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Of this issue of the Street Railway Journal 8000 *copies are printed. Total circulation for* 1907 *to date* 262,550 *copies, an average of* 8204 *copies per week.*

Standardizing Equipment

The work of standardization was considerably advanced at the Cleveland meeting of the committee on standards, a report of which appears elsewhere in this issue. The task laid out for completion before the Atlantic City convention is vast in its proportions and is especially difficult because of the great variety in practice in different parts of the country. Moreover, many of the companies have not yet exchanged rolling stock with each other to any extent, so have not yet experienced quite so acutely as others the desirability of uniformity in the dimensions of those parts capable of standardization. In this respect the subject of standards differs from that of the steam railroad companies. Nevertheless, under the able administration of Chairman Evans, order seems gradually rising out of chaos. Long sessions with the manufacturers disclosed many points upon which agreement could be reached, and while the work has not advanced far enough to warrant the final adoption of any proposed set recommendations an excellent start has been made. This work is to be supplemented by a second meeting to be held during the early part of September, at which it is hoped that the suggestions made at Cleveland will be crystallized around certain definite recommendations.

The Brass Foundry

In many distant parts of the country the high freight charges and the difficulty of getting prompt deliveries have lead to practices which would not be feasible under ordinary conditions. Many of these "home-made" appliances and methods have been described from time to time in these columns and have proved useful to those who, on account of their location, are thrown largely on their own resources. A recent letter bearing upon this subject makes the inquiry as to the proper method of conducting a brass foundry.

A road operating but a very few cars, say less than a score, might find it unprofitable to organize a brass foundry, but as the number of cars increases above fifty or thereabouts the advantage of making one's own castings where a road is some distance from the base of supplies is frequently apparent. On one road operating some seventy cars a small brass foundry was installed in a corner of the shop and trolley wheels, bearing shells, handles for the mechanical operation of reversers, spiral rings; brass fittings for the car interiors, window catches and other appliances have been turned out, if not for less than the market price, at least more quickly than could have been obtained otherwise. One of the shop carpenters makes the original patterns in wood; these are then duplicated in aluminum if the product is to be repeatedly used, and the road becomes independent of the weather changes which are liable to cause shrinkage or other distortion in the wooden patterns.

It is not even necessary in small brass foundries for the labor expense to be continuous; that is, the man in charge can be utilized on other work part of the time, and when the days for pouring off come around, one of the shop employees can be pressed into service to help operate the brass furnace. This is the plan followed in the case above mentioned, the foundryman devoting his time to babbitting bearings when he is not at work on the flasks or the brass furnace equipment. The scrap of the brass foundry can be reclaimed profitably in these days, even to the metalliferous

sand on the floor beneath the point where the furnace discharges into the pouring ladle. Provision for proper ventilation is an important point to secure in small foundries as well as adequate lighting, but the expense of doing these things is a small matter if care is taken to shut off power when it is not needed. Elaborate equipment is not necessary, but the foundry work should be done by an experienced man commanding first-class wages, for the foundry is no place for the costly experiments of incompetent employees.

Delta vs. Star Transformer Connections

The relative advantages of delta and star transformer connections frequently come up in the selection of three-phase power house and sub-station equipment, both with and without a grounded neutral connection. No hard and fast line can be drawn between the sizes best adapted to each style of connection, and a proper decision can only be made with local conditions in mind, influenced by the characteristics of delta and Y windings as modifying the price, weight and reliability of the capacities demanded.

With the delta connection the pressure across the terminals of one phase is the same as that of the circuit to which they are connected, but in case of a Y connection, each winding furnishes only 57.7 per cent of the line or bus potential. The current in one leg of a delta winding is 57.7 per cent of the line current, while in a star system each leg carries 100 per cent line current. For a given transmission voltage the star connection theoretically allows the use of smaller transformers, although the actual saving is not large, and the installation is not subjected to over 58 per cent of the voltage, normally. The size of the wire must be increased, but in small transformers, where the insulation takes up a considerable portion of the volume of the coil, and where the wire is of small cross-section, the star connection probably gives a better mechanical construction. Less insulation is required when the neutral is grounded or than when the delta connection is employed. With the grounded neutral there is less strain on the apparatus in case the line grounds.

As the sizes of transformers increase, the insulation advantages of the star connection become of less moment, and the flexibility of the operating arrangement tends to become important. If the transformers are connected in delta and one coil breaks down, the voltage relations are not seriously disturbed, and the transformers will keep in service. The faulty one can then be disconnected and three-phase current at full line potential obtained from the other two. In a three-transformer Y system, in case of the failure of one unit, the tendency is for the entire system to break down, though with a grounded neutral operation will be possible in many cases. Generally speaking, therefore, the reliability desirable in heavy power work seems better served by the use of the delta winding, though in very high potential practice the Y should be considered seriously on its merits as applicable to the conditions so far as known.

Limitations of Through Service

The extension of through car service in electric railway work shows little sign of abatement in sections of the country where high-speed operation is feasible, and in the last few years there has been a remarkable enlargement of through car facilities even in populous regions like Eastern Massachusetts, where the roads, in the main, occupy the highways between the cities and towns connected. It is important, however, to bear in mind the limiting conditions of through service, in order that the expansion of such facilities in the future may proceed along lines calculated to develop the maximum traffic.

The mere condition of a continuous track connection between two distant cities is by no means all that is necessary to encourage through riding, and the operation of cars from terminus to terminus without change does not in itself insure the development of heavy travel. In some communities the through service furnished is encumbered by such slow schedule speeds that the advantages of lower fares than rival steam lines charge are insufficient to persuade persons whose time is valuable to take the trolley. Often the physical limitations of the route preclude fast running. Whatever the conditions may be that choke swift movement between important centers, it is becoming more and more important for the electric railway manager to be able to look at the service from the standpoint of the prospective passenger, as well as from the railroad point of view. It is not enough to figure on a certain traffic induced by one or two paramount advantages over competitors; cleaner service and cheaper fares are strong points in favor of the electric railway in about all localities where it has been introduced, but these do not offset with all classes of riders the time element, the factor of safety in travel, the comfort and the reliability of competitive lines. The mistake of looking at the attractions of the service separately has often been made, and nothing is more certain than that the purchasing public will weigh a large number of conditions in the long run before it settles upon any one line of transportation in the face of keen competition.

It sounds like repeating platitudes to enumerate the essentials of a successful through service, but it is constantly being demonstrated that only that service which offers the most attraction for the price charged will win out in the continued patronage of the public. In some parts of the country the choice of facilities is exceedingly limited, but in others it is so broad that every time a man patronizes a railroad a choice between several is exercised. It is safe to say that no single condition settles the problem in the minds of the public as a whole. Some will be reached by the convenience of the stops, others by the frequency of the service, others by the transfer privileges accorded, and so on. The longer the run, however, the more important certain factors become, notably the total time required for the journey, the competitive fares and schedules of other lines, and the comfort of the rival facilities. Some of the conditions of travel are necessarily antagonistic—convenience in stops must often be sacrificed to speed requirements, and the longer the run, the less is the allowable number of inter-terminal stops. Compromises are essential in the shorter runs, but as the service broadens out to cover points a hundred or two miles apart without change of cars, it is clear that speed and comfort will go far to offset the inconvenience of a single stop in small towns and two or three in the larger centers, except, of course, in cities where the population runs up into the scores of thousands. On

such runs as this the traffic cannot be captured simply by a difference of 25 or 50 per cent in fare over that of competing steam lines unless the difference in fare is worth more to the passenger than the extra time required to cover the route. The value of time is so great in these days of shortened hours of labor and intensified human production that unless the long-distance through trolley car makes a schedule reasonably close to that of local steam trains, or even better, it cannot expect to secure as large a share of the travel as would be the case with a little faster service. Thus if it "spoils a forenoon" to go from A to B by through trolley at a cost of 50 cents in 2.5 hours, the rival charge of $1 from A to B on the steam line competing by a run of 1 hour will look insignificant to the man whose time is worth over 33 cents an hour. Pleasure travel is another matter, of course.

It may be safely assumed that a fast schedule is the prime essential—safety, of course, included—of all through runs over the longer distances between terminals. High-powered equipment may or may not be necessary, but the track must permit sustained running at good average speeds with comfort to those on the cars. It costs money to maintain such tracks, but with careful management the work should be afforded under reasonably good traffic. By cutting down all superfluous stops and slowdowns and making prompt changes of cars at junctions the need of high maximum speed can be diminished. A sustained high average speed is the key to the situation in competitive through travel.

The Size and Capacity of Car Shops

In the design of new power plants or the extension of existing stations, the problems of building size and machinery capacity seldom suffer from the lack of careful study on the part of the management of each system. To a certain extent this is true of car-shop designs, but there is still need of a broader appreciation of the possibilities of future growth in many instances. It is a chronic complaint, even among master mechanics in comparatively new shops, that the different departments soon are cramped for space, and the result is invariably either a reduced repair output or a performance of work under discouraging handicaps.

Of course, there is a practical limit to the size of car shops which should be afforded by a particular system, and doubtless it is sometimes necessary to pare down the dimensions somewhat below those which seem ideal to the shop executives. But the usual experience of being hard pressed for room soon after the shops are finished and sometimes before all the machine tools are set up, indicates the need of building larger structures and allowing more floor space per department than seem absolutely necessary with a liberal eye toward the future. With the old wooden car houses and shops the space question could be solved easily enough as time passed, provided the company owned enough land at the site. As brick and steel came into vogue the cost of enlargements and extensions increased, and now, as concrete, reinforced or in block form, is rapidly coming into favor, the expense of alterations leading toward more capacity is plainly a serious matter. In many cases it is next to impossible to enlarge a shop along the symmetrical lines which we see in so many of the broadly conceived power-plant designs.

Extensions of storage tracks and inspection pits are easier problems to solve than the enlargement of machine, forge, store and winding departments. If the worst comes to the worst, storage space for cars can be arranged elsewhere on the system and inspection pits provided beneath one or more of the old storage tracks. By the use of a little finesse in rearrangement, the paint shop's ministrations can be extended over a wider area. New storage bins and racks may be added in various parts of a group of shop buildings, but unless the storeroom is located in a place where symmetrical expansion is possible without sacrificing its centralization of access, the operating convenience of this important branch of the shop is sure to be greatly hindered. Motor-driven machine tools with individual outfits independent of the usual line-shaft and group-belting facilitate the extension of the machine shop, but unless the enlargement of the machine room floor space proceeds along lines symmetrical with respect to the hoisting facilities, pits and tracks already in place, the cost of handling work and the delays in preparing for repairs are certain to increase beyond desirable bounds.

In the forge shop and winding departments it is highly desirable that truck parts and armatures, field coils and contactor equipment shall be transferred between the car and the shop division with the least delay and with the least possible obstruction to other operations. Expansion of the forge shop into adjacent rather than adjoining quarters tends to interfere with the work in other parts of the establishment, unless the new quarters are on the opposite side of the leading in track layout. In the most carefully planned shops for electric railway repairs full attention is, or should be, given to avoiding idle or return travel as cars and parts journey from point to point.

Shop size, as evidenced by floor area per department, is not the final factor which settles the speed and cost of repairs. A satisfied force of men provided with plenty of labor-saving machine tools will produce a far greater output than a poorly paid and ill equipped force in larger quarters. The use of home-made contrivances for facilitating repairs in simple, but effective, ways is a powerful agent in the reduction of shop costs. It is a mark of clean, honest loyalty to a company's best interests that in so many shops, particularly on small roads which cannot afford extensive facilities, the shop force takes pride in making economical repairs and a progressive interest in doing first-class work under obstacles which would daunt a poor mechanic or one without the desire to do his best all the time. The recommendations of the master mechanic should always be carefully considered in reference to extensions either of plant or equipment, and their advisability discussed as thoroughly as a request of the chief engineer for a new generating unit. Floor space rarely is wasted when a first-class master mechanic takes command in an electric railway repair shop. If the desired areas work out as much too costly, nothing is lost in explaining the whole situation from the viewpoint of the management. Larger shops than at first seem necessary are a serious need at the present time on many well-operated properties.

THE PITTSBURG & BUTLER STREET RAILWAY CO.—I.

BY M. N. BLAKEMORE

The prevailing inclination toward higher speeds on interurban electric railways calls for a roadbed and equipment closely approximating standard steam railroad practice. This has been exemplified by the measures adopted by the Pittsburg & Butler Street Railway Company, whose single-phase equipment was placed in regular service on May 1.

The total length of the road is approximately 39 miles, of which about 6 miles include the trackage of the Pittsburg Railways Company, which secures the entrance into Pittsburg. Except for this part of the road, and about 3 miles in the borough of Etna, and also through the towns of Valencia and Mars, the route is over a private right of way. In Butler, the cars use the tracks of the Butler Passenger Railway Company, an affiliated concern.

Butler is the county seat of Butler County, has a population of about 28,000 persons and is an aggressive and prosperous town. Besides the local business it boasts of several large manufacturing concerns, among which is the Standard Steel Car Company, employing several thousand hands. The other towns which are connected by this road have a varied population, but with the opening of the electric road the population is expected to increase considerably, owing to the excellent facilities offered. The cities of Pittsburg and Allegheny have a population of 321,616 and 129,896, respectively, so that a large amount of travel on the road is assured.

The country traversed by this line, while largely agricultural, is rich in coal and oil and on this account is well populated. While the Baltimore & Ohio Railroad connects many of the towns in this district and parallels the electric road a great distance of the way, it has been the aim of the Pittsburg & Butler Street Railway Company so to plan its route as to serve the principal localities as well as the more remote ones, and at the same time to follow the most direct route between Pittsburg and Butler, the two terminals of the road. This procedure necessitated a great deal of structural work along the line and involved many new engineering features, as the country covered is extremely hilly.

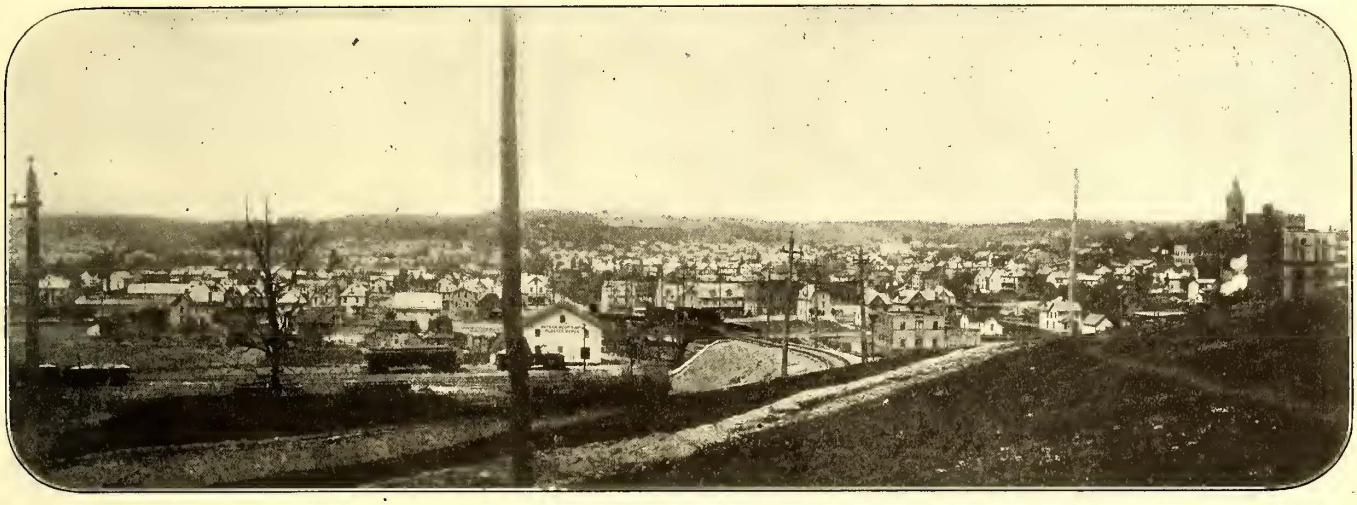
As the road has adopted the single-phase railway system as designed by the Westinghouse Electric & Manufacturing Company, by whom it was also installed, there are many radical departures from the customary street railway practice and the installation presents, on the whole, many interesting features which it is intended shall be described in this article.

POWER STATION OF PITTSBURG & BUTLER RAILWAY AT RENFREW, SHOWING DAM

POWER HOUSE

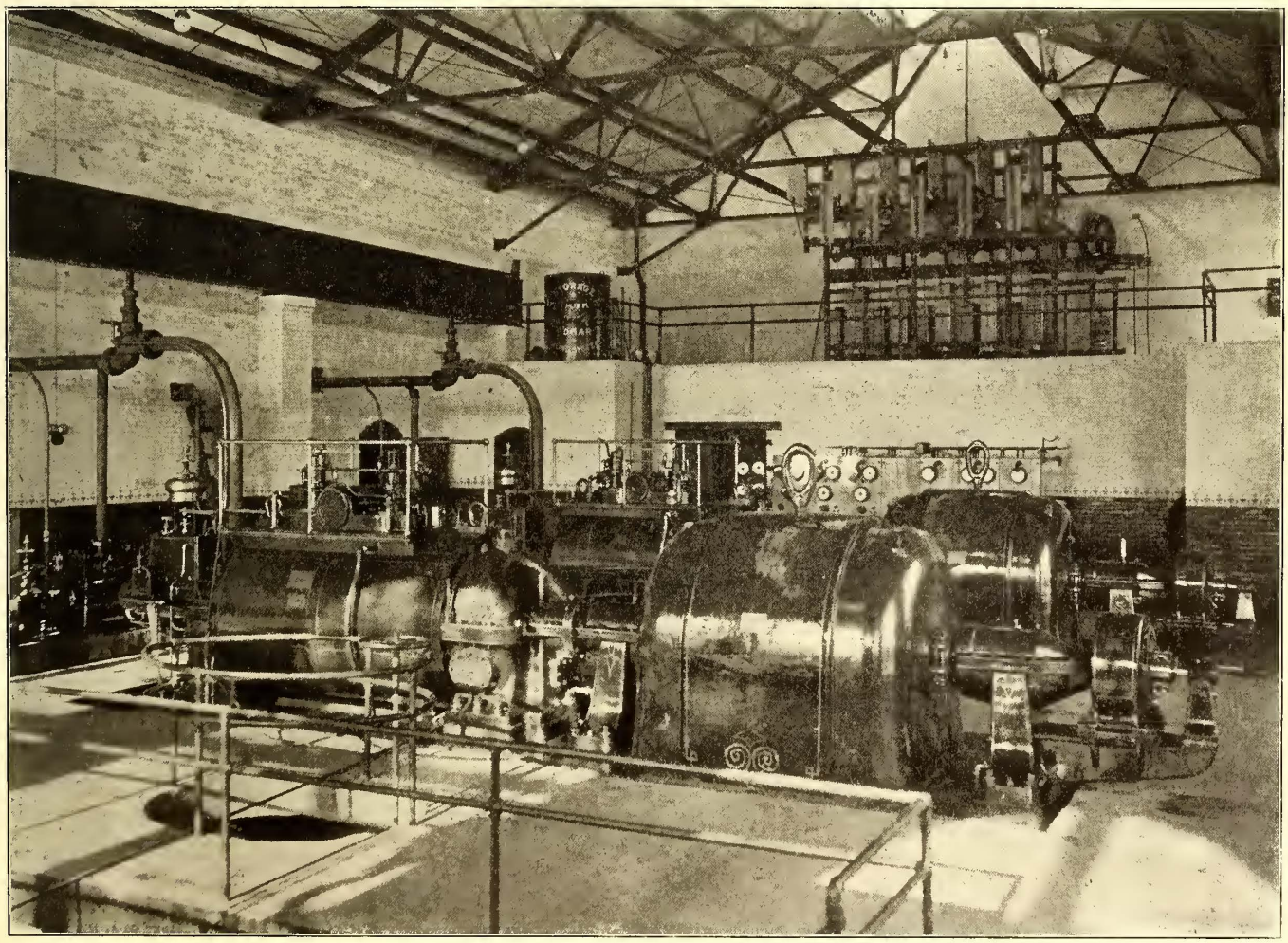
The situation of the power house, at the confluence of the Connaquenessing and Thorn Creeks, about 6 miles from Butler, affords ample water supply to meet all present and future requirements of the plant. It is also adjacent to the tracks of the Bessemer & Lake Erie Railroad and a spur of the Baltimore & Ohio Railroad has been run along the side of the power house, thus giving facilities for the handling of the coal, which is dumped through an open trestle into an extension of the boiler room floor on the outside of the building into which it can be taken through suitable doors which have been provided for that purpose.

The power house, as illustrated in the accompanying engraving, is of pleasing design and is built of pressed brick and measures 105 ft. 10 ins. wide x 98 ft. 7 ins. long.



PANORAMIC VIEW OF BUTLER

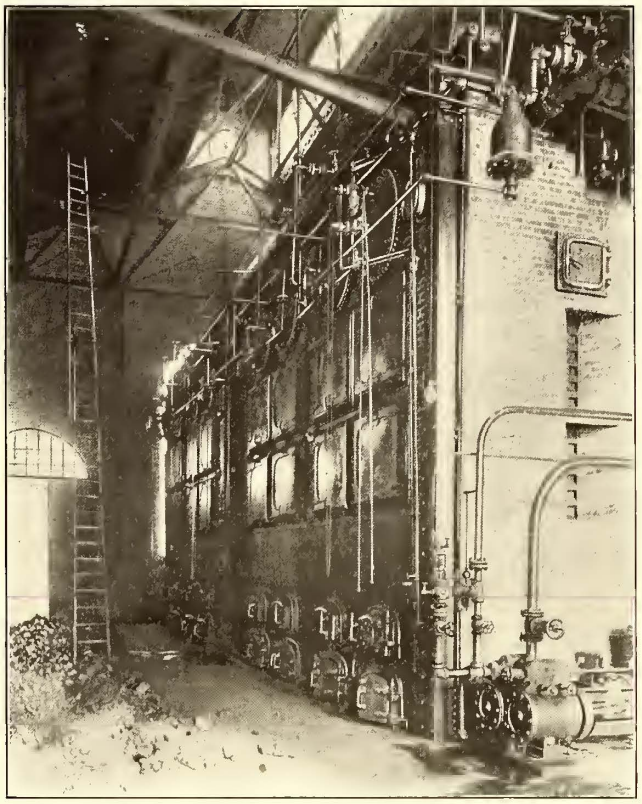
It is divided longitudinally into the boiler and turbine rooms, which measure 49 ft. 0 in. and 52 ft. 0 in. in width respectively. Ample light and ventilation are afforded by means of a skylight which extends the entire length of the boiler and turbine rooms. The illumination at night is supplied by means of Nernst lamps, receiving their current from step-down transformers in the high-tension transformer room. In addition to this, large windows are provided on all sides of the plant. The roof of the building, which is covered by Bangor slate, is supported by means of a light steel framework, which in turn rests upon the brick walls of the power house. One end of the turbine room has been partitioned off into a toilet room provided with lockers and shower bath, while the remaining part forms the high-tension room for the raising transformers. The ceiling of these two rooms forms the floor of the high-tension switching gallery. A 30-ton Whiting crane serves the ma-



INTERIOR OF POWER STATION OF PITTSBURG & BUTLER RAILWAY

chinery in the turbine room. This crane runs on a 50-lb. rail, supported upon a 35-in. steel girder, which is mounted upon brick pilasters forming a portion of the station walls.

The foundations of the building are of concrete, the aver-



BOILER ROOM

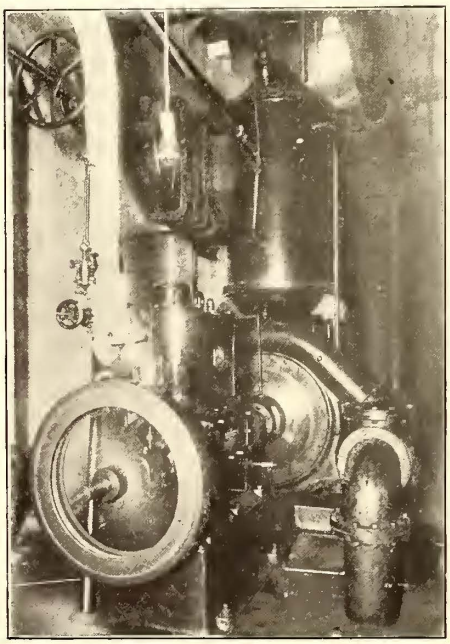
age thickness of which is about 24 ins. The base, however, varies from 3 ft. to 6 ft. at the pilasters. On the boiler room side the pilasters have been extended so as to form the foundations for the railroad siding of the Baltimore & Ohio Railroad, to which reference has already been made. One point worthy of notice is the ample space provided in the boiler room. Contrary to usual practice, a large unobstructed space has been left at the rear of the boilers which allows ample room for cleaning or repairs. A large amount of headroom has also been provided above the boilers, which affords ready access to the valves and fittings.

Running the entire length of the building, under the boiler room floor, and in front of the boilers, is a concrete tunnel, varying in height from 5 ft. 4 ins. to 6 ft. 4 ins., and 5 ft. 0 in. in width, which has been provided for handling the ashes and refuse from the boilers. This tunnel is supplied with a narrow-gage track upon which a small ash car may be run. When loaded, the ashes are pushed to the end of the tunnel and are there raised by means of an elevator to the surface, where they are hauled to the dump.

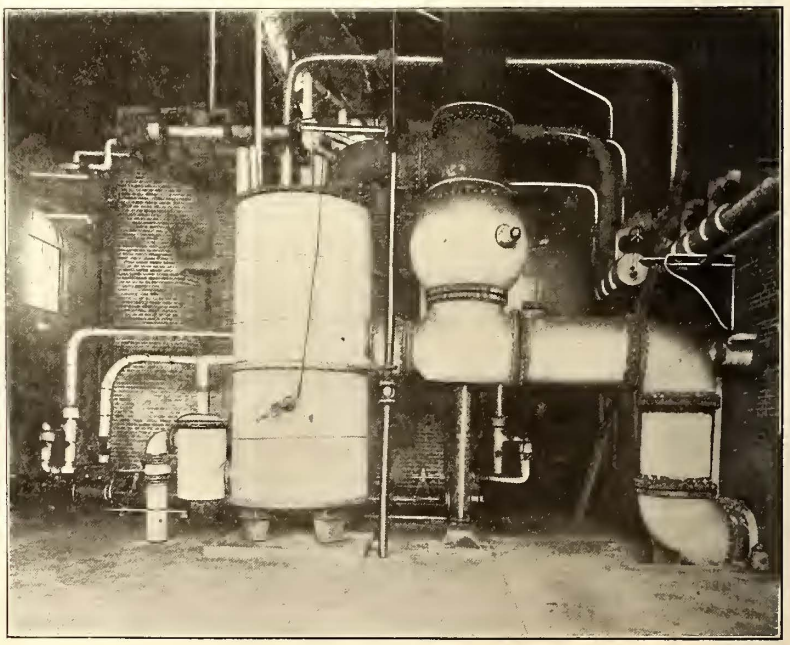
The stack is built of Kellogg radial hollow tile and stands 125 ft. in height above the under side of the breeching. The stack rests upon a concrete base 16 ft. in diameter and 16 ft. deep. The external diameter at its base is 14 ft. 10 ins., while the internal diameter is 10 ft. 6 ins. The internal diameter at the top of the stack is 9 ft. 0 in.

In order to secure an ample supply of water a concrete dam has been constructed near the power house site. The condensing and boiler-feed water is carried through a concrete tunnel to the power house. The water enters an intake some distance above the breast of the dam through a settling basin containing movable screens which prevent foreign substances being carried through the tunnel. This basin is filled with coke which thoroughly filters the water, thus insuring its cleanliness. The intake tunnel, measuring 2 ft. 6 ins. x 2 ft. 6 ins., extends the entire length of the building below the condenser room floor, thus materially cutting down the length of pipe to the condensers and other apparatus, which would otherwise be required.

A discharge tunnel, 2 ft. square, running parallel to the intake tunnel, also extends the full length of the condenser room. From the power house this tunnel extends to a point near the creek where it divides, one branch going above the breast of the dam, while the other empties below the dam. Each of these branches is controlled by means of a 30-in. gate valve. Under normal conditions, when the creek is high, the outlet above the breast of the dam is closed, the

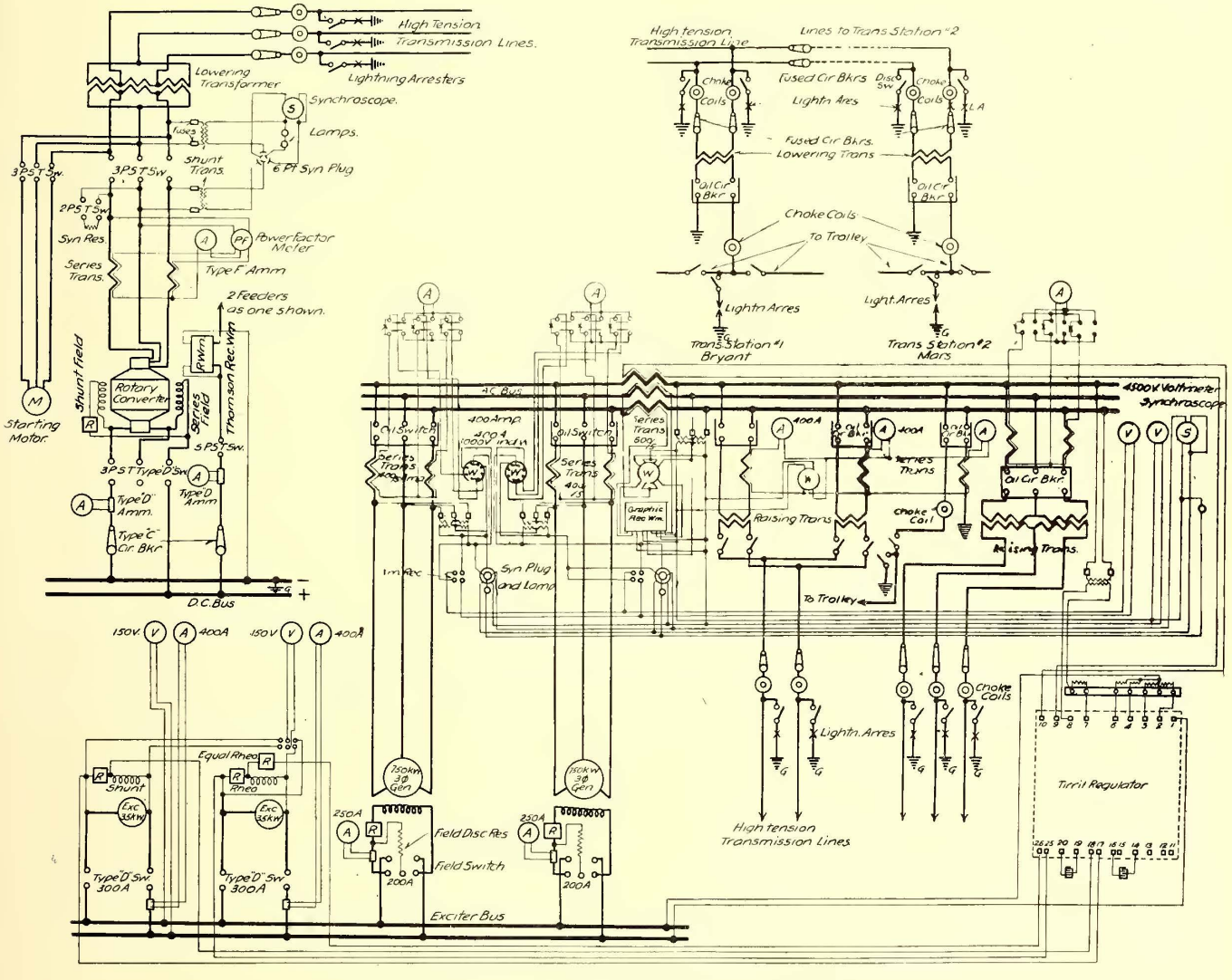


CONDENSER OUTFIT



INTERIOR OF BOILER ROOM, SHOWING HEATER AND PIPING ARRANGEMENT

condensing water emptying below the dam. When the creek is low, the upper outlet is opened, the lower one being closed and the condensing water then empties above the dam, and it eventually re-enters the intake tunnel again and in this manner it is used an indefinite number of times, the creek forming a large cooling basin for the discharge water. In connection with the intake and discharge tunnels, it is to be noted that both of them form an integral part of the power house foundations and are provided with pockets for the collection of sediment and foreign particles. Each of these pockets has a manhole rendering it accessible for cleaning.



SCHEMATIC DIAGRAM OF CONNECTIONS OF SYSTEM

BOILERS

The boiler plant at present consists of four 350-hp Babcock & Wilcox water-tube boilers set in batteries of two boilers each. Provision, however, has been made for an additional battery of boilers to take care of the future extensions of the turbine plant. They are designed for a working pressure of 160 lbs. per sq. in., and each boiler has a total heating surface of 3500 sq. ft. The boilers are of the double-deck type and have 4-in. tubes. They are provided with a superheater capable of superheating the steam 125 degs. F. when working under normal pressure. At present firing is done by hand, but provision has been made so that stokers can be installed if it is decided to do so at a later date. The contents of the ash pits are deposited by gravity into chutes terminating over the narrow-gage railway in the ash tunnel above referred to.

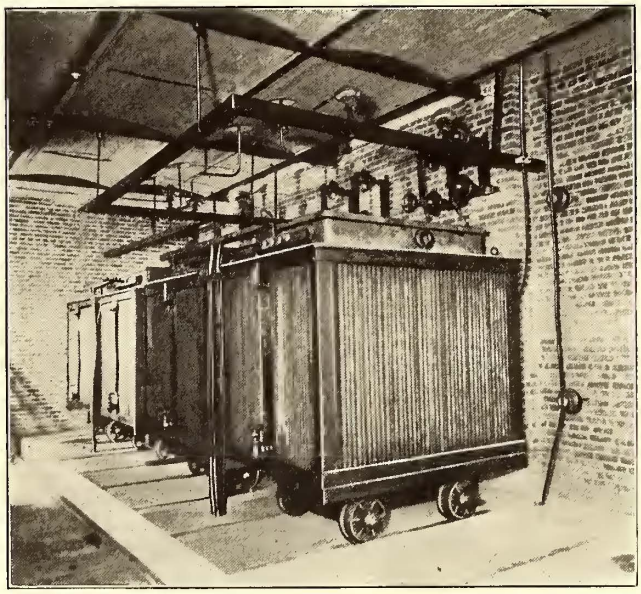
Each battery of boilers is supplied with an independent Epping-Carpenter 12-in. and 7 x 12-in. feed pump, and is fed by duplicate feed-water pipes, so arranged that either pump can be used to feed either or both batteries of boilers. This system of water supply is the only one which is duplicated in the power plant, but it has been found advisable to do so in this instance in order to insure a constant supply of water to the boilers in case of accident to one set of supply pipes. Each feed line is equipped with a Worthington water meter.

The boiler gases are conveyed to the stack through a 13-ft. 2-in. x 5-ft. 8-in. flue, which extends along the rear of the boilers about 10 ft. from the ground. Passing through the end of the boiler room it makes connection with the stack above described. No attempt has been to localize the gases from individual boilers, but all discharge into the common flue. Each boiler, however, is provided with a Ford automatic damper regulator. Each individual boiler is also supplied with a Williams feed-water regulator, by which the boiler feed-water supply is controlled.

PIPING

Two complete systems of piping are provided in the plant, one for saturated and the other for superheated steam.

The superheated steam is carried from each boiler through a 6-in. heavy steel pipe, which is provided with screwed male and female flanges. Each of these supply pipes is provided with a 6-in. stop and check valve, which controls the supply of steam to the 10-in. header running along the



INTERIOR HIGH-TENSION ROOM, SHOWING 500-KW OIL-INSULATED, SELF-COOLING TRANSFORMERS

boiler room wall. From this header the supply for the steam turbines is conveyed through a 6-in. steel pipe. The saturated steam passes through a 2½-in. stop and check valve on each boiler, through a 2½-in. pipe to the main 6-in. header, mounted beside the 10-in. super-heated steam header above described. Both of these headers are supported by means of cast-iron brackets supplied with roller bearings to provide for the expansion and contraction of these pipes. The expansion and contraction of all other piping is taken care of by means of long bends.

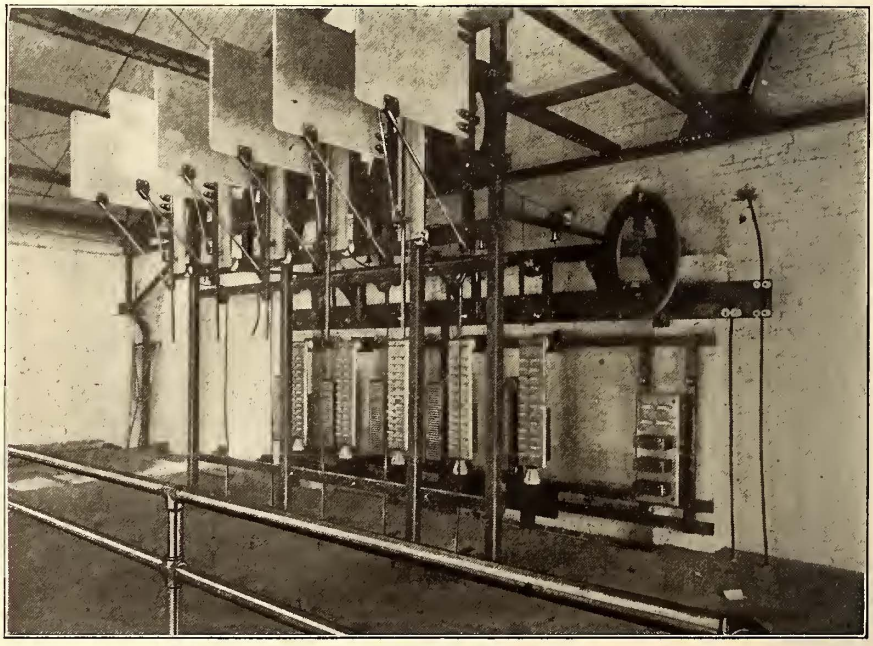
If, for any reason it is desired to connect the superheat and saturated steam headers, this can be accomplished by means of a 6-in. pipe connection which has been provided between these lines, the same being controlled by a suitable gate valve. The piping is so arranged that if it is desired the plant can be run on the unit system, each individual bank of boilers supplying steam to its own turbine. Ordinarily, however, this procedure is not resorted to. The auxiliary machinery is operated entirely from the saturated steam line.

HEATERS

In the boiler room adjacent to the feed-water heaters, there has been installed a 2000-hp Bonar vertical open heater, through which exhaust steam from all the auxiliaries passes. A special arrangement of piping has been provided by which the steam can be by-passed around the heater in the event of its being desired to clean or repair it. The exhaust from each steam turbine is taken care of by an 18-in. pipe supplied with suitable check valves. These pipes in turn discharge into a 30-in. main exhaust pipe, which is fitted with a 30-in. atmospheric relief valve. When operating non-condensing, the exhaust from the turbines also discharges into this Bonar heater, or it can be discharged to atmosphere through a 30-in. exhaust pipe fitted with a suitable exhaust head and drain.

CONDENSER

In the condenser room there have been installed two Epping-Carpenter 7½-in. and 8½-in. x 10-in. service pumps. The object of these pumps is to supply water to the heater, or to a storage tank located some distance from the power house. They also supply the gland water for the steam turbines, and the jacket water for the dry vacuum pumps. These pumps receive their supply either from the discharge tunnel or from the intake tunnel direct, depending upon whether the turbines are operating condensing or non-condensing. The condensers in the plant are of the Alberger Condenser Company's manufacture. The volute centrifugal pump forming a portion of these condensers is operated by means of a 6½-in. x 8-in. Westinghouse Junior engine receiving its supply of steam from the saturated steam header. The engine is connected to the pump by means of a flexible coupling. Each condenser is served by means of a 30-in. pipe provided with a suitable valve. The discharge from the condensers is carried through a 10-in. pipe into the discharge tunnel. In order to maintain a positive vacuum in the condensers, each is supplied with a dry vacuum pump and with condensing water at a temperture of 70 degs. F. they are capable of maintaining a vacuum of 28 ins. The condensers each have a capacity of 15,000 lbs. of steam per hour; all piping for these condensers is located below the turbine room floor with the exception of the air-discharge line from the dry pumps.



HIGH-TENSION SWITCHING APPARATUS AND LIGHTNING ARRESTERS IN POWER HOUSE

The live steam lines are connected to the Holly system for the extraction of the condensed steam in these pipes, and to effect its return to the feed-water heater. The trap is located in the condenser room, while the reservoir, for securing sufficient head, is located above the boilers. In like manner, the exhaust piping is provided with returns to a Bundy trap, placed in the condenser room which pro-

vides for the return of the condensed steam to the Bonar heater.

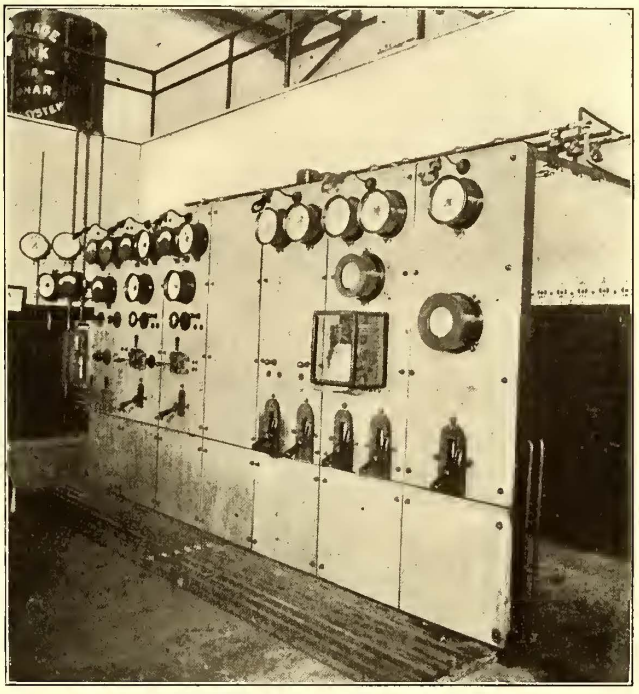
FLANGES AND VALVES

All of the live steam piping in this plant is of extra heavy steel, provided with male and female flanges screwed and peened. The low-pressure piping, as well as pipes conveying the water supply, are of cast iron with standard flanges. Chapman valves are used throughout.

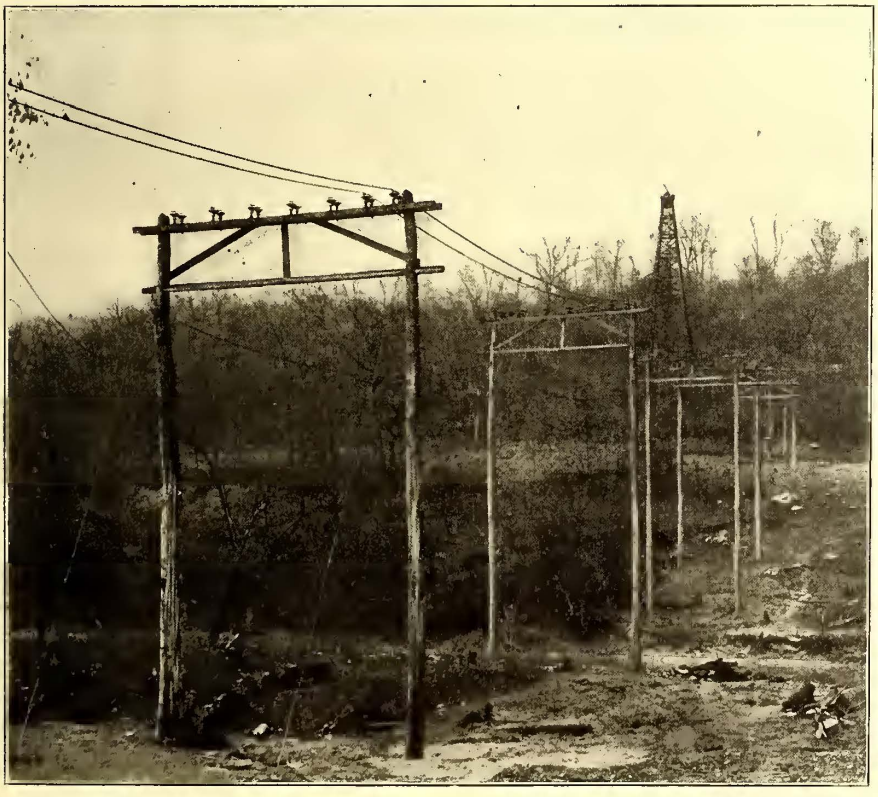
TURBINES

The steam plant at present, as illustrated in the engraving, consists of two 1125-hp multiple expansion, parallel flow, Westinghouse-Parsons steam turbines, each adapted for driving a direct-connected, 25-cycle alternator at 1500 r. p. m. Each unit is mounted upon a bed-plate of adequate rigidity, which in turn is supported on concrete foundations independent of those of the power house. The overall length of each unit, including generator and turbine, is 34 ft. 10 ins., while the width is 7 ft. 4 ins. and the height above the engine room floor level 8 ft. 10 ins.

The turbines are designed to operate with dry saturated steam, 150 lbs. gage pressure per square inch at the throttle, with pressure in the exhaust pipe of 28-in. vacuum. They are guaranteed to have a continuous overload capacity of 50 per cent and will further withstand 100 per cent overload momentarily. The lubrication of the main bearings is effected entirely by gravity with a continuous oil-circulating system, including a cooling reservoir in the bed-plate and a feed reservoir in the governor gear case. The circulating oil pump is directly driven from the turbine through a worm-gear on the turbine shaft. In addition to this rotary pump there is an auxiliary duplex direct-acting steam pump adjacent to each turbine, by which oil from the turbines, after having been used for a certain period is pumped into a Bonar filtering system. In addition, this also furnishes oil to the turbines during the periods of starting and stopping when the rotary pump is not in service. The oil-storage tank is mounted on the high-tension switching gallery, while the filters and small steam pump for raising the purified oil from the filters to the oil reservoir are in the condenser room. There is also a check valve provided with each turbine by which the lubricating oil can be by-passed around the strainer in the event this should become clogged with any foreign substance.



SWITCHBOARD



HIGH-TENSION LINES LEAVING POWER HOUSE

GENERATORS

Connected to each steam turbine by means of a sleeve coupling is a 750-kw, 3300/6600-volt, three-phase, 25-cycle Westinghouse alternator of the revolving field type. The armatures are star-connected so that single-phase current can be taken from any two terminals. The advantage of this type of winding is that a small amount of polyphase power can be secured at the same time that single-phase current is being obtained. This type of winding has an additional advantage in that if anything should occur to one of the single-phase windings, current can still be maintained by throwing the load over to another leg of the armature winding. The generators have been temporarily wound for delivering 3300 volts, but provision has been made so that they can be reconnected for 6600 volts when extensions of the road make this step necessary.

The winding of the generators has been so proportioned that with constant speed and excitation with 100 per cent power factor, the regulation will be practically constant when used in connection with an automatic regulator. The machines have a guaranteed overload efficiency of approximately 95 per cent, and will stand an overload of 50 per cent

for 1 hour, and an overload of 100 per cent momentarily.

On the division wall of the turbine room there has been installed a Westinghouse air pump, operated from the saturated steam header. This pump furnishes compressed air for cleaning the generators and other apparatus in the plant.

SWITCHBOARD

The switchboard is shown in the engraving and is located on the turbine room floor of the power house in close proximity to all machinery, and is made up of seven blue Vermont marble panels. The connections of the various circuits are indicated in the diagram reproduced on page 211. All of the instruments on the board are of the latest standard deadbeat type.

TRANSFORMERS

At present only four 500-kw oil-insulated, self-cooling transformers have been installed, although provision has been made to accommodate six transformers of this capacity. The arrangement of the high-tension room is clearly shown in the illustration. The transformers are wound for a ratio of 6600/22,000 volts, although at present they are operated with a primary voltage of 3300 volts. The low tension leads from the switchboard are conveyed to a point in front of the transformers where they are carried up to the transformer terminals. The high-tension bus-bars are located above the transformers, the wires being supported on insulators, which in turn are mounted on a suitably treated wooden framework. The disconnecting switches for the high-tension side of the transformers are mounted on the wall back of the transformers and are so arranged as to enable the operator to disconnect any transformer readily in case of a breakdown, or if repairs are necessary. From the high-tension bus-bars the wires lead up through large circular holes cut in the cement roof of the high-tension room.

For the ready handling of these transformers they have been mounted on wheels which run on short pieces of track connecting to a small car, which can be run in front of any transformer to enable its being removed to another position. Two of the transformers are connected in multiple for supplying single-phase current to the two static sub-stations along the line. The remaining two transformers are connected in open delta for supplying three-phase current to the rotary sub-station at Butler.

HIGH-TENSION LINES

In the gallery there is mounted the necessary number of high-tension fuse circuit breakers which control the outgoing high-tension feeder lines and are separated by means of large blue Vermont marble barriers. Behind the wooden framework on which these circuit breakers are mounted are located the lightning arresters and choke coils. Disconnecting switches are provided between the outgoing lines and the lightning arresters so that the latter may be disconnected from the line to allow for inspection and repairs. All of the high-tension framework is of especially treated wood and is so spaced and located as to afford ready access to all of the apparatus.

The outgoing feeder lines pass through the building in 12-in. terra cotta pipe, placed in an inclined position, thus preventing rain and snow from collecting at these points and gradually entering the building by way of the sides of the tubes or conducting wires. The anchorage for the high-tension wires at the power house is provided for by means of a suitable framework mounted adjacent to the exit of the wires from the building. A suitable covering has been placed above this bracket, thus effectually protecting the openings from the weather.

GAGE BOARD

A blue Vermont marble gage board has been placed on the wall of the turbine room, and on this has been mounted a clock recording steam-pressure gage, a pyrometer, a steam gage, and two vacuum gages, each connected to its own condenser.

In the next and concluding portion of this article, the equipment of the Pittsburg & Butler Street Railway, outside of the power station, will be described.

OVERCOMING CONDENSER TROUBLE AT BROCKTON

A. H. Warren, writing for the "Public Service Journal," published in the interest of Stone & Webster, of Boston, relates some condenser troubles at the power station of the Brockton & Plymouth Street Railway Company, and tells how they were overcome. This station, which was completed early in 1900, was provided with two Blake vertical condensers piped to pump salt water. Owing to a galvanic action set up by the salt water between the metals in the condensers, the condenser bases caused much trouble and expense until a remedy was recently tried which proved effective. In January, 1901, it was discovered that the iron studs in No. 1 condenser, which held the auxiliary cylinder in place, had been badly eaten. Angle-irons were made and fitted to supplement the studs. In October, 1901, the old iron studs were drilled out and replaced by bronze studs.

In July, 1902, it was found that the valve deck of No. 2 condenser base was badly eaten and useless; so a new cast-iron base was installed. This old base was repaired by boring out the valve deck and valve chamber and fitting a Tobin bronze lining, and the relined base was put under No. 1 condenser in January, 1903, and the base then removed from No. 1 was lined with Tobin bronze. In March, 1903, this second relined base was put under No. 2 condenser, replacing the all cast-iron base which had been installed in July, 1902.

By February, 1904, a hole had been eaten through this No. 2 base at the bottom, where it rests on the foundation. This hole was drilled and plugged. By December, 1904, the walls which separate the auxiliary suction chamber in this same base were destroyed, opening a clear passage through the auxiliary cylinder to the atmosphere. The auxiliary cylinders were taken out and the holes through the valve decks and main plungers covered with bronze plates, thus doing away with the auxiliary cylinders.

The frequent and expensive repairs had all been due to the eating away of the iron of the bases. As a remedy it was decided to introduce metal plugs or pencils, in the hope that the galvanic action would be attracted to these pencils. The pencils were of zinc, about 6 ins. long, and were introduced in the suction chamber of No. 2 condenser. This was in December, 1904, and although this condenser has been in almost constant service since, and was at that time badly eaten away in places, it has given no further trouble, and the deterioration of the iron seems to have ceased absolutely. The pencils, on the other hand, are eaten away quite rapidly, requiring renewal, but at a trifling expense.

The old lined base under No. 1 condenser has recently been replaced by a cast-iron base with several zinc pencils.

HANDLING TRAFFIC IN BOSTON OLD HOME WEEK

The Boston Old Home Week celebration, which was held during the week of July 28 to Aug. 4, imposed unusually severe and varying traffic conditions upon the system of the Boston Elevated Railway Company. With thousands of visitors entering the city the service to and from the North and South stations had to be strengthened, the regular morning and afternoon peak traffic to and from the business district had to be handled, and the service leading to special sections where parades and illuminations were in order was necessarily heavy in volume of traffic and frequency of cars. At times large areas of the business district were entirely shut off to permit the passage of parades, and cars had to be diverted from accustomed routes and new routes established through the crooked and devious thoroughfares of the city proper. The service given during this period, however, reflects great credit upon the Boston Elevated; there were no blockades of any consequence, and enough cars were provided at points where the public gathered in mass to meet every reasonable demand for accommodation, though division of routes and the concentration of rolling stock upon tracks leading to points of public interest necessarily lengthened the time of transit somewhat. The subway and elevated lines were, of course, of the greatest value in providing routes through the city absolutely independent of street obstructions and surface congestion in general. Heavy riding began on the evening of Saturday, July 27, when the general illumination of streets, parks and business houses was inaugurated. Throughout the entire week the company's private branch telephone exchange at the Milk Street headquarters was of the utmost facility in the movement of cars.

On Sunday, July 28, heavy riding occurred from 3 to 11 p. m., most of this being inward bound to the city in contrast with the usual outward flow of traffic at this time in the week. A band concert on the Common, with an address by Vice-President Charles W. Fairbanks, together with the evening illumination, furnished the attraction for many thousands of extra inward passengers. The service on lines focussed on the center of the city was increased about 25 per cent. On account of the short headway employed on the elevated division, the extra traffic there was handled mainly by adding more cars than usual to the trains. On Monday, July 29, an extra car service of 10 to 15 per cent was provided at the main steam railroad terminals throughout the day. At night an electrical parade in the Back Bay, lower West End and Cambridge districts attracted spectators from all parts of the metropolitan district. Service was increased about 100 per cent on this occasion. Between Massachusetts Avenue and the Public Garden via Huntington Avenue the route of the parade overlapped the inward flow of traffic, and to give the parade the right of way, and at the same time provide car service for persons wishing to enter the subway from the west via the south side of the Back Bay, cars were diverted down Tremont and Boylston Streets and Columbus Avenue, the inward bound Huntington Avenue track being free for the parade, which consisted of about twenty electric car floats operated by Boston Elevated crews. Cars followed and preceded the parade closely, and the tracks inbound were not closed for over half an hour. Cambridge, Allston, Brighton, Newton and Brookline cars were handled as usual through Copley Square and passed into the subway with accumulated Huntington Avenue cars directly after the parade. At junction points the street inspectors passed the cars over the lines as fast as was feasible without regard to their origin. At the close of the parade the crowds poured into the Back Bay and subway lines. This traffic was handled by the accumulation of a large number of extra cars behind and also laterally related to the parade. Movement was free between Harvard Square and the Back Bay.

On Tuesday morning, July 30, a veteran firemen's parade in the Back Bay and central business district was held, and the inbound distributed service increased about 10 per cent. The business district was closed to vehicles of all kinds from Boylston Street to Adams Square. Through car service north and south was diverted mainly through Beach Street and along the Atlantic Avenue water front. New routes were made up to handle this business and the frequency of the schedules maintained by set-backs at the ends of routes. At the conclusion of the parade extra outbound service was afforded. In the evening a large number of extra cars were run to Jamaica Pond for an illumination and, as on other evenings, the electrical display in the heart of the city, and band concerts required extra facilities inbound and later outbound. On Wednesday morning, July 31, occurred a civic parade headed by Lieutenant-General Nelson A. Miles, with about 10,000 participants. This required about 2 hours to pass a given point, and the central business district was closed and cars diverted in the same general manner as on the preceding day. As this parade was not scheduled to start until 11 a. m., the inbound pleasure traffic in the forenoon was more evenly distributed than on the day before. Outward bound cars were very lightly loaded, but these were run to their terminals, reversed and brought back to the city to handle the flow of traffic outward at the conclusion of the parade; it is estimated that the latter was viewed by 500,000 persons. The absence of confusion in the car service was noteworthy. In the evening occurred the formal dedication of the new Longfellow Bridge across the Charles River between the West End of Boston and Cambridge. The new rapid transit line connecting with the Cambridge subway will pass over this bridge. The occasion was the scene of a competitive fireworks display, which attracted a large extra traffic and the car lines centering on the new bridge and Harvard Bridge were increased in service 150 to 200 per cent. New routes were placed in operation with these points as objective, and extra cars from other divisions of the system were sent to the river. The homeward travel after the exercises was handled in the reverse way.

The plans for the balance of the week were not materially different in scope from those already outlined. A large number of special cars for children were operated on Thursday, Aug. 1, and plans were made for diverting cars in the business section on account of an automobile parade. The latter did not interfere with the regular service to any extent, however. The plans for car handling during the military parade of Saturday, Aug. 3, were in general similar to those in effect during the civic parade on July 31. A prominent feature of the week's service was the widespread use of dasher posters on the cars advertising the principal events reached by specific lines.

During the eight days beginning Saturday, July 27, which was the day the increased travel began, the company transported 7,195,000 paying passengers. It is estimated that in addition to these paying passengers, 4,317,000 passengers were transported on free transfers, making the grand total of passengers carried 11,512,000.

WHEEL PRACTICE AT KANSAS CITY

The fact that almost every line of the Metropolitan Street Railway, Kansas City, is built over steep grades necessitates more attention being given to the wheel question than is accorded it by most of the companies operating the street railway systems in cities of equal size where the tracks are comparatively level. Through the courtesy of Charles N. Black, general manager, and George J. Smith, master mechanic, of the system, the following notes on wheel practice are made available.

In order to have definite data regarding the wearing qualities of different kinds of wheels, Mr. Smith has devised a system of records by means of which an individual record is kept of each wheel. When the wheel is scrapped its mileage can be obtained by simply a glance at the record.

WHEEL RECORD

On receipt of a shipment of wheels every one is stamped with an individual number. This relates to wheels which are not numbered by the maker. When wheels are removed from a car the foreman having charge of the work reports the fact to the shop office on a form which contains blank spaces for the car number, the date, the individual numbers of the wheels put on, and of those removed, whether or not the wheels put under the car were old or new ones, the kind of wheels, whether steel or chilled iron, and the cause for the removal of the old wheels. There

Form 419 Car No.

NOTE.—Report should be made to Master Mechanic same day wheels are changed.

METROPOLITAN STREET RAILWAY COMPANY.
WHEEL REPORT

190

Wheels Put On	Wheels Removed	New or Old	Kind	Cause of Removal

12353

Foreman.

KANSAS CITY WHEEL REPORT

are also received from the division superintendents monthly trip sheets showing total trips made by each car on their respective divisions, from which the monthly mileage of the cars is obtained. The wheel record which is made up from the data on the foremen's reports and the monthly mileage reports is kept in the form of a loose-leaf ledger, with separate leaves for each car. The leaves or sheets contain ten vertical columns, each one for one wheel. The columns are headed by the wheel numbers and below are spaces for the dates of removal of the wheels and when they were put under the car, the car from which they were removed, the cause of the removal, and the back mileage, if any. Below are spaces for the mileage for each month as obtained for the car from the monthly reports of the division superintendents. The space for back mileage is necessary because it frequently happens, for some reason or other, that a wheel is removed from one car before being worn out and is at a later date mated and placed under another car. In such an event the old mileage is carried forward. When the wheel is scrapped the total mileage is computed and is kept for future use.

In addition to the wheel record a separate index of the wheels is kept. At the time the wheels are received and numbered each number, with a brief description of the wheel, is entered in the index, and when the wheel is placed under a car the car number is entered opposite the wheel number. The index enables the past record of any wheel to be obtained by simply referring to the sheets of the wheel record, which is kept by car numbers, as indicated by the index. At the present time the wheel record sheets are made to last two years, but as the smaller per cent of the wheels are not in service a whole year the new sheets will be made to last only twelve months. To keep the record for 600 cars less than two hours' time per day of one man is required.

CHILLED WHEEL PRACTICE

The wheel record enables the company to determine definitely whether or not wheels fulfil the guarantee of the makers. At one time the company had an individual guarantee with the makers which required that every wheel make a certain mileage. The wheel record showed that while the average mileage was far above the guaranteed mileage of each wheel, several wheels fell below the minimum figure and for these the company was allowed credit. The variation of mileage obtained was, in some instances, 300 per cent. Some wheels ran 25,000 miles, while others ran three times this amount. At the present time the company has an average guarantee for each shipment, the maker allowing new wheels when the mileage falls short.

The average life of chilled iron wheels is about 40,000 miles. The records show the rather unaccountable fact that the life of plate wheels is considerably in excess of that of spoke wheels. The mileage obtained is probably lower than is gotten in other cities, and this is due largely to the fact that the wheels are subjected to very rough usage because of the excessive grades. It is not unusual to find fifteen or twenty flat spots on the wheels in that portion of the circumference that can be seen from one point. The mileage would be considerably less were it not for the fact that the flat spots are kept ground out. The grinding is accomplished by removing the wheels from the car and placing the axle in a grinder similar in many respects to a wheel lathe. Considering the conditions encountered, the absence of disagreeably flat wheels on the cars in the city is very noticeable, and some companies which operate in comparatively level cities would do well to follow a similar practice in grinding wheels.

At the Columbus convention the discussion regarding the width of treads indicated that it was a rather widely spread opinion that wide treads were the cause of much chipping and breaking of rims, due to the fact that rims were broken by the paving. Mr. Smith has found that since widening the treads from 2½ ins. to 3 ins. there has been a decrease in the number of broken rims and a very marked decrease in the chipping of flanges. The latter is attributed to the fact that the wide rims do not let the wheel down far enough in passing over special work to permit the flanges to strike the bottom of the throats of the frogs. Practically no trouble is experienced by broken flanges in the city. One reason which is regarded as largely responsible for this is that the track is set accurately to a gage of 4 ft. 8½ ins. on curves as well as on tangents, and that the wheels also are set to the same gage. This reduces the liability of the inside of the flanges striking special work and of binding or riding on the flanges when Trilby rails are employed. At the present time the flanges

on chilled wheels are 1 1/16 in. wide by 7/8 in. deep. On future orders, however, the flanges will be only 3/4 in. deep, as it has been found that after two or three months of service the flanges increase in depth about 1/8 in. Decreasing the depth of the flanges will decrease the liability of them wearing deep enough to be injured by special work. It is thought that a brake-shoe might be designed to keep the height of the flange down, but it is regarded as a more certain method to reduce the height in the first place.

STEEL WHEEL PRACTICE

The company has in service practically all of the cars used on the intramural railway at the Louisiana Purchase Exposition and which were equipped with all-steel wheels of M. C. B. cross section. It has been found that the treads are too wide for city service. As the wheels are set to gage, practically all of the wear is up next to the throat, and after a time the rim gets so high that it strikes special work and high spots in the paving. The difficulty has been overcome by turning the rim about 3/16 in. lower than the inner portion of the tread when the wheels are being turned up. Practically no trouble at all is experienced with sharp flanges on the steel tired wheels, and, as a result, when wheels are turned it is usually necessary only to true up the treads. Generally the inner portion of the tread of the smaller wheel is not turned down. In order to benefit it at all by turning at least 1/8 in. of metal would have to be removed. It is found more economical to turn the large wheel and then finish the other one by grinding the tread in the same machine as is used for grinding the chilled wheels. The saving of the 1/8 in. of tire adds considerably to the life of the tire. The M. C. B. section of the tires was for a time the cause of exasperation on the part of residents of a certain street in the city and considerable worry on the part of the railway company. After rains the wheels in traveling over a section of track laid with Trilby rails made an unusually loud and piercing sound. It was at first thought that the wheels would have to be abandoned, but investigation and experiment showed that the noise was caused by the cars riding on the inside of the flanges, which bore against the inside of the throats of the rails. After turning off an eighth of an inch or more of metal from the back of flanges of the wheels of several cars it was found that the noise ceased, and since that time all of the tires of the M. C. B. section have been treated similarly.

Metropolitan Street Railway Company. **Car No.**_____

WHEEL RECORD.

WHEEL No.									
KIND									
PUT ON									
REMOVED									
FROM CAR									
CAUSE OF REMOVAL									
BACK MILEAGE									
190 January Mileage									
February "									
March "									
April "									
May "									
June "									
July "									
August "									
September "									
October "									
November "									
December "									
TOTAL "									
January "									
February "									
March "									
April "									
May "									
June "									
July "									
August "									
September "									
October "									
November "									
December "									
GRAND TOTAL "									
DISPOSITION									

DETAIL WHEEL REPORT, INCLUDING MONTHLY MILEAGE RECORD

EXCURSION AND CHARTERED CARS AT SAN ANTONIO

The San Antonio Traction Company operates an excursion or sight-seeing car which takes in practically all the historical and interesting points in the city. The car makes two trips per day, about four hours being required to make the trip. The route is about 35 miles long, and a charge of 50 cents per passenger is made. It is provided with signs denoting its use, and a guide with a megaphone calls the passengers' attention to interesting places or relates bits of history concerning many of the old buildings in the city which are relics of Spanish and Mexican occupation. Advertising matter regarding the car is found in hotel lobbies and announcements are kept posted in the guests' rooms of the hotels. Before starting on the trip the car stops in front of the principal hotels and the guide with the megaphone enters the lobby and announces the arrival of the car.

The company derives considerable receipts from chartered cars, there usually being ten or twelve cars chartered per week for picnic parties or for trolley rides gotten up by different societies. The charges for an open bench car with a capacity for forty-five people is $3 for the first hour, $2.50 for the second hour and $2 for each succeeding hour.

A RADICAL DESIGN OF SEMI-STEEL CAR

The new semi-steel cars of the Milwaukee Railway & Light Company, built for service on the recently constructed single-phase interurban systems west and southwest of Milwaukee, are different in almost every detail from previous types of steel cars. The most out-of-the-ordinary features of this type of car are the method of supporting the platforms, the construction of the bottom framing, as necessitated by the limited headroom, the height of the arm rest and the manner in which the lower sash are raised up against the roof inside the side plate. The car was designed by E. W. Olds, superintendent of rolling stock of the operating company, and under the general direction of John I. Beggs, president and general manager of the company. An order for ten cars is now being completed by the St. Louis Car Company. Several of the cars have been delivered and are now in service.

SEMI-STEEL CAR IN SERVICE ON AN INTERURBAN DIVISION

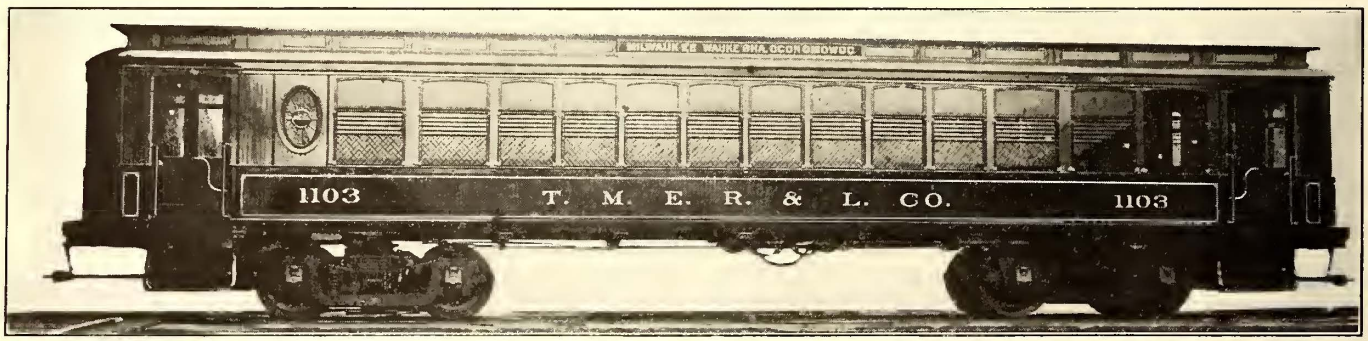
BOTTOM FRAMING

Bridge and subway construction in Milwaukee limits the headroom to 13½ ft. The car was accordingly built with a height from rail to top of roof of 11 ft. 11¾ ins. In order to avoid a squatty appearance to the interior, the floor was placed as low as possible, and as built the flange of the wheels may come within 1¾ ins. of the bottom of the floor. With 36-in. wheels the height of the floor with the car body light is 41¾ ins. above the rail or about 8 ins. lower than is customary with wood or steel under-framing. The trussing effect of the car body is practically all obtained by steel side plates extending from the floor to the arm rest.

The only longitudinal member under the car floor is a 10-in. 25-lb. channel, which extends under the center of the car continuously from bumper to bumper. At the end sills and bolsters this channel is offset so as to avoid cutting any of the members. The channel passes between the top and bottom members of the bolsters. Between the bolster and the bumper there is riveted to its under side a 4-in. x 5-in. T-iron. The needle beams, which are 6-in. channels, are reinforced with ¾-in. truss-rods. The end sills are of similar channels and are trussed in a similar manner. They are further reinforced by gusset plates riveted to them on the upper side and to the corner posts. The gusset plate at each corner of the car is intended not only to support the end sill, but also to form a rigid base for a truss post placed over an I-beam knee supporting the platform.

These knees are the main support of the platform. Together with the central channel and floor plate they form a truss, all members of which are either in tension or compression. The bending strength of beams, as in the usual construction, is not depended on for support. The knees are of 4-in. 8-lb. I-beams. They are secured to the channels forming the side sills, pass under and behind the top step and are riveted through a strut to a 6-in. cross-channel under the forward door post and also to the platform floor.

The side sills of the car consist of two angle-bars, one measuring 3½ ins. x 5 ins. x ⅜ in. placed outside, and an inner one 3 ins. x 4½ ins. x 5/16 in. Extending between

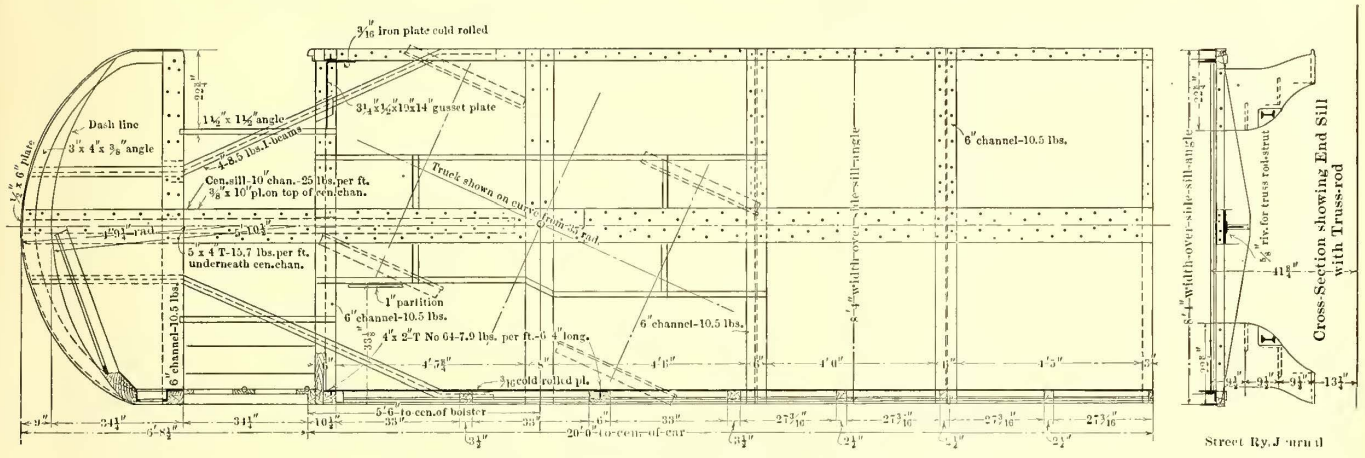


SEMI-STEEL CAR BUILT FOR THE MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY

the two angles is the ⅛-in. steel plate which forms the under flooring. This flooring, which covers the entire under-framing, extends from bumper to bumper and is riveted to all the longitudinal and cross-members of the bottom framing. The seperate plates of which it is made up are joined over the needle beams and cross-sills.

SIDE FRAMING

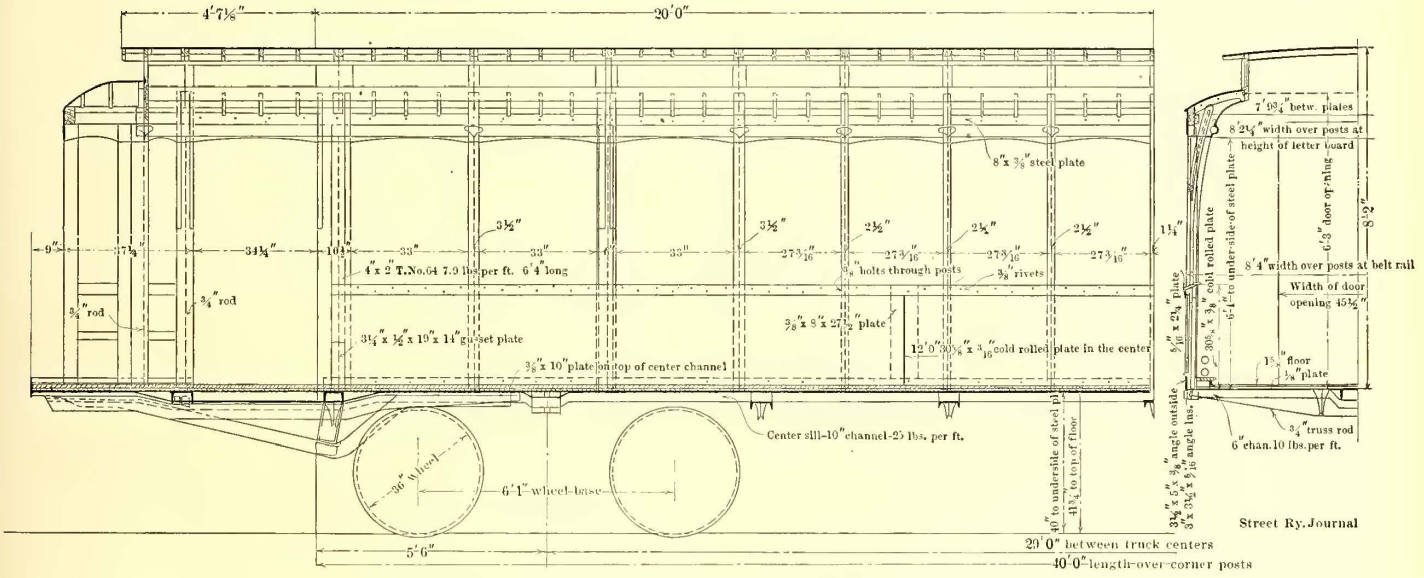
The side plate previously referred to as forming the longitudinal truss of the car body is 3/16 in. thick and 30⅝ ins. high and forms the inside finish of the car below the



BOTTOM PLAN OF 40-FT. SEMI-STEEL MOTOR CAR

windows. The smaller of the side-sill angles is riveted to it and the posts are also riveted and bolted to it. The corner posts and those immediately behind the bolster are the only ones in compression. These are of 4-in. x 2-in. T-irons

The spaces between the posts below the arm-rest are filled in with wood and this furring is covered with vertical-matched siding in the usual manner The roof construction is similar to that for cars with wood framing. It is of the



BODY FRAMING OF 40-FT. SEMI-STEEL MOTOR CAR

sandwiched between wood fillers. All of the other of the posts are of wood, but tensional stresses are cared for by ½-in. rods running through and behind them. The lower ends of these rods are secured by a nut underneath the side-sill construction and their upper ends are secured to a plate forming the top member of the side framing by bolts passing through broad feet on the ends of the rods. The plate referred to is 8 ins. x ⅜ in. and is bolted between two wood plates. The letter board is of wood and is secured in the usual manner to the posts and to the outside top plate. The four steel posts on each side of the car are riveted to the

monitor type with the monitor extending well forward. This style was preferred to the usual steam-coach type because the end of the monitor gives an excellent location for the destination sign.

The steel floor of the car is covered with a double floor 1⅝ ins. thick.

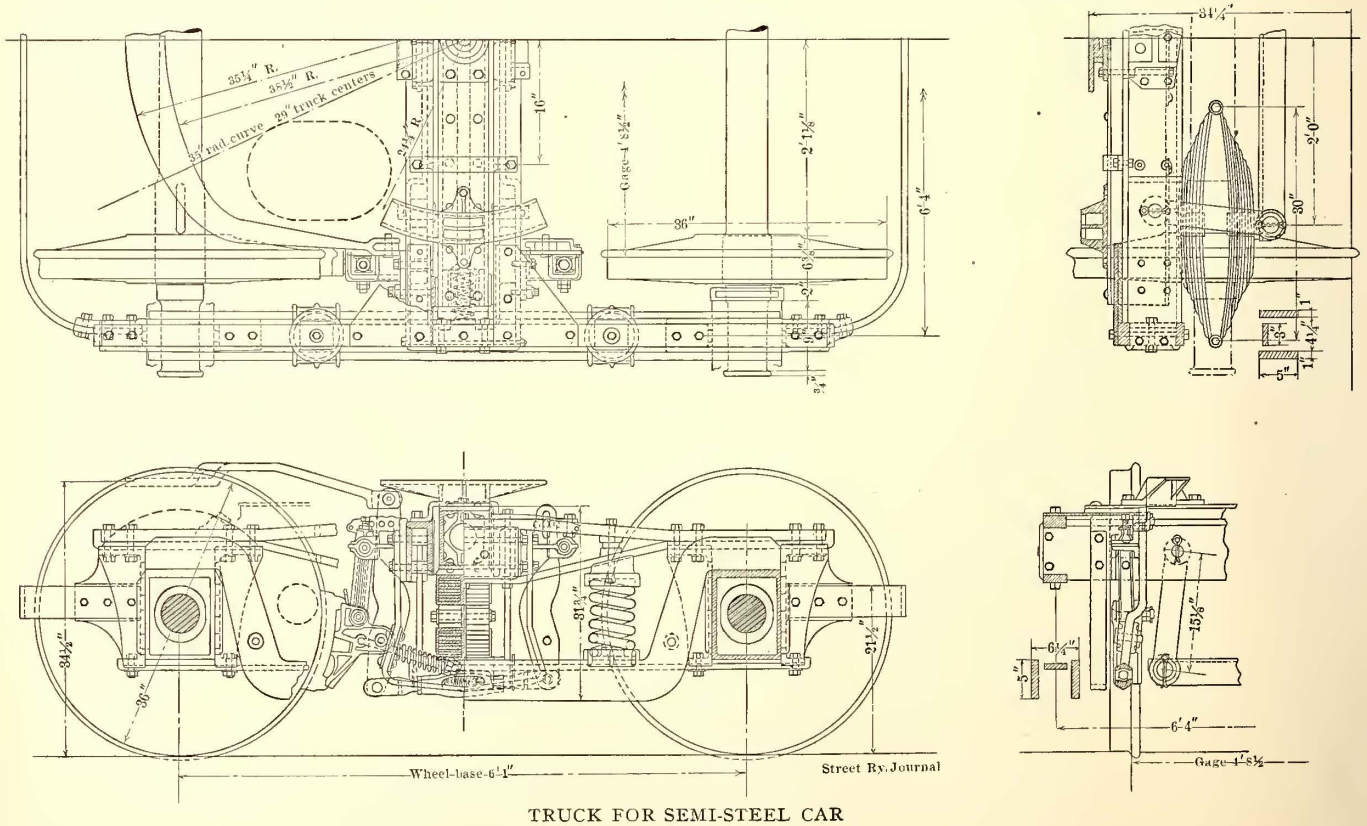
The interior is divided into an observation compartment at each end and a center passenger compartment. The hot-water heater, toilet room and a high-tension switch cabinet are in one end of the car, and in the opposite end is a small cabinet for the air brake and light switches and fuses and

fire tools. Seats are provided for sixty-four people. The car is equipped with the General Electric a. c.-d. c. system of control. The dimensions of the control apparatus were considered in spacing the cross-members of the bottom framing. The compensator is hung between the needle beams. It is supported by a strap fastened to the longitudinal channel in the center and to the main side sills.

HIGH-TENSION SWITCH CABINET

The car is equipped with National Electric air brake apparatus which includes a combination a. c. and d. c. compressor motor, so that the equipment can be used with equal facility on single-phase railways, or on such lines where part of the operation is by direct current. A detailed description of this system is published elsewhere in this issue, but it may be interesting to note here that the principal novelties are the use of a four-pole commutator type motor with two inter-poles, and the automatic relay for changing from one kind of power to the other. In general, most of the other parts are of standard character.

INTERIOR OF SEMI-STEEL CAR, SEEN FROM SMOKING COMPARTMENT



TRUCK FOR SEMI-STEEL CAR

The truck is a modification of the T. M. E. R. & L.

standard M. C. B. truck and was designed by Mr. Olds. It is distinctive in that each shoe has an individual release. Attached to the shoe head is a release rod which passes through a U-shaped support or hanger immediately behind the head. A coil spring between this support and an adjustable nut on the end of the rod, holds the shoe back when the brakes are not applied. The rod passes through a sleeve bolted to the U-shaped support of such a length as to form a guide and prevent the shoe from tipping sidewise. The shoe head is hung by the St. Louis Car Company open link hanger, described in the STREET RAILWAY JOURNAL July 13, 1907, and which was originally designed by Mr. Olds.

Instead of being attached to rods running to an arch bar carried on the truck, the live levers of the truck are pinned directly to the arch bar, which is made in the shape of a bail. This construction eliminates one set of pins in the brake rigging and the arch bar is gotten close up to the king pin so that its movement is lessened. The bail, moreover, is supported from the car body.

The transom construction is extra heavy. The transoms are built up of ¾-in. x 7-in. x 3½-in. channel bars reinforced by ¾-in. x 7-in. steel plates. At the center these plates are hot-riveted up against the web of the channel. They are then bent outward and extend to the side frame parallel with the channel and 2 ins. from it. The head of the bolster hanger is held between the plate and the channel by a pin extending through both plate and channel.

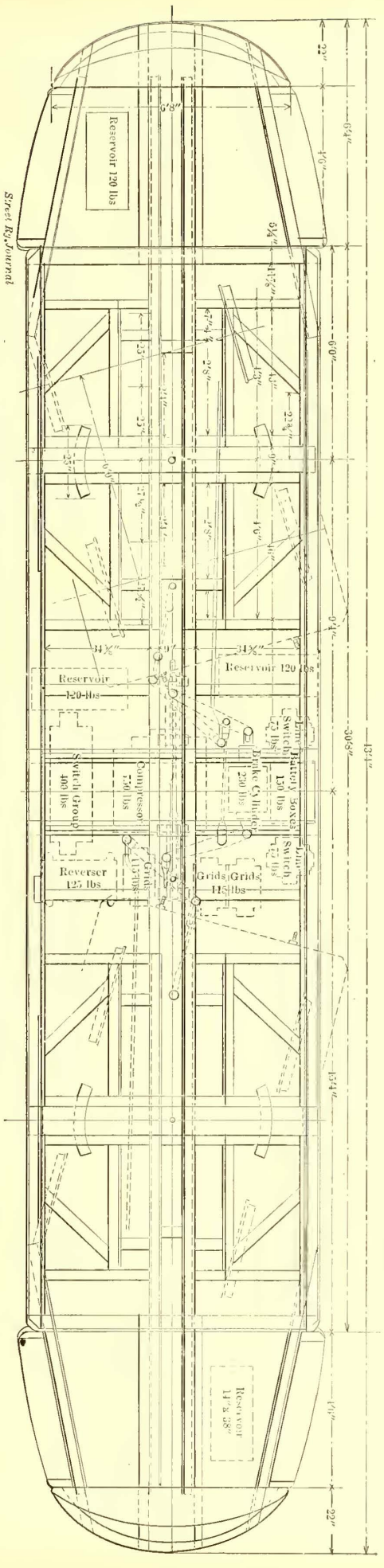
Gussets extending from the top arch bars to the transoms give rigidity to the center construction, but gussets are not employed at the corners between the top arch bars and end bars, the idea being to allow a little flexibility of the truck frame. Under heavy strains, Mr. Olds is of the opinion that a truck built absolutely rigid will break at some point, when with a flexible truck only a slight deformation will occur.

The truck has 5-in. x 9-in. journals. The wheels are of the Standard Steel Company's rolled steel pattern. They are 36 ins. in diameter, have 2¾-in. tread, ¾-in. x 1⅛-in. flange and a 2⅝-in. tire. They are mounted on 5½-in. axles, which were the largest that could be used with the motor. The wheel base is 6 ft. 1 in.

MULTIPLE UNIT SURFACE CARS IN BALTIMORE

The United Railways & Electric Company, of Baltimore, ordered some time ago for its Sparrow Point & Bay Shore line eighty Brill semi-convertible cars. Forty of these are now in service and the remainder are being wired and equipped at the company's Carroll Park shops. The cars, which measure 43 ft. 4 ins. over all, are not only the largest operated on the Baltimore lines, but are the first to be equipped for multiple-unit control. In possessing the latter feature they mark a distinct advance in electric car equipment, for while the cars are used for suburban high-speed service, they are similar in construction to those of like size now in use in some of the larger cities. The principal dimensions of this car will be found in the accompanying plan, which also shows how the problem was worked out of distributing a lot of extra apparatus in the limited space under a car with 34-in. diameter wheels. The body is 30 ft. 8 ins. over all and has special platform rails with folding gates. The doors are double and are operated by a ratchet and rack mechanism instead of the less reliable chain movement. An interesting feature in the equipment of the car is the use of wire glass ventilator sash to reduce breakage.

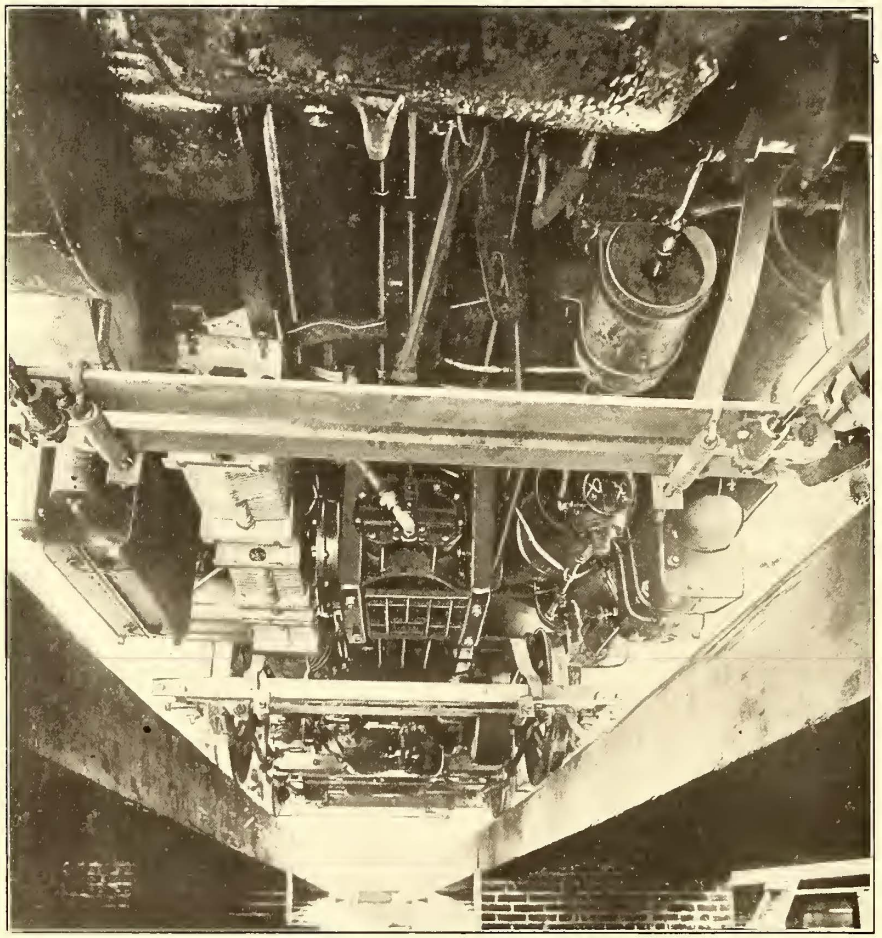
The interior of the car is furnished with fourteen trans-



PLAN OF BALTIMORE CAR, SHOWING THE LOCATION OF MULTIPLE-UNIT AND AIR-BRAKE APPARATUS ON THE UNDER SIDE

verse seats and four longitudinal seats. All are of rattan and have grab handles, although there are also straps installed. The corner seats each seat four passengers comfortably and leave enough free area to allow the rapid movement of passengers in and out of the car. The windows have arm rests and curtain fixtures from the Curtain Supply Company.

The electrical equipment consists of four 101-D Westinghouse 55-hp motors mounted on No. 27 E-1 trucks and controlled by a Westinghouse unit switch group. In addition to the usual contactors, reverser, line switches, air reservoir and battery boxes mounted under the car, there is an extra air tank as a reserve for operating the contactors should the regular air supply fail. The brakes are of the Westinghouse type with D-2 combination straight and automatic valve, straight air being used when the cars are operated singly. The cars also have Van Dorn draw bars and hose attachment so that they can be operated in trains immediately. All cars are also furnished with Peacock hand brakes, Earll trolley retrievers and United States combination arc and incandescent headlights.



UNDER SIDE OF SURFACE CAR WITH MULTIPLE-UNIT EQUIPMENT

The total weight of the equipment suspended from the car body is 3105 lbs. distributed to balance on each side of the center sill as nearly as practicable. Of this weight, 1195 lbs. is taken up by the air-brake equipment, so that the multiple-unit outfit under the cars weighs 1910 lbs. The under-car apparatus of a straight four-motor equipment would weigh 1100 lbs., so that about 2005 lbs. is added by using multiple-unit control and air brakes. As the cars weigh 50,700 lbs. fully equipped, it will be seen that the extra weight of the improved brake and control system constitutes only 3.9 per cent of the total weight. All circuits are carried in metal conduit except the motor wiring run from the switch group to the motors. This consists of asbestos-covered flame-proof wire placed in canvas hose, varnished with flame-proof paint.

All of the mounting of the apparatus and wiring was done by the company's men under the direction of H. H. Adams, superintendent of shops. Sixteen men were assigned per unit. The best record was the completion by thirty-two men of eleven cars in six days, which is certainly fast work, considering the fact that the men were dealing with a novel and unusually complicated equipment. The total cost per car, including unloading of cars, labor, piping, miscellaneous material, finishing up, etc., was $148.45.

THE LEFFLER ELECTRO-MAGNETIC RAILWAY SYSTEM

Circulars have recently been issued of the Leffler electric railway system for car propulsion. According to the circulars, electromagnets are placed between the tracks 2½ ft. center to center, and of alternate polarity. The car carries another magnet whose poles span the distance between the track magnets. This car magnet is excited by a storage battery and is provided with a pole changer, which alternates the current in the car magnet every time the car travels 2½ ft. The mutual effect of the car and track magnets is then to give a progressive magnetic pull to the car and produce motion. The air gap is said to be 1 in. and the storage battery required is reported to be "small." On long-distance railways it is proposed to use a sectional third rail instead of storage batteries.

No doubt a small model made up on this principle would run around an experimental track, but the major portion of the power required to propel the car must come from the storage battery, and as the application is an uneconomical one, the battery would have to be very large. Other possible complications not explained in the circulars are the hysteresis and eddy losses in the car magnets, and the troubles incident to maintaining an air gap of this size in the streets, especially with the presence of so much magnetism. It is possible, however, that the inventor has some way to avoid these defects, as he says, "This description is only general, because it is very difficult to go into details without a lengthy description, such as we would not have room for in this booklet on all the technical details."

The Sandusky-Fremont branch of the Lake Shore Electric is now in good shape and cars are running regularly. The work of ballasting the roadbed is going forward satisfactorily. This branch will enable through Cleveland-Toledo cars to pass through Sandusky, which has heretofore been impossible without losing quite a little time in doubling on the route.

STREET RAILWAY LEGISLATION IN MASSACHUSETTS

The work of the Massachusetts General Court of 1907 was not especially important, so far as the interests of street railway companies and investors were concerned. The number of matters referred to the committee on street railways was smaller than usual and their general effect not so far-reaching, with the result that legislation was proportionately minor in effect.

The most important street railway legislation of the year was that referred to the committee on metropolitan affairs and affecting the interests of the Boston Elevated Railway in the matter of providing the metropolitan district with improved rapid transit facilities. In fact, this subject occupied a large part of the time of the legislature. The problem presented by the rapid growth of the city and its suburbs is an ever-present one, in spite of the strides which have been made toward solving it in the last decade. Among the propositions presented this year were the petition of Mayor Fitzgerald for a Beacon Street subway from Park Street to the Back Bay Fens; of George B. Upham for a similar subway; of Mayor Fitzgerald for a crosstown subway from the present Park Street station to the South Terminal Station; and of George Holden Tinkham and others for a subway between the North Union Station and East Cambridge, to be constructed in place of the elevated railway, for which a location was given by the legislature last year. These bills were given almost innumerable hearings before the committee on metropolitan affairs, and from the first three there was evolved what is known as the "Riverbank Subway Bill," designed to follow the general line of the bank of the Charles River from the present Park Street subway station to a point in the Back Bay, near the junction of Commonwealth Avenue and Beacon Street. This subway is to be built and owned by the city of Boston, and the Boston Elevated Railway Company is to be given the exclusive use of it for a term of twenty-five years, with a rental of 4½ per cent of the net cost of the work of construction. The construction of the subway is made subject to the acceptance of the act by the Elevated Railway Company, which has not yet been filed, but nearly twenty days yet remain in which this action may be taken.

For several years, the trend of street railway legislation, as well as that affecting other public service corporations in Massachusetts, has been to enact general legislation whenever possible, rather than grant special privileges, and this policy has been consistently carried out by this year's General Court, with one exception, when it revived a special charter for the Boston, Quincy & Fall River Bicycle Railway Company. The committee on street railways stood by the policy and reported a bill allowing the aged inventor, Moody Boynton, to incorporate his company under the interurban act of last year. This bill was sent to the House, rejected, and Mr. Boynton's special bill put in its place. The special bill reached the Senate, and again became a general bill. Then there followed the appointment of a conference committee, which reported in favor of the general bill. This report the House refused to accept. A second committee was appointed which reported recommending that Mr. Boynton be given the bill he desired. This report was adopted, the bill went to the Governor and was signed by him.

Another measure which would have vitally affected every street railway company in the Commonwealth had it become law, was that heard before the committee on taxation, providing for the taxation of bonds of street railway companies. It came before the legislature as a part of the report of last summer's special recess committee on taxation, and, strange to say, attracted very little attention in that report, the companies not becoming thoroughly alive to its importance until it appeared in the Senate calendar with a favorable report of the committee. They had it recommitted to the committee in order that they might be heard, and after pointing out the great hardship it would work on the country roads, succeeded in getting from the committee a recommendation that it be referred to the next General Court, which suggestion was adopted.

The bill providing for one day's rest in seven would also have caused considerable trouble among street railway companies had it found its way onto the statute books in its original form. This bill came from a recess committee appointed to consider the laws relating to the observance of the Lord's Day, and provided that no employer should "require or permit" an employee to work more than six days in any week. Massachusetts street railway companies expressed no opposition to the idea of the bill, but they realized that any such iron-clad law would work havoc with the Sunday traffic, and so at their suggestion the words "or permit" were stricken out, and employees in Massachusetts are permitted to work seven days in succession if they desire, but they cannot be required to do so.

Perhaps the most bitter fight of the session came on the bill providing for the joint use of tracks by two or more street railway companies, giving the board of Railroad Commissioners authority to fix the compensation for which one company might be required to transport the cars of another. The bill remained in committee for several weeks, finally going into the Senate with an adverse report of the committee on street railways. Senator Shaw, president of the Boston & Worcester Street Railway Commpany, however, after repeated roll calls succeeded in getting the bill through the upper branch. It was overwhelmingly defeated in the House, however, upon its first appearance, and no attempt was made to ask for reconsideration..

A bill which caused a great deal of comment was that authorizing the Fitchburg Railroad Company to purchase the Conway Electric Company. This matter was introduced early in the session, and those who oppose control of street railway lines by steam railroads immediately announced that it was only an entering wedge for the absorption of trolley lines by steam railroads. When the bill was heard in committee, however, it developed that the Conway Street Railway Company was operating its road at a loss each year, and that only the public spirit of the citizens of the isolated country town had for some years kept running this, the one means of transportation connection with the outside world. The company owned a very valuable waterpower, however, which the Boston & Maine was desirous of acquiring, and which the Conway Company was equally anxious to sell, realizing that with its limited field of endeavor it could not be developed to its full value. The bill finally reached the Governor and was signed by him.

A bill requiring a street railway company, in case of accident, to file with the Railroad Commission all names taken of witnesses to such an accident caused considerable debate, but was killed in the Senate. The argument was made that such legislation would tend to make the Railroad Commission a detective agency for accident attorneys.

The bill requiring every street railway car to be equipped with fenders suitable for saving life also failed of passage, it being deemed best to leave this matter in the hands of

the Railroad Commissioners, who have full powers to deal with it and are now making an extensive study of the matter.

The "missing link" bill was hard fought at all stages, but became a law. It provided that in case a street railway company has authority to do the business of a common carrier in two towns, but is unable to secure the necessary authority in a third and intervening town, either by the refusal or neglect of the selectmen to give permission, it can secure such authority from the Railroad Commissioners. Opponents of this bill urged that it would take away the last vestige of local control of street railway companies, but the legislature did not think that any one community should have the power to prevent a street railway company from engaging in the business of a common carrier, perhaps for a distance of 40 miles or more, as in the case of the Boston & Worcester, and the bill was made a law.

Other matters of legislation which were given leave to withdraw were: to give local boards additional powers in the granting of locations to electric railroads; that the Railroad Commissioners upon complaint may order changes in the service and accommodations of street railways; that common carriers operating less than 75 miles of track provide protection for patrons by insurance or otherwise; that motormen and conductors of street railways be licensed by the Railroad Commission; that employees of railroads and street railways be given receipts for money collected; that the Railroad Commissioners investigate the furnishing of sanitary accommodations by street railways; and that pupils of normal schools be transported at half-fare, the same as pupils of other schools.

THE FUEL-TESTING PLANT OF THE UNITED STATES GEOLOGICAL SURVEY NEAR NORFOLK, VIRGINIA

The fuel testing work of the United States Geological Survey should be followed with close interest by all engineers, not only for its importance to all power consumers, but because it is undertaken to point out new paths for the development of the natural resources of the country by locating, classifying and testing all kinds of available fuel. In Europe, where the fuel resources are now fully known, there has been no need for so powerful an organization as that which is now rapidly making facts about the resources of this country equally available. Accurately compiled results of the more recent work of this branch will soon be published, and the following particulars of the plant in Virginia will doubtless be of interest.

The machinery under test is placed in the Power and Alcohol Building at the Jamestown Exposition. The following apparatus has been added to the steam engineering division: a 250-hp B. & W. boiler, with superheater, provided with a Roney stoker; a Jones underfeed stoker with fan, added to one of the old Heine boilers; two direct-current De Laval turbine sets, rated 300-hp at 9000-900 r. p. m., also three Green Fuel Economizer Company's induced draft fans.

The method of work planned for this section is to be slightly changed, so that instead of testing a great number of coals, more tests will be made of the same coal, different sizes and different methods of stoking or feeding, etc., being employed with the object of determining the most economical performance under different rates of combustion and the best ratios of grate and heating surfaces.

The B. & W. boiler will be placed beside the two Heine boilers which have been brought from St. Louis, all three having been provided with induced draft apparatus in order to get a wide range of capacity. The Heine boiler provided with the Jones stoker has the usual arrangement for forced draft. The B. & W. boiler was inserted partly to enable tests to be made of the same fuel with different types of boilers. It serves to represent the types employing a perpendicular flow of the gases through the tubes, the parallel flow types being represented by the Heine boilers. The Heine boilers have been so rebaffled or partitioned as practically to double their length by compelling all the heated gases to pass along the entire length of the tubes twice. An additional alternating-current turbo-generator set may be installed as indicated to supply power for external and exhibition purposes. The steam engineering division, which has now practically succeeded in isolating the performance of the boiler from that of the combined performance of the boiler and furnace, will carry on further tests with the object of still further determining the performance and efficiency of the furnace alone.

Some changes have also been made in the producer-gas section. For instance, producer No. 7 has been provided with a water seal at the base to permit the ashes to be removed without admitting air, and several holes have been bored at different heights to be used for extracting samples of the gas. A special steam pipe has been provided to insure a steady water pressure, since the pressure of the supply mains fluctuates considerably.

The gas engine is belted to a 200-kw Bullock generator, which serves to drive the motors for the apparatus in the building, the machine shop, the briquette plant, the elevators and the conveyor. Any additional load required is obtained by a water-box resistance.

The plans of the gas section include the following determinations: The proper length for a test run, the effect of the size of the coal, the best depth of fuel bed, the effects of rapid load variations, the maximum returns from different fuels, and the response of a producer plant to sudden demands for power.

A new work of great importance is being undertaken. in the alcohol and gasoline engine section. The equipment includes two 15-hp, 250 r. p. m. Otto gas engines; two 15-hp Nash Company's engine; one 2-hp International Harvester Company's engine, and two John Deere engines rated at 14 hp and 18 hp respectively.

Experiments will be made covering the whole range of this field, but for the present the work will be confined to examinations of different carburetters with the object of showing the lines along which a more efficient method of vaporization may be obtained. The other more prominent work is the examination of the kinds of fuels available, with special reference to gasoline versus alcohol, and an investigation of the use of kerosene as fuel for this class of engine.

The study of the destructive distillation of the coal and its combustion in gas producers, coke ovens and furnaces, especially from the standpoint of physical chemistry, will be undertaken by several divisions.

The briquetting division, which occupies the large room at the end of the building, is putting down one additional German briquetting machine, while the previous apparatus of English and American manufacture that was used at St. Louis is installed in the same room. The work of this division will be chiefly the manufacture of briquettes from various run-of-mine coals of the Eastern fields, which will be tested on war vessels.

MEETING OF THE STANDARDIZATION COMMITTEE

As announced in the last issue of this paper, a meeting was held in Cleveland, on July 26-27, of the Committee on Standards of the American Street and Interurban Railway Engineering Association At that time a list of the attendants was given, but in view of the general interest on the subject a fuller account of the meeting is published below.

The three subjects discussed were:

1. Standard axles, journals, journal bearings and journal boxes.
2. Standard brake-shoes, brake-shoe heads and keys.
3. Standard sections of treads and flanges of wheels.

A summary of the remarks upon the topics under consideration appears under the three respective heads.

AXLES

W. H. Evans, of Buffalo, chairman of the committee, called the meeting to order Friday morning and announced that the subject of axles would first be considered. He then called attention to the four axles recommended by the Central Electric Railway Association, and illustrated on page 974 of the STREET RAILWAY JOURNAL for June 1, 1907, and suggested that it would facilitate matters to discuss these axles seriatim. Axle "A," or that with a 4¾-in. x 7-in. journal, and 4½-in. motor fit, and designed to carry 1500 lbs., was the first to be considered.

Mr. Priest thought that this axle would suit motors up to 40 hp, that motors from 40 hp to 60 hp could use the 5 to 5½-in. axle; those from 75 to 100 hp, 5½ ins. to 5¾ ins.; 150 hp, 5¾ ins. to 6 ins., and 200 hp, 6½ ins. For the larger motors he insisted 50 ins. between wheel hubs was necessary. He then called attention to the shape of the key ways, and suggested that a key way cut with an end mill might be more desirable than that shown. He also said it was the practice of his company to make the key way about 3 mills less in width than the thickness of the key to insure a tight fit. Mr. Taylor explained that the shape of the key way had been adopted after a long experience with different patterns, and that it had reduced very materially the trouble of axle breaking. No difficulty had been experienced in pressing on the gear. It had been the hope of the committee which was responsible for this design that when solid gears were adopted, possibly a key might not be required at all. For that reason all keys were designed to be of the same length and size. The chairman said that it was the intention to make the "A" axle accommodate everything up to a 50 hp maximum. With the wheel fit of 5 7/16 ins., the axle would take care of the maximum strain at the point where the most trouble is usually had, that is where the axle enters the wheel.

Mr. Adams, of Baltimore, asked Mr. Taylor why the length of wheel fit 7½ ins. had been adopted on the "D" axle, with a diameter 7 15/16 ins. He thought it was considered desirable to have the length of hub equal the diameter of the bore. Mr. Taylor replied the principal reason was the desire not to increase the length of the axle, and it was hoped that the coefficient of friction with the diameter selected would be sufficient to hold the wheel in place. He thought that it would be interesting to find out the shortest length of hub that could be used on any diameter of axle without the wheel becoming loose. Mr. Lewis, of the Standard Steel Works, replied that there would be no difficulty in using the size of wheel seat suggested, or 7½ ins. When asked if it was possible to reduce the length of the wheel fit to 6½ ins. for a 7 15/16 in. diameter bore, he said that it would for steel wheels. Mr. Lewis added that his company never used a key in their wheels on axles and had never had trouble with loose wheels. In some cases, where a pressure of 80 tons had been used to press the rolled steel wheel on the axle, 300 tons had been required to press it off.

Mr. Storer, of the Westinghouse Company, agreed with Mr. Priest that in the larger size motors it would be necessary to have at least 50 ins. between wheel hubs. He believed that a 6½-in. axle was large enough for a 200-hp motor, which was about the largest which would be used. Mr. Evans defended the desire of the committee to provide axles of ample size, and said that the entire tendency of modern practice was in this direction. He referred to the time, not long ago, when a 4-in. straight axle was considered large enough for street railway service.

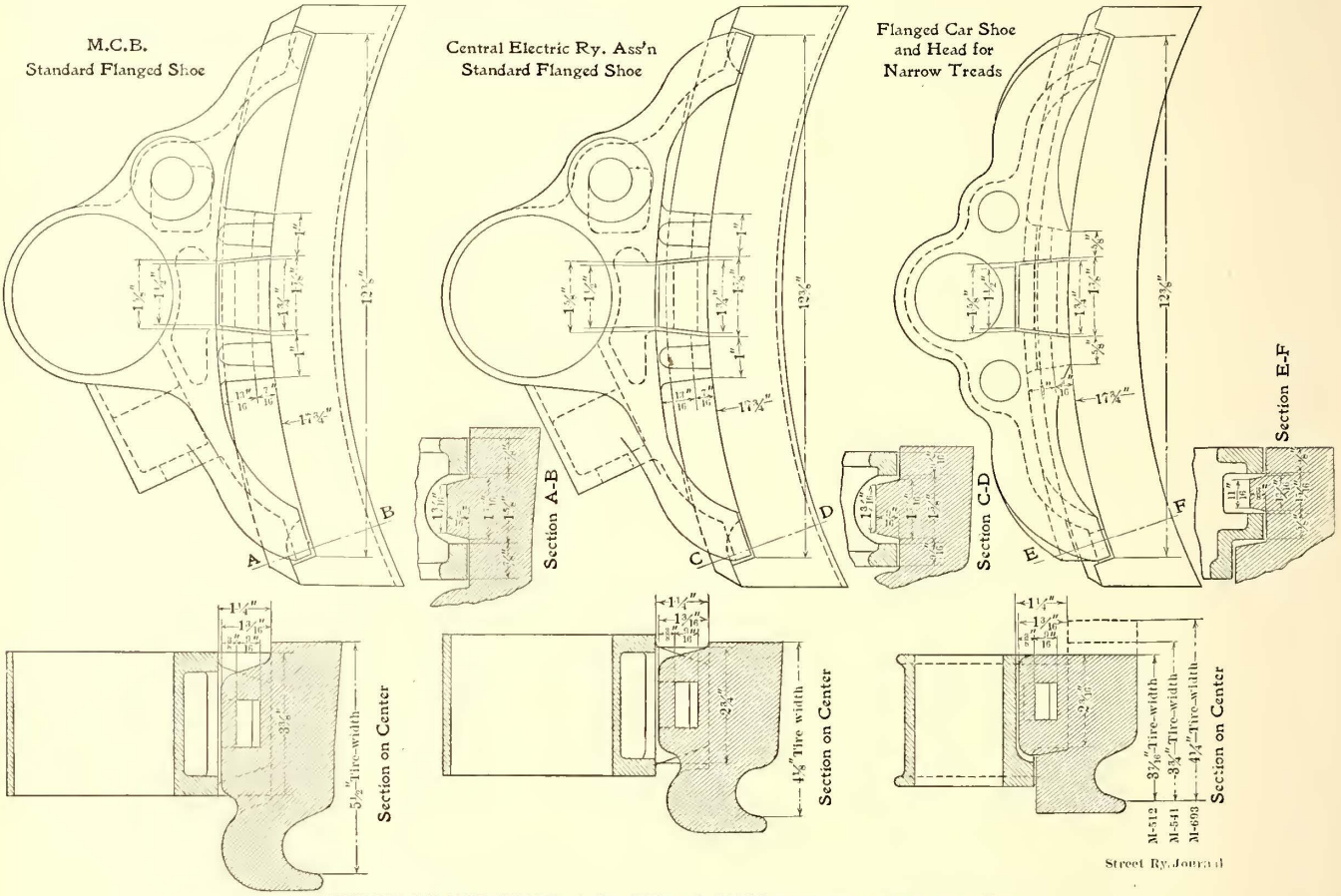
At the suggestion of the chairman, Messrs. Priest and Stover went over the question of limiting dimensions. At the conclusion of their conference Mr. Priest stated that in the absence of data from the office it was impossible to make any positive recommendation. He thought, however, in a general way, that five axles would meet the requirements of the electrical manufacturers, viz.: 25-hp to 40-hp motor, 4½-in. lining, 5½-in. gear fit, and 48 ins. between hubs; 45-hp to 65-hp motor, 5-in. lining, 6-in. gear fit, and 48 ins. between hubs; 70 hp to 100 hp, 5½-in. lining, 6½-in. gear fit, 48 ins. between hubs; 105-hp to 150-hp motor, 6-in. lining, 7-in. gear fit, 50 ins. between hubs; 155-hp to 225-hp, 6½-in. lining, 7½-in. gear fit, 50 ins. between hubs. In each case the gear fit is 1 in. larger in diameter than the lining fit, and the length of the key could be ¼ in. shorter than the length of the gear fit. As the diameter in each case of the gear seat is 1 in. larger than the lining fitting, he suggested that the committee could cut the key way the full depth at the end if it desired.. This practice, he thought, would avoid any weakening the axle because of the increased diameter at that point. A discussion on the proper sizes of axles then followed. Mr. Taylor explained that the wheel fits of the Central Railway Association were made slightly larger than with the M. C. B. axles, as electric railway axles are motor axles, while the M. C. B. axles were designed merely to carry the load, while Mr. Storer pointed out an increase in the diameter of the axle increased the length of wheel base on account of the space required for the motors.

In conclusion, the chairman announced that the committe could allow 50 ins. for the larger sized motors by slightly increasing the total length of the axles. He said that the committee would prepare a series of drawings showing the dimensions which seem desirable, and would forward prints of these drawings to the electrical manufacturers. Mr. Priest, in the meantime, agreed to take up the question of dimensions with his company, and to confer with Mr. Storer on the subject.

JOURNAL BOXES

The discussion on journal boxes centered principally on the space required on the axle, the shape of the top of the box and the space between the guides. On this latter point it developed that the principal objections to increasing the space between the guides were the question of utilizing old equipment and the adjustment of the equalizer bars. Mr. Taylor, however, pointed out that old equipment could be utilized by the adoption of slipper shoes, and that in the case of equalizer beams the slipper shoes could be left low enough to clear the equalizer beams if that construction were used. He also said that in many makes of trucks it

would be very easy to put on new pedestal jaws in case slipper pieces were not desired. The chairman suggested that it might be possible to standardize on 5⅛ ins., as the width between pedestal guides for all boxes. Mr. Adams, of the Brill Company, said that the recommendation was in favor of an M. C. B. type of journal, and called attention to the check plate type of journal for city service, which has given good satisfaction. It limits the side play of the wheels in regard to the journal boxes, which is a consideration where clearances are very close in city work. H. H. Adams asked if the check plate would not require an extra long axle. Mr. Adams thought it would require a slight increase in length. Mr. Weston, of the Symington Company, offered a diagram showing the clearances required to prevent the wear of the box against the wheel hub to aid the committee in its design of axles. The suggestions were received and were referred to the chairman.



THREE BRAKE-SHOES AND HEADS SUGGESTED BY MR. SARGENT

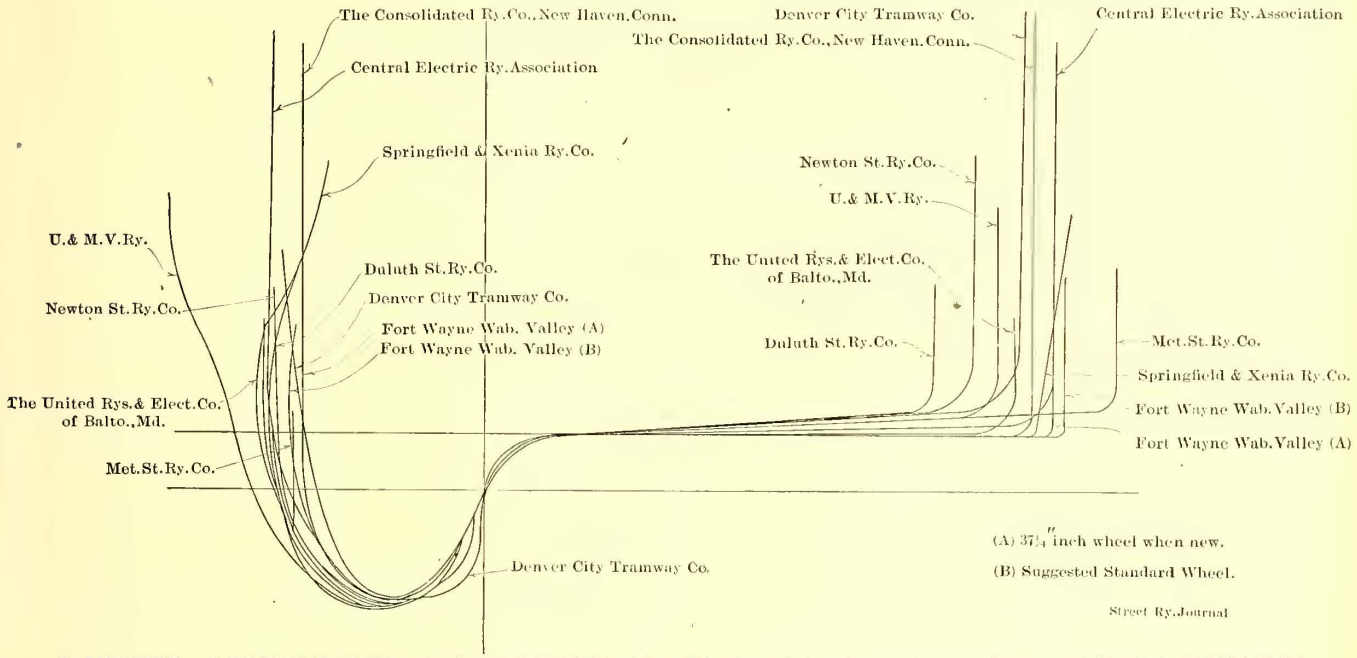
BRAKE-SHOES

The subject of brake-shoes was first considered Friday afternoon, and the discussion was continued on Saturday. Mr. Evans explained that it was the purpose of the Central Electric Railway Association to adopt a shoe which could be interchangeable to some extent with the master car-builders shoe. The shoe recommended by that association can be applied to an M. C. B. head, and vice versa. The M. C. B. shoe can also be used with the Central Electric head if desired, although it would be wider than the tread of the wheel, which had been taken as 3 ins. The Central Electric Railway Association recommended a shoe without a flange where it could be used, but furnished plans for a flange shoe to be used on trucks where it was necessary or was considered desirable.

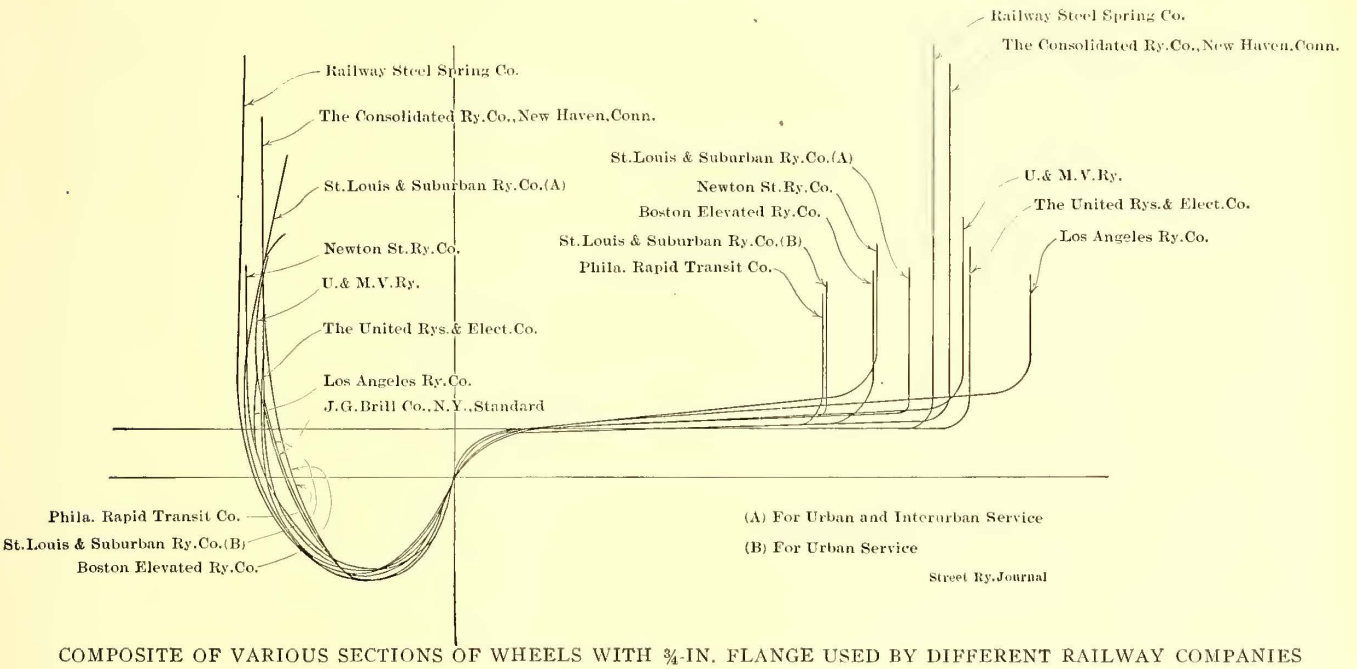
Mr. Sargent, of the American Brake Shoe Foundry Company, on being called upon, said that the 3-in. brake-shoe suggested was very desirable where it could be used. He thought, however, that many companies were employing narrow tread wheels, on which such a shoe could not be employed. At one of the Eastern plants of his company there were about 500 live patterns of street railway brake-shoes which were in constant use in filling orders. Of these, 70 per cent were for shoes on wheels with 2¼-in. tread or less; 20 per cent for shoes on wheels with 2¼-in. to 2¾-in. tread, and 5 per cent for shoes with treads more than 2¾ ins. He therefore suggested three types of shoes to cover the range of wheel treads from the M. C. B. standard to the narrow tread of the street railway lines of the East, with the idea of changing from one to the other as the equipment changes. He presented drawings (shown herewith) of the three patterns he had in mind. For the narrow tread wheels he had narrowed the width of the brake head and the end guides. The narrowest head shown will take in all of the wheels not covered by the Central Association standard and has been used for several years past in the East. Mr. Sargent added that the narrow shoe was not interchangeable with either the M. C. B. or the 3-in. shoe. A discussion followed as to the possibility of using the Central Electric Railway head with a narrow tread shoe. Mr. Evans stated that in one of the large traction roads of the country the Central Electric shoe had been used for a number of years, although the width of wheel tread on some of the cars was only 2⅛ ins. Mr. Larned, of Pittsburg, believed that many of the companies in the large cities would not adopt the 3-in. tread wheel for a long time. Mr. Thompson, of the American Track & Foundry Company, gave a history of the development of the Central Electric Railway head. The Indianapolis Traction & Termi-

nal Company originally had eleven patterns of brake-shoes, including the off-center Brill, the combined Peckham and the slipper Dupont. These have been reduced to one by the Central Railway standard. Mr. Scullen, of the Cleveland Southwestern Railway, said that some years ago he had gotten out a brake-shoe to be adaptable to different trucks and had applied it to the Brill 27, 22 and 21, and Peckham 11 and 14 B, and with wheels from 2-in. to 2¾-in. tread, of great assistance to the Master Car Builders' Association in selecting a standard wheel for the steam roads, and asked Mr. Griffin to discuss the subject of wheels for electric roads.

Mr. Griffin said that, in his opinion, the flange section selected by the Central Electric Railway Association was a very good one, although, personally, he thought that the flange might be thickened about ⅛ in. above the line where



COMPOSITE OF VARIOUS SECTIONS OF WHEELS WITH ⅞-IN. FLANGE USED BY DIFFERENT RAILWAY COMPANIES



COMPOSITE OF VARIOUS SECTIONS OF WHEELS WITH ¾-IN. FLANGE USED BY DIFFERENT RAILWAY COMPANIES

and it had been very satisfactory. Final decision on the subject was deferred for further consideration by the committee.

WHEEL SECTIONS

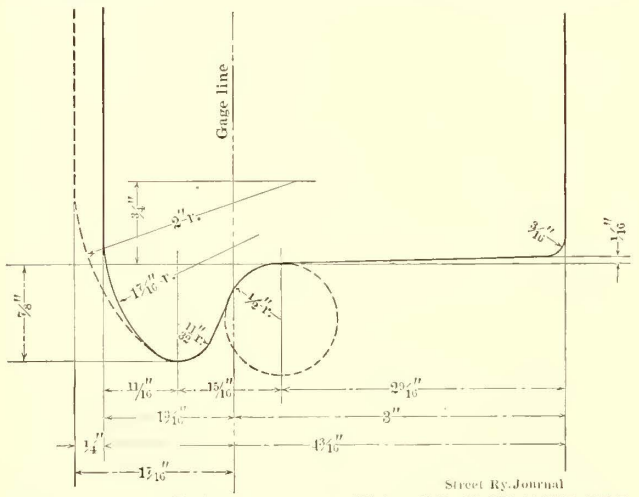
The principal discussion on wheel sections was held Saturday, when P. H. Griffin, of the New York Car Wheel Works, and J. B. Rhoades, of the National Car Wheel Company, members of the wheel manufacturers' committee, were present. Chairman Evans, in introducing Mr. Griffin, said that the wheel manufacturers' committee had been

the flange would come in contact with the rail, except in special work. Mr. Griffin showed a section, published on page 228 of such a wheel. He considered the question of length of hub as the most serious matter to-day in electric railway practice. The function of the wheel is very different in electric than in steam practice, as in the former there is a constant torque, which tends to loosen the wheel. Another important point is the shape of the switchpoint, which is often so blunt that it strikes a severe blow to the wheel flange and causes chipping. Thickening the flange

has been tried, but this does not prevent the jar to the car and does not effect any material relief to the wheel. In regard to the proper thickness of hub, Mr. Griffin believed that a 6½-in. wheel fit would answer the present needs on the larger size of axles, provided a spoke wheel was used. In regard to the coning of a wheel, the Master Car Builders' Association has recently increased the cone, the principal reason being to do away with the excessive wear on flanges. The usual practice of electric roads is to have a cone of about 1/16 in. As the electric wheels are traction wheels instead of carrying wheels, it is desirable to have as much contact between the rail and the wheel all the time as possible, so that the argument in favor of a considerable cone, as employed by the steam roads, does not apply. He considered the question of coning more or less theoretical, as after a wheel has been in service three or four months the cone is gone. Mr. Rhoades also referred to the importance of having a long hub, and the small amount of room often allowed for the wheel seat. His company has furnished wheels with 4-in. axles and only 3⅞-in. wheel seat. These wheels had to be put on from 50 to 55 tons pressure, whereas 40 tons is all that should be used.

During the discussion on wheels, Chairman Evans distributed blue prints showing composite sections of wheels with ¾-in. and ⅞-in. flanges, used by different street railway companies. These drawings had been prepared from blue prints sent to the committee by different member companies in the association and are reproduced on page 227.

Mr. Angerer, when asked to speak for the manufacturers of special work, said he believed the future wheel would be



CENTRAL ELECTRIC RAILWAY WHEEL WITH FLANGE PROPOSED BY MR. GRIFFIN

(Original section shown by solid line; proposed change shown by dotted line.)

one with a wider tread and deeper flange than at present. He thought the ⅞-in. flange a desirable one as being the minimum flange suitable for interurban railways and the maximum permissible by the conditions as they exist in city streets. He did not think that the chipping of wheels was caused by the switch points, but by the flange bearing at intersections where a heavy load is carried on the flange. To do away with the flange bearing, a wider tread even than 3 ins. was desirable, and he thought that in the future a 3½-in. tread might be recommended. Mr. Clark, of Buffalo, and recently of Cleveland, argued in favor of a shallow flange. In Cleveland a ⅝-in. flange with 2¾-in. tread is employed, and if a ¾-in. flange should be used the cars would have to run on the flange most of the time. He also advocated the thickening of the wheel flange so as to save the wear on the outside rails at curves. Mr. Entwisle thought there would be difficulty in increasing the thickness of the wheel flange, as so much special work has been laid for the thin flange. He also considered a 3½-in. tread more desirable than a 3-in. tread, as it would protect the special work and would also eliminate the flange bearing, which he considered the chief cause of broken and chipped flanges. H. H. Adams suggested that a prolific cause for chipping was too thin a flange, and said the flange should be strengthened by a backing of gray iron. Mr. Simmons did not think it necessary to recommend a 3½-in. tread. It might be an ideal condition, but almost impossible of fulfilment at the present time. Mr. Triest stated that the Pennsylvania Railroad employed a wheel flange 1 in. in height for both steel and chilled wheels, instead of the 1⅛ in. of the Master Car Builders. The Harriman lines were doing the same thing with steel wheels, but he was unacquainted with their practice with chilled wheels. Mr. Griffin pointed out that an electric wheel wears the back of a flange as well as the front, whereas in steam railroad work the wear on the back is practically nil. This tended to sharp flanges in electric railway work and made it desirable to protect the back of the wheel.

The committee, in conclusion, decided to prepare plans of standards based on the testimony given and forward such plans to those most interested. The next meeting of the committee will be held in New York during the second week in September, at which final suggestions will be heard and final recommendations will be drawn up for the report to be presented at Atlantic City.

NOTES FROM MEXICO

Governor Miguel Cardenas, of the State of Coahuila, has granted Rodolfo Garza and Guillermo de Velasco a concession to construct an electric railway in Saltillo. Saltillo had a mule car system until about four years ago when the operation of the lines was discontinued.

The Federal Government has granted the Electric Tramways Company of Mexico, Ltd., a concession to extend its system in Mexico City 2 miles. The extension must be finished within one year from the date of the concession.

It is reported that the Salvatierra & Western Railroad, which is to be built from Salvatierra, in the State of Guanajuato, to Puruandiro, in the State of Michoacan, may be operated by electricity. Andres Bermejillo, of Mexico City, is the promoter of the proposed road. He is one of the owners of the railway system in Guadalajara, which is now being equipped with electricity, and is also interested in the electric light and power plant at Guadalajara. The Guadalajara plants and systems are operated under the name of Compania de Tranvias, Luz Y. Fuerza. C. A. Malau, head of the construction department of the Compania de Tranvias. Luz Y. Fuerza has been appointed chief engineer of Salvatierra & Western. The latter road will be 80 miles long.

The survey for the Torren & San Pedro Interurban Electric Railway will soon be finished and the contract let for the construction of the line. It will be 26 miles long running between Torreon and San Pedro and will traverse the richest portion of the Nazas River valley. The city of Torreon is rapidly becoming the center of a number of electric lines. In addition to the one which is to be built to San Pedro, a line is to run from Torren to Matamoros. An electric railway is already in operation between Torren and Lerdo, a distance of 7 miles.

THE HANDLING OF TRAINMEN BY THE SAN ANTONIO TRACTION COMPANY

As soon as a trainman has been employed by the San Antonio Traction Company he is given a number and an envelope of heavy manila paper is made out for him. In this envelope is afterwards put all his application and other blanks and all written reports turned in against him, news-

CLUBHOUSE FOR THE TRAINMEN OF THE SAN ANTONIO TRACTION COMPANY

paper clippings or any other information concerning him. The envelopes are filed according to number and an index book is kept to get any man's number. After the trainman is accepted he is put on a car with a competent motorman or conductor and kept on this run until he is pronounced competent. He then gets one day of service on each of the other lines of the system.

Three inspectors ride the cars and make reports direct to the superintendent of transportation. These inspectors keep cars on their schedules, maintain discipline among the men and keep a lookout in general for anything out of order. They report car troubles on special blanks, which are afterward passed over to the car house foreman, who notes on them what disposition was made of the cars. Similar blanks are provided for daily reports of motormen. The inspectors' reports concerning the trainmen are made on special blanks which are afterward kept in the trainman's record envelope in the superintendent's office.

Fort Sam Houston, at which several regiments of United States troops are kept, is located at San Antonio, and the railway company receives many applications for positions from discharged soldiers. These soldiers are preferred to other applicants, largely because they expect discipline for misdoings and take it properly. When they are disciplined they never let it appear that they consider the superintendent has a special grudge against them and get sullen, as is too often the case with trainmen.

As a means of entertainment for the trainmen, a club house has been built adjacent to the shop. The club rooms are provided with billiard and pool tables and a supply of current literature on file. The lawn surrounding the club house is kept unusually well, partly with the idea of impressing the idea of neatness upon the men.

TRAIN SCHEDULE BLANKS FOR THE NASHVILLE RAILWAY & LIGHT COMPANY'S TRAINMEN

To make trainmen of the Nashville Railway & Light Company familiar with their schedule, they are compelled to copy it on small cards which they carry with them while on duty. The original schedules are posted on large sheets in the office of the superintendent of transportation and the trainmen are required to fill in their own cards from these. It would be an easy matter to have the trainmen's cards printed complete, but if this were done it is probable that in many instances the trainmen would never study the card except at times when its use was required.

Nashville Railway & Light Co.

SCHEDULE.

For - - Line

TRIP NO.	No.		No.		No.		No.		No.	
	Station	End	Station	End	Station	End	Station	End	Station	End
1	In									
	Out									
2	In									
	Out									
3	In									
	Out									
4	In									
	Out									
5	In									
	Out									
6	In									
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17	In									
	Out									
18	In									
	Out									
19	In									
	Out									
20	In									
	Out									

Each motorman will please fill in these blanks from schedule and always carry same while on duty.

NASHVILLE TRAINMEN SCHEDULE CARD FOR

FORM T-28-4-07 15M.

SAN ANTONIO TRACTION CO.

MOTORMAN'S DAILY REPORT.

Run Car No. . . . . out of Repair as follows

Line . . . . .

Time in . . . . .

Date . . . . .

Run into shed on Car No. . . . . .

Signed . . . . .
Motorman.

DISPOSITION.

Foreman.

MOTORMAN'S DAILY REPORT

Form T-28-5-06-5m

SAN ANTONIO TRACTION CO.

INSPECTORS REPORT
TO SUPT. OF TRANSPORTATION

*Line*_____ *Car No.*____

*Motorman*_____

*Conductor*_____

*Time*_____ *M*

*Date*_____ *190*__

Signed _____
Inspector.

INSPECTOR'S REPORT TO THE SUPERINTENDENT OF TRANSPORTATION

San Antonio Traction Co.

Road Inspector's Daily Report.

Run Car No._____ out of Repair as follows:

Line _____

Motorman _____

Time Inspected _____ M.

Date _____ 190__

Signed _____
Inspector.

DISPOSITION.

Signed _____
Shed Foreman.

ROAD INSPECTOR'S DAILY REPORT

FORM T 28—4-07 5M

No._____

NAME_____

Employed _____

Resigned _____

Discharged _____

REMARKS

COVER OF EMPLOYEE'S RECORD ENVELOPE

A. C.-D. C. STRAIGHT AIR BRAKE APPARATUS

For service on single-phase electric railways and those operating on both single-phase and direct-current circuits, the National Brake & Electric Company has developed a class of air brake apparatus along lines similar to its direct-current air brakes. The motor and closed type compressor are separate, except that the motor bearing at the pinion end of the motor base forms a cover for the upper part of the gear, but when assembled form a compact and rigid compressor unit. Either may be replaced without interfering with the successful operation of the other. The compressor and motor are separated by a ½ in. air space, which carries off the heat radiated by the compressor.

The crank chamber and gear case are cast in one piece, The crankshaft has a third bearing in the center which strengthens it at its weakest point, eliminates all tendency to fracture at the center, makes the operation of the compressor quicker and produces less vibration than two-bearing compressors. The crankshaft and gear are removed by lifting them straight out of the crank chamber. This enables the compressor to be dismantled and reassembled in less time than where the gear must be removed from the shaft. The compressor is of the two-cylinder, single action type, with trunk pistons fitted with Dunbar type piston ring. The connecting rod head is connected to the body of the rod by a hinge and a hinged eye-bolt with lock-nuts and a split pin.

The valve head is constructed with the discharge valve towards the center and the suction valve towards the outside of the head. The discharge pipe runs straight out from the valve head to the main reservoir, thus dispensing with attaching elbows, etc. The suction has two openings, one on each side of the valve head; either or both can be used. The suction openings have straining screens to exclude foreign matter from the cylinders.

The gear and pinion are of the herring-bone pattern. Both gear and pinion are made in halves and riveted together. They are carried on their respective shafts by a taper fit and are clamped with lock-nuts to facilitate their removal when required. The lower half of the motor magnet frame is a steel casting, which also carries the bearings and forms a cover for the upper half of the gear, thus insuring permanent alignment of all parts, and the accurate replacement of the armature when it must be removed.

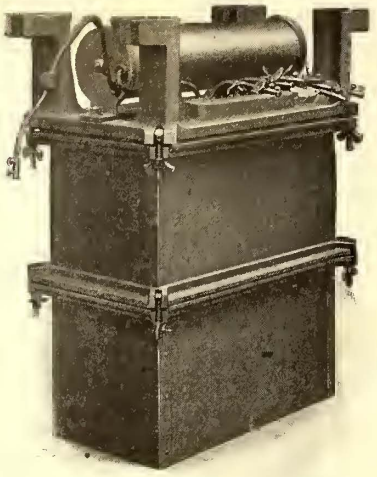
The diameters of the shaft and bearing at the pinion end have been considerably increased to stiffen the shaft at its weakest point. An oil deflector is provided just inside of the pinion end of the shaft to prevent the oil from the gear and pinion creeping into the armature bearing and damaging the insulation of the motor. An overflow device into the crank chamber is also added to the armature bearing at the pinion end to maintain the oil-level constant even though some oil may work past the deflector.

The motor is of the four-pole commutator type with two consequent poles, and is designed for operation on 500 to 600-volt direct-current circuits, and on 280 to 340 volts alternating current 25-cycle single-phase circuits. The motor has two distinct field windings, one for alternating current and one for direct current. Laminated sheet-steel pole pieces are used. The pole faces have a compensating winding, consisting of four coils which are short circuited upon themselves.

The armature is removed by taking off the motor cover, then removing the bearing cap and cap screws holding the magnet frame to the motor base and lifting the magnet frame and armature away from the base. The field coils are removed by first removing the armature and then taking out the four cap screws that hold the pole piece on to the magnet frame. The pole piece can then be pushed in toward the center line of the shaft far enough so that the field coil can be removed. This can be done without disconnecting the compensating winding, as the latter is flexible and can be bent as the pole is pushed inward or back into place.

The brush gear proper is fastened to a cast-iron yoke made in two halves, secured in a groove running entirely around a projection of the armature bearing at the commutator end of the motor. Two sets of brush holders of two brushes are used. The inspection of the armature, commutator and brushes is rendered easy by the inspection doors at the sides of the motor casing.

The compressor is started by throwing it directly on the full voltage, either alternating current or direct current.



RELAY FOR A. C.-D. C. COMPRESSOR

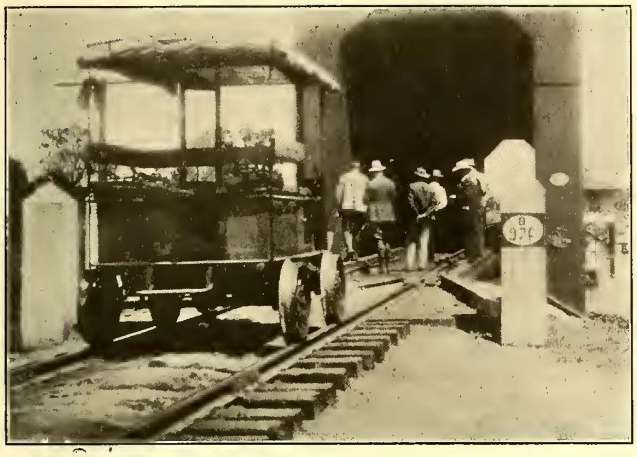
A relay is provided for automatically making the connections for running the motor either on alternating or direct-current circuits. When the direct-current circuit is closed, the necessary connections for direct-current operation are made by the solenoids of the relay attracting plungers to which the contact pieces are secured. When operating on the alternating-current circuit these solenoids are not in circuit, and the contact carrier drops by its own weight and makes the necessary connections for operating on alternating current. The relay is entirely enclosed. A diagram of connections is supplied with each compressor and relay, and the leads are all tagged so that no wrong connections need be made.

The compressor is suspended in a cradle under the car body. This allows the pump to be exposed to the cooling effect of the air at all times. None of the parts of the suspension cradle obstructs access to the compressor. The relay is mounted under the car body with the compressor. The capacity of the a. c. d. c. type of compressor is 25 cu. ft. of free air per minute. The standard National type "N" oil pneumatic governor is furnished in connection with a. c. d. c. air brake equipments, and will operate equally as well on either direct or alternating current circuits. Thirteen of these equipments with compressors, as described, were recently furnished the Milwaukee Electric Railway & Light Company for service on its new interurban lines.

It is reported that the syndicate of American and Canadian capitalists which has been operating in Brazil for some time, mainly in connection with traction and lighting properties, has secured control of a number of steam roads and is planning extensions and improvement that will result in an expenditure of from $50,000,000 to $100,000,000. Among the members of the syndicate are: Sir Wm. Van Horn, Frederick S. Pearson and Lauman Bull, of Edward Sweet & Company, of New York.

GASOLINE MOTOR CARS FOR INSPECTION SERVICE

The general interest felt in gasoline motor cars for railroad service has called attention to the application of this power to inspection cars. Fairbanks, Morse & Company, of Chicago, have done a great deal of work in this direction, first with a small velocipede car and later with a larger car for section gangs, signal service, track inspection, trolley repair work, etc., in place of the ordinary hand car. The



GASOLINE INSPECTION CAR ON THE SANTA FE RAILROAD

engine used in this company's cars is of the high compression type, four-cycle and water jacketed. The accompanying engraving shows an inspection car built by the company for the Santa Fe Railroad. This car has made 286 miles in a day and has run 2000 miles without repairs.

In some cases these cars are being used for passenger service, as at Houston, Tex., on a suburban extension to the Houston electric railway system. This road is owned by Brook Smith, a prominent banker at Houston, and a gasoline motor car of the kind illustrated, and designed to be operated at any speed up to 35 or 40 m. p. h. is employed.

Another point where a Fairbanks-Morse gasoline motor car is being used for passenger service is between Hoxie and Walnut Ridge, Ark., a distance of about 2 miles. This car has transported 600 passengers in one day. Another car is owned by the Mineral Wells & Lake Wood Park Street Railway Company, of Mineral Wells, Tex., which has lately ordered two others of the same type.

CIRCUIT BREAKERS FOR ELECTRIC CARS

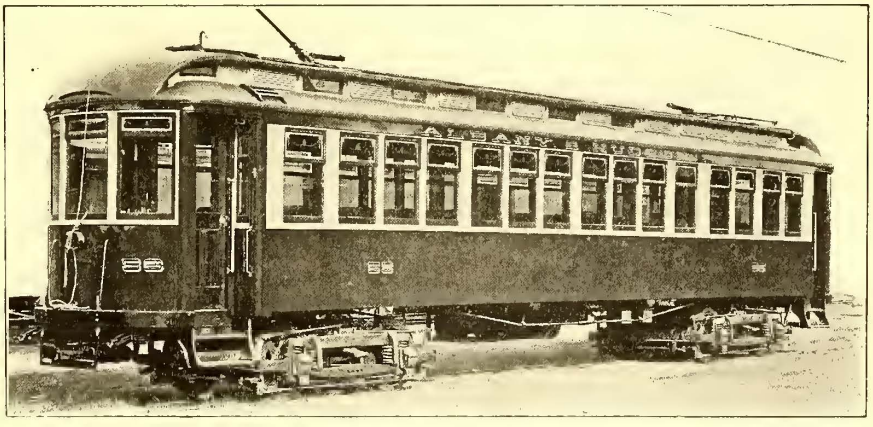
A new line of circuit breakers to be used on electric railway cars, having cylinder controller equipments up to 300-hp capacity, known as the MR, has recently been placed on the market by the General Electric Company. These devices automatically break the main control circuit in case of excessive overloads on short circuits and can also be used as a hand-operated main circuit switch. The circuit breaker operates on the well-known magnetic blow-out principle, the arc being extinguished in an extension arc chute located at the top of the casing so that the circuit breaker can be placed in any convenient position in the car vestibule without objectionable arcing or flashing.

INTERESTING CARS FOR ALBANY & HUDSON RAILWAY

The Wason Manufacturing Company, of Springfield, Mass., has recently turned out a number of combination passenger and smoking cars for the Albany & Hudson Railway, which contain some interesting features. The side posts are of various widths so as to permit wide pilasters

INTERIOR OF ALBANY & HUDSON CAR

to be put where the posts are widest. The passenger compartment is made up of windows in triplet with a single window at each end of the compartment, while the windows of the smoking compartment are arranged in pairs. The entrance ways are arranged with the doors set back. This avoids the necessity for using a trap door. The ventilating system is the same as that used on the cars for the Boston Elevated, built by the J. G. Brill Company, and recently described in these columns. The seats in the passenger compartment are upholstered in plush, and those in the smoking compartment in leather. The



EXTERIOR OF ALBANY & HUDSON CAR

windows raise in the usual manner, the top sashes being stationary. The inside finish is in mahogany. There are trolley poles at either end, but the line, except where it passes through the several towns between Albany and Hudson, is operated by the third rail. Some dimensions are: Length over end posts, 43 ft.; over vestibules, 52 ft.; length of smoking compartment, 11 ft.; width over sills, 8 ft. 2 ins.; height from track to under side of sills, 3 ft. 2 ins.; from under side of sills over trolley board, 9 ft. 2⅜ ins.; size of side sills, 5½ ins. x 8½ ins.; end sills, 6 ins. x 10 ins.

FINANCIAL INTELLIGENCE

Wall Street, Aug. 7, 1907.

The Money Market

The active demand for money both here and in Europe has been reflected in a decided hardening of rates for practically all classes of accommodation. Bankers and other large lenders of money are not disposed to offer funds for fixed periods with any degree of freedom, and in consequence the asking charges for time money are now at the highest of the year. It is true that the demand for money from railroads and other corporations, and from stock exchange houses, has been comparatively small, but there has been an increasing demand for accommodations from commercial sources. Brokers making a specialty of mercantile paper report an active demand for money on the part of merchants, and 6 per cent is now quoted as the minimum for prime paper. The demand is also urgent at all of the principal interior points. It was generally believed that the demand for money at the West would be delayed this year owing to the backwardness of the grain crops, but the advance in the rate of New York exchange to 30 cents premium indicates that preparations are already making to finance the movement of the various crops. As yet no shipments of money for that purpose have been made, but indications are that the New York banks may soon be called upon to make the usual provisions to meet the crop-moving requirements. Canada has been drawing gold rather freely from this center, and Europe has also been in the local market for gold. In all $1,000,000 of the precious metal has been sent abroad during the past two weeks, of which $500,000 went to Paris as a regular exchange transaction, while the $500,000 shipped this week to Holland was arranged for when rates of exchange were materially higher than they are at the present time. At the present level of foreign exchange further gold exports to Europe are entirely out of the question. There exists, however, an urgent demand for gold at all of the leading European centers, and this is emphasized by the fact that last week the Bank of England secured only $2,000,000 of the $5,000,000 laid down in the London market from the Cape, while Continental institutions were successful in securing the bulk of the receipts of gold from the same source this week.

Money on call loaned at rates ranging from 3½ to 3 per cent. Rates for time loans, however, reached the highest of the year, six months money commanding the full legal rate of 6 per cent, plus commission, bringing the total charge to the borrower up to 6¼ and 6½ per cent while in some instances still higher rates were demanded. Rates for other maturities ruled at 5 per cent for sixty days, 5½ and 5¾ per cent for ninety days, 5¾ per cent for four months and 6 per cent for five months. Under ordinary conditions foreign capital would have been attracted by the prevailing high rates, and while some foreign money has been loaned here against exchange transactions the aggregate amount has been small compared with former years, owing to the fact that foreign bankers are not disposed to make advances with the same degree of liberality as in former years. At the close of the week indications pointed to a continued firm market. This week the banks have gained from the Sub-Treasury about $1,500,000, which compares with a loss of nearly $2,400,000 in the corresponding period last week. An instalment on account of the Union Pacific bonds becomes due this week, and other similar payments become due in the near future.

The bank statement published on last Saturday was favorable. Loans increased $3,787,000. Cash decreased $903,100, which was considerably below expectation. The reserve required was $822,375 more than in the preceding week owing to an increase of $3,529,500 in deposits. The surplus reserve therefore was reduced by $1,785,475 to $7,473,200. This compares with a surplus in the corresponding week of 1906 of $14,122,675, $12,163,525 in 1905, $56,308,850 in 1904, $21,587,075 in 1903, $9,031,250 in 1902, $22,165,350 in 1901, and $29,144,875 in 1900.

The Stock Market

Wall Street continues in a pessimistic frame of mind, and in consequences prices for stocks generally have suffered further material declines during the past week. There have been quite a number of favorable developments, such as the publication of the report of the United States Steel Corporation for the quarter ended June 30 last, showing net earnings nearly $4,000,000 in excess of any recorded for a similar period in the history of that enterprise; the announcement that the labor troubles of the Steel Corporation have been practically settled, the publication of numerous gratifying statements of railway earnings, and the raising of the Southern Pacific dividend from a 5 to a 6 per cent basis. These developments, however, have been totally ignored, or else they have failed utterly to have their rightful influence upon values. One reason for this condition of affairs is found in the fact that speculation is at present entirely in the hands of professional operators, who evidently believe that the profits to be made just now are on the short rather than on the long side of the account. The public still refrains from taking anything like an active part in the market, as witnessed in the comparatively small transactions on the floor of the Stock Exchange, and from present appearances there is no reason to expect that these very essential elements to any prolonged or sustained upward movement will come in until the uncertainties now hovering over the financial situation have been effectually removed. Monetary conditions have played a considerable part in offsetting all there was good in the situation, as while there has at all times been an ample supply of call funds at easy rates, time money has ruled decidedly firmer, with fears entertained that the coming fall may be productive of more or less stringency in all branches of the loan market. While all this is largely problematical and may never transpire, it has, nevertheless, served as a deterrent to the purchase of both stocks and bonds, not only on the part of investors but among speculators as well. However, there have been several more tangible reasons to account for the drooping tendency of values. The report of the United States Steel Corporation was accompanied by a statement that there had been quite a considerable falling off in orders during July, and this was accepted as a forerunner of similar conditions in all kindred industries, if not in all lines of business. The unfavorable construction placed upon the crop report, the disturbed foreign financial market, are partly reflected in a drop in British Consols to the lowest price touched for a long time, and finally the enormous fine of more than $29,000,000 imposed upon the Standard Oil Company by the Federal Court for violation of the rebate clause of the Elkins law, and the action of the Alabama State Legislature in revoking the license of the Southern Railway Company to do business in that State supplied the bearish element with a plentitude of ammunition, and they were careful not to waste any of it.

In the slump in prices which resulted from the unsettling factors above referred to, not to mention the advance and no doubt unfounded rumor concerning the forthcoming dividend on Erie second preferred stock, those stocks which were prominent in the advance of a few weeks ago were the chief sufferers. The impression that the action of Judge Landis in the Standard Oil case would be followed by other prosecutions of alleged violators of the rebate law was by no means calculated to inspire confidence, hence the shares of railway companies in general sustained losses equally as great as those of the industrial concerns. It is worthy of note, however, that Standard Oil stock held firmer than most others.

The local traction shares withstood the bearish pressure better than any other group of stocks, and failed to exhibit any pronounced weakness or liquidation worthy of note.

Philadelphia

There was a larger volume of business transacted in the local traction shares during the past week, but prices continued to move with considerable irregularity. Philadelphia Rapid Transit was again the center of interest, the total transactions in the stock aggregating nearly 15 000 shares. In the early dealings there was rather heavy selling as a result of the decision of the directors to call an assessment on the stock of $7.50 per share, and in consequence the price declined ⅝ to 19⅝. Later, how-

ever, support was rendered, and the stock rose to 21⅛. At the close, however, there was another reaction to 19. In other parts of the list trading was comparatively small. American Railways declined ½ to 48, and Philadelphia Traction lost ¾ to 93¾. Union Traction, after an early rise to 57½, subsequently lost all the improvement. Other transactions included Philadelphia Company at 40 and 40½, and United Companies of New Jersey at 247.

Chicago

There have been no important developments in the traction situation during the past week, but it is understood several conferences will be held in the near future, after which the amended plan for the reorganization of the Chicago Union Traction Company will be made public. It is believed that the modified plan will satisfy a large majority of the various interests. Trading in the local traction shares was practically at a standstill during the week. Chicago City Railway stock sold at 160, which is somewhat higher than the last previous transaction. South Side Elevated brought 81 and 80, and Metropolitan Elevated preferred sold at 64.

Other Traction Securities

Trading in the Baltimore tractions was confined almost entirely to United Railway issues, and while the dealings in them were not large, prices displayed decided strength. The free stock was in excellent demand throughout the week, and on purchases of about 1200 shares the price advanced nearly a point to 13½. The 4 per cent bonds brought 87½ and 87¼, and the incomes sold at 53½. The refunding 5s were under slight pressure early in the week, but later on there was a full recovery to 80. Macon Railway & Light 5s sold at 92½. The feature of the Boston market was the advance of nearly a point in Boston & Worcester common from 22¾ to 23⅝. Massachusetts Electric common sold at 14, but the preferred dropped from 56 to 54, and recovered to 55. Boston Elevated sold at 139 and West End common sold at 87½ and 88.

While trading on the Cleveland Stock Exchange the past month did not amount to more than half as much as July a year ago, tractions were not trailers after all. Cleveland Electric stood second in the list, 1210 shares having changed hands, with prices ranging from 46½ to 53. In traction bonds, Washington, Baltimore & Annapolis securities lead, though they showed a 2-point loss for the month. Cleveland Electric stock showed a decline of a few points from the price reached a week ago, and has been selling about 50 for the past few days. Forest City stock has held close to the old prices and closed at 97 bid and 98¼ asked. It is still in the unlisted column.

Security Quotations

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

	July 31	Aug. 7
American Railways	48½	48
Boston Elevated	136	134
Brooklyn Rapid Transit	56⅛	50¾
Chicago City	155	—
Chicago Union Traction (common) certificates	3	—
Chicago Union Traction (preferred) certificates	15	—
Cleveland Electric	46½	49¾
Consolidated Traction of New Jersey	71	70
Detroit United	65	—
Interborough-Metropolitan	15⅜	13
Interborough-Metropolitan (preferred)	43⅝	38¼
International Traction (common)	—	45
International Traction (preferred), 4s	—	a67
Manhattan Railway	130	130
Massachusetts Elec. Cos., (common)	14	14
Massachusetts Elec. Cos. (preferred)	55	54½
Metropolitan Elevated, Chicago (common)	a24	22
Metropolitan Elevated, Chicago (preferred)	a64	63
Metropolitan Street	a91	a91
North American	68½	66
North Jersey Street Railway	40	40
Philadelphia Company (common)	40	40
Philadelphia Rapid Transit	19¾	19
Philadelphia Traction	94	93
Public Service Corporation certificates	66	65
Public Service Corporation 5 per cent notes	90	92
South Side Elevated (Chicago)	80	80
Third Avenue	104	90
Twin City, Minneapolis (common)	91	88
Union Traction (Philadelphia)	57¼	57

a Asked.

Metals

According to the "Iron Age" the July output of coke and anthracite pig iron was somewhat disappointing. The production was 2,259,687 tons, compared with 2,234,675 in June. While the pig iron markets in the East are irregular and weak, they show a moderate amount of activity. The Southern and Western markets are very dull. Eastern steel makers report a somewhat better volume of business in billets. An improved demand from car builders is reported.

Copper metal continues quiet. Consumers are not disposed to enter the market at this time, and in some quarters a further reduction of the leading grades is looked for. Lake is quoted at 22 and 23, and electrolytic at about 22 cents.

KENTUCKY COMPANIES CONSOLIDATE

The Lexington & Versailles and the Frankfort & Versailles traction lines have been merged under the name of the Central Kentucky Traction Company, the articles of consolidation for which have been filed. The capital stock of the new company is now $425,000. Louis des Cognets, J. R. Morton, J. W. Rhodes, Theo. Harris and C. N. Manning signed the articles for the Lexington & Versailles, while Louis des Cognets, J. R. Morton, M. J. Meagher and J. C. Noel signed for the Frankfort & Versailles.

The directors of the consolidated company consist of the following gentlemen: Louis des Cognets, C. N. Manning and J. W. Rhodes, of Lexington; Theo. Harris, of Versailles; M. J. Meagher and J. C. Noel, of Frankfort; Howard E. Young, J. B. McAfee and J. Levering Jones, of Philadelphia; C. E. Emmons, of Ft. Wayne, Ind., and Judge J. R. Morton, of Lexington. Louis des Cognets was elected president; J. Levering Jones, vice-president; T. D. Murray, secretary; Henry Rainey, assistant secretary; H. J. Delaney, treasurer; J. W. Stoll, assistant treasurer. The company is authorized to issue $4,000,000 bonds and it is said that $3,500,000 will be spent in building lines from here to Nicholsville, Versailles, Winchester, Shelbyville, Owenton, Paris, Cynthiana, Lancaster, Harrodsburg and a number of other towns in the central part of the State.

THE KANSAS CITY BOND ISSUE

The Kansas City Railway & Light Company has announced the terms of the $5,500,000 notes. The notes are in two series: Series A, $4,125,000; series B, $1,375,000, bearing interest at 6 per cent, redeemable at the option of the company at par and accrued interest upon eight weeks' notice on any interest day after Sept. 1, 1908. The notes mature Sept. 1, 1912, and each of the series A $1,000 notes is convertible at the option of the holder after Sept. 1, 1908, into 6½ shares of common stock and 7 shares of preferred stock of the company.

The notes are secured by the pledge of at least $5,500,000 par value notes of the Metropolitan Street Railway Company of Kansas City, $1,000,000 par notes of Kansas City Electric Light, $2,695,000 par of the common stock of the Kansas City Railway & Light, subject as to said preferred stock to the lien of the indebtedness now secured by the deposits of such preferred stock as collateral, which indebtedness matures Dec. 15, 1907, and also the various securities of subsidiary companies.

Series "A" notes are offered at 95 per cent of their par value and accrued interest to the stockholders. Every stockholder can subscribe to an amount equal to 22 per cent or less of the par value of his holdings.

Kuhn, Loeb & Company and Blair & Company are to form a syndicate to guarantee the sale of notes of series A and to buy all the notes not taken by the stockholders.

The proceeds of the notes are to meet the maturing obligations of the company and to provide for improving and extending the property in which it is interested.

THE TRANSIT INQUIRY IN NEW YORK

William M. Ivins, as special counsel for the Public Service Commission, began Thursday, Aug. 1, the investigation of transit conditions in New York. Mr. Ivins had with him at the counsel table Herbert D. Mason, A. E. Blackmar, general counsel for the Public Service Commission, and A. H. Walker, the Commission's assistant counsel. In addition to its legal staff, the Commission has also retained Marvin Scudder, as financial expert. Paul D. Cravath and De Lancey Nicoll represented the Interborough-Metropolitan Company as counsel. The other officers of the company present in addition to Mr. Shonts, the president, who was the first witness, were H. H. Vreeland, president, and Oren Root, vice-president of the New York City Railway Company, President Bryan of the Interborough, General Manager Hedley of that company and others.

At the outset of the hearing Mr. Ivins made a preliminary statement as to the methods and purposes of the investigation. He then asked the Interborough-Metropolitan representatives to produce an index of all the charters and franchises of all the companies included in the merger, and for all the correspondence that has passed between the company and the old Board of Railroad Commissioners for the last seven years for the purpose of determining what regulative orders have been issued and in what manner they have been obeyed.

Mr. Shonts was first called on for an outline of his railroad experience and reviewed briefly his work since 1881, when he began his career. This statement closed with the announcement that when he accepted his present position he was chairman of the Isthmian Canal Commission. After this Mr. Shonts, in reply to questions, said that while the systems under his control, the subway, elevated and surface lines, differ in operation they can be advantageously operated as a whole. Mr. Shonts said that there was at present ordered and awaiting delivery 200 cars for the elevated lines, 50 cars for the subway, 155 cars for the surface lines, and 50 cars for the New York & Queens County Railway. These will go on in addition to the present equipment, except in the case of the subway, where the road had been overtaxing its present car capacity, and hence will be obliged to retire some cars to the shops for repairs. The new elevated cars, he said, were of the present type, while those for the subway were of steel construction, so arranged that side doors could be put into them if desired. The new surface cars are of the pay-as-you-enter type, and Mr. Shonts said distinctly, an experiment. Then Mr. Shonts said, the limit in capacity of some of the lines was reached long since, and that in order to better service it was his purpose to apply to the city authorities for help in keeping the tracks free from vehicle traffic, which was constantly growing and ever becoming more of a hindrance to the operation of cars. Mr. Shonts said that in the last four years this congestion has increased so rapidly that the average speed had been cut down from 8 miles to 7 miles an hour.

Taking up the situation in the subway after Mr. Shonts testified that the company had in subway service 791 cars, of which 300 are steel and the rest are wooden. The wooden bodies cost about $5,700 exclusive of the wiring. The steel cars cost, bodies and trucks, some $15,000. In reply to a question as to whether he considered the wooden cars safe, Mr. Shonts said: "A good deal depends upon a point of view. As compared with cars in other subways they are very safe, and when the subway was opened they were the best cars known. The steel car was an experiment. There is, of course, a greater danger in the wooden cars than in the steel cars, but the accident record of the subway speaks for itself."

Mr. Ivins and Mr. Shonts then took up the matter of types of subway cars with specific reference to the feasibility of using the Illinois Central type, which has side doors for its entire length and which has been described in these columns. Mr. Shont's main objection to this car was that it would increase the danger to passengers at stations where the platforms curve, that it would tend to a worse confusion of the entering and leaving crowds than there is at present, and that inasmuch as the present 8-car express trains overlap the platforms at each end, the Illinois Central type of car would not be of much avail at either end of a train in point of saving time.

He told of some of the troubles that his experts had in studying the congestion in the subway, and said that if relief could be obtained as sought by the company and approved by the late Rapid Transit Commission for the jam at Ninety-Sixth Street, it would at least enable the subway to run its expresses on a 2-minute headway and average 25 miles an hour including stops, which the company is not doing at present. Mr. Ivins called attention to the fact that the agreement between the city and the Interborough provides that the expresses shall average 30 miles an hour including stops. Mr. Shonts said that an average speed of 30 miles would mean 56 miles between stations, which was not considered safe, and hence could not be deemed within the terms of the contract.

When the hearing was resumed on Friday, the first questions asked related to the value of certain underlying lines of the Metropolitan Street Railway Company. Mr. Shonts agreed to prepare for the Commission schedules setting forth the physical cost values of the various properties, the cost of intangible rights in the streets, such as easements and the like, and the value of its franchises.

In reply to a question by Mr. Ivins as to how many miles of track the Interborough-Metropolitan has that are not electrified, Mr. Shonts said about eighty, but that contracts were let for the electrification of some fifteen of these. It would cost in the neighborhood of $900,000 for the street work alone, the witness added, and then Mr. Ivins asked for the aggregate figures covering both construction and equipment so that the Commission might be able to compare these expenses with some of the previous ones going to make up the costs referred to above. When Mr. Ivins asked the witness whether there was in contemplation the electrification of still other lines Mr. Shonts said that if the company had received the permit in time it would have electrified the Twenty-Eighth and Twenty-Ninth Street lines, whereupon Mr. Ivins asked Mr. Shonts for the circumstances connected with this delay in order that it could be looked into. Mr. Hedley and Mr. Bryan were witnesses after Mr. Shonts, but their appearance was in connection with details of little concern here.

Mr. Ivins made various requests for additional data on Friday, among them one for a detailed schedule of the trains run on the Ninth Avenue line at 135th Street, 116th Street, Fifty-Third Street, Christopher Street, and the Battery. Another request was for a statement showing the number of cars run on the surface and the elevated lines just prior to the opening of the subway and thereafter; also similar figures showing the conditions before and after the last merger of the traction lines.

Commissioners Bassett, McCarroll and Eustis have been appointed a committee to investigate the Coney Island & Brooklyn Railroad Company.

When the hearing was resumed on Tuesday, Mr. Hedley, general manager of the Interborough Company, was called as witness. All the questions put to him by Mr. Ivins concerned the details of operation of the subway and elevated lines, and the inquiry was continued along similar lines on Wednesday. The object sought by Mr. Ivins was an insight into the methods of train operation, with the object of learning if possible whether additional trains could be secured with the present facilities. Special attention was given to the number of trains run on the Sixth and Ninth Avenue elevated lines. An examination of schedules of these lines showed that the maximum density of travel on the Ninth Avenue line in the morning rush hours between 7 and 8 o'clock was fifty-one trains an hour. The average headway for all trains between 6 and 7 o'clock appeared to be 3½ minutes, and between 7 and 9 o'clock 1½ minutes. Mr. Hedley then told how efforts are made to increase the service to meet special requirement, and showed by examples from operation that it is impossible promptly to meet the vagaries of traffic. Mr. Hedley said that the service on some of the lines had been increased 40 per cent to meet the demands of public during the non-rush hours, and that now a schedule was being worked out for the Ninth Avenue elevated line providing for a 17 per cent increase there which would go into effect just as soon as equipment now ordered was received. Mr. Hedley said he deplored the action of the present Police Commissioner, who had caused to be withdrawn from service on the elevated lines special policemen in blue uniforms paid for by the company, as the gray-coated special officers are not respected by the hoodlums who so frequently are a cause of considerable annoyance to the company. At the close of the session on Wednesday it was announced that Mr. Hedley would be called again when the hearing was resumed Thursday afternoon.

EARNINGS OF THE KANSAS CITY RAILWAY & LIGHT COMPANY FOR YEAR ENDED MAY 31, 1907

The full comparative income account of the Kansas City Railway & Light Company for the year ended May 31, 1907, is as follows:

	1907	1906
Gross receipts	$5,715,339	$5,153,168
Operating expenses	2,909,136	2,596,539
Net earnings	$2,806,203	$2,556,629
Other income	9,440	9,671
Total income	$2,815,643	$2,566,300
Charges, etc.	*2,095,684	1,644,524
Surplus over charges	$719,959	$921,776
Bond retirement	55,000	55,000
Balance	$664,959	$866,776
Dividends	476,105	476,105
Surplus for year	$188,854	$390,671
Previous surplus	657,351	266,680
P & L surplus, May 31	$846,205	$657,351

*Includes $329,814 transferred to surplus in reserve.

A few years' comparison of the most important statistics follows:

Street railway companies:	1907	1906
Gross earnings	$4,821,902	$4,454,286
Rev., passengers	94,996,998	88,296,480
Trans., passengers	41,074,800	37,810,545
Gross earnings per car mile	21.36c	21.61c
Net earnings per car mile	11.24c	11.25c
Miles of road	124,998	113,838
Miles of track	239.038	222,715
Electric light companies:		
Gross earnings	$893,436	$902,744
Connected load, equivalent to 16-candlepower:		
Incandescent lamps	$546,790	$380,832

The general balance sheet of the Kansas City Railway & Light Company, as of May 31, 1907, compares as follows:

ASSETS.

	1907	1906
Stocks, gold, notes, etc.	$28,456,884	$28,456,884
Met. St. Ry. Co. adv.	4,234,134	2,910,429
Cent. El. Ry. Co. adv.	.....	.....
K. C. El. Lgt. Co. adv.	1,012,376	636,079
Accounts received	62,699	71,025
Cash	18,977	142,110
Treasury stock, common	2,978,200	2,864,420
Treasury stock, preferred	2,864,420	2,978,200
Treasury bonds	1,875,000	1,875,000
Total	$41,502,690	$39,934,147

LIABILITIES.

Preferred stock	$12,500,000	$12,500,000
Common stock	12,500,000	12,500,000
First lien bonds	9,200,000	9,200,000
Coll. 3-year notes	3,000,000	3,000,000
Bill and accounts payable	3,007,645	1,957,769
Dividend	119,026	119,026
Surplus in reserve	329,814	.....
Surplus	846,814	657,352
Total	$41,502,690	$39,934,147

In his annual report to stockholders, President Corrigan says in part as follows:

During the past fiscal year the gross earnings of your company have shown a satisfactory increase over those of the preceding year, amounting to 10.91 per cent. The percentage of increase in the operating expenses amounts to 12.04 per cent, due principally to the increase in wages and increase in cost of paving and track maintenance.

During the fiscal year ending May 31, 1903, the management of the Metropolitan Street Railway Company adopted a new policy in reference to handling personal injuries and damages, and since that time have contested up to the Court of Last Resort all cases where the company, in the opinion of its legal department, was not liable. The result of this policy has been that, while the total number of passengers carried both for revenue and on transfers, has increased from 90,823,557 to 136,071,798, or over 50 per cent, the total expense in connection with the account has, during the same period, increased from $253,946.51 to $276,892.19, or only 9 per cent, and the percentage in money paid out in damages to gross earnings has decreased from 7.97 to 5.74.

During the past year the street railway company paid out in premiums on fire insurance policies $26,684.00, which is $10,449.00 less than paid out for the same account during the preceding year. This economy has been effected by the installation of sprinkler systems in the most important car houses. Contracts have been awarded and the work of equipping two more houses is now in progress.

At the present time the Metropolitan Street Railway Company is operating 222.28 miles of single track, and the Kansas City & Westport Belt Railway Company, 16.76 miles of single track, making a total operated by the two companies of 239.04 miles of single track.

In the fall of 1906 your company secured the stock of the Kansas City & Westport Belt Railway Company, which operated a single track steam railroad from the old town of Westport, now located in the southern part of Kansas City, Mo., to Dodson, a small town about 8 miles south of Kansas City, where it made connections with the tracks of the Missouri Pacific Railway and the St. Louis & San Francisco Railroad. This road affords the only entrance into the southern part of Kansas City, Mo., for the delivery of freight, and in view of the fact that the growth of the city is principally towards the South, we believe that these freight facilities will be of great value. Since its purchase this road has been stone-ballasted, and the entire track relined and resurfaced. A substantial overhead line has been erected and the operation with steam locomotives abandoned and electricity substituted. A fireproof sub-station equipped with a 750 K. W. rotary converter has been completed and put in operation, and furnishes the necessary current for handling both the freight and passenger business. The company purchased a 50-ton 500-hp electric locomotive, capable of hauling twelve loaded freight cars. It is expected that during the coming year the operating expenses will be very materially reduced, and that this company will contribute a substantial amount toward the general income.

ELECTRICAL OPERATION FOR ST. PAUL RAILROAD IN NORTHWEST

It is announced from Spokane, Wash., that the Chicago, Milwaukee & St. Paul Railway Company is planning to install a series of hydro-electric power plants on the St. Joe River, between North Fork and St. Joe, in Northern Idaho, east of Spokane, and to utilize the electrical power developed for operating the railway across the Bitter Root Divide and also for operating several saw-mills and other plants. The work will cover 35 miles of the St. Joe River and it is stated that 180,000 hp can be developed. Three years will be necessary to complete the work which will cost nine million dollars. If the trial is successful, it is possible that electricity will be used on the entire line between Missoula, Mont., and Puget Sound, a distance of nearly 600 miles.

It is stated that three dams are to be constructed at once and others will be built later. One dam, 86 ft. high, will be built at Little Falls, three miles above St. Joe, to develop 5000 hp. Another dam will be constructed at Cottonwood Island, 10 miles up the river. Good dam sites are to be found at frequent intervals and it is thought no difficulty will be found in making the power developments.

The power will also be used extensively in developing the resources of the tributary country, especially in the operation of saw-mills, as the St. Paul interests control large timber lands in Idaho. A large paper-pulp mill is also to be erected.

The development of the power possibilities are in charge of C. B. Price, a hydraulic engineer, and they are said to have received the sanction of A. J. Earling, president of the railway company.

THE CLEVELAND SITUATION

The officers of the Forest City Railway Company caused a curative ordinance to be introduced in the City Council at a special meeting called Thursday evening. This ordinance, fathered by Councilman R. J. Koch, will operate to re-enact all the grants formerly made to the Forest City Railway Company and in addition makes a number of amendments to the old ordinances that are intended to guide the company in its attempts to gain the joint use of the Cleveland Electric's tracks in certain places. The assertion was made in a letter to the Council and personally by the officers of the company that Mayor Johnson is no longer interested in the company and that there is now nothing to make the grants to the company by the corporation itself illegal.

While the letter does not admit all the transactions in which the mayor is said to have been interested in the way of aiding this company, it virtually says that the old company was right in its contentions in suits brought from time to time and that the courts were justified in the decisions they arrived at. The new ordinance provides that all the rights and privileges given the company by former ordinances shall continue. It further states that these ordinances are not repealed but re-enacted, to give strength to the new position the company now assumes. Amendments to these ordinances are to the effect that the company shall have joint use of the tracks of the Cleveland Electric in what is called free territory and that in other territory the company shall gain joint use of tracks by appropriation and the case shall be tried in a competent court. The franchises are to expire on Sept. 9, 1923, except in cases where the right of joint use of tracks is given and they shall expire on the date that the Cleveland Electric's grant expires. The ordinance was read a second time at a meeting of the Council Friday evening.

All last week was taken up in the preparation of this ordinance, but the Central Avenue franchise is still in question, even if the curative ordinance holds good on the others, as it has been held to be invalid. In order to make it good, the curative ordinance would require the consents of the abutting property owners, which can not be gotten, it is thought. Fulton Road is also in doubt, as a suit is pending that may render the grant there illegal and void. While the company states that it will proceed to build a road on Central Avenue and Quincy Street at once, if the curative ordinance is passed, there is grave doubt about the matter.

Councilman Orgill has raised the question of the power of the Council to re-enact ordinances that were originally illegal because of the financial interest of the Mayor. City Solicitor Baker claims that the Council has full power to re-enact them. However, it would seem that if they are illegal, they have never really existed and it would be difficult to re-enact an ordinance that had never existed.

Secretary Albers, of the Forest City, has been questioned as to his reason for stating that the guarantees of the Mayor were made without the solicitation or knowledge of the company, when the Mayor had testified before a notary some time ago that he had made certain guarantees that could hardly have been made without the knowledge of the company. Mr. Albers did not answer the questions, but referred to his letter to the Council and to the attorneys for the company.

By a vote of nineteen to eleven the City Council passed the Koch ordinance at a special meeting Saturday. A number of Councilmen opposed to the ordinance attacked it vigorously on the floor and declared that it was useless to take such action, since the ordinance would be worthless. In addition it was admitted that one or two of the Mayor's guarantees are still out, notwithstanding the fact that the letter of the Forest City Railway Company stated in explicit terms that they had all been taken up or liquidated. The company will probably attempt to act in accord with this ordinance, but it is said that the Cleveland Electric is preparing a suit that will attack the validity of the whole procedure and that injunctions will be brought against the Forest City Railway Company to prevent its doing anything further in the way of construction. Attorneys for the Cleveland Electric, it seems, believe that the action of the Council has done nothing toward giving validity either to the company or its grants.

Papers showing the revocation of Forest City consents for 1200 feet of frontage on Fulton Road were filed with the City Clerk Saturday morning. This, it is claimed, leaves the Forest City 512 feet short of a majority and invalidates the blanket franchise that was passed later in the day, since the grants included this thoroughfare, for which consents are necessary. Cleveland Electric agents had been at work along that street for some time and seem to have been quite successful in their quest.

THE SOUTHERN PACIFIC'S ELECTRIC PLANS

In regard to the Southern Pacific Company's plans for operating its suburban system in Alameda and Oakland by electricity, Vice-President Julius Kruttschnitt recently stated: We are soon to build up on the Oakland estuary on a block of land we bought for the purpose, one of the finest, most modern and up-to-date electric power plants in the United States. It will occupy the whole block, which is about 400 feet square. It will be quite a showy building, and high, because we shall have big coal bunkers there and mechanical stoking machinery for supplying the furnaces with fuel. The plans for this electric power house have been finished, and Electrical Engineer Babcock has started East to submit them to Mr. Harriman. They are the result of Mr. Babcock's study and adaptation of a number of notable plants in different parts of the country, and they embody all the latest ideas. When the service will be established I can not now state definitely.

KEY ROUTE EXTENSIONS

The San Francisco, Oakland & San Jose Railway Company, operating the Key Route ferry and electric-train system, is planning several important extensions to its property in Oakland and Berkeley on the east side of San Francisco Bay. These extensions will embrace a new line beginning at a point at Adeline and Sacramento Streets and running up Sacramento Street to Hawkins Street, where the line crosses to the Santa Fe right of way and parallels its tracks for a short distance, leaving them to skirt the base of the foothill slopes at that point along the 400-ft. boulevard passing by the proposed new capitol site in Berkeley. There will also be a spur from Sacramento Street running into the lands of the Piedmont Improvement Company.

One of the most important extensions proposed is the new line into Piedmont. It will start at the corner of Fortieth Street and Telegraph Avenue and run northeast across the intervening country and tap the lower section of the central Piedmont tracts, and then cross the upper portion of the East Piedmont Heights section, crossing the proposed city park at that point. The line will then run to Thirteenth Avenue just north of the Fourth Avenue Terrace tract. The entire right of way for this Piedmont extension has been purchased.

The extension of the company's tracks up Claremont Avenue to the new Claremont Hotel has practically been completed and service will probably be inaugurated as soon as the hotel is completed. When these extensions are made it is probable that the Key Route officials will introduce a 10-minute ferry service in place of the present 20-minute service. This will necessitate the addition of more boats.

The extensions which have been planned by the Oakland Traction Company, which is under the same control as the Key Route, are also of a very comprehensive nature. One of the important lines which they will at once build is on the Grand Avenue car-line. This extension will cross the head of the lake and run up Lakeshore Avenue into the lower portion of the Piedmont district. There will also be an extension of the Fourth Avenue line and an extension up Alicia Avenue to Allendale from the Hayward line. Four extensions are also planned for the Berkeley district, as previously mentioned in these columns. The two companies have placed large orders for new cars of a heavier and more modern type, with all modern conveniences, and will take up all the light rails on their lines and replace them with rails of a heavier type, making marked improvements in the service and equipment of the two companies. The officials say that the cost of the improvements under way and in contemplation will involve the expenditure of at least $3,500,000.

Interests closely identified with the San Francisco, Oakland & San Jose Railway have bought the entire double block in Oakland known as the old Pope and Talbot tract, between Twelfth, Fourteenth, Union and Poplar Streets. The purchase of the site has given rise to much speculation as to the use to which it will be put. The best information at this time obtainable indicates that a large station and yards will be established on the property as a center for the West Oakland department of the Key Route business.

PAID-IN-CAPITAL CLAUSE MADE PART OF RECENT CONNECTICUT INCORPORATION REQUIREMENT

A provision that not less than 25 per cent of the capital stock shall be paid for in cash, which has been incorporated into the franchises of two street railway companies just chartered by the Legislature, establishes a new Connecticut policy toward public utility corporations. The Windsor Locks & Western and the Meriden, Middleton & Guilford charters contain this requirement, and they have been signed by the Governor. From the outset of the present session Governor Woodruff has consistently urged legislation providing that the capitalization of street railway companies shall rest on a cash basis.

THROUGH DETROIT-CHICAGO SERVICE PROMISED AS RESULT OF SALE OF CHICAGO ELECTRIC TRACTION

Through electric railway service between Chicago and Indianapolis is promised by Detroit capitalists who purchased the Chicago Electric Traction Company at a receiver's sale before Master in Chancery James S. Hopkins, of the United States Court. The road, which has 32 miles of track connecting Chicago with Harvey, Ill., will be used to bring passengers into the city from a network of lines in Illinois and Indiana. Efforts will be made to run cars from the present terminal of the road, Sixty-Third Street and South Park Avenue, downtown over the South Side Elevated Company's tracks. The price paid was $330,000, of which $250,000 was paid in court. The sale was the result of foreclosure proceedings brought by Moran, Mayer & Meyer on a mortgage of $1,200,000 held by the Manhattan Trust Company, of New York. The road failed in 1900, and since that time Charles Henrotin has operated it as receiver. The line was built in 1896.

KANSAS CITY AS AN INTERURBAN CENTER

It is announced by J. J. Heim, promoter of the Kansas City, St. Joseph & Excelsior Springs Electric Railway, that within the next few years it will be possible to travel by electric car from Kansas City to Coffeyville, 175 miles distant. Kansas City will soon be a suburban electric railway center, says Mr. Heim. Lines to Olathe and Leavenworth, Kan., are now in operation and lines are projected to Atchison, St. Joseph and other North Missouri towns, with branches to Excelsior Springs and Liberty. Other lines are planned up the Kaw Valley. One of these is projected to Paola, Kan. Mr. Heim says only 60 miles of track are needed to connect Kansas City with the extensive electric interurban systems in Southern Kansas and Southwest Missouri. This will give Kansas City direct connection by electric car with the gas and oil fields of Southern Kansas and Oklahoma. There is a population of 2,000,000 within a radius of 170 miles of Kansas City. Where there is no local electric light plants electricity could be furnished for light and power. Mr. Heim says plans are being discussed for a general union station at Kansas City like the one in Indianapolis, to be used by all traction lines.

PENINSULAR RAILROAD TO CONNECT SAN JOSE AND SAN FRANCISCO

Work on the railway being constructed by the Peninsular Railway Company of San Jose is progressing favorably. This railway will connect San Jose, Cupertine, Mayfield, Palo Alto, Redwood City and San Mateo and will later be extended north to San Francisco. The grading for the railway has been finished from Mayfield to its intersection with the old narrow-gage road at Vasona near Los Gatos. It is expected that the ballasting will be done at once and that rail laying will be commenced within a few weeks.

Trains will be run between San Francisco and Los Gatos in one hour and fifteen minutes when the Bay Shore cutoff of the Southern Pacific is opened and the Peninsular road completed. It is understood that work will proceed as promptly as possible on the electric road, which is already built ten miles west of San Jose, with a junction with the Peninsular road. It will use the same right of way as far as Mayfield and then go across the Stanford University along the foothills to Redwood City and San Mateo, the right of way having been purchased. The street grading and cement are being put down in the town of Los Altos on the line, and surveys are being completed for the town of Elevada.

Congress Springs, which has been purchased by the railroad, will be improved to some degree this year, but not till next season will plans be made for its ultimate development as one of the great California resorts. It is the intention of the railroad to give Congress Springs one hour and half service from the city. A branch line is being built which will make an important junction near the Sorosis farm. The company has recently applied for franchises in Mayfield and for Santa Clara County.

In regard to the railway entering San Francisco there is some talk that it will use the Valencia Street railroad line of the Southern Pacific when it is abandoned for regular service by that company on the completion of the Bay Shore cut-off.

CONNECTICUT TROLLEY BILLS PASSED OVER GOVERNOR'S VETO

The House received five veto messages from Governor Woodruff, of Connecticut, July 31, all of amendments to trolley charters, and passed all of them over the veto except that of the Meriden, Southington & Compounce Tramway Company, which was indefinitely postponed. The other vetoes were of amendments to the charter of the Norwalk, Bridgeport & Bethel Traction Company, the Connecticut Railway & Lighting Company, the Thomaston & Watertown Electric Railway Company and the Middletown & Middlefield Traction Company. A new resolution incorporating the Orange Street Railway Company, with provisions objectionable to the Governor removed, was passed in concurrence. The public utilities matter was tabled. The Consolidated, Connecticut Railway & Lighting, Thomaston & Watertown & Norwalk, Bridgeport & Bethel trolley bills were passed over the vetoes in the Senate.

STREET RAILWAY PATENTS

UNITED STATES PATENTS ISSUED JULY 23, 1907

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

860,673. Braking Device; Van Buren Lamb, New Haven, Conn. App. filed Oct. 28, 1905. Consists of a plurality of brake-shoes having interfitting faces welded together by a self-fusing compound.

860,681. Contact Pole Retriever; Joseph F. Mackin, Columbus, Ohio. App. filed April 6, 1906. Includes a pneumatic cylinder and means actuated by an abrupt movement of the pole for putting such pneumatic cylinder into operation.

860,726. Surface Contact Electric Railway; William M. Brown, Johnstown, Pa. App. filed July 29, 1904. Means for preventing the continuation of arcs in contact boxes after the passage of a car. Consists in means whereby any arc which tends to continue in the boxes is short circuited as the car leaves the same and thereby extinguished.

860,734. Railway Crossing; Walter V. Cushing, Chicago, Ill. App. filed Dec. 24, 1906. Short sections of the rails at intersecting points are pivoted and adapted to be turned by mechanical means to provide continuous rails on either track.

860,777. Car Grip; Frederick B. Wentworth, Boston, Mass. App. filed Sept. 21, 1905. Provides handles arranged upon individual supports which depend from a single hanger and are so arranged thereon that one handle and support may be used independently of another.

860,800. Automatic Slack adjuster for Brakes; Richard F. Hamilton, New York, N. Y. App. filed Jan. 26, 1907. A slack for use in connection with air brakes.

860,892. Car Truck Bolster; Jahn McE. Ames, Dongan Hills, N. Y. App. filed May 1, 1907. The bolster is deepest at its middle and has horizontal end portions, the side plates being extended vertically below the bottom member along the adjacent upwardly extending and horizontal end portions of the same.

860,935. Signal; William H. Nelson, Kingsville, Mo. App. filed April 27, 1907. Details of a pneumatically operated semaphore signal.

860,923. Rail-Joint; George V. Lawrence, Carnegie, Pa. App. filed April 30, 1907. The heads of the abutting rails are provided with longitudinal holes for the reception of a

pin, and splice bars integral with one rail adapted to overlie the base flange of the other rail. Spike recesses in the rail and splice bars adapted to register. Dispenses with the use of nuts and bolts.

860,945. Apparatus for Railway Signaling; Henry W. Spang, New York, N. Y. App. filed Sept. 22, 1902. Means for controlling the action of an electromagnet by the moving of the rolling equipment of the railway. Provides means whereby the current from sectionally energized track rails may be caused to flow in different directions through a polarized relay in the locomotive, thereby giving different signals.

860,955. Construction of Car Trucks; Ransom C. Wright, Philadelphia, Pa. App. filed Oct. 18, 1904. A truck frame having metallic sides and flanged transom beams, and a straight flanged beam with upwardly projecting flanges secured to the flanged transom beams and sides.

860,976. System of Control; George H. Hill, Schenectady, N. Y. App. filed Nov. 14, 1905. Apparatus for controlling the operation of motors through a distant point, and relates more particularly to systems wherein a plurality of motors or groups of motors are controlled from a single station.

861,015. Block Signal System; Elmer F. Bliss Schenectady, N. Y. App. filed March 7, 1906. Has sectional track rails energized by an alternating voltage and connected by inductive bonds. Has protective devices adapted to reduce the current in case of abnormal flow.

861,018. Switching Mechanism for Electric Railways; Ed. W. Clark, Coalton, Ohio. App. filed March 26, 1907. Means whereby a motorman may control a switch from a distance so that the car may be made to take a siding or vice versa. Has a special trolley co-operating with a suspended contact plate in the overhead system.

861,064. Strain Insulator; Theodore Varney, Pittsburg, and Christian Aalborg, Wilkinsburg, Pa. App. filed June 4, 1906. Has a metallic cylindrical core on which is placed an insulating tube which in turn supports an eye-ring or bolt.

861,065. Nut-Lock; Thomas P. Vuncannon, Van Vleck, Tex. App. filed April 3, 1907. Relates to nut-locks especially designed for rail-joints for preventing the nuts of fish-plate bolts from jarring loose, and consists of a sheet metal plate disposed under the rails and bent upwardly and inwardly and having holes therein for the reception of the cuts of the fish-plates.

861,071. Strain Insulator; Christian Aalborg, Wilkinsburg, Pa. App. filed May 2, 1906. Consists of an insulating body with tapered holes containing supports which are threaded to engage the nuts of a U-shaped bolt or staple.

861,086. Railway Tie; Judson Carr, Longbeach, Cal. App. filed Feb. 14, 1907. Two relatively spaced ties to provide broader bearing space for the rails and means for fastening the ties together and the rails to the ties.

861,094. Strain Insulator; Harry P. Davis, Pittsburg, Pa. App. filed June 4 ,1906. Comprises a metal tube with a rod projecting therein and having an enlargement located substantially at the middle of the tube, and insulating tubes interposed between the end walls of the metal tube and the ends of such enlargement.

861,143. Means for Securing Wheels to Shafts or Axles; Thomas S. Scott, Pittsburg, Pa. App. filed Dec. 4, 1905. The shaft has a circumferential recess into which a segmental ring is inserted after the wheel has been placed on the axle and a circumferential collar adapted to be secured to the wheel.

861,145. Passenger Car Construction; Albert H. Sisson, St. Louis, Mo. App. filed Oct. 11, 1906. A car having a metal floor, framing posts and base places, each having an outwardly inclined portion to provide a tapering pocket for the filling.

861,149. Strain Insulator for Electric Lines; Theodore Varney, Pittsburg, Pa. App. filed June 4, 1906. Has a ribbed insulating body with metallic rings molded therein and which support thereon bolts projecting from the ends of the insulating body.

861,204. Railway Tie; Samuel M. Coleman, Johnstown, Pa. App. filed March 2, 1907. A composition tie provided with a metallic top.

861,233. Automatic Trolley Pole; Hugh W. Fellows, Cahuenga, and Ira A. Cammett, Hollywood, Cal. App. filed July 16, 1906. The pole is impelled upward by a spring connection which is automatically tripped or released in case of a too abrupt movement of the pole occurring when the pole leaves the trolley conductor.

PERSONAL MENTION

MR. JOHN B. PULLIAN, of Fruitport, Mich., has been made general manager of the Winnebago Traction Company, of Oshkosh, Wis., to succeed Mr. Edward B. Kirk. The company was recently placed in the hands of a receiver.

MR. R. B. HAMILTON has been elected secretary of the Chicago City Railway Company, vice Mr. J. B. Hogarth. Mr. Hamilton will continue his present duties as purchasing agent. Mr. A. G. Mitten has been elected auditor, vice Mr. Hogarth.

MR. WALTER MOREHOUSE has resigned from the Cincinnati Northern Traction Company to accept the position made vacant by Mr. A. S. Swank as assistant superintendent of construction of the electric railway to be built from Buffalo, N. Y., to Erie, Pa.

PROF. CHARLES HENRY BENJAMIN, dean of the School of Engineering at Purdue University, has been appointed to succeed Prof. William F. M. Goss, who resigned to accept a similar appointment at the University of Illinois. Prof. Benjamin comes to Purdue from the chair of mechanical engineering at the Case School of Applied Science at Cleveland.

MR. HARRY A. MOORE, for the past five years claim agent of the Public Service Corporation's street railway department, and Mr. Charles H. Flatt, a claim adjuster, have resigned. Mr. Moore is succeeded by Mr. Harry Down, assistant claim agent, while Mr. Flatt is replaced by Mr. Edwin L. Cushing. Mr. Down came to the Public Service Corporation from the Rhode Island Company in February, 1907. He had previously been with the Cincinnati Traction Company and Pittsburg Construction Company.

MR. ALFRED B. NELSON, of Trenton, N. J., has accepted the position of chief engineer of the Columbus Railway, Light & Power Company, of Columbus, Miss. For the past two years Mr. Nelson has been engineer of construction for the Conestoga Traction Company, of Lancaster, Pa., previous to which time he built the Trenton, Newhope & Lambertville Street Railway the Camden & Trenton Railway, and several roads which now form a portion of the Public Service Corporation of New Jersey, besides having had considerable experience in gas, light and water works construction. It is the intention of the Columbus Railway, Light & Power Company, to build several extensions to the railway system and enlarge and remodel the electric light and gas plants.

MR. JOHN C. HENDERSON, assistant to the president of the Louisville & Southern Indiana Traction Company, the Louisville & Northern Railway & Lighting Company and of the companies owning and operating the various utilities of New Albany, is dead, after an illness that had confined him to the house for nearly a year. He was 63 years old and is survived by three daughters. Mr. Henderson came to New Albany about three years ago, having been appointed to the position of chief engineer in the construction of the approaches to the Big Four bridge at Jeffersonville, which were built for the use of the interurban trains in crossing from Indiana into Louisville. Two years ago he was appointed by Mr. Samuel Insull assistant to the president and had complete charge of the interests above mentioned in and about New Albany.

MR. J. F. COLLINS, formerly superintendent of the Toledo Railways & Light Company's lines, has been promoted to manager of railways, with entire charge of the transportation end of the business. Mr. Collins thus is rewarded with a position that will give wider scope of authority and judgment in the operation of the lines. Mr. Collins will announce the appointment of a superintendent later. Mr. C. R. McKay, superintendent of light and power, has been made manager of light and power, and in addition to the gas and electric departments, he will have charge of the power and heating plants as well. These promotions will relieve General Manager L. E. Beilstein of much of the detail in the management of the properties. Mr. Collins began his career in Indianapolis as a horse car driver, when Mr. Tom L. Johnson was interested in that city. He was in the employ of the roads there when they were changed to electric power and later on was made night superintendent. For ten years he has been superintendent of the Toledo lines and for the past year or more has also had charge of the Maumee Valley and the Toledo Beach lines.