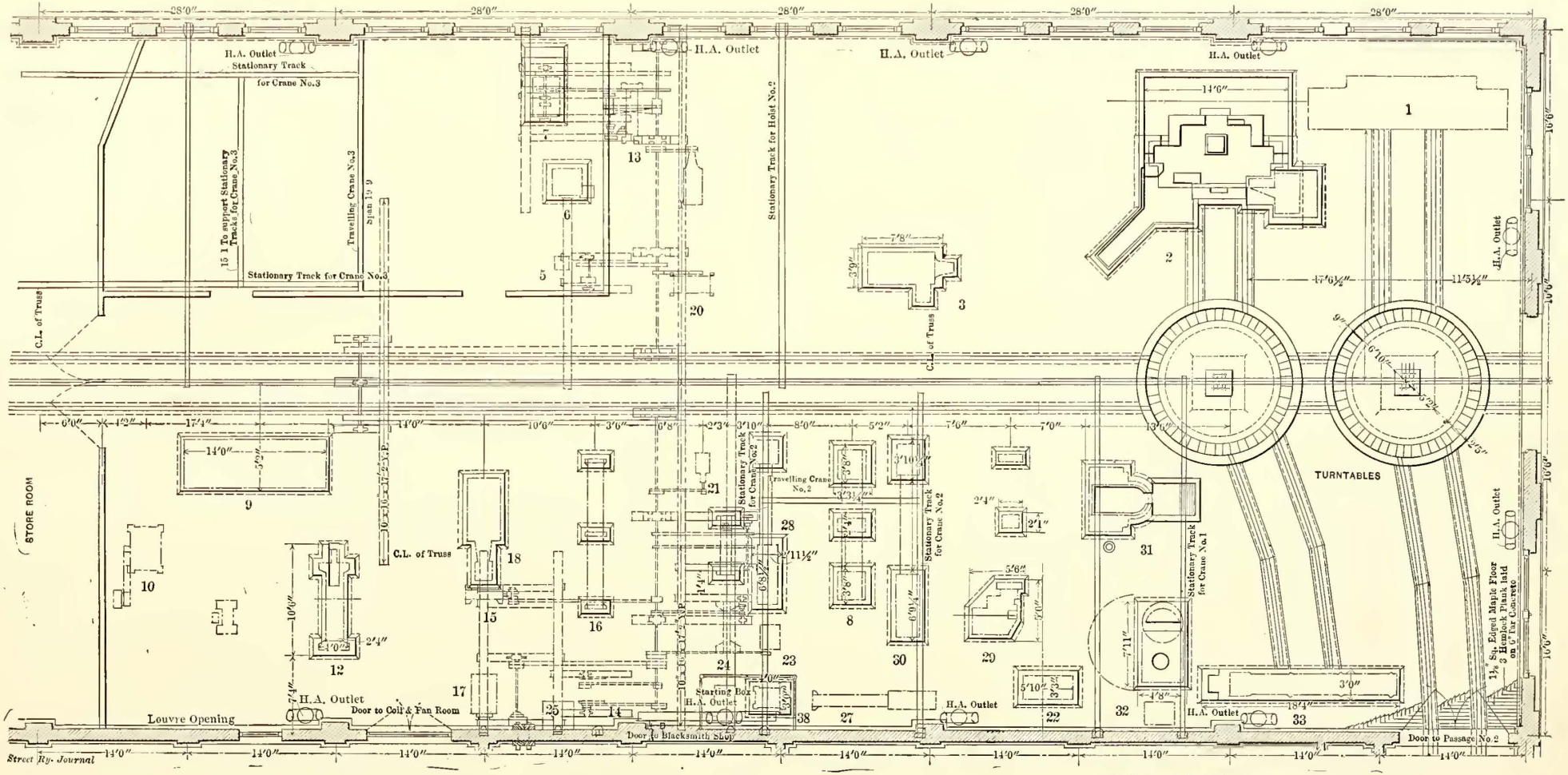
A car or locomotive brought in for truck or wheel repairs will not be kept out of service until the defective part has been put in order, but a duplicate equipment will be substituted at once to permit the rolling stock to go on the line without delay. In short, it is cheaper to pay the interest on the investment required to carry extra parts than to lose the mileage earnings caused by holding up a car whose total value must be far greater than any one or several parts of its equipment. Hence, there will always be on hand a reserve of trucks, motors, wheels and axles, as well as such parts as rheostats, contactors and air pumps.

THE NORTH WHITE PLAINS PLANT

The inspection plant at North White Plains is at the end of the electric zone on the Harlem Division, 24.4 miles from the Grand Central Station. The installation has been laid out on the west side of the running tracks. From the general plan on page 1025, it will be seen that the electric car storage yard is also on the same side, the steam rolling stock being cared for on another plot of the through tracks. The two plants, therefore, are entirely independent, except that the power equipment for the new installation has been placed in one of the old steam buildings.

The general plan also shows that at present only three of the tracks terminate in the inspection shed, but eventually the latter will be doubled in size to make room for three more. Space also is provided at the west for a locomotive shop.

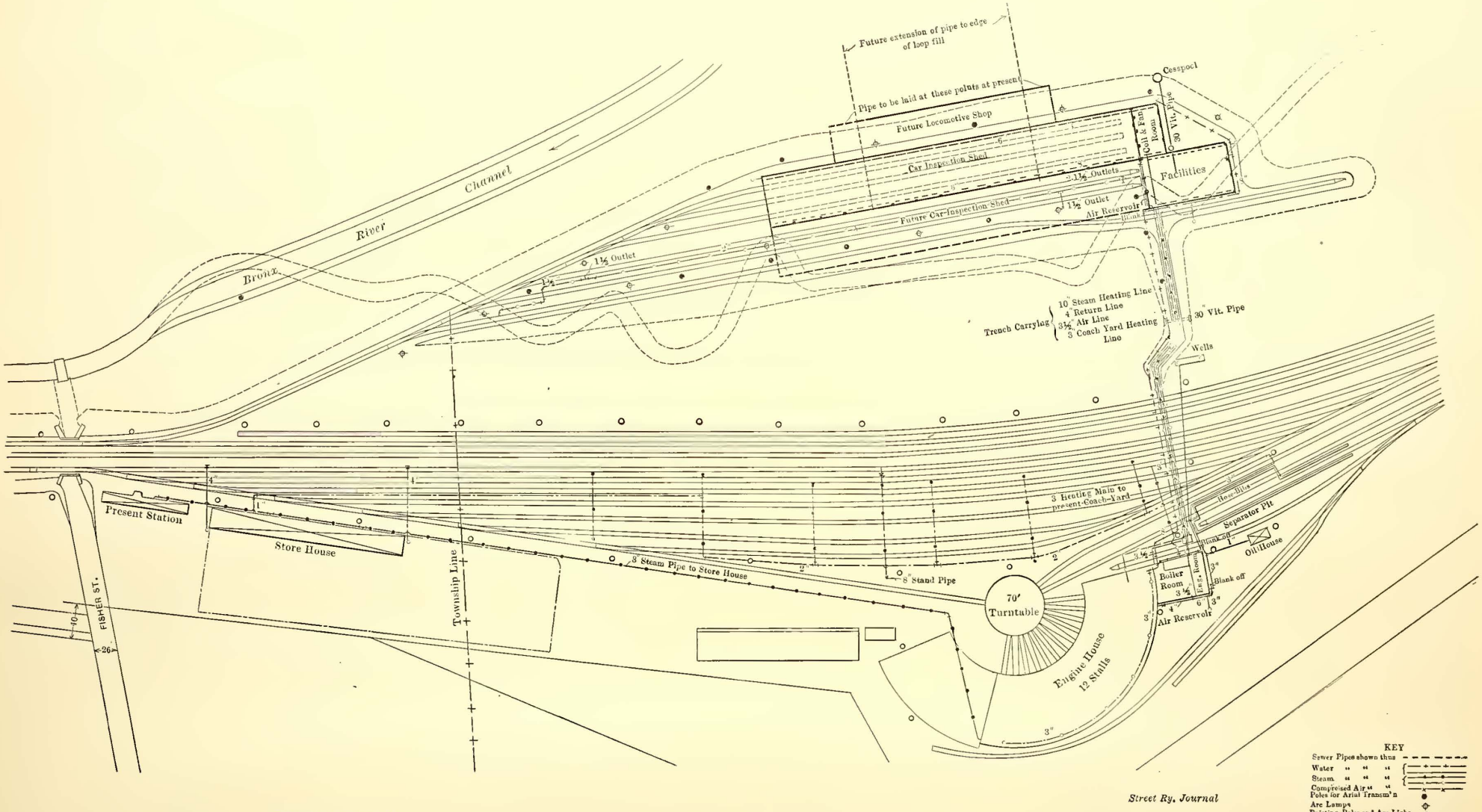
On the whole, the present inspection shed, which is 420 ft. long and 56 ft. wide, follows the constructional features



PLAN AND KEY OF HARMON MACHINE SHOP, SHOWING THE LOCATION AND CHARACTER OF THE TOOLS, ETC.

INDEX TO MACHINE TOOLS

1. Second-Hand Driving-Wheel Lathe, 25-hp Motor.
2. 42-in. Pond Tire Lathe, 25-hp Motor.
3. No. 1 60-in. Bickford Radial Drill, 4-hp Motor.
4. 28-in. Cincinnati Upright Drill, Belted.
5. Sellers Drill Grinding Machine, Belted.
6. No. 2 Cincinnati Universal Cutter and Tool Grinder, 1½ + ⅛ hp Motor.
7. No 4 Cincinnati Universal Milling Machine, Belted.
8. 36-in. x 14-ft. Schumacher & Boye Engine Lathe, 15-hp Motor.
9. Plate Straightening Rolls, 7½-hp Motor.
10. Rip Saw, 15-hp Motor.
11. Band Saw, 5-hp Motor.
12. No. 2 Hilles & Jones 25-in. Punch and Shear, 7½-hp Motor.
13. Pipe Threading Machine, Belted.
14. Cutting-off Machine, Belted.
15. Pratt & Whitney 2-Spindle Centering Machine, Belted.
16. 30-in. Pond Planer, 7½-hp Motor.
17. Acme Bolt Cutter, Belted.
18. 18-in. Dill Slotter, 7½-hp Motor.
19. Northern Electrical Company Emery Grinder, 10-hp Motor.
20. Pond Grindstone, Belted.
21. Rochester Davis 20-in. Drill, Belted.
22. Gould & Eberhardt 24-in. Shaping Machine, 3-hp Motor.
23. Fenn 4-in. Spindle Sadler Sensitive Drill, Belted.
24. Reed 11-in. x 5-ft. Speed Lathe, Belted.
25. No. 5 Greenard Arbor Press, Hand Power.
26. Hendey & Norton 14-in. Lathe, Belted.
27. Lodge & Shipley 16-in. Lathe, 5-hp Motor.
28. Lodge & Shipley 24-in. Lathe, 7½-hp Motor.
29. Niles No. 3 Double-Head Axle Lathe, 25-hp Motor.
30. Lodge & Shipley 30-in. Engine Lathe, 10-hp Motor.
31. Bullard 62-in. Boring Mill, 15-hp Motor.
32. Putnam No. 2 Car Wheel Boring Machine, 10-hp Motor.
33. Niles 48-in., 500-Ton Hydraulic Wheel Press, 7½-hp Motor.
34. Fan Blower, 15 hp.
35 and 36. Cast Iron Forges.
37. Chambersburg 1000-lb. Steam Hammer.
38. 35-hp Motor to Run Line Shaft.



GENERAL PLAN OF THE NORTH WHITE PLAINS OLD STEAM AND NEW ELECTRICAL INSTALLATIONS

of the Harmon buildings. However, owing to its erection over the old channel of the Bronx River, it was thought advisable to reinforce the pit floors longitudinally and transversely; the first reinforcement consists of six ¾-in. rods and the second of ½-in. rods spaced 18 ins. center to center.

The drainage and pit lighting also follow the Harmon practice. Fire protection is secured by outside fire hydrants, inside hose connections, chemical extinguishers, dry powder extinguisher and fire pails. There will also be the same standpipes and roof ladders as at Harmon.

Aside from the coil and fan room mentioned later in connection with the heating, the facilities rooms comprise offices, a storeroom, small machine shop and blacksmith shop, employees' locker room and toilets. This section is built in the same style as the inspection shed, except that a 10-in. cinder floor replaces concrete in the blacksmith shop, and in the offices a pine floor is laid over the concrete on 3-in. x 4-in. sleepers. The relative location and size of these rooms is shown on page 1027.

For the lighting and power equipment of the inspection shed there has been added to the present 300-hp plant one 150-hp locomotive type boiler and two direct-connected engine-driven sets. The latter comprises one horizontal automatic engine connected to a 100-kw, 220-volt, 250-275-r. p. m. generator and one vertical automatic engine connected to a 100-kw, 440-volt, 250-275-r. p. m. generator.

All of the electrical equipment is controlled from a switchboard in the power station. The control switches for different parts of the installation are mounted in slate-lined cabinets. In all, there are about 400 16-cp incandescent lamps, sixteen inside arc lamps with inverted concentric diffusers, and eleven outside arcs.

A VIEW TAKEN IN THE MACHINE SHOP DURING THE INSTALLATION PERIOD

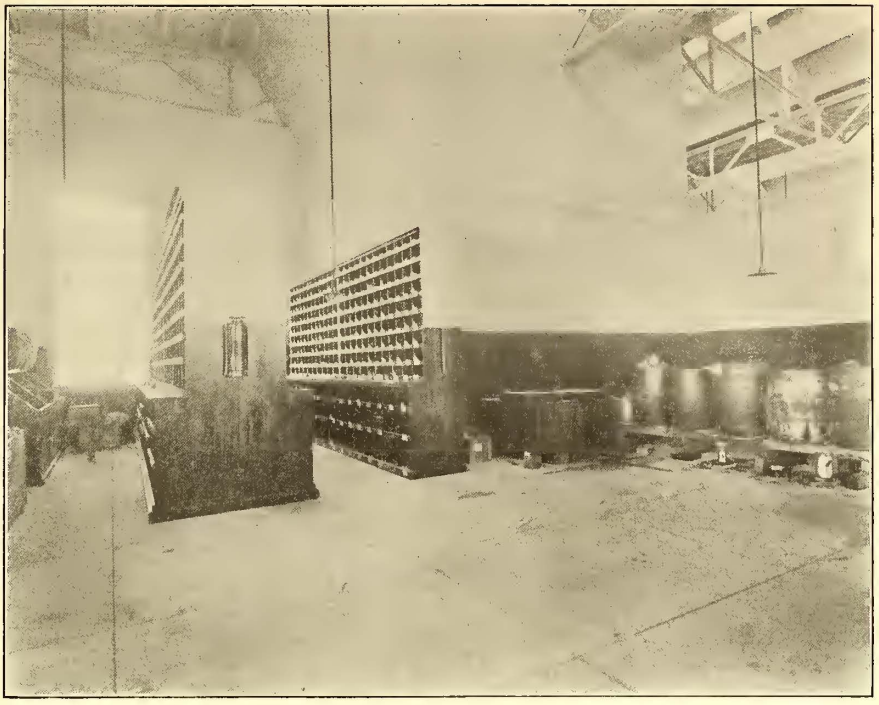
The steam and compressed air lines are carried over to the new plant in a buried rectangular wooden conduit built up of 4-in. yellow pine planks waterproofed with tar paper. This duct contains a 10-in. exhaust steam-heating line; a 3½-in. air line; a 4-in. return line, and a 3-in. coach yard heating line.

The steam for the heating system is brought to the blower and coil room which is directly behind the three tracks of the inspection shed, from which it is separated by a brick

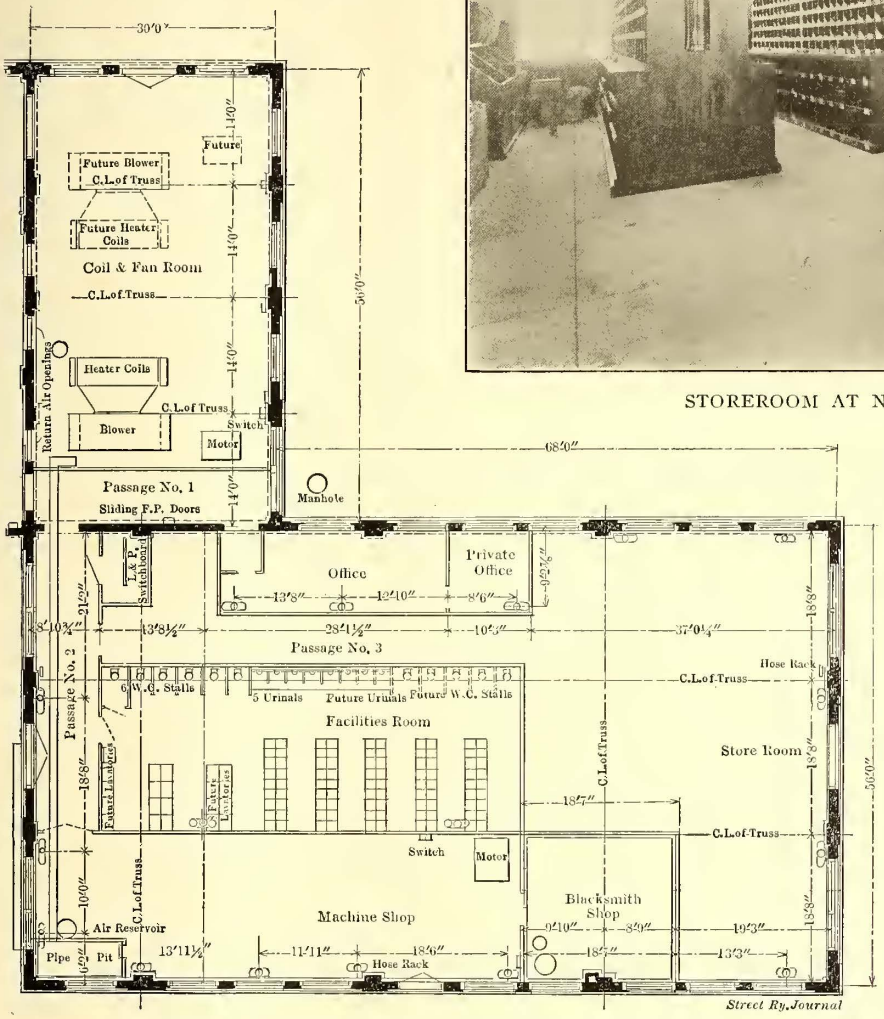
ENTRANCE TO THE NORTH WHITE PLAINS INSPECTION BUILDING

wall with the openings protected by standard fire doors. This room is 56 ft. long and 30 ft. wide, which gives sufficient space for the installation of a duplicate equipment. The present apparatus consists of a 9-ft. three-quarters-enclosed wheel 4½ ft. wide driven at 180 to 190 r. p. m. by a 30-hp, 1025-r. p. m. motor. The minimum heating capacity is not less than 57,000 cu. ft. of air per minute at a pressure of 1 oz. per square inch at the fan outlet. The heating coils are arranged in two groups, each giving a heating surface of approximately 2100 sq. ft. The volume to be heated is about 320,000 cu. ft., and the apparatus is figured to maintain an average temperature of 65 degs. in zero weather. The entire heating system is designed for about double its present capacity.

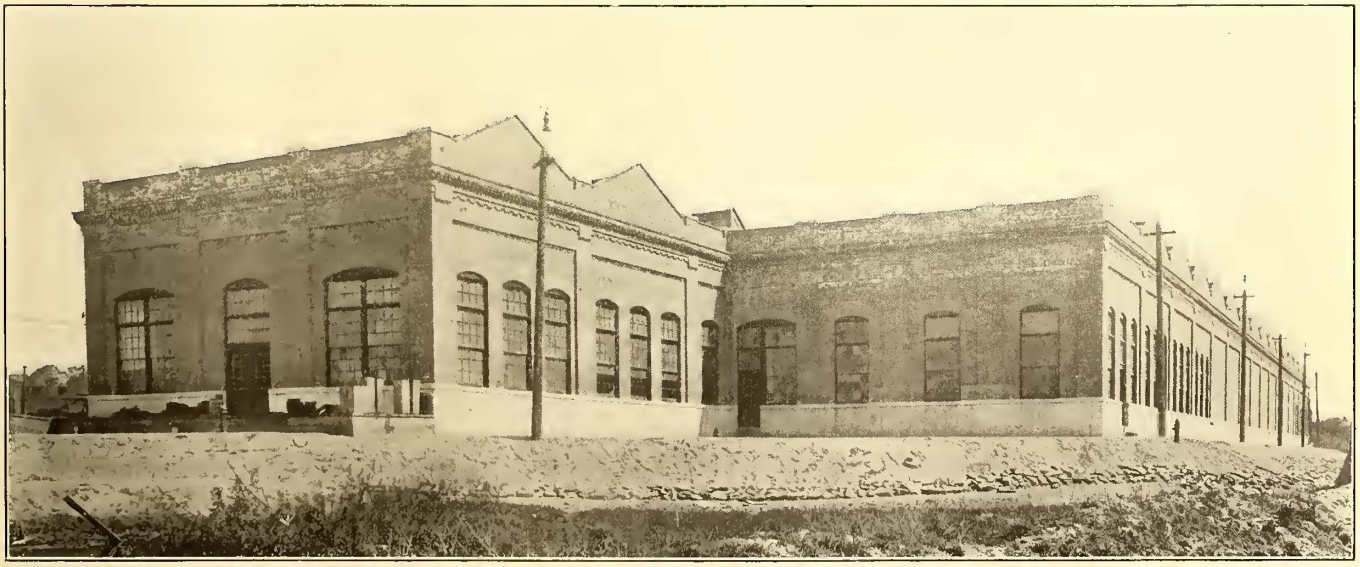
The heated air is forced through a concrete duct extending across the back of the pits. This duct is tapped at two points for the pit heating, one branch serving two pits and the other taking care of the third. The facilities rooms are heated through galvanized iron outlets, as at Harmon, except that floor registers are installed in the office.



STOREROOM AT NORTH WHITE PLAINS



LAYOUT OF THE NORTH WHITE PLAINS FACILITIES ROOMS



THE NORTH WHITE PLAINS PLANT, SHOWING THE POSITION OF THE FACILITIES ROOMS

THE NEW STEEL CARS OF THE HUDSON COMPANIES

BY HUGH HAZELTON

The plans of the Hudson Companies, which are building a double set of tunnels from Cortlandt Street, New York, through Jersey City and Hoboken to Christopher Street and thence by Sixth Avenue to Thirty-Fourth Street, New York, have been generally discussed in the technical press, but little has been said about the rolling stock to be used. In designing the cars for this service the engineers have had three requirements constantly in mind:

First—The car must be absolutely fireproof.

Second—Doors must be arranged so that passengers may enter and leave with least delay.

Third—The weight must be kept as low as is consistent with safety.

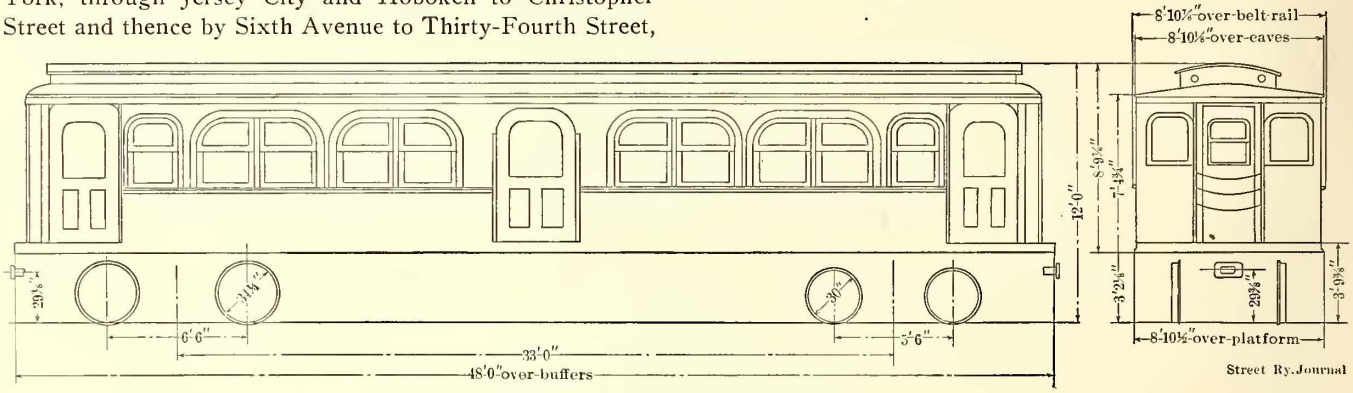


FIG. 1.—SIDE AND END ELEVATION OF HUDSON CAR

FIREPROOF MATERIALS

In order to make the car absolutely fireproof unusual precautions have been taken. The entire car body is made of steel, including doors, roof and headlining. The floor is made of "monolith" cement laid on steel, with ¼-in. finish of carborundum cement, which is used as a substitute for maple strips. The seat cushions and backs are covered with a metal fabric instead of with rattan. All insulated wires are covered with an asbestos braid and are placed in iron conduit pipes. The magnet coils of the control equipment are insulated with mica and asbestos in place of the usual covering of cotton tape.

ARRANGEMENT OF DOORS

In order to facilitate rapid movement of passengers, the car is designed as indicated in Fig. 3, with wide center doors, side seats, and an unobstructed passageway between the car platforms and the interior of the car. This arrangement minimizes the time of station stops without sacrifice of carrying capacity. At the terminals the cars will discharge passengers on one side to an incoming platform and will receive passengers on the opposite side from a special outgoing platform. These provisions are particularly necessary owing to the density of traffic and the close headway of trains during the rush hours.

REDUCTION IN WEIGHT

In a local service like that of the Hudson Companies the stations are from 1/3 to ½ a mile apart, and a large percentage of the power for operating the cars is required for their acceleration. For this kind of service it is particularly desirable to minimize the weight of the cars as much as considerations of safety will permit. The problem which presented itself to the engineers of the Hudson Companies was to design a steel car with center doors and of the least possible weight.

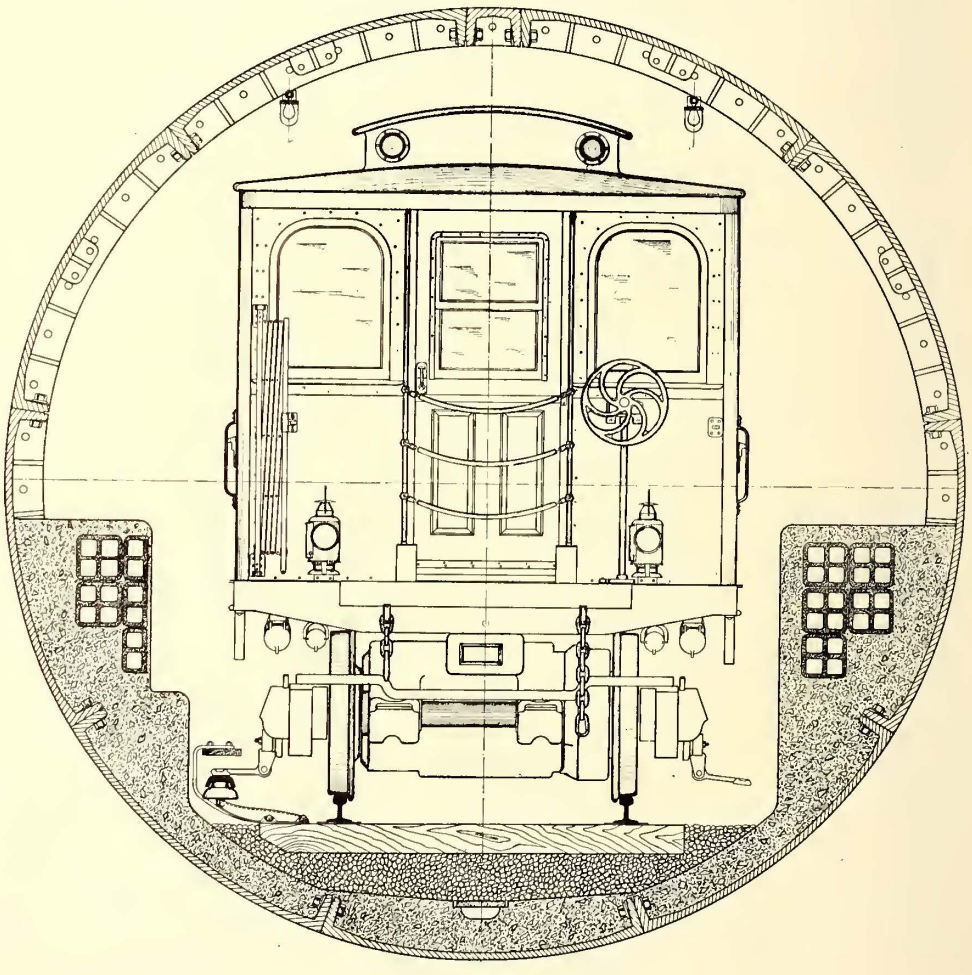


FIG. 2.—SECTION OF TUNNEL, SHOWING END OF CAR

The type of construction used on Interborough subway steel cars was at first considered, but was not found appli-

cable on account of the decision to use center doors. The unbroken side of the Interborough car below the window sill forms a plate girder about 3 ft. in depth. To introduce a center door in a car of this type would have made it necessary to cut the girder in two, and no satisfactory way was found to frame around the door without adding materially to the weight.

The use of drop frame girders at each side of the car below the floor line was also considered, but as such girders are limited in depth by clearance requirements to 16 ins. or 18 ins., it would have been necessary to make them of heavy sections which would have added materially to the weight of the car.

TRUSS FRAME

The truss frame illustrated in Fig. 3 was finally designed as the best solution of the problem. This truss frame is arranged in five panels, the center door occupying the middle panel. As the depth of this truss is about 7 ft., it follows that its weight, for a given strength, is much less than that of any girder or truss construction which can be placed below the car floor. The bottom chord of the truss is a 6-in. channel carried below the door sills and extending from end to end of the car. The top chord is a similar channel placed above the doors and extending the length of the car. The vertical members of the truss frame are 8-in. channel posts spaced at uniform distances, and placed between pairs of win-

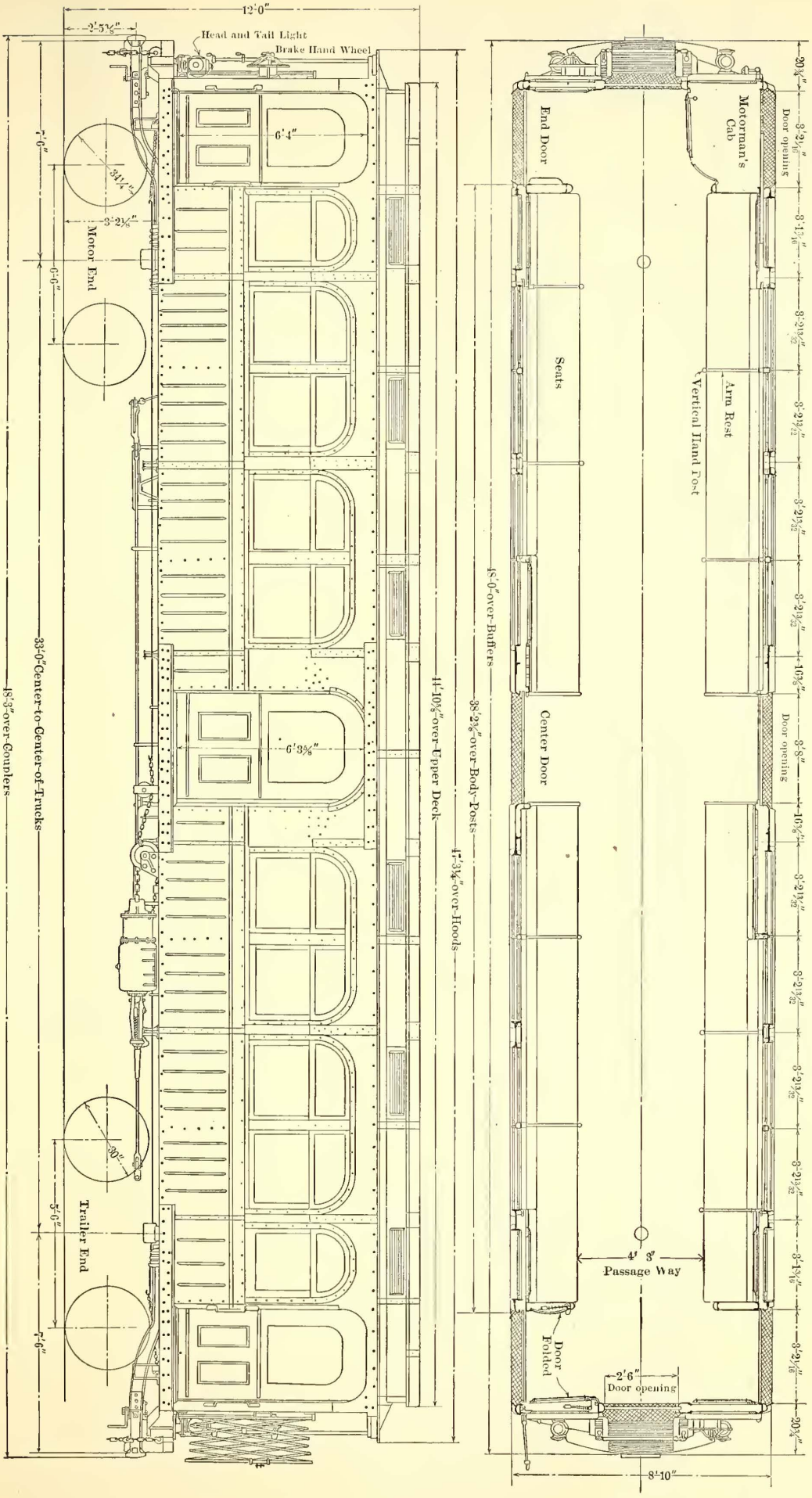


FIG. 3.—PLAN AND SIDE ELEVATION OF HUDSON CAR

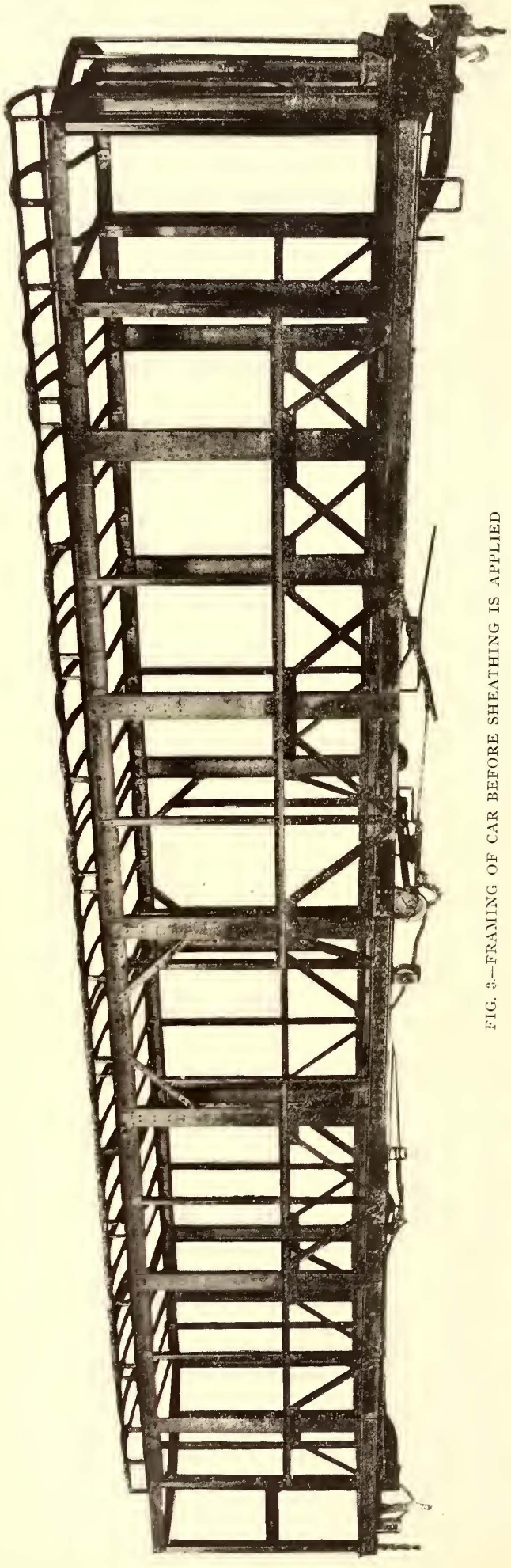


FIG. 3.—FRAMING OF CAR BEFORE SHEATHING IS APPLIED

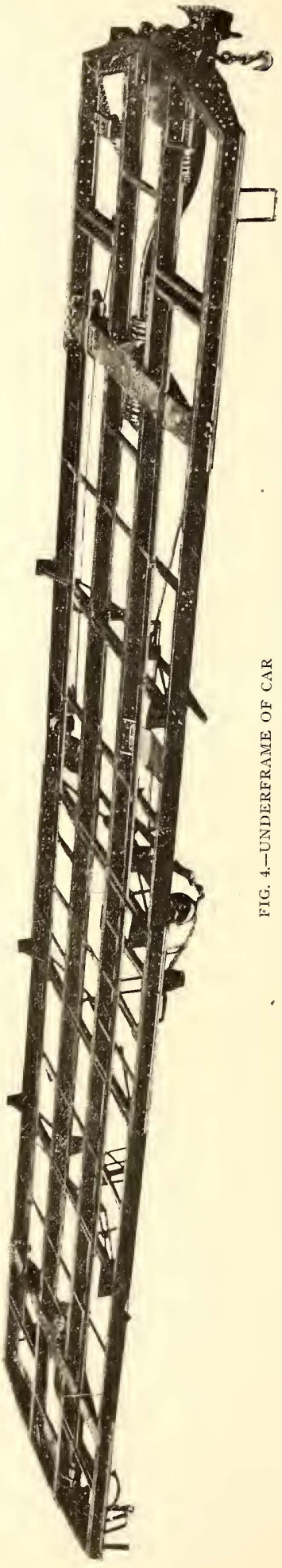


FIG. 4.—UNDERFRAME OF CAR

dows. Below the window sills these posts are braced by diagonal members to the bottom chord. Above the window sill the posts are reinforced by angle irons and plates, which arch over the pairs of windows and are riveted to the top chord. At the center door the top and bottom chords are reinforced by bulb angles, and similar bulb angles are riveted to the bottom chord below the end doors to furnish additional support for the car platforms. The truss frame is designed to carry the entire weight of the car with full passenger load with a fiber stress not to exceed 12,000 lbs. per square inch in any member.

UNDERFRAME

The underframe of the car is shown in photograph Fig. 4. The side sills are made of the 6-in. channels already described as a part of the truss frame. The center sills are 6-in. I-beams, which run from end to end of the car. The needle beams are composed of angles with truss rods and turn buckles. The attachment of the needle beams to the side sills is made by means of bent plates which serve also to stiffen the posts against side pressure.

END SILLS

The end sills shown in Fig. 5 have been made unusually strong in order to distribute the strains due to impact to the center and side sills. Attention is called to the shelf angle which is secured to the end sill for the support of the drawbar. This shelf angle furnishes a stronger sup-

port than the sector bar usually employed for the purpose.

To prevent the telescoping of car platforms in the event of a collision, two heavy steel castings, shown in Fig. 6, have been riveted to the ends of the center sills. These castings extend about 8 ins. above the top of the buffer timbers, and if the buffer timber of one car is forced up over that of the adjacent car, it will be stopped by the steel castings before damage is done to the end of the car.

SIDE SHEATHING

The sheathing of the ends and sides of the car consists of steel plates 1/16 in. thick. These plates are riveted to the truss frame after the latter is in place, and none of the rivets which hold the truss frame together pass through the sheathing. Therefore, the plates may be removed for repairs without disturbing the truss frame.

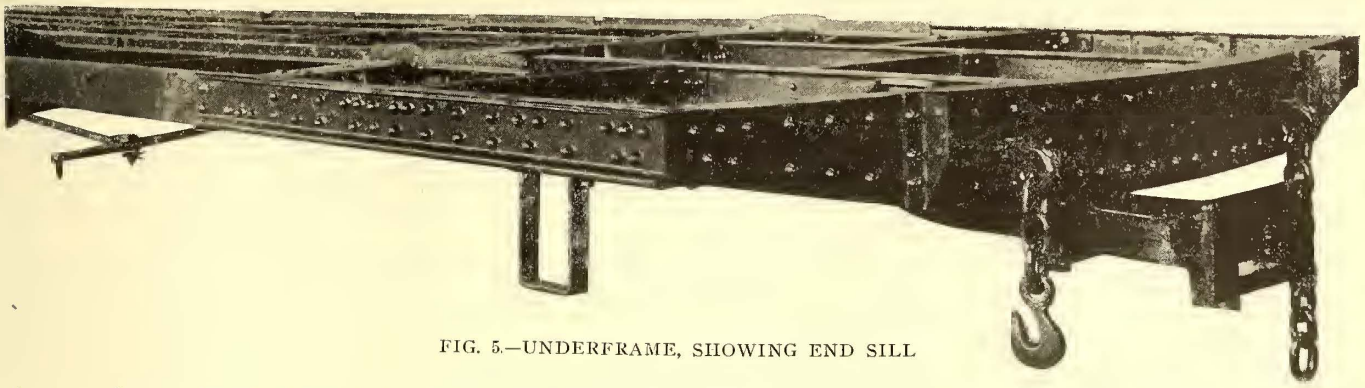


FIG. 5.—UNDERFRAME, SHOWING END SILL

CAR ROOF

The roof is made of 1/16-in. steel plates coated on both sides with lead. The roof plates are supported by angle irons bent to conform to the shape of the roof and spaced about 14 ins. apart. The plates are secured in place by ¼-in. rivets with heads soldered, and all seams between plates are lapped and soldered.

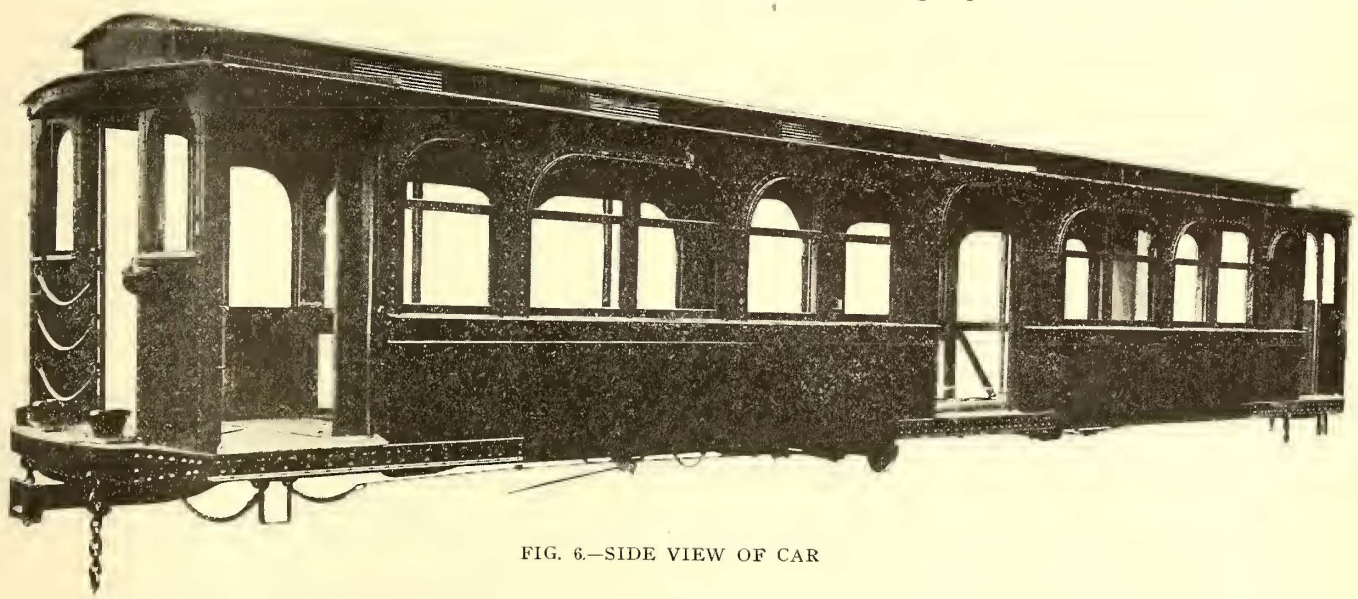


FIG. 6.—SIDE VIEW OF CAR

INTERIOR FINISH

The headlining and side panels on the interior of the car are of steel 1/32 in. thick, and all window guides and post covers are made of steel plates pressed to the required shapes.

MONOLITH FLOOR

The floor is made of "monolith" cement laid on galvanized "Keystone" iron, which securely holds the cement down to the metal. The top surface is coated with a layer of cement containing about 30 per cent of carborundum. This forms a hard wearing surface, and the sharp particles of carborundum prevent slipping.

SEATS

The longitudinal seats are provided with partitions, as shown in Fig. 8. These partitions consist of steel plates which extend from the seat cushion to a height a little above the shoulder of a seated passenger. The top edge of the partition is finished with a 1-in. pipe bent to a graceful curve. These partitions are high enough to form a support to the passenger and thus obviate the disagreeable effect due to the sudden starting and stopping of trains.

The Hale & Kilburn Manufacturing Company, which is furnishing the seat cushions and backs, has developed for the Hudson Companies' cars a metal fabric which is to be used as a covering in place of rattan. The frames of the cushions are made of pressed steel, and the seats are, therefore, fireproof throughout.

VERTICAL HAND RODS

A vertical hand rod is located at each of the seat partitions; this rod extends from the seat to the ceiling fixture which supports the hand strap rod. The vertical hand rods furnish convenient supports for standing passengers.

SLIDING DOORS

Steel sliding doors are provided at the sides of the car and in the vestibuled ends. Each door is supported on a ball-bearing hanger which runs on a track above the door. A piece of rubber hose is attached to the edge of the

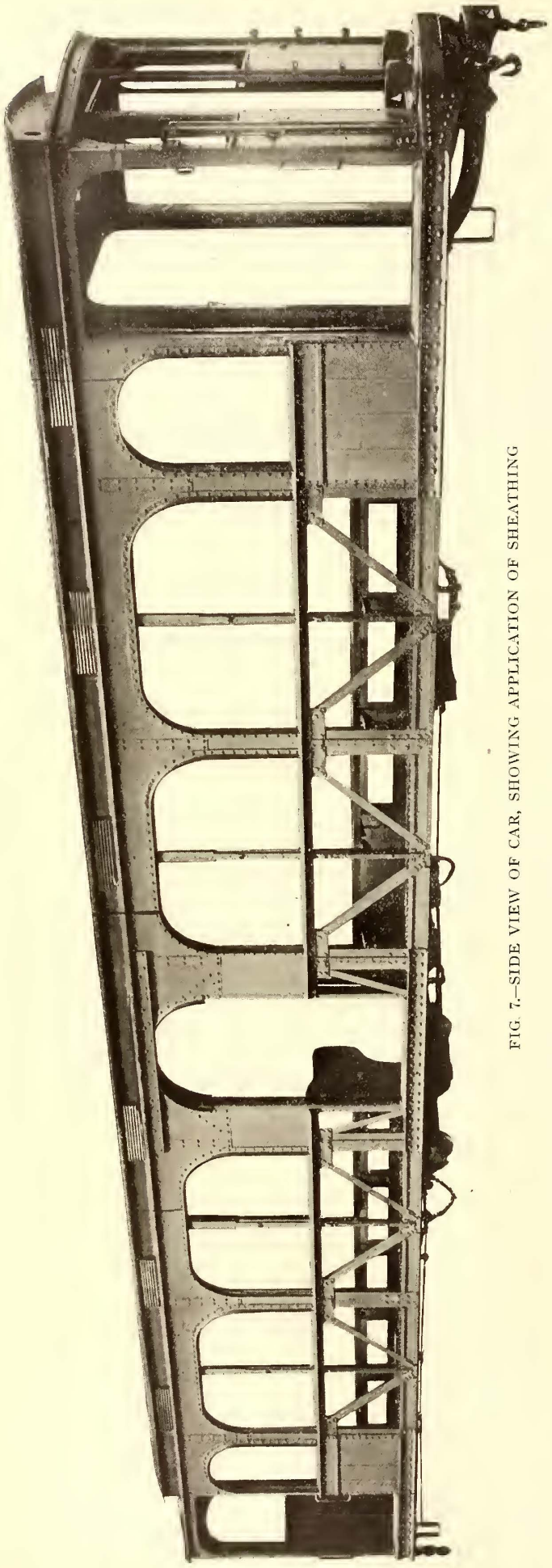


FIG. 7.—SIDE VIEW OF CAR, SHOWING APPLICATION OF SHEATHING

door to prevent the possibility of pinching the fingers of passengers when the door closes.

The doors are being furnished by Hale & Kilburn Manufacturing Company, and the ball-bearing hangers by the Pitt Car Gate Company.

DOOR-OPERATING MECHANISM

The doors are operated by air cylinders controlled by the guard. The piston has a stroke of about 15 ins., and in order to increase the movement to equal the door travel a rack and pinion is used. The mechanism is so arranged that the door moves up to the end door post, but does not strike against it.

The air cylinders are connected by pipes to air valves, which are located at the ends of the car. The guard opens and closes the doors by operating these air valves. This door operating mechanism is supplied by the Burdette & Rountree Manufacturing Company.

DOOR SIGNAL

To prevent the starting of the train before all doors are closed, it is proposed to provide an electrical signal wire throughout the train, with a bell or indicating lamp in the motorman's cab, and with contacts at each door so arranged that every door must be closed before the motorman receives the signal to start.

CAR LIGHTING

Each car is equipped with thirty 10-cp incandescent lamps, two of which are placed above each vestibule. Switches are provided so that the current may be transferred from the two vestibule lamps, in the end occupied by the motorman, to the two lamps in the destination signals. As the cars are to be operated exclusively in tunnel service, the thirty lamps will be lighted continuously.

EMERGENCY LIGHTS

In addition to the thirty lamps in the regular lighting system, each car is provided with four emergency lamps, which are supplied from a 60-volt storage battery on each car. In case the power goes off the line, the emergency lamps continue to be lighted from the battery.

STORAGE BATTERY

The storage battery consists of thirty cells having a discharge rate of 1½ amps. for eight hours. The battery is placed in series with the six circuits of five lamps each, and the four emergency lamps are connected across the terminals of the battery. The four 60-volt lamps take nearly the same number of amperes as the thirty lamps in the main lighting system, so that the battery normally "floats" on the line. The storage bateries are furnished by the Gould Storage Battery Company.

DESTINATION SIGNALS

The destination signals are placed above the ceiling of the vestibule at each end of the car. Each signal consists of a stationary lamp surrounded by a cylinder containing four segments of glass of different colors. This cylinder may be turned from the vestibule by the guard or motorman. The lamp is accessible from the vestibule by means of a hinged door at the bottom of the cylinder. A fixed lens is placed in front of each destination signal. The destination signals were designed by Hudson Companies engineers and furnished by Adams & Westlake Company.

HEADLIGHTS

Two oil headlights are placed on the front end of the forward car in a train, and two similar lanterns are placed at

the rear end of the rear car, showing red to serve as "tail" lights. These lanterns are also furnished by Adams & Westlake Company.

HEATERS

The heaters are of the panel type placed below the seats. The heater coils are arranged in two circuits, which, at 600 volts, take 7 amps. and 14 amps., respectively. The heaters are furnished by the Consolidated Car Heating Company.

DRAWBARS

The drawbars are of the radial type designed for clearances with cars on a 90-ft. radius curve. The drawbars are made of 85-lb. bent rails with Van Dorn couplers.

AIR-BRAKES

The cars are equipped with Westinghouse automatic air brakes. The type of brake is designated as Schedule A. M. M., which includes the following features:

Quick recharge of auxiliary reservoir.
Quick service application of brake.
Graduated release of brake cylinder pressure.
High-pressure emergency application.
Electro pneumatic operation of triple valves.

This air brake equipment is intended especially for the class of service required of Hudson Companies cars, and is of the latest and most improved design.

Each car is supplied with air by a Westinghouse D-2-E.G. motor-driven air compressor, which has a piston displacement of 20 cu. ft. of air per minute. In addition to the air brakes, each car has a complete system of independent hand brakes.

CONTROL EQUIPMENT

The latest type of Sprague-General Electric multiple-unit control has been adopted, and a number of improvements have been made in the materials used for insulation to render them fireproof. For example, in the contactor and reverser coils mica and asbestos have been substituted for cotton tape, and all insulation in molded forms has been made of fireproof material.

The control equipment on each car includes a current limit relay which provides automatic acceleration of the train with predetermined current in the motors. This re-

FIG. 8.—INTERIOR OF CAR WITH SEATS IN PLACE

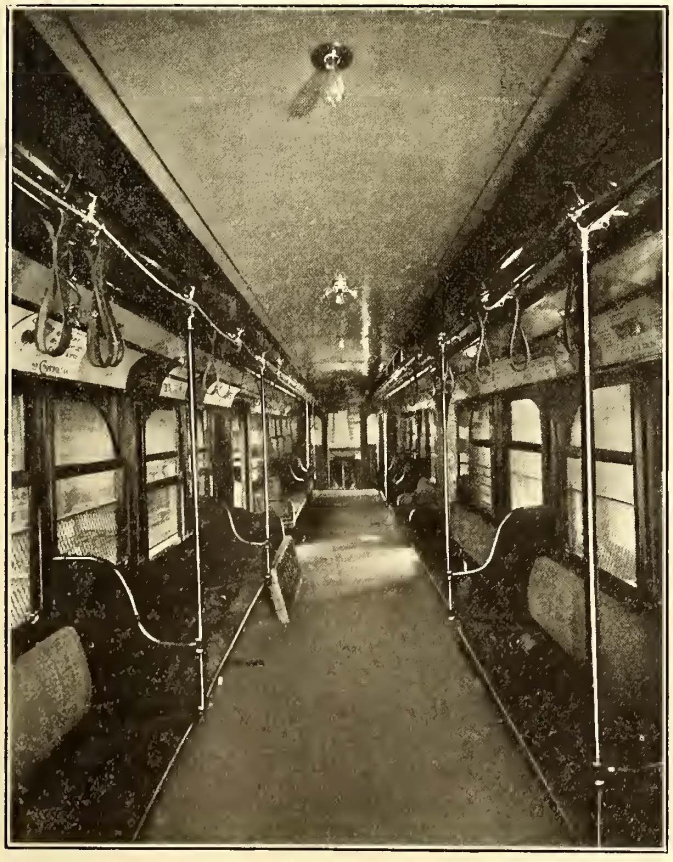


FIG. 9.—INTERIOR OF CAR WITH SEATS REMOVED

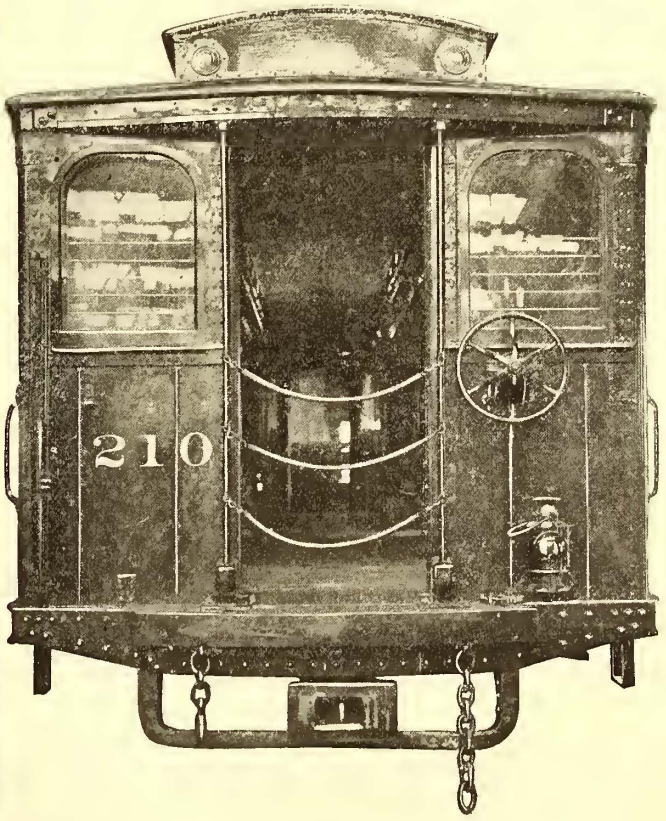


FIG. 10.—END VIEW OF CAR

lay, however, does not prevent manual operation of the master controller at less than the predetermined current, if desired.

The motor circuit is protected by a copper ribbon fuse with magnetic blowout, and, in addition, by a circuit-breaker with tripping and resetting coil. The circuit breakers in all of the cars in the train may be set or tripped by means of a switch located in the motorman's cab of each car.

A bus line cable is installed on each car which will connect the contact shoes of all cars in the train. The bus line cable prevents loss of current when passsing through crossovers.

TRUCKS

The motor and trailer trucks are of the M. C. B. type, and were built by the Baldwin Locomotive Works. The motor trucks have the following general dimensions:

Wheel-base, 6 ft. 6 ins.

Wheel diameter, 34¼ ins.

Tires, rolled steel, 5¼ ins., M. C. B. tread.

Axles, hammered steel, 6 ins. diameter at center, 6½ ins. at wheel seat.

The wheels have cast steel spoked centers and rolled steel tires held on by double retaining rings. One wheel on each axle has an extended hub upon which is shrunk the driving gear.

The general dimensions of the trailer truck are:

Wheel-base, 5 ft. 6 ins.

Wheel diameter, 30 ins.

Tires, 5¼ ins., M. C. B. tread.

Axles, hammered steel, 4¾ ins. at center, 5¾ ins. at wheel seat.

The wheels are of solid steel, forged, and were made by the Standard Steel Wheel Company.

MOTORS

Each car is equipped with two 160-hp motors furnished by the General Electric Company and of the type known as G. E. No. 76. This motor has been specially designed for the Hudson Companies service, but follows closely the design of the G. E. 66, a motor which has given such good service on the Manhattan Elevated. In the G. E. 76 motor the armature speed has been reduced and improvements have been made in commutation.

CONTACT SHOES

The contact shoes are of the hinged type, similar to those used in the subway cars of the Interborough Rapid Transit Railway Company. The shoe is pressed down on the contact rail by springs which give a tension of 15 lbs.

CONTACT-SHOE FUSES

An enclosed fuse protected by an asbestos-lined wooden box is located directly above each contact shoe. The fuse base is mounted on springs in order to reduce the vibration, and thereby prolong the life of the fuse link. Each fuse is designed to carry 650 amps. continuously.

The cars above described were designed and built under the direction of L. B. Stillwell, consulting electrical engineer, and F. M. Brinckerhoff, who has followed the details of this work and to whom many of the novel features are due.

Fifty cars have been ordered for the initial operation of the Hudson Companies tunnels. Forty of the car bodies are being built at Berwick by the American Car & Foundry Company and ten car bodies at McKees Rocks by the Pressed Steel Car Company. The writer is indebted to the latter company for several of the photographs which illustrate this article.

The first one of these cars is at present being equipped with electrical and air brake apparatus. The fifty cars are to be ready for operation in September, and it is expected that the line between Hoboken and Sixth Avenue, New York will be opened for passengers a few weeks later.

SOME SUGGESTIONS ON CAR LUBRICATION

BY AN OIL EXPERT

The high cost of oil lubrication on roads having the old type motors is not caused by dust or dirt but from the motors not being properly equipped with oil cups to regulate the flow of oil onto the bearings. In years past grease was considered a proper lubricant for both motor and truck equipment, largely because it was so easily applied. In those days, however, no attention was paid to friction nor to the causes of the wear on armature shafts or bearings.

It has not taken long, however, to demonstrate that with the proper use of oil on these motors the cost of repairs to motors and truck journals can easily be reduced 50 per cent; and if the oil is properly cared for and rightly applied its cost should be less than that of grease. Unfortunately, the crude conditions under which oil is being used on the old equipments on some roads, while greatly reducing the cost of repairs, still makes the cost of oil as a lubricant far more than that of grease. This high cost is due to the lack of proper oil houses, drip pans, oil cans, soaking tanks for the waste packing. Having no oil cups for their motors, these companies use felt and waste in attempting to regulate the flow of oil, thus causing a loss which amounts to over 60 per cent. There is no excuse for this condition, as there are now several cups manufactured for use on the old type of motors which are giving very satisfactory results.

ADAPTING OLD MOTORS FOR OIL

A little difficulty may be experienced in fitting the oil cups to old motors, as the grease opening in the motor frames varies from ¼ to ⅜ ins. It will perhaps require several patterns, as it is impossible to cut the opening in the motor frame to fit the cup. There is also some trouble to hold the cup in place securely and keep it from jumping up and down in the grease opening. One method of holding the cup in the motor frame is to drive wooden wedges around it. On a large Eastern city system it is customary to put a set screw in the side of the cup, set it up against the side of the motor frame, and secure it with a lock nut.

If one does not care to use oil cups, he could fill the hole in the bottom of the cup or opening in the bottom of the motor frame with babbitt. Then drill a 3-16-in. hole and countersink same and fill the opening with cotton waste well soaked in oil. This is the next best thing to the automatic oil cup, but very expensive, as the oil flows constantly whether the car is in operation or not.

With the use of oil, men must be better trained as to what is required to get the best and economical results. In re-babbitting split bearings, the sharp edge left by the mold should be cut back at least three-sixteenths of an inch so that it will not cut the oil of the shaft, but enough should be left on each end of the bearing to keep the oil from running over the edge of box.

PACKING JOURNAL BOXES

In regard to the use of felt or waste packing with oil for car journal boxes, the writer has concluded that to get the best results in journal boxes one should use a good quality of waste. With regard to the difference between felt and

waste: in using the felt feed for carrying oil up to the axle it is necessary to have a fairly soft felt, which, however, does not last long otherwise; but on the other hand, if hard felt is used, it glazes over and the felt as an oil feeder becomes useless.

In packing journal boxes everything depends upon the way the waste is taken care of or soaked before it is put into the journal boxes and on the manner it is put in. To get the best results out of a journal, strict attention must be given to the brass. The latter should be made so that its two outer edges will not touch the axle from the time it goes in until it is worn out. The edge of the brass forms a scraper which takes the oil off the axle and therefore produces a hot box. The waste should not be allowed to get above the center line of the journal, for if it does get up under the brass, which carries from 250 lbs. to 300 lbs. per square inch, it wipes the oil off the journal and also causes a hot box.

In packing a journal box, especially of the old type, the two little shelves in the bottom of the box put in to support the felt should be cut out. This will permit packing the waste in proper form. The writer once observed a case where a man was packing out on the floor a journal box which previously had been used for felt feed with very bad results. He had placed his waste in the box and was jamming it down into the box with a bar. It is needless to say that good results cannot be secured by that style of packing. Another point about the use of felt is that it cannot be changed on the road but one is compelled to wait until the car gets into the shop. Then it is necessary to raise the truck frame enough to relieve the journal brass which must be taken out so as to drop the box to get at the felt. In several cases where users had a hot brass with a felt feed, they would pack waste in on top of the felt, but as the waste was not in contact with the oil it can readily be seen that this was a bad practice, as the car would not go very far before another hot journal appeared.

The writer does not approve the use of babbitted brasses in heavy service, for if the babbitt is very thick the hammer blow it receives in going over special work causes it to work out on the sides of the brass and to form a scraper which cuts the oil off the axle.

The results obtained with journal boxes packed with waste depends entirely on the quality of material used, the method of properly soaking and draining the same, and the manner in which the journal box is packed. The most successful practice is to pick the waste thoroughly, submerge it in oil for at least forty-eight hours, allowing about five pints of oil for every pound of waste. The oil room should be kept at a temperature of about 70 degs. F. After drainage, the packing should be placed in journal boxes as follows: The first lot should be in the form of a roll packed tightly around the back end of the box not only for the purpose of retaining the oil but also better to exclude the dust; the waste should be packed sufficiently tight under the journal to avoid the settling away caused when passing over special work; the waste between the side of the axle and journal box should be packed more lightly to avoid the wiping effect produced when waste is packed too tight.

Oil houses should be steam-heated in the winter so that the oil will not solidify or congeal, thereby keeping it at all times so that it can be readily handled. Once in the oil cup, the internal heat of the motor will keep it warm enough to allow it to feed with perfect freedom. The unavoidable loss caused through cold oil houses in the winter will more than make up for the cost of heating them.

STORAGE BATTERY EQUIPMENT OF THE NEW YORK CENTRAL & HUDSON RIVER RAILROAD

Of the eight sub-station batteries of chloride accumulators contracted for by the New York Central & Hudson River Railroad as a part of its electrical equipment, four have now been put in service at sub-stations No. 1, No. 2. No. 3 and No. 7. The entire equipment of the electric zone includes the following battery installations, which, together with two exciter batteries for the Yonkers and the Port Morris power stations, were included in the contract between the New York Central & Hudson River Railroad and the Electric Storage Battery Company:

Location.	Number of Cells.	Capacity One Hour.	Number of Boosters.
In Service:			
Grand Central yards	318	4020 amp.	2
Mott Haven	318	3750 "	2
Kings Bridge	318	3000 "	2
Bronx Park	318	2250 "	1
Under Contract:			
Yonkers	318	2250 "	1
Irvington	318	2250 "	1
Ossining	318	2250 "	1
Scarsdale	318	2250 "	1

The cells are of the standard type maufactured by the Electric Storage Battery Company, the elements, consisting of Manchester positive and box negative plates, being installed in lead-lined tanks of sufficient size to permit of a future increase in capacity by the addition of plates. The tanks rest upon two tiers of glass petticoat insulators, separated by stringers in the usual manner.

The boosters are all identical and were built by the General Electric Company under specifications issued by battery maker. Each consists of an induction motor driving a d. c. generator, the latter being constructed with commutating poles. A maximum output of 6750 amps. for one minute was called for, but the machines were successfully tested under loads far exceeding this. To handle the maximum output of the three larger installations, two of these boosters are included in each, operating in parallel.

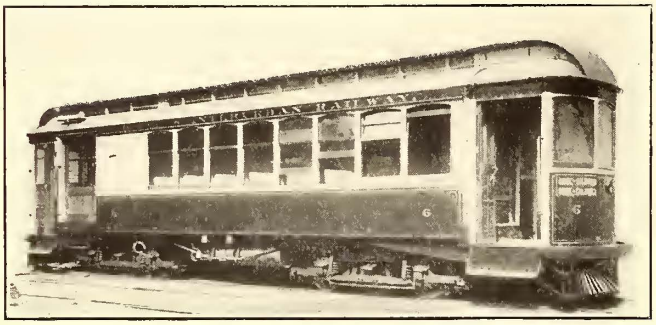
The automatic operation of the boosters, to cause the batteries to charge and discharge in response to fluctuations of load, is secured by motor-driven exciters controlled by the company's standard carbon regulator. Two of these exciters were included at each plant, each of sufficient capacity to excite the fields of two boosters operating in parallel, giving a spare exciter set at each station.

The batteries were installed to relieve the generating and transforming machinery of the violent fluctuations of load incident to the operation of heavy electric train service; also to provide a reserve source of energy for insurance of absolute continuity of power supply. The aggregate capacity of the eight batteries was sufficient to permit a reduction in the generating machinery by the omission of one of the large turbo-alternators at each of the power stations, which would otherwise have been installed, as well as a considerable reduction in the rotary converter capacity required. The saving in cost of machinery thus effected was almost sufficient to offset the cost of the battery installations, leaving the balance chargeable against the other advantages of the bateries quite negligible.

While the electric train service has not thus far been sufficient to provide the maximum load conditions for which the batteries were installed, the results already obtained in relieving the machinery of load fluctuations and maintaining a practically constant load on the rotary converters indicate that the accumulators installed are destined to be important factors in the economy of the distributing system.

THREE TYPES OF ROLLING STOCK FOR BOISE CITY

Three different types of cars were received last month by the Boise & Interurban Railway Company, of Boise, Idaho, from the American Car Company. The first lot comprised



EXTERIOR OF BOISE COMBINATION CAR, SHOWING PROXIMITY OF FREIGHT AND PASSENGER COMPARTMENT DOORS

four 30-ft. 8-in. grooveless post semi-convertible cars built under Brill patents. Two 31-ft. 8-in. cars with the same window system, but having in addition baggage compartments, were also received, and the third type to go forward was a 41-ft. baggage car. The interurban line forms a connecting link with the rich gold and silver mining districts in that part of the State near Boise. The terminus of the line is at Caldwell, which is situated near the borders of Oregon and about 30 miles distant from Boise City. The line will shortly be extended in a southerly direction to Nampa, about 12 miles distant. The passenger cars present no unusual features. The combination car, however, has a side door in the baggage compartment set next to the door at the passenger entrance, instead of next to the partition, which is the usual mode of construction. These cars, like the straight passenger cars, are equipped with

INTERIOR OF BOISE COMBINATION CAR, SHOWING SEATING AND LIGHTING ARRANGEMENTS

the No. 27-E1 trucks with a 6-ft. 6-in. wheel-base. Other features common to the types mentioned are Brill seats and specialties, such as gongs, signal bells, sand boxes, etc. The chief dimensions of the car shown are as follows: Length over end panels, 31 ft. 8 ins.; over crown pieces, 41 ft. 8 ins.; length of baggage compartment, 9 ft. 2 ins.; width over sills, including sheathing, 8 ft. 6 ins.; height from floor to ceiling, 8 ft. 5⅝ ins.; from track to platform step, 18 ins.; size of side sills, 4 ft. 7¾ ins.; end sills, 5¼ ins. x 6 13/16 ins.; sill plates, 12 in. x ⅜ in.

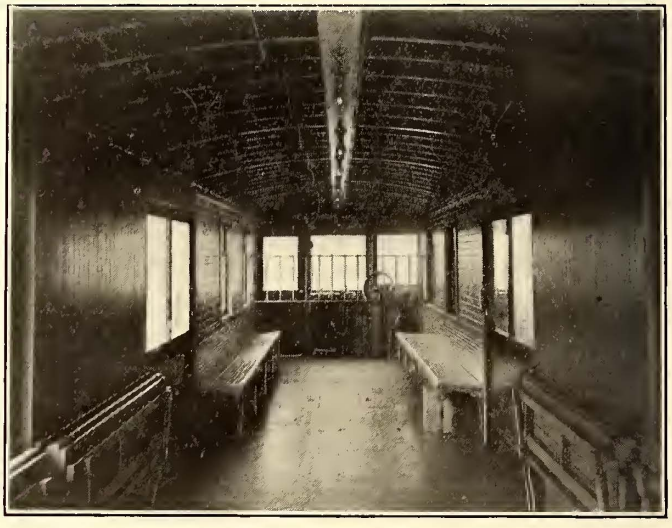
The baggage car is standard—four windows to a side and sliding doors at center and at ends of car. The interiors have the regulation folding seats, which, on this line, will be largely used by miners and others who wish to smoke.

EXTERIOR OF BOISE FREIGHT CAR

The truck employed in this case is the No. 27-G1 with 4-ft. 6-in. wheel-base.

A RETRIEVER OPERATED BY COMPRESSED AIR

A trolley retriever operated by compressed air is being placed on the market by the Milloy Electric Company, of Bucyrus, Ohio. This device, arranged to be installed on top of the car to the right-hand side of the car facing forward, is automatic in its action and pulls the pole down to a plane below the level of the wire the instant the wheel jumps. To adjust the pole, the rope is used. In this work the retriever plays no part, for it immediately readjusts itself for future service. It is even said that the retriever tends to lessen the labor of the conductor in replacing the pole by pulling the trolley down to a point directly beneath the wire, from which it is an easy matter to locate the wire.



INTERIOR OF BOISE FREIGHT CAR, SHOWING SEATS ADAPTED TO THE USE OF MINERS

A flexible steel cable is used to engage the pole about half way between the base and the wheel, thus giving the pole a full lateral swing on curves. After a thorough trial of the retriever by the International Traction Company, of Buffalo, N. Y., thirty-seven of them were ordered and are in regular service on the Lockport branch of the system, over which a speed of 60 miles an hour is not infrequent. In addition, the Milloy Company only a few weeks ago supplied this company with a hundred retrievers for service elsewhere on its lines.

METAL MOLDS FOR CASTING BRAKE-SHOES

The Keystone Brake Shoe Company, of New York, whose brake-shoe was exhibited for the first time at the Columbus Convention, has been experimenting since then with sandless molds for casting its brake-shoes. The company was led to develop this process of manufacture by the belief that it would result in more perfectly finished shoes, and at a less cost than by the old method of casting in sand. The company has now perfected the process and is casting brake-

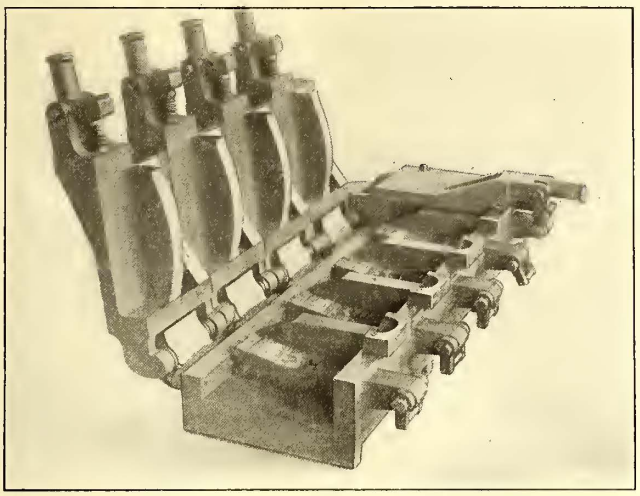


FIG. 1.—MOLD FOR M. C. B. SHOE

shoes in sandless molds to its satisfaction. As soon as enough molds can be made to handle the manufacture on a commercial basis, the company will be ready to deliver shoes. The company will not only manufacture the special Keystone shoe, but also ordinary brake-shoes M. C. B. patterns, steel brake-shoes, etc. It is now negotiating for foundry facilities, and is planning to have its first foundry located in the East, with a capacity, when completed, of 250 tons of shoes a day. It is hoped to have the product ready for delivery this fall.

In this connection, it may be of interest to publish a paper describing this process which was written by John H. Shaw and read by V. B. Lamb before the American Foundryman's Association in Philadelphia, on May 22, 1907.

THE MANUFACTURE OF SANDLESS CASTINGS

Casting in so-called chills is a method well known at the present time. Outside of the making or rolls and ingot molds, we find it used for making bedsteads, sash weights and other simple castings where there is no difficulty from undue expansion and contraction. The troubles arising from an iron mold and the lack of understanding of the regulation of temperature in casting have caused many a failure of an otherwise good idea. These objections have been largely overcome by the construction of a peculiarly arranged mold, such as those shown in Figs. 1 and 2, which are used in casting brake-shoes. The parts of the mold are so arranged that they automatically open out sufficiently to take care of the expansion due to heating up without destroying the correctness of the castings made.

The mold is constructed essentially in two parts: the outer shell, which may be locked readily, and the inner dies in close contact with the shell and securely fastened to it. The design of the mold is such that expansion in two directions may readily take place unhindered except for powerful springs. The arrangement of dies and shell allows of a ready replacing of the former when damaged, this depending upon the thickness of the mold and the temperature they are allowed to reach, their composition, of course, being such that a high melting point is attained. Further attention is given to the molds in designing them so that they may be closed and opened very quickly, and thus rapid work accomplished.

In operating a sandless mold it is necessary occasionally to coat the metal in contact with the molten iron with a compound containing graphite and crude oil or other refractory substance carried in a vehicle, which, in being driven off by heat, will not ruin the surface of the casting. In operating the mold, after spraying it, the first few castings are rejected, the intention being to heat up the mold, though in continuous work this may be accomplished in a special heating furnace or oven if desired. Any cores required are set in the regular way before casting. The metal is poured in rapidly, and the mold opened as quickly as may be, provided that the metal is set sufficiently that no bleeding takes place. The elastic condition of the mold, however, prevents trouble if this time is not kept properly, and the casting allowed to remain in the mold too long. When the castings are taken out they are piled up for the whole mass to cool slowly, so that the chilling effect of too quick cooling may not cause hard spots. The molds should not be allowed to get too hot—that is, beyond 900 F.—otherwise they are liable to expand permanently and cause trouble. It is only necessary to coat the dies about every fifth pouring, the idea being to get a thin layer of the refractory material evenly spread over the face of the dies. Between this and a hot mold and fairly soft iron no undue chilling effect results in the casting beyond the very desirable closing up of the grain of the metal. In the case in point, the making of brake-shoes, every fifth cast requires a spraying of the mold.

The system is, of course, adapted to mechanical elaboration, in order to get the lowest shop cost. Thus, by performing many of the small operations automatically, by special devices, or arranging the molds to pass the point of pouring, much labor can be saved. The work that can be made by sandless molds is naturally of a standard kind, where large quantities of the same piece are required. Hence its introduction for the brake-shoe, iron bedstead and other work. Moreover, for the car wheel, the usual cold chill, with a suitable adaptation of a center core, makes a very easily handled wheel.

The sandless mold is best adapted only to work of fairly good bulk, though practically everything can be made in this way, with proper care of the niceties of construction and manipulation. The heating up of the mold consumes some time, and uses metal which must be returned to the cupola, though this can be avoided by heating in the oven. Molds are naturally expensive at first, and hence advisable only when a large number of castings are to be made of a kind. The red-hot castings, if small, where machining is to be done, or special requirements are demanded, must be practically annealed either in pile or by an

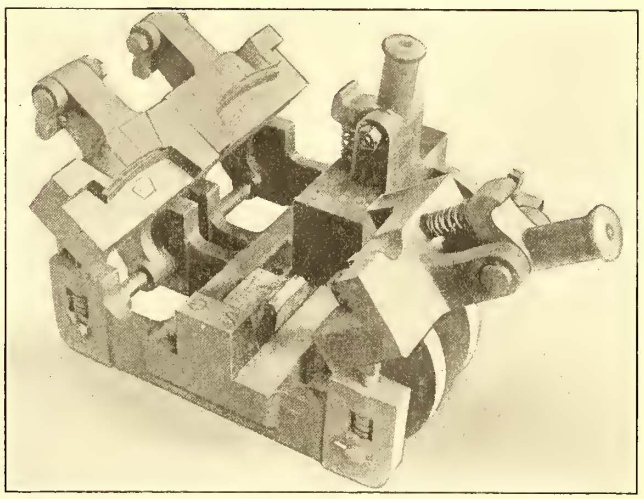


FIG. 2.—MOLD FOR KEYSTONE SHOE

oven. The silicon of the metal also must be a little higher than for sand castings.

The advantages are the following: A limited number of molds will make a great quantity of casting with very little labor, and this is not high class. The surface of the castings being practically smooth and accurate in dimensions, the loss of extra metal through excessive rapping of patterns in sand work is avoided, and no expensive cleaning department is required beyond some little grinding of thin fins. The life of the molds is long, as may be seen in ingot molds for brass and iron bedsteads. The foundry plant is very small for a heavy tonnage, and the process is adaptable for continuous melting and operating.

COMBINATION INTERURBAN CARS FOR THE LOS ANGELES PACIFIC RAILROAD

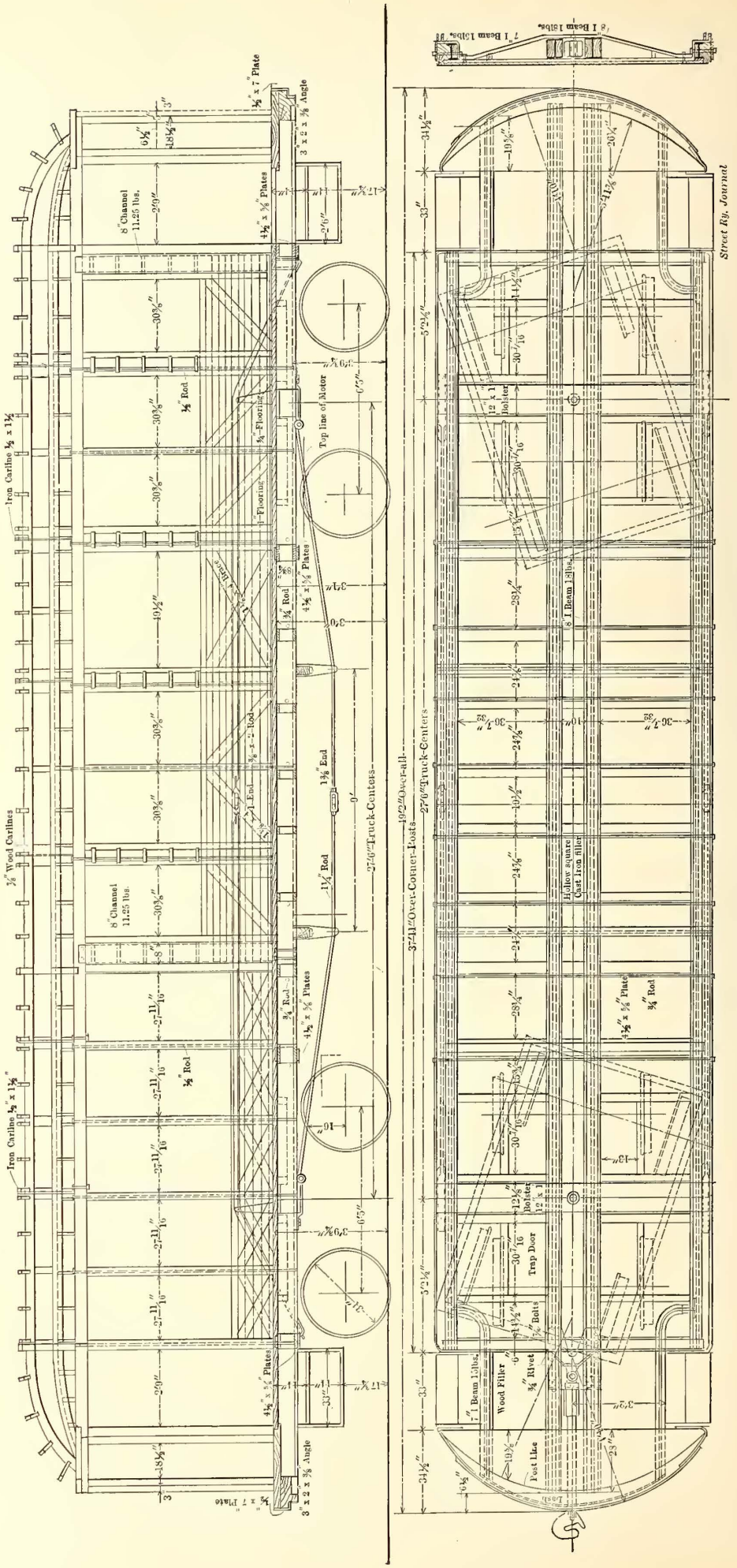
Some interurban cars of interesting design have recently been built for the Los Angeles Pacific Railway Company by the St. Louis Car Company. The cars are built with both an open and closed compartment. They are 49 ft. 2 ins. long over all and 9 ft. 4 ins. wide over posts. The height from the rail to the top of the car is 12 ft. 8 ins. The closed compartment is 24 ft. 2 ins. long, and the open section 13 ft. 1 in. in length.

The bottom framing is of rather heavy construction. Two center sills are each formed of an 8-in., 18-lb. I-beam sandwiched between wood fillers, while the side sills are made up of a 7-in., 15-lb. I-beam placed between a 5-in. x 8-in. wood sill on the outside and a filler block inside. The wood sill is further reinforced by a ½-in. x 8-in. steel plate bolted to the outside. The center sills run the full length of the car.

The double floor is made up of an under one of 1-in. x 5¼-in. yellow pine flooring laid diagonally, and an upper one of ¾-in. x 3¼-in. flooring. The roof sheathing is double with felt paper between the two layers.

The car, although built for double-end operation, has but one vestibule. On the open end there is no partition or railing between the passengers and the motorman, but at both ends of the car are end doors, which permit passage from car to car. No vestibule doors are provided, but instead there is an ingeniously contrived bar, which is so connected with the trap door underneath that both are raised and lowered together.

The interior of the car, which is finished in inlay mahogany, is noticeably free from metal fixtures. No registers are employed, and consequently no register brackets and rods are installed, and there are no ventilator fittings visible.

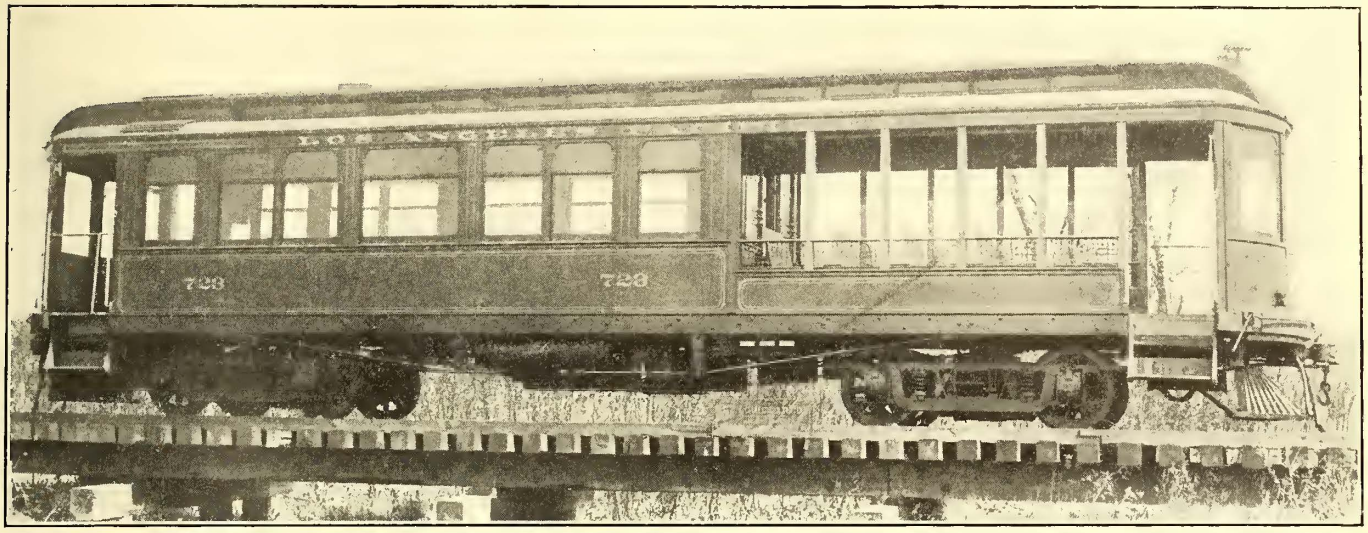


SIDE ELEVATION AND PLAN OF LOS ANGELES COMBINATION CAR

In each corner of the enclosed portion of the car is a 10-in. mirror placed diagonally across the corner. There are four short seats placed longitudinally in the corners. The remaining seats are 37 ins. long. All are covered with green plush. The seats in the open compartment are of the slat type. The metal trimmings of the car are all nickel-plated.

The car is equipped with Washburn radiating M. C. B. couplers slotted to take a link. The trucks are the St. Louis Car Company's 61-A type. They are fitted with 34-in. steel tire wheels having 3½-in. treads and 1-in. flanges. The wheels are mounted on 5½-in. axles. The trucks are mounted with four G. E. 73 motors controlled by the G. E. Type M controller.

The cars which have just been completed, fifty in number, were shipped from St. Louis to Los Angeles on their own wheels.



COMBINATION CAR FOR LOS ANGELES INTERURBAN SERVICE

KERN RIVER PLANT OPENED

Kern River Station No. 1 of the Edison Electric Company, of Los Angeles, which is located in the lower Sierras of California, almost at the headwaters of the Kern River, has been placed in operation. The route of transmission lies through the canyon in a direct line, thence over the hills, plains and divide, to follow the course of the Piru River and its tributaries. Large galvanized iron towers carry the heavy wire cables of the transmission line. In many respects the Kern River development is unique. It is claimed to be the largest hydraulic electric plant west of Niagara. The transmission line, which is 117 miles long, is one of the longest in the world. The pressure over the line is 75,000 volts. The conduit which leads to the pressure main is the longest underground tunnel system in use for this purpose. The four impulse wheels were built by the Allis-Chalmers Company, of Milwaukee, and have each a capacity of 10,750 hp at full gate and a speed of 250 r. p. m. when operating under a net effective head of 865 ft. In addition to the main turbines, there are two exciter turbines, also of Allis-Chalmers design, each with a capacity of 450 hp. and a speed of 430 r. p. m. The Kern River installation of the Edison Company is but one of three water-power developments owned by this company, in addition to six or seven steam plants located within a radius of 200 miles, all of which will operate in synchronism. A portion of the output of this plant will be disposed of along the line to Los Angeles. A very considerable amount of power will be utilized in the city of Santa Barbara. The Edison Company contemplates building plants Nos. 2, 3 and 4 on the Kern River, which will aggregate over 100,000 hp in addition to the output of the present station.

ABESTOS-WOOL MIXED GREASE

An asbestos-wool mixed grease that has been in use for a number of years on steam railroads for car journal lubrication is being introduced for service on electric railways by the Crosby Lubricating Company, of New York. In this preparation grease and wool waste are mixed, and it is only necessary in applying the material to twist it into the form of a loose rope and pack the box until it is entirely filled. The material, when pushed hard up against the back of the box and the dust board, acts as a dust protector to the bearings. Stirring the material freshens it and presents a new surface to the bearings. The grease will lubricate at 20 degs. below zero and its melting point is 350 degs. F. It is now in use on a number of city and interurban roads throughout the country, and the company has in its possession a number of letters testifying as to the results attained in operation, and also figures showing the actual record of the grease. A report from the company's own engineer of a series of tests made on a large city system shows interesting results. These tests were made under instructions issued by the superintendent of car equipment of the railway, and the first one was started April 21, 1906, and concluded August 3, 1906. On April 20 the trucks were packed with 32 lbs. of No. 1 grease, and at the conclusion of the test the grease taken out of the boxes weighed 31¾ lbs. This left a consumption of only ¼ lb. to be charged up to cost of lubrication for four boxes for a run of three months and eleven days, in which were recorded 15,736 car-miles, after which the material was replaced for service.

In a test now under way on another road the company filled the boxes of a double-truck Brill car on Dec. 20, 1906, proposing to run the car without touching the material until hot-boxes develop. On June 4 the car had been in service 166 days continuously, and there were recorded to its credit 25,232 car-miles.

THE WORK OF AN ELECTRICAL TESTING LABORATORY

The commercial electrical testing laboratory is a development of the last few years. Up to that time a laboratory was looked upon principally as a means for research in pure science, not as an adjunct to the purchasing department of an operating company. Here and there some of the larger corporations had started laboratories on their own account, but even they could not afford to secure more equipment than that needed for testing only a fraction of the varied sorts of material purchased. The pioneer in the field of the commercial laboratory was undoubtedly the Electric Testing Laboratories of New York, whose field has grown so rapidly that some account of it is worthy of remark.

At first nearly all of the work was confined to incandescent lamps, but while some 13,000,000 lamps were examined in 1906 alone, the Laboratories have carried out thousands of trials on almost every article of electrical interest. This work is not limited to the headquarters of the company, for the organization undertakes, if desired, to serve its client's interests in the shop of the manufacturer or at the place of installation.

In electric railway work the field of the laboratory is principally in the analysis of insulating paints, bonds, lightning arresters, line material, signal apparatus, and the like, as a basis for purchases. Where the nature of this material is such that the real merits are difficult to ascertain by anything but actual service, the tests are conducted with these conditions approximated as closely as possible. In one instance rail bonds were tested in sea-water because they were to be used in a locality where provision had to be made against corrosion; and quite frequently insulators are tested in artificial showers at voltages far above those expected after installation on the line.

A very interesting feature of the Laboratories is that their clientèle embraces numerous manufacturers, who send their own and competitors' products for comparative tests. Thus a rail-bond manufacturer may learn all he desires about the merits of different styles of terminals, or an insulator maker satisfy himself as to shapes and compounds. It is hardly necessary to add that all tests are absolutely confidential, the custom being to indicate the pieces tested by numbers or letters and not by names. The latter need be known by the client only.

The equipment of the Laboratories includes both low and high-tension direct and alternating currents, which are received from the New York Edison Company and converted by motor-generators, frequency changers, storage batteries and transformers to supply a great variety of currents and potentials. For insulator testing and other high a. c. voltage work, there is a transformer with a 100-volt primary and a secondary wound for 30,000 to 120,000 volts. Another high-potential outfit is a glass plate condenser used for lightning-arrester tests. It is built in sections and in full series discharges at 144,000 volts. The storage-battery outfit supplies the high-ampere currents. There are numerous measuring instruments, including frequency meters, potentio-meters, oscillographs, and the like. The line of photometers is probably the most extensive in the United States.

A notable point about the equipment is the division of the laboratory into testing units, each of which always contains exactly the apparatus needed to carry out a particular kind of experiment. This scheme is a valuable one in cases where orders for material must be placed or shipped in a hurry, for it enables the tests to be started immediately.

The room where lamp-endurance tests are conducted contains fully 6000 sockets for potentials from 1 to 300 volts. Photometric tests of incandescent and other lamps are also conducted on a large scale. Other features of the Laboratory are the carbon-tube electric furnace for finding the fusing temperatures of materials, a constant-temperature room for such work as varnish testing, a room for trying out incandescent lamps at high temperatures, and private laboratories where clients may do their own testing without observation or disturbance.

RULES FOR THE FIRE ALARM AND SPRINKLER SYSTEM AT THE PLANK ROAD SHOP OF THE PUBLIC SERVICE CORPORATION

In connection with Martin Schreiber's article on "The System of Fire Protection at the Plank Road Shops of the Public Service Corporation of New Jersey," published in the Street Railway Journal of June 1, it is interesting to note the following rules which have just been adopted by the company for the fire alarm and sprinkler systems:

(1) PAINT SHOP OR PAINT STOREROOM, Sections 1-7, one long and one short blast of whistle.

(2) ERECTING SHOP AND DRY KILN, Sections 9-11, one long and two short blasts.

(3) MACHINE SHOP BUILDING, Sections 12-16, one long and three short blasts.

(4) STOREROOM, Section 18, two short blasts.

(5) STORAGE BARNS, Sections 19-24, two long blasts.

(6) BOILER HOUSE, three short blasts.

(7) ANY OTHER LOCATION, as yard etc., four short blasts.

(8) Fire alarm to be sounded distinctly and repeated three times in succession, with an interval of 5 seconds between each alarm.

(9) During nights the night engineer at boiler house on sounding an alarm will then turn in city alarm and start pump. He then will take a position in Ferry Street, opposite the pump house and direct the city fire department to the fire. After directing the fire department to the fire, boiler-house engineer will return to pump house and see that pump is kept going.

(10) All night watchmen on property will proceed to building where fire is located and do what they can to extinguish the conflagration with the chemical fire extinguishers and local apparatus.

(11) In the day time the duties of the engineer in boiler house are the same as those of the night engineer, as explained above, while the regular fire brigade will take action as trained.

(12) If there are no indications of fire, and water is found running from the sprinkler heads, turn off post indicator valve or outside screw and yoke valve and close air-supply valve on system in service, and then drain system.

(13) If water is not found running from any sprinkler head, no action need be taken during clear weather, but during cold weather when pipes are liable to freeze, the system must be drained and dry valves reset.

(14) In case of fire or any indication of smoke, sprinkler system must not, under any circumstances, be shut off until the chief of the city fire department or his representative authorizes it.

(15) After alarms have been responded to and causes ascertained, if there is any fire, report result of investigation to engineer at pump house.

(16) The engineer at pump house will see that system is properly drained when thus requested to do so.

(17) Fire pump must be tested every 24 hours and see that it is working properly.

It is understood that the Consolidated Railway Company is studying the feasibility of running limited express cars between Springfield and Hartford, with the idea of cutting down the running time from the present hour and fifty minutes to an hour and twenty minutes.

FINANCIAL INTELLIGENCE

Wall Street, June 5, 1907.

The Money Market

Although the developments in the money market were of a generally unfavorable character during the past week, rates for accommodation experienced very little change. Money on call was in abundant supply, at rates ranging from 2½ to 1¾ per cent, the average rate being about 2 per cent. In the time loan department business was practically at a standstill, although a slight increase in the inquiry for money running into January and February was reported. The asking rates for these maturities advanced ¼ per cent to 5¾, but the quotations for the shorter periods ruled absolutely unchanged at 3½ to 3¾ for sixty days, 4 per cent for ninety days, 4¼ per cent for four months, 4¾ for five months and 5 per cent for six months. The demand from Stock Exchange houses was extremely light, owing to the continued liquidation in the securities market. The demand from corporations, however, continued, the most important development in this connection being the decision of the American Telephone & Telegraph Company to issue about $21,000,000 additional stock. The stock will be offered to stockholders of the company at $100 per share, payment to be made one-half on or before July 25, 1907, and the remainder on or before Oct. 25. Several other loans have been negotiated on behalf of railroad companies, but the amounts were comparatively small. A feature of the week has been the heavy absorption of gold by the Bank of France. Within the past ten days foreign exchange rates in the local market have held at a point which, together with the interest allowed by the Bank of France, on the gold in transit, made it more profitable for our bankers to remit in gold than by the purchase of bills of exchange. Up to this time the shipments of gold from New York to Paris aggregate $6,800,000, and within the same time the Bank of France has succeeded in drawing more than $6,000,000 from the London market. At the close of the week the position of the foreign exchange market was such as to permit further shipments of the yellow metal to Europe, and from present indications it is quite probable that a further considerable amount will be sent abroad. Bankers, as a rule, are not inclined to offer money with any degree of freedom, the opinion being generally held that higher rates will prevail in the near future. The Secretary of the Treasury has, as yet, taken no action in the matter of recalling Government deposits, and in well-informed quarters it is doubted if such action will be taken at this time. The depository banks now hold something like $172,000,000 Government money, but as the Treasury surplus is constantly on the increase, it may not be necessary to call in any considerable amount for refunding purposes.

The bank statement published on last Saturday was rather unfavorable. Although cash increased $982,100, there was an increase in the loan item of $13,541,600. Deposits increased $15,554,100, thus increasing the reserve required by $3,888,525. Deducting from this the gain in cash, the surplus was diminished by $2,906,425. The surplus now stands at $12,782,450, compared with $6,616,025 in the corresponding week of last year, $6,050,275 in 1905, $31,760,675 in 1904, $4,775,650 in 1903, $11,285,575 in 1902, $21,523,050 in 1901, and $20,123,275 in 1900.

The Stock Market

The story of stock market movements during the week was limited to periods of urgent liquidation and shifting of position of the speculative members of the Exchange commonly referred to as the trading element. There was heavy enough liquidation on Monday to cause material and disturbing declines all through the list, and all the while that the heavy selling of long stock was in progress, the Wall Street district was flooded with rumors of embarrassment and failure. The names of two houses were freely mentioned in these reports, and those who seemed best posted on the market situation told their friends that unless arrangements were made to tide the houses over their failures would be announced on that day. The day passed though, without any official announcement of trouble and the relief from the tension in itself caused a decided improvement in speculative conditions. The liquidation gave a good opportunity to cover shorts that was availed of by some of the larger bear operators. One of these operators alone covered fully 100,000 shares of short stock, and several others covered lines ranging from 10,000 to 20,000 shares. This covering movement created a false impression of underlying strength, especially as it was of large enough dimensions to force a sharp recovery on Tuesday and was an incentive to an attempt at bullish manipulation by a clique of speculators who thought the market could be easily lifted after the liquidation had been completed. There was one clique that made a demonstration in Union Pacific and American Smelting, buying and bidding up both those stocks and later extending their operations to Reading, and for a short time they were successful in holding prices at a fairly high level and forcing other professional speculators to hurriedly cover some of their shorts. They used for a reason for these bull operations vague intimations that the administration would take no step in the matter of prosecutions because of the disclosures made in the Interstate Commerce investigation. These rumors found no confirmation in the official news from Washington on Wednesday, and those who had joined in the bull movement in Union Pacific, sold that stock in London on Wednesday morning and left it without support in the trading on the New York Stock Exchange from the start. American Smelting was bid up in anticipation of the increase in the dividend rate, and when the news came that the directors had declared a quarterly dividend of 2 per cent, putting the stock on an 8 per cent dividend basis, there was no market response except that the buyers of the day before hurriedly sold and sent the price of the stock back to about where it started from. The outflow of gold continued in about the same volume as last week, bringing the total exports up to date for this movement to $6,850,000, but the foreign demand for gold had no influence as a market factor and was not even discussed by those active in forcing price movements. The net changes for the week were unimportant, advances and reactions just about offsetting each other and leaving values of current Wall Street securities in about the same range that has been established since the reaction following the recovery from the March depression.

The traction stocks were extremely weak, especially those of the Interborough-Metropolitan, both of which made new low records. The weakness in these shares was accompanied by reports that the management may be compelled to discontinue the dividend on the preferred stock. It is stated, however, that the regular 1¼ per cent dividend for this quarter will be declared on the stock this week. It is understood that the management of the company is figuring on a substantial increase in earnings later in the year, and if these expectations are realized the directors will be disposed to continue the dividend payments indefinitely.

Philadelphia

The dulness prevailing in the general securities market was reflected, to a great extent, in the local traction shares during the past week. The demand for these shares was not very large, but in the absence of any pressure to sell, prices remained steady. The only exception to this rule was Philadelphia Company common, which lost a point to 40. Philadelphia Traction fluctuated between 22 and 23½ on transactions aggregating about 6000 shares. Philadelphia Traction sold at prices ranging from 91 to 91½, the final transaction taking place at 91⅛. Union Traction was quiet, with sales at 58 to 58⅛. A semi-annual dividend of 2½ per cent has been declared on the stock of this company, payable on July 1. This is an increase of ½ per cent over the previous payment and places the stock on a 5 per cent basis. Under the terms of the lease to the Philadelphia Rapid Transit Company the stock will receive 5 per cent dividends up to 1909, when the rate will be increased to 6 per cent. Consolidated Traction sold at 72½; United Com-

panies of New Jersey at 246½ to 247, and United Traction of Pittsburg at 47½.

Chicago

The Chicago City Railway Company has declared a quarterly dividend of ½ per cent. This is a reduction of ¾ per cent as compared with the previous payment, thus reducing the rate from a 9 to a 6 per cent annual basis. The reduction is believed to be the initial step to bring the fixed charges of the company within the income which may be expected under the new franchise ordinance requiring a division of the net income with the city. The stock of the Chicago City Railway Company held steady at 180 during the early part of the week, but toward the close the price dropped to 170. Otherwise the market for traction issues was dull and without special feature. Union Traction sold at 3⅜ and the preferred at 14½. South Side Elevated rose from 85 to 85½. Other sales were: Chicago & Oak Park common at 3¾; preferred at 14; Metropolitan Elevated at 65, and Northwestern Elevated at 23.

Other Traction Securities

The market for traction issues at Baltimore was quiet and generally weak. United Railway incomes declined from 53 to 50½, while the new refunding 5s broke from 83½ to 78¼. The 4 per cent bonds held steady at 86¼ to 86. Other sales were: City & Suburban 5s at 109; Baltimore City Passenger 5s at 101¼; Norfolk Railway & Light 5s at 95, and Washington City & Suburban 5s at 101½. The Boston market also was quiet. Prices during the first half of the week held firm, but toward the close there were rather sharp reactions. Boston Elevated dropped from 135 to 134, and Boston & Worcester common declined from 24½ to 23½. Massachusetts Electric ran off from 17 to 16, and the preferred brought 57½.

On the Cleveland Stock Exchange, Cleveland Electric stock reached a new low level within the past few days, the last sale being at 48. Some of the bids were much lower than this, but the asked price for the past day or so has been above 50. Quite a block of Northern Ohio Traction & Light changed hands at 25 and another at 24, but on Tuesday the figures stood 25 bid and 25¼ asked. Aurora, Elgin & Chicago preferred has stood at 76 and 76½, with 77 asked, while the common was marked up 32½ bid and 33½ asked. Washington, Baltimore & Annapolis pooling certificates stood at 10 bid, with 11 asked. Quite a little business has been done in traction securities, but they have not been especially strong in price for the past two weeks. The continued litigation keeps Cleveland Electric down to a low point.

Security Quotations

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

	May 29	June 5
American Railways	49¼	48
Boston Elevated	—	133
Brooklyn Rapid Transit	49¼	50¼
Chicago City	180	160
Chicago Union Traction (common)	3¼	3
Chicago Union Traction (preferred)	14	16
Cleveland Electric	—	—
Consolidated Traction of New Jersey	72½	71
Detroit United	67	66
Interborough-Metropolitan	19	15¾
Interborough-Metropolitan (preferred)	51	45½
International Traction (common)	54	50
International Traction (preferred), 4s	50	66½
Manhattan Railway	133	134
Massachusetts Elec. Cos. (common)	16½	16
Massachusetts Elec. Cos. (preferred)	58	56
Metropolitan Elevated, Chicago (common)	24	23
Metropolitan Elevated, Chicago (preferred)	63	63
Metropolitan Street	85	—
North American	67	66½
North Jersey Street Railway	40	40
Philadelphia Company (common)	41	40
Philadelphia Rapid Transit	22	23⅛
Philadelphia Traction	91¼	91
Public Service Corporation certificates	64	64
Public Service Corporation 5 per cent notes	94	92
South Side Elevated (Chicago)	83½	84
Third Avenue	103	105
Twin City, Minneapolis (common)	90¾	91½
Union Traction (Philadelphia)	57½	58½

Metals

The "Iron Age" says that the pig iron markets throughout the country have been very quiet. The furnaces are sold far ahead and show little disposition to press iron for more distant delivery, while many buyers have little confidence in the market, in view of the general business situation and the financial outlook. The feeling is prevalent, however, that the present level of prices will be well maintained until the end of the summer.

Copper metal is reported firm and unchanged at 25¼c. for electrolytic and 25½c. for lake.

NEW HAVEN MERGES WITH CONSOLIDATED

At a special meeting of the stockholders of the New York, New Haven & Hartford Railroad, held at New Haven, May 31, this corporation, according to the terms of the call for the meeting, was merged with the Consolidated Railway Company, a company with $10,000,000 capital stock, which was organized to operate the New Haven's electric lines in Connecticut. Under the terms of the transaction the Consolidated Company will continue to use the name of the New York, New Haven & Hartford but will operate under the charter of the Consolidated Railway Company, which is very liberal.

President Mellen told the stockholders that no danger of skipping a dividend exists. He said that the recent demands of union labor will cost the road $800,000 this year, and that with every demand granted efficiency has decreased.

"The only uncertain, unhappy elements," said Mr. Mellen, "with which the management has to contend are the demands of organized labor, which are very tremendous, and which will cost us this coming year in the vicinity of $800,000 for increases in wages; and the unfortunate situation we are in with regard to the freight car demurrage, which is doubled by the American Railway Association, beginning July 1, which will make another $800,000 increase in our expenses. Therefore, I have to look in the face from July 1, 1907, an increase in the expenses of this company of $1,600,000 from these two items alone, and I regret to say, so far as the organized labor item is concerned, that I am meeting constantly a decreased efficiency with every increase in wages."

In addition to this Mr. Mellen said:

"The amount of money that has been expended, and regarding which there has been expressed to me at times more or less apprehension, doubt, uncertainty as to the wisdom of the policy of the company, has been large, and approximates from July 1, 1903, to May 21, 1907, the enormous sum of $147,000,000. That was for a period beginning four months before the advent of my administration.

"Out of the $157,000,000 that have been raised, $97,750,000 have gone for investments in securities of other companies, which are paying the interest upon the cost of their investment. Out of the balance $37,000,000 has been spent for real estate, new equipment, second, third and fourth tracks, and the electrification of the New York division, and there was no possible way that I can conceive of by which any administration could have avoided those expenditures."

It was learned that the new $30,000,000 of stock for which application has been made for listing on the New York Stock Exchange, mentioned in the Street Railway Journal of June 1, is immediately connected with the merger. The Consolidated Railway Company recently took over the New England Navigation Company at a valuation of $20,000,000, or exactly the price which C. W. Morse some time ago offered for the property. Against this $20,000,000 of Consolidated Railway Company stock was created, which, added to the previous outstanding $10,000,000 makes $30,000,000 of stock, which in the merger now is represented by the $30,000,000 of stock, share for share, of the steam corporation. It was announced on June 5 that this $30,000,000 of stock will be used to secure control of the Boston & Maine Railroad.

REPORT ON MUNICIPAL OWNERSHIP

The full report of the commission on public ownership and operation of the National Civic Federation, a work upon which for more than eighteen months twenty-five expert accountants, engineers, economists and other specialists have been engaged, is now being sent to press. This report will contain all of the data gathered abroad and in America, and upon which the commission will have based its conclusions.

The investigation embraced the four leading public utilities: gas, water, electric lighting and power, street railways. Examinations were made of twenty-nine private and public plants in America and twenty-four in Great Britain. Among the American cities visited were Cleveland, Chicago, Philadelphia, Wheeling, Detroit, Indianapolis, Richmond, Atlanta, South Norwalk, Syracuse, Allegheny, New Haven and Norfolk. The inquiry abroad included the leading private and public undertakings of Great Britain and Ireland. Examinations were made in the following cities: Glasgow, Newcastle-on-Tyne, London, Liverpool, Norwich, Manchester, Birmingham, Dublin, Leicester and Sheffield.

The keenly analytical character of the work of this investigation only a study of the full report of the commission can indicate. Some idea of the scientific methods employed may be had from the fact that schedules of questions prepared by noted engineers and economists were followed in the case of each plant and system examined. These schedules disposed the questions under several general heads, as follows:

(a) Historical and General.
(b) Supervision of Municipalities.
(c) Public Supervision of Private Companies.
(d) Franchises of Private Companies.
(e) Organization.
(f) Political Conditions.
(g) Labor.
(h) Character of Service and Plan.
(i) Financial Matters.
(j Capital Stock and Bonds.
(k) Assets.
(l) Liabilities.
(m) Receipts.
(n) Expenses.
(o) Profit and Loss.

Several days were personally devoted by the experts upon each plant examined, and in some cases weeks were consumed.

The commission's full report will appear in two main divisions. The first part is intended for popular reading; the second will include the reports of the experts, which will be of especial interest to accountants, engineers, managers of public utility corporations, city officials, members of legislative committees, and all who are interested in municipal ownership and franchises. The second part will also show in the case of each American and foreign plant examined to what extent the experts agreed. Thus will be provided technical information of the correctness and impartiality of which no question can be raised.

The contents of each division of the work will be substantially as follows:

PART 1., VOLUME I.:

General conclusions of commission.
British Municipalities, by Frank J. Goodnow, author of "Municipal Home Rule," "City Government in the United States," etc.
American Municipalities, by Walter L. Fisher, traction counsel to ex-Mayor Dunne and to Mayor Busse, of Chicago, and author of the franchise plan adopted by the voters of that city.
A Critical Review of the Experts' Reports, in two sections by Edward W. Bemis and Milo R. Maltbie and Walton Clark and Charles L. Edgar.
Certain Phases of the Labor Investigation, by John R. Commons and by J. W. Sullivan.
Verbatim Reports of Conferences upon Municipal Trading Held at London with Rt. Hon. Lord Avebury (Sir John Lubbock), Mr. Sydney Morse, president of London Chamber of Commerce; Hon. Robert P. Porter, author of "Dangers of Municipal Ownership;" Hon. T. McKinnon Wood, progressive leader, London County Council; Hon. J. Allen Baker, chairman London Municipal Tramways, and Mr. Robert Donald, editor of the "London Daily Chronicle."

PART 2, VOLUMES I. and II.:

Vol. I., the United States:
Reports of experts on gas lighting:
Alf. E. Forstall, Fred. Burnett, Jno. H. Gray, Jno. R. Commons, J. W. Sullivan, Marwick, Mitchell & Co.
Special report on Philadelphia Gas Works, by Leo. S. Rowe.
Reports of Experts on Electric Lighting and Power:
Theo. Stebbins, Chas. E. Phelps, Jr., John H. Gray, John R. Commons, J. W. Sullivan and Marwick, Mitchell & Co.
Report on the History of Chicago Municipal Electric Lighting, by Marwick, Mitchell & Co.
Report on Water Works Systems, by Dabney H. Maury, John H. Gray, John R. Commons, J. W. Sullivan and Marwick, Mitchell & Co.
Vol. II., Great Britain and Ireland:
Reports of Experts on Gas Lighting:
Milo R. Maltbie, J. B. Klumpp, Wm. Newbigging, Robert C. James, E. H. Turner, Jno. R. Commons and J. W. Sullivan.
Reports of Experts on Electric Lighting and Power:
J. B. Klumpp, A. E. Winchester, Milo R. Maltbie, Robert C. James, E. H. Turner, J. W. Sullivan and Jno. R. Commons.
Reports of Experts on Tramways:
Norman McD. Crawford, Milo R. Maltbie, J. H. Woodward, E. H. Turner, Robert C. James, Jno. R. Commons and J. W. Sullivan.
Report on Taxation of Public Utilities, by Milo R. Maltbie.

The book may be purchased from the secretary of the Federation, 281 Fourth Avenue, New York, N. Y. The price for Part 1, Volume I. (about 500 pages), is paper, $1.00; cloth, $2.00; that for Part 2, Volumes I. and II. (about 1000 pages each), is $8.00.

MEETINGS OF THE MASTER MECHANICS' AND MASTER CAR BUILDERS'

The meetings of the Master Mechanics' and Master Car Builders' Associations of the steam railroads will be held this year at Atlantic City. That of the Master Mechanics' Association occurs June 12-14, and that of the Master Car Builders on June 17-19. In connection with the conventions the Steel Pier will be used for exhibits, which, it is expected, will be more interesting and better arranged than at any previous meeting of the associations. A harmonious scheme of erection and decoration of booths has been adopted, and, it is understood, will afterwards be employed at the meeting of the American Street and Interurban Railway Association next October.

The following manufacturers which are doing a business in the electric railway field, among others, have expressed an intention of making an exhibit at the convention:

Adams & Westlake Company Chicago, Ill.
American Blower Company, Detroit, Mich.
American Brake Shoe & Foundry Company, Mahwah, N. J.
American Locomotive Company, New York City, N. Y.
American Mason Safety Tread Company, Boston, Mass.
American Steam Gauge & Valve Manufacturing Company, Boston, Mass.
American Steel Foundries, Chicago, Ill.
American Water Softener Company, Philadelphia, Pa.
Anglo-American Varnish Company, Newark, N. J.
Armstrong Bros. Tool Company, Chicago, Ill.
Atha Steel Casting Company, Newark, N. J.
Baeder-Adamson Company, Philadelphia, Pa.
Baldwin Steel Company, New York City, N. Y.
Bickford Drill & Tool Company, Cincinnati, O.
F. S. Bowser & Company, Ft. Wayne, Ind.
Brady Brass Company, Jersey City, N. J.
Buda Foundry & Manufacturing Company, Chicago, Ill.
Columbia Nut & Bolt Company, Bridgeport, Conn.
Carborundum Company, Niagara Falls, N. Y.
The Philip Carey Manufacturing Company, Cincinnati, O.
Chicago Pneumatic Tool Company, Chicago, Ill.
Chicago Railway Equipment Company, Chicago, Ill.
Cling Surface Manufacturing Company, Buffalo, N. Y.
Consolidated Car Heating Company, New York City.
Crocker-Wheeler Company, Ampere, N. J.
Curtain Supply Company, Chicago, Ill.
The John Davis Company, Chicago, Ill.
Dearborn Drug & Chemical Company, Chicago, Ill.
Joseph Dixon Crucible Company, Jersey City, N. J.
G. Drouve Company, Bridgeport, Conn.
Dressel Railway Lamp Works, New York City.
Richard Dudgeon, New York City, N. Y.
Duff Manufacturing Company, Allegheny, Pa.
The O. M. Edwards Company, Syracuse, N. Y.
Electric Storage Battery Company, Philadelphia, Pa.
Flexible Compound Company, Philadelphia, Pa.
Fox Machine Company, Grand Rapids, Mich.
Galena Signal Oil Company, Franklin, Pa.
Garvin Machine Company, New York City, N. Y.
General Electric Company, Schenectady, N. Y.
Gold Car Heating Company, New York City, N. Y.
Goldschmidt-Thermit Company, New York City, N. Y.

Grip Nut Company, Chicago, Ill.
Hale & Kilburn Manufacturing Company, Philadelphia, Pa.
Edw. Harrington, Son & Company, Philadelphia, Pa.
Harrison Dust Guard Company, Toledo, O.
Indestructible Fibre Company, Massena, N. Y.
H. W. Johns-Manville Company, New York City, N. Y.
Kalamazoo Railway Supply Company, Kalamazoo, Mich.
Keystone Brake Shoe Company, New York City, N. Y.
Keystone Lubricating Company, Philadelphia, Pa.
Kinnear Manufacturing Company, Columbus, O.
V. O. Lawrence Company, Philadelphia, Pa.
John R. Livezey, Philadelphia, Pa.
Lodge & Shipley Machine Tool Company, Cincinnati, O.
Geo. W. Lord Company, Philadelphia, Pa.
John Lucas & Company, Philadelphia, Pa.
McConway & Torley Company, Pittsburg, Pa.
McGuire-Cummings Manufacturing Company, Chicago, Ill.
McCord & Company, Chicago, Ill.
Modoc Soap Company, Philadelphia, Pa.
National Brake & Electric Company, Milwaukee, Wis.
National Lock Washer Company, Newark, N. J.
A. O. Norton, Boston, Mass.
Norton Company, Worcester, Mass.
Ohio Brass Company, Mansfield, O.
Oil Well Supply Company, Pittsburg, Pa.
Pantasote Company, New York City, N. Y.
Perry Side Bearing Company, Chicago, Ill.
Riverside Metal Company, Riverside, N. J.
Rubberset Brush Company, Newark, N. J.
Sauvage Safety Brake Company, New York City, N. Y.
Schoen Steel Wheel Company, Pittsburg, Pa.
Shelby Steel Tube Company, Chicago, Ill.
Sherwin-Williams Company, Chicago, Cleveland.
Sprague Electric Company, New York City, N. Y.
Standard Paint Company, New York City, N. Y.
Standard Steel Works, Philadelphia, Pa.
Stoever Foundry & Manufacturing Company, New York City, N. Y.
T. H. Symington Company, Baltimore, Md.
H. B. Underwood & Company, Philadelphia, Pa.
U. S. Metal & Manufacturing Company, New York City, N. Y.
Union Spring & Manufacturing Company, Pittsburg, Pa.
Watson-Stillman Company, New York City, N. Y.
Wells Light Manufacturing Company, New York City.
West Disinfecting Company, New York City.
Westinghouse Air Brake Company, Pittsburg, Pa.
Wilmarth & Norman Company, Grand Rapids, Mich.
J. H. Wagenhorst & Company, Youngstown, O.
Wheel Truing Brake Shoe Company, Detroit, Mich.
Yale & Towne Manufacturing Company, New York City, N. Y.

THE CLEVELAND SITUATION

Judge Chapman has granted the Cleveland Electric Railway Company a temporary injunction restraining the Low Fare Railway Company from operating cars on the Euclid Avenue line between the Public Square and East Fourteenth Street, where it was proposed to form a junction with the tracks of the new company that have been extended from the Erie Street Cemetery. The court stated that the order would have been made to cover the Superior Street line from West Twenty-Eighth Street to the Public Square, but consideration for public convenience induced him to leave that portion open until the final decision of the question. No need for such consideration exists as to Euclid Avenue, as there is no particular need of the original line of the Low Fare Railway Company about the cemetery.

Officers of the Low Fare Railway Company stated that they would go to Council for another franchise ordinance enabling them to use Euclid Avenue, and they are quoted as saying that they will be able to get another ordinance much easier than they can get a favorable decision from the courts.

Officials of the American Steel & Wire Company have asked for a street railway line that will accommodate the men who will be employed in their new mills on Harvard Street in the village of Newburg Heights. Mayor Johnson suggested that he would co-operate in securing a line to connect the Cleveland Electric tracks at Harvard Street and Marceline Avenue, through Harvard Street over the flats and across the river on a bridge, with the Denison Avenue line of the Forest City Railway Company. J. J. Stanley has a bid based on 2-cent fare in the village of Newburg Heights. The Mayor's suggestion would compel the Cleveland Electric and the Forest City Railway to co-operate and use tracks jointly, a scheme that is impossible under existing conditions in Cleveland.

Hereafter the board of directors of the Cleveland Electric will hold weekly meetings, at which all phases of the situation will be discussed. The company is progressing well with its campaign for renewal of franchise, and has adopted the phrase, "Speak or write to your Councilman about it," which appears on all the advertising matter that is issued. If a political issue is made of the question the company will probably not appeal to either party.

As expected an ordinance was introduced in the City Council, Monday evening, for the purpose of granting the Low Fare Railway Company the right to use the tracks of the Cleveland Electric jointly with that company on Euclid Avenue, between the Public Square and East Fourteenth Street, the portion of the street the new company was enjoined from using by Judge Chapman. The ordinance also provides for the joint use of the Cleveland Electric tracks on Superior Avenue and Detroit Avenue to West Twenty-Eighth Street. This ordinance is meant to get around the injunctions on all these lines and evade the court orders which contemplate facts and not mere wording of ordinances.

The ordinance granting the Cleveland Electric a five-year franchise on Central Avenue and Quincy Street came up for consideration Monday evening, but was again referred to the committee on railroads pending the filing of consents by the company. It is probable that the company does not care for so short a franchise on the streets and will not use its consents until it feels reasonably sure that its measure will receive the support of the Council.

Opposed by the attorneys for the new companies, Judge Chapman overruled the motion of the Cleveland Electric to advance the financial interest case affecting the East Side and secure a speedy trial. The court wanted to combine this case with one affecting Denison Avenue and other West Side streets in which the same allegations were made, but both companies objected to this. He then refused to advance the case in question, and it will come up in its regular order. It is said the Mayor opposed the advancement of any of the cases, as he wishes no settlement or decision of any kind until after the election this fall, fearing that it would injure his chances of re-election.

On Wednesday, June 5, the Cleveland Council suspended its rules and passed the ordinance granting the Low Fare Company joint use of tracks on Euclid Avenue from the Square to Fourteenth Street, and on Superior Avenue and Detroit Streets to West Twenty-Eighth Street.

ELECTRIC RAILWAY ENGINEERING AT THE WORCESTER POLYTECHNIC INSTITUTE

Progress in electric railway engineering will occupy a conspicuous place in the program of commencement week at the Worcester Polytechnic Institute this year. The commencement ceremonies begin with the baccalaureate sermon in Central Church, on June 9. On June 11 the new Electrical Engineering Building will be opened for inspection, and in the evening the annual commencement lecture will be given in the lecture room of the Electrical Engineering Laboratories, by A. S. Richey, professor of electrical engineering. The subject of the lecture is "The Electric Railway." On Wednesday the hydraulic testing plant at Chaffins will be opened for inspection and an opportunity also given to see a four-stage centrifugal pump, an 80-hp. horizontal turbine, a turbine flow recorder, a pitometer of latest design, a Pelton water-wheel, a current meter, and a water-wheel governor in full operation. On Thursday, June 13, the commencement address will be given by Charles F. Scott, consulting engineer of the Westinghouse Electric & Manufacturing Company. The subject of Mr. Scott's address is "Some Aspects of Electrical Development."

BROOKLYN SUBWAY CONSTRUCTION BIDS

The Board of Estimate held a special meeting Monday, June 3, for the purpose of acting on the request of the Board of Rapid Transit that the Board of Estimate rescind its previous action so as to allow the advertising for bids on the construction alone of the Fourth Avenue Subway in Brooklyn. A resolution to this effect was passed unanimously.

Borough President Haffen, of the Bronx, tried to bring up another matter, but was ruled out of order. Afterward he and Mr. Metz had a slight altercation. Haffen wants subways for the Bronx, and Metz, just at present, is helping Brooklyn get one.

AFFAIRS IN CHICAGO

The protective committee for the West Division and North Chicago City Railway Companies have sent a letter to the stockholders of these companies in which the committee's position is stated as to the deposit of stock in the "blind pool" now being worked out to insure the acceptance by the Union Traction interests of the recently passed street railway ordinance and the reorganization of these interests under the name of the Chicago Railways Company. In brief, it is a demand that the West Division and North Chicago City Railway Companies be recognized in the reorganization plans and that an attorney representing them be joined by C. W. Wickersham, now acting on behalf of the West and North Chicago Street Railway Companies, and L. C. Krauthoff for the Union Traction Company. Quoted in the circular is a letter written by Cyrus H. McCormick to Judge Grosscup in which this same demand is made. The circular, which is signed by Cyrus H. McCormick, Thomas Templeton, Charles W. Ware and John F. Bass, on behalf of the West Division Company, and Leon Mandel, Charles A. Mair, James F. Porter, John A. Chapman for the North Chicago City Company, sets out that there is now deposited the needed amount of stock of the first named company and practically enough of the second one to comply with the terms of the ordinance, but "your committee will not recommend the deposit of the required percentage of the stocks of the underlying companies until they are satisfied that the arbitrators are not going to be hampered in any way in making their award."

"The most important points about which we are not satisfied," the circular continues, "are in regard to the raising of the new money which the company will require for rehabilitation and in regard to the persons who are to prepare in the first place the plan of reorganization for submission to the arbitrators. On the first of these points we ask to have disclosed the names of the bankers and their terms. On the second, we demand that Messrs. Krauthoff and Wickersham, who were originally employed at the instance of the North and West Chicago Street Railway Companies and the Union Traction Company, and who, at the direction of these interests, are at work upon a plan, shall have no more power in the distribution of securities than your attorneys or the attorneys of bondholders. They represent only particular interests. They do not represent you. If any official plan of organization is to be given out you should have a voice in framing it. The fairest would be first to arrange for the financing, next to agree on the kinds of other securities to be issued by the new company, and then to leave the distribution of the latter entirely to the arbitrators."

The employees of the Chicago City Railway Company have voted to accept the offer of the company made prior to the last municipal election. This decision ends all likelihood of labor trouble in Chicago, as the men of the North and West divisions, whose contracts expire on May 31, also have decided to accept the action of the South Side division as a basis for their demand. By the action of the men they will receive back pay dating from April 1, and the contract which the men have approved will date from the first day of August, 1907, and be in force for one year from that date. The 2700 employees will receive back pay amounting to more than $50,000, in addition to their regular salaries. During the year the advance granted by the company will amount to $150,000. The agreement approved by the employees is the same as was repudiated shortly after the notices were posted in the car houses of the company, and a counter demand made upon the company, which was denied in every particular by President Mitten when he resubmitted his original proposition without a single change, and gave the employees until the last day of May to accept, stating that the offer would be withdrawn after that date. Men who received 19 cents an hour will in the future receive 25 cents; those receiving 25 cents an hour will receive 27, and the same working conditions contained in the present agreement are renewed for the period of one year, commencing Aug. 1.

NEW YORK LEGISLATION

The Public Utilities bill has been repassed over Mayor McClellan's veto in the New York Assembly.

The Senate has defeated a motion made by Senator Grady to discharge the railroad committee from further consideration of the Coney Island Five-Cent Fare bill. This means that the bill will die in committee.

The Assembly has passed unanimously the Phillips bill which compels corporations to pay franchise taxes as a condition of their going into court to obtain a review of their assessment by the State Tax Commission.

CONFERENCE ON MILWAUKEE SITUATION

At the conference between the transportation committee of the Merchants & Manufacturers' Association, of Milwaukee, and President John I. Beggs, of the Milwaukee Electric Railway & Light Company, with reference to the matter of a more complete and comprehensive transportation system for the city of Milwaukee, it was stated by members of the committee that the intention and desire is to give President Frost, of the Chicago & Milwaukee Electric Company, who is now building toward Milwaukee from Racine, and Vice-President Walker, of the Milwaukee Northern Electric Railway Company, an opportunity also to present their views. It was thought best, however, to have these conferences at different times, as President Beggs desired to present his ideas and display his plans for extensions to the committee without being subject to questions relative to them before a general meeting of men interested in the move to construct new lines in the city.

LIGHTNING REPORT AND DATA BLANKS DISTRIBUTED

The Central Electric Railway Association is sending to every traction manager in Indiana and Ohio a set of lightning report and data blanks prepared by the chairman of the lightning arrester committee, Geo. Whysall, of Marion, Ohio. It is the desire of the chairman to have the lightning report blanks filled out according to the number of storms occurring during the summer months, and then returned to the committee for compilation prior to the fall meeting in September. The data blanks are to be filled out and returned immediately to the secretary.

The data blank covers the details of the generating station equipment, sub-station equipment, low-tension arresters, high-tension lines, trolley lines, overhead ground wires, track, and rolling stock. The lightning report blank covers such observations of the discharge as the time, whether there was a steady static discharge, whether there was a temporary arc, the location of the discharge and other data, incidental phenomena and damage or interruption.

ANOTHER DIVISION OF THE SPOKANE & INLAND OPENED

General Manager J. B. Ingersoll, of the Spokane & Inland, has announced the inauguration of passenger service south from Oakesdale to Garfield and Palouse, a distance of nearly twenty-five miles. For the present it is probable that trains will reach Garfield by electric power, and then proceed to Palouse by steam, as the overhead construction is still incomplete between those towns. The extension of the train service will require an entire new train schedule. Three through trains will be run between Spokane and Palouse in either direction. Trains will leave Spokane for Palouse at 7:35 a. m., 1:30 p. m. and 4:55 p. m. Trains will leave Palouse at 7:55 a. m., 12:15 p. m. and 4:55 p. m. Trains on the eastern or Palouse division will not make stops between Spring Valley Junction and Spokane, going or coming, but will make all stations below the junction. The running time between Spokane and Palouse will be 3 hours, until the roadbed becomes more settled, when it is probable the time will be reduced. By the new schedule the forty stations between Spokane and Rosalia, on the western division, will be served by four trains each way, as at present. South-bound the trains will leave Spokane at 7:00, 9:40, 1:00 and 5:30, while trains will leave Rosalia for Spokane at 6:00, 9:30, 1:45 and 4:15. With the opening of train service to Palouse the Spokane & Inland will be operating 81 miles of road, 76 from Spokane to Palouse, and 5 on the western division, Spring Valley to Rosalia. This, with the 44 miles now in operation on the Coeur d'Alene division and the 23 miles operated by the Spokane Traction Company, makes an aggregate mileage of 150 for the Inland Empire system.

PROGRAM OF NEW YORK STATE CONVENTION

J. H. Pardee, secretary of the Street Railway Association of the State of New York, expects to issue, in about a week, a circular giving the program to be followed at the meetings of the Association at Hotel Champlain, Bluff Point, N. Y., on June 25-26. This circular will also include a statement of the method of securing the usual convention transportation rates, as well as the summer schedule of trains of the Delaware & Hudson Railroad to Bluff Point. This schedule will go into effect a few days before the date of the meeting.

MR. BAER RETRACTS—ADMITS ELECTRICITY TO BE SOLUTION OF SUBURBAN SITUATION

George F. Baer, president of the Reading Railway, ordered on Tuesday, June 4, what is virtually a restoration of the passenger rates that were enjoyed by the commuters on the Reading Railway out of Philadelphia prior to May 28, when a new and advanced summer schedule went into effect, as noted in the Street Railway Journal of June 1, with effects other than those Mr. Baer had anticipated. Instead of the old 50-trip tickets at the increased rates that were announced on May 25, 60-trip tickets, representing a rate of about 1 cent a mile, good only for use by one individual during one calendar month, are now on sale at all points in the territory between and including the Reading Terminal, Third and Berks Streets, Chestnut Hill, Glenside, Frankford, Fox Chase, Rydal, North Manayunk and West Manayunk. School tickets containing 46 trips and good between the above-named points are also included in the concessions granted by the company. In announcing the increase Mr. Baer said that the low rate heretofore prevailing was due to the competition of the trolley lines, but that the company felt that the rates must be readjusted in order that a more uniform rate might be adopted. The general passenger agent, Mr. Weeks, was made responsible for the change, the notice being issued over his signature. Mr. Baer has now promised that as soon as practicable the Reading will establish electric lines to all its suburban points and reduce the fares to the lowest possible minimum.

PENNSYLVANIA BILLS SIGNED BY THE GOVERNOR

Governor Stuart has signed both the Dunsmore State Railroad Commission bill and the Hoshmer trolley eminent domain bill.

The State Railroad Commission will consist of three commissioners, who shall take office the first Monday in January, 1908. They will be appointed by the Governor for three, four and five years, respectively, and each succeeding appointment will be for five years. Headquarters of the commission, which will have jurisdiction over the electric, as well as steam railroads, of the State, will be at the State Capitol. Among other appointments which the commission will have authority to make is that of an inspector, who shall be an expert in electrical affairs. The commission is empowered to recommend the manner, under existing laws, in which one electric railway may cross another electric railway, and also to compel the giving by steam or electric roads of any information requested by the commission, which shall also have power to administer oaths in all matters relating to its duties; to inquire into the management and business of all common carriers, including freight and passenger tariffs and rates, equitable distribution of cars, granting of sidings and regulation of crossings, location of freight and passenger stations, adequacy of facilities for transportation purposes.

If the commission finds that any of the "rates or charges established or demanded by any railroad are excessive or unreasonable, or that improvements to a railroad's property are reasonable and expedient to promote the security and convenience of the public," it shall give notice to the company. If, after a hearing, the carrier neglects to carry out the recommendation, the facts are to be certified to the Attorney-General and the next Legislature.

The Hoshmer bill grants to trolley companies the right of eminent domain, provided they secure the consent of 51 per cent of the property holders along the proposed new line or extension. The bill was opposed by the steam roads and also by residents of suburban towns outside of Philadelphia who feared it would permit the cutting up of many fine residential sections. Trolley men expect the bill will give a tremendous impetus to the building of electric roads all over the State.

The bill introduced by Representative Fahey, of Philadelphia, amending the act of 1895 governing street railway companies, was also signed. It provides that the consent of the local authorities of all the cities, boroughs and townships of the first class and the Board of Road Supervisors of townships of the second class be obtained before the granting of any such charters.

Another measure approved is that forbidding those officers, employees or agents of any railroad company operating within the State, who have charge directly or indirectly of the distribution of cars to shippers, to own or have any interest whatsoever in any operated coal property or the stock of any mining or manufacturing company along the line of such railroad.

The bill is intended to prevent the gifts of coal and other stocks to railroad men, such as were brought out in the Pennsylvania Railroad scandal.

The bill to prohibit trolley companies from purchasing or guaranteeing the stock or bonds of other securities or the lease or purchase of the works or franchises of any competing street railway or any company having under its control a parallel line was also signed.

PROGRESS ON THE NORTHERN ELECTRIC COMPANY'S LINES

The Northern Electric Company has decided to commence at once the construction of the Chico-Hamilton City line. It is understood that work on the road will be prosecuted on both sides of the Sacramento River simultaneously in order to connect Chico and Hamilton City at the earliest possible time. The company will soon convert its property at 1020 Eighth Street, in Sacramento, into a baggage room and ticket office for the accommodation of the passengers when the company has its interurban line running into Sacramento from Marysville, Chico and Oroville. The company is rushing work on its lines to this city, and expects to be operating cars to Sacramento about Aug. 1.

Henry A. Butters, Eugene de Sabla, John Martin and Sloss & Lilienthal, who own the Northern Electric Company, are said to be the real parties interested in the Vallejo & Northern Electric Railroad, and it is asserted that in the near future they will have an electric railroad system from Vallejo via Sacramento as far north as Red Bluff. In fact, if present tentative deals are perfected they are likely to extend the electric railway system on to Napa City, San Rafael and a point near Belvedere, and have a ferry system into San Francisco in addition to a connecting boat line between this city and Vallejo. The Northern Electric, or Butters Syndicate, is now completing a system which takes in Chico, Oroville, Marysville, Red Bluff, Sacramento, Hamilton and Colusa. Richard Hotaling, W. M. Rank and their associates project an electric railway from Belvedere via San Rafael to Napa and thence to Lakeport.

CAPITAL TRACTION DEED FILED FOR RECORD

The Capital Traction Company, of Washington, has filed for record the deed of trust upon its property recently given to the Union Trust Company, to secure an authorized issue of $6,000,000 in bonds, dated June 1, 1907, and maturing June 1, 1947. The issue is to be known as forty-year 5 per cent gold coupon bonds, and is made under the provision of an act of Congress of March 3, 1891, in which it was provided that bonds might be issued by the company not to exceed in the aggregate amount of their face value one-half of the capital stock of the company, which is $12,000,000.

It is recited in the paper filed for record that April 2, 1900, the company authorized the issue of bonds to the extent of $1,500,000, the proceeds of which have been entirely used to aid in paying for the construction and equipment of its railroads. Other sums, it is stated, are now required by the company for further necessary construction and equipment, which, it is believed, with the preceding issue, will not exceed the sum of $4,000,000 to be expended in the near future. In order to provide for probable future needs it was thought expedient to make the authorized issue $6,000,000. Only $4,000,000 worth of bonds are to be issued at present.

Of the $4,000,000 issue, bonds to the amount of $2,520,000 are to be first offered to the stockholders of the company pro rata at par, and so many of the bonds as shall not be so taken by the stockholders, together with the remaining $1,480,000 of the issue are to be held by the company, to be negotiated by the directors when and as they shall deem best.

The proceeds of the sale of the $2,520,000 of the issue are to be applied first to the payment of the outstanding bonds, amounting to $1,080,000, then to the payment of the company's floating indebtedness of $600,000, and the balance used for further necessary construction and equipment of the company's railroads and extensions now authorized, including new power stations, new car houses, changing grades and purchasing new cars and other equipment. When the $4,000,000 issue has been exhausted, it is provided that the remaining authorized $2,000,000 may issue in the discretion of the board of directors.

STRIKE IN BIRMINGHAM DECLARED OFF

The strike on the lines of the Birmingham Railway, Light & Power Company, of Birmingham, Ala., which has been continued in a very small way ever since it started on May 20, was formally declared off June 11. As a final desperate effort to revive interest in it the leaders attempted on June 10 to start a sympathetic strike by calling out the barbers and carpenters of the city. Most of them, however, refused to leave their work, and 24 hours later the sympathetic strike was declared a failure. The former street railway employees are now making applications for reinstatement and the leader has left the city in disgust. The railway strike occasioned inconvenience for only about three days, or from May 20-23, but since that time all the cars have been kept running on schedule time.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED MAY 21, 1907

854,066. Clock Mechanism for Signals; Frank O. Warner, Baltimore, Md. App. filed Feb. 25, 1907. Clock mechanism for signals including an indicator arranged to be actuated by the closing of an electric circuit and adapted to indicate the exact time of the happening of an event, such as the passage of a train past a given point.

854,124. Train Pipe Coupling; Clarence W. Taylor, Oak Park, Ill. App. filed Jan. 7, 1907. Comprises a pile coupling member having an aperture therethrough and a locking bar slidably seated therein, and adapted to be pushed through into an aperture in an opposing pipe coupling member by the recession of the members in the act of coupling.

854,148. Fluid Pressure Brake; Francis L. Clark, Pittsburg, and Walter V. Turner, Wilkinsburg, Pa. App. filed Aug. 11, 1904. An apparatus adapted to be adjusted to a light braking position or to a heavy braking position, and means operated by the train pipe pressure of the system for automatically setting the apparatus to its light braking position.

854,185. Trolley Amusement; Harry G. Traver, East Orange, N. J. App. filed Jan. 17, 1906. A pleasure railway in which the car is pulled to the top of a spiral trackway down which it travels by gravity.

854,328. Rail-Bond Protector; Leonard B. Buchanan, Woburn, Mass. App. filed March 18, 1907. A cover or guard for rail-bonds to prevent their removal by thieves.

854,330. Passenger and Like Car; Andrew Christiansen, Butler, Pa. App. filed Aug. 25, 1906. A metallic vestibule construction for cars comprising vestibule end posts having webs substantially longitudinal of the car, and metallic filling pieces between the posts of flanged shape and having integral flanges at their ends secured to the webs of the posts.

854,344. Electrical Signaling Apparatus for Engines; George J. Exterkamp, Covington, Ky. App. filed Feb. 25, 1907. An auxiliary rail between the traction rails, and specially constructed wheel axles whereby the rails are not short circuited by a passing train.

854,349. Metallic Car-Underframe; John M. Hansen, Pittsburg, Pa. App. filed Sept. 6, 1906. Details of construction.

854,403. Underframe for Passenger and Like Cars; Andrew Christianson, Butler, Pa. App. filed Aug. 25, 1906. Comprises a center sill, a transom extending outwardly therefrom and a connection plate having its body arranged vertically and secured to the end of the transom and having a top flange resting on the transom.

854,404. Frame for Passenger and Like Cars; Andrew Christianson, Butler, Pa. App. filed Aug. 25, 1906. A metallic post for railway cars having a web and flanges on the inner and outer edges, the outer flange being wider than the inner flange and having its upper portion bulged outwardly.

854,405. Passenger and Like Car; Andrew Christianson, Butler, Pa. App. filed Sept. 7, 1906. Relates to the interior finish of metallic cars.

854,406. Metallic Compartment Construction for Passenger and Like Cars; Andrew Christianson, Butler, Pa. App. filed Sept. 7, 1906. Relates to details of construction for applying a compartment at the end or in the corner of the car and which is entirely or mostly composed of metal.

854,435. Rail Anti-Creeper; Neil E. Salsich, Hartland, Wis. App. filed Jan. 2, 1907. Comprises an anchor fulcrumed on the rail, a yoke embracing the anchor and rail, and means for spiking the anchor to a tie.

854,442. Electric Motor Truck; Benjamin R. Van Kirk, Philadelphia, Pa. App. filed Nov. 30, 1906. Relates to that type of electric motor trucks in which the motors are carried by the trucks and extend beyond the wheel base of the truck. The outer portion of the motors is attached to equalizing beams which rest upon the axle boxes.

854,449. Brake Mechanism for Pivoted Car Trucks; William L. Austin, Philadelphia, Pa. App. filed Jan. 7, 1907. The brake chain extends first to the center of rotation of the truck and then around a sheave to the brake rod, so that the truck is free to swing without affecting the brake mechanism.

854,475. Key for Brake-Shoes; David H. Fairbanks, Nashville, Tenn. App. filed Oct. 23, 1906. Comprises a key having lugs or barbs on opposite faces thereof to engage abutments on the brake head and shoe to thereby lock the key in place.

854,668. Ball Cleaner; Hilary Quertier, Dunedin, New Zealand. App. filed Feb. 13, 1906. Means for mounting a plow and revolving brush for cleaning the grooves of rails.

854,687. Convertible Car; John A. Brill, Philadelphia, Pa. App. filed June 26, 1906. A car having angle-metal side sills which have a lower horizontal web, a plate secured upon the web and forming side steps and stanchions secured to the step and sill web.

854,688. Controller Operating Means; Arthur J. Brown, Norwood, Ohio. App. filed Aug. 27, 1906. Has a quick break mechanism. The controller drum has a spring or resilient connection with the handle shaft. A detent device is provided by which it follows the movement thereof abruptly.

PERSONAL MENTION

MR. E. L. SCHMOCK has been appointed purchasing agent of the Cleveland, Painesville & Eastern Railroad Company, of Cleveland, Ohio. Mr. Schmock will have his headquarters at Willoughby, Ohio.

MR. JOHN HANF, who recently resigned as master mechanic of the International Traction Company, of Buffalo, N. Y., was presented with a handsome silver loving cup by the foremen and the office force under him, a few days ago, as a token of their esteem.

MR. L. H. KIDDER, formerly of the Westinghouse Electric Manufacturing Company, has severed his connection with that company and has been appointed superintendent of motive power of the Pittsburg & Butler Street Railway and the Butler Passenger Railway.

MR. DANIEL FRANCISCUS has been appointed to succeed Mr. C. Faller as superintendent of the Carlisle & Mt. Holly Traction Company. Mr. Faller is now superintendent of the Carlisle Gas & Water Company, and Mr. S. P. Goodyear has been chosen auditor of both companies.

MR. GEORGE SYDNEY BINKLEY, late chief engineer and manager of construction of the Monterey Water & Sewer Company and the Monterey Railway, Light & Power Company, of Monterey, N. L., Mexico, has become manager of the mining properties and smelter of the Douglas Copper Company, State of Sonora, Mexico.

MR. E. F. DAVIS has resigned from the Brooklyn Rapid Transit Company as district superintendent of the southern district, and expects to leave Brooklyn shortly for Minneapolis,

Minn., for the purpose of attending to personal interests located there. Mr. Davis has been connected with the Brooklyn Rapid Transit Company since October, 1903. During this time he has held positions as assistant superintendent and division superintendent, and, finally, on Jan. 1, 1906, was made district superintendent of the southern district, which embraces all the surface lines in South Brooklyn, including the Coney Island lines, the system being divided into two districts. Mr. Davis has been railroading continuously since 1893, except for three years, which were occupied in gold mining in the Northwest.

MR. G. J. ANDERSON, who has been assistant to Mr. P. F. Sullivan, general manager Massachusetts Electric Companies for the past eight years, has resigned from the company to become private secretary to Mr. S. Z. Mitchell, vice-president of the Electric Bond & Share Company, of New York.

MR. J. M. BRAMLETTE, general superintendent of the Michigan United Railways Company's lines, has been appointed to the position of general manager of the company. Mr. Bramlette succeeds Mr. J. R. Elliott, who will retain the office of vice-president, and will have active charge of the construction of the Lansing & Jackson line, on which work will begin immediately.

MR. R. C. TAYLOR, superintendent of motive power of the Indiana Union Traction Company, of Anderson, Ind., has been appointed chairman of the standardization committee of the Central Electric Railway Association, to fill the vacancy caused by the resignation of Mr. W. H. Evans, who, as noted elsewhere in this issue, has been appointed master mechanic of the International Railway Company, of Buffalo.

MR. JOHN POWERS, superintendent and electrical engineer of the Sterling, Dixon & Eastern Electric Railway Company, of Sterling, Ill., has resigned from the company to enter the employ of the Milwaukee Electric Railway & Light Company, of Milwaukee, Wis., owned by the same interests as control the Sterling, Dixon & Eastern Company. Mr. Powers on leaving Sterling was presented by his associates in the company with a handsome Masonic watch charm as a token of esteem.

MR. CHARLES KENMOUTH STEARNS, an electrical engineer, who was identified as an assistant engineer with the electric equipment of the Nantasket Beach branch of the New York, New Haven & Hartford Railroad, is dead. Of late Mr. Stearns had acted in a consulting capacity for a number of street railways. He was a member of the American Institute of Electrical Engineers and of the American Society of Mechanical Engineers. He was born at Newton Center, Mass., in 1864, and was a graduate of the Massachusetts Institute of Technology.

MR. L. F. LOREE, president, and MR. C. S. SIMS, general manager of the Delaware & Hudson Railroad, were elected on June 1 as president and vice-president, respectively, of the United Traction and Hudson Valley Railway Companies, Mr. I. A. Culver formally retiring as president and general manager of the Delaware & Hudson Company. Messrs. Loree and Sims also were recently elected president and general manager, respectively, of the Schenectady Railway Company, another Delaware & Hudson interest.

MR. T. FRAME THOMSON, of Buenos-Aires and London, and director of La Capital Company, of Buenos-Aires, is on a short trip to this country. Under the plans of the new organization which will control the tramways of Buenos-Aires, described in the last issue, Mr. Thomson is to be one of the directors of the new company and also a member of the executive committee, which will consist of Messrs. V. Fris, D. Heinemann, Ch. Cicogna and Leon Janssen, of Brussels; O. Oliven, of Berlin; Thomson and Lazarus, of London.

MR. J. H. BRENNAND, superintendent of the Sydney division of the New South Wales Government Tramways, at Sydney, Australia, is making an extended visit in this country. Mr. Brennand arrived at Vancouver some two months ago, and has been inspecting the electric railway systems of the country on his trip East. He expects to sail for Australia during July, and on his return trip will visit Los Angeles, San Francisco and some of the other cities on the Pacific Coast. Mr. Brennand is making this trip in company with Mr. John Mitchell, architect of the Educational Board, of Auckland, New Zealand. Mr. Mitchell is making a special study of reinforced concrete construction as exemplified in this country .

MR. G. U. G. HOLMAN has been appointed manager of the electrical department of the Boston branch of the H. W. Johns-Manville Company and has already entered upon his new work. Mr. Holman is well known in electrical and railway circles. After graduating from the Massachusetts Institute of Technology, he was for several years with the Thomson-Houston and General Electric Companies, in Lynn, Mass., New York City and Minnesota. He left the General Electric Company in 1892 to become railway engineer with the Mather Electric Company, of Manchester, Conn., and later was engaged in the lighting field in Philadelphia for five years. During the last few years he has been connected with the construction and operation of electrical enterprises in New York, Philadelphia and Canada. He has also been a contributor to this and other technical papers on engineering and financial subjects.

MR. W. H. EVANS has been appointed master mechanic of the International Railway Company, of Buffalo, N. Y., to succeed Mr. John Hanf, resigned, who retired from the company on June 1, as noted in the Street Railway Journal of May 25. Mr. Evans formerly was master mechanic of the Indianapolis Traction & Terminal Company, of Indianapolis. He first entered street railway work several years ago at Minneapolis with the Twin City Rapid Transit Company. Subsequently he was connected for a short time with the Chicago City Railway Company. Mr. Evans has been very active in the affairs of the Central Electric Railway Association, and has taken a considerable interest in the American Street & Interurban Railway Association, serving for the former as chairman of its standardization committee and for the latter as a member of the standardization committee.

MR. C. V. WOOD has been appointed general freight and passenger agent of the New England Investment & Security Company, of Worcester, Mass., which operates the electric railways in Massachusetts controlled by the New York, New Haven & Hartford Railroad. Mr. Wood, who will co-operate with Mr. A. B. Smith, general traffic manager of the company, is to take charge of the excursion business and the through passenger and parcel express business of the company, and will supervise and advise in regard to the development and management of all lines that come under his jurisdiction. Mr. Wood formerly was superintendent of the Pittsburg and Cleveland divisions of the Wheeling & Lake Erie Railroad, the Wabash-Pittsburg Terminal Railway and the West Side Belt Railway at Canton. Mr. Wood's steam railroad experience, however, dates from his connection in 1881 as telegraph operator with the Grand Trunk Railway.

MR. T. F. GROVER has been appointed general manager of the Terre Haute division of the Terre Haute, Indianapolis & Eastern Traction Company, which owns the properties of the Terre Haute Traction & Light Company, including the local railway and lighting plants in Terre Haute and Brazil and the interurban railways from Haute to Brazil, Clinton, Sullivan, St. Mary's and Paris, and entered upon his duties June 1. Mr. Grover, who since 1905 has been employed in consolidating the street railway, electric and gas properties in and about Trinidad, Col., has been identified with electrical interests since the electric current was first introduced on a commercial scale. He was born and brought up in New Jersey and the East, but has been in the Northwest since 1892. He was the superintendent of the former Milwaukee & Wauwatosa Electric Company, which he left in 1896 to go to Fond du Lac, Wis., where he acquired an interest in and was vice-president and superintendent of the then Fond du Lac Electric Company. Having secured a new electric light, street railway and gas franchise, he then formed the Fond du Lac Railway & Light Company, which later acquired the property of the Gas Light Company. In 1899 he built the street railway system in Fond du Lac, which in the following year was extended to North Fond du Lac. In 1902 the Fond du Lac & Oshkosh Electric Railway Company was incorporated, of which he was the general manager and later its president. This company was subsequently absorbed by the Eastern Wisconsin Railway & Light Company, from which Mr. Grover retired in 1905.

T. F. GROVER