Street Railway Journal

VOL XXX. NEW YORK, SATURDAY, AUGUST 31, 1907. No. 9

PUBLISHED EVERY SATURDAY BY THE

McGraw Publishing Company

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

MAIN OFFICE:
NEW YORK, ENGINEERING BUILDING, 114 LIBERTY STREET.

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

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

TERMS OF SUBSCRIPTION

In the United States, Hawaii, Puerto Rico, Philippines, Cuba, Mexico and the Canal Zone

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

To Dominion of Canada

Street Railway Journal (52 issues), postage prepaid.....$4.50 per annum
Single copies ..... 10 cents

To All Countries Other Than Those Mentioned Above:

Street Railway Journal (52 issues), postage prepaid..... $6.00
25 shillings. 25 marks. 31 francs.
Single copies ..... 20 cents
Remittances for foreign subscriptions may be made through our European office.

NOTICE TO SUBSCRIBERS

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

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

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

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

Of this issue of the Street Railway Journal 8000 *copies are printed. Total circulation for* 1907 *to date* 287,550 *copies, an average of* 8215 *copies per week.*

Graphic Methods of Watching Rolling Stock

The clerical labor of keeping track of the condition of cars, trucks and motors on the ordinary street railway usually involves more or less waste of time when the master mechanic or operating department wishes to know, as it often does, just how many cars are in service or ready for operation and how many are in the shops at any given moment. On some lines a daily report of the car numbers available for service is laid on the dispatcher's desk each morning, and that is the end of the matter for the day. Breakdowns, accidents, sudden increases of traffic, and weather changes often necessitate instant knowledge of the car numbers on hand at the car houses, and much valuable time can be consumed in telephoning for different employees to count and report the cars in the car house at any specific time.

There is room for the use of simple, positive bulletin boards in many instances, which will indicate at a glance the condition of every car on the system or division. Rows of numbered brass checks hung on hooks, or card slips, colored pegs or colored buttons can be pressed into service in such cases, and it is a simple matter thus to keep an up-to-date minute record of each car or equipment part. One section or color will indicate equipment in the machine shop, another will apply to the paint shop, to the storage tracks, armature room, and so on. With such a bulletin board close by the shop or car house telephone, it is a matter of a few seconds to give any official the exact status of all the equipment on the road or division.

The percentage of equipment laid up for repairs is also worth following closely, and the plan mentioned affords an opportunity of doing this as well as a check upon frequently recurring trouble on any single car, motor or truck.

Electrification and the Smoke Nuisance

A recent order of the Massachusetts Railroad Commission in reference to the smoke nuisance of steam locomotives in the Boston suburban districts emphasizes again the value of electricity for such service. Complaints have lately poured in upon the Board thick and fast from residents of Brookline and the Newtons in regard to the annoyances to persons and injury to property caused by locomotive smoke. The situation has grown acute through the increase in number, speed and load of trains, the construction of new stations and the building of new blocks and houses upon lands adjacent to railroad premises.

The Board finds that it is practically beyond question that soft coal of a high grade is the fuel best adapted for the fast and heavy train service of steam roads, and it emphasizes the need of better smoke-consuming devices and more careful firing. An additional inspector experienced in locomotive firing has been employed by the Board, but we are glad to note that the Commission recognizes the fact that all such measures are merely palliative in comparison with the certain cure which electricity affords. The Board states that "from time to time for many years the electrification of railroads has been the theme for active discussion and the subject of sanguine prophecy. In suburban service this improvement may be confidently predicted as an event of the near future, the practical tests being made in New York between the two advanced systems of equipment assuming a solution of the question as to the best method of operating railroads with electric power. The new service will be a boon in other ways, but in none so much as in complete relief from the smoke and cinders and dust and gases of coal and coke." This utterance is in accord with both anticipation and experience—the improved conditions on the elevated lines of New York and Chicago, in tunnels and subways on interurban routes, mountain roads and already in the partially electrified steam service at New York—all

these indicate beyond question that the steam locomotive is doomed as a transportation agent in metropolitan communities.

Up to the present the applications of electric power to transportation systems in this country have all been in thickly settled communities, where the frequent service afforded has been of great importance. In the proposed utilization of electric power on the Sacramento division of the Southern Pacific Railway, described elsewhere in this issue, an entirely different duty is desired. Here it is a question of increasing the track capacity on a single section of the large transcontinental railway system of the company, a section which limits the capacity of the entire road, and of combating grades, distances, snow-falls and other obstacles which have not been present in the notable Eastern installations. The results of the study of the board of engineers appointed to consider this subject will be of the greatest value, but with the opportunity which electricity affords of applying any amount of power to the driving wheels, of dividing that power into as many units as may be desirable, of eliminating smoke, of recuperating power on the down-grades and of utilizing any waterpower which may be available in the neighborhood, it would seem as if it might afford the solution to the problem sought.

Power Stations for Single-Phase Railways

One of the striking things about the New York, New Haven & Hartford power station, shared, indeed, with some other single-phase lines, is the use of three-phase generators. This practice has two reasons for being. In the first place, it enables polyphase power to be supplied to motors and rotary converters when and where it may be now or hereafter necessary. In the second place it is generally believed to result in a better generator than if the winding were simply single-phase. The plan is really an old one, first brought into notice some years ago in Dresden, where single-phase lighting was carried on from three-phase generators, motors being worked from all three lines. As regards convenience it is certainly useful to be able to operate three-phase motors along the line, as these machines are for many purposes preferable to any commutator motors, either for alternating or direct current. It gives, too, opportunity for ready exchange of power with other stations, or for an entirely different utilization of the power if such a step should be locally desirable. There is, therefore, a flexibility about the system which is highly desirable at this particular stage of proceedings.

Another strong reason is the second one. While a simple consideration of the currents would lead to a considerably reduced capacity if one phase of the star-wound machines is unutilized, yet practice seems to have shown that the loss of capacity is much smaller than would be at first supposed. Owing to the distribution of the windings the armature heating as regards steady temperature is somewhat reduced and heavier current can be carried than if all the windings were alike sources of heat. There is, too, an advantage over the ordinary single-phase winding in the matter of heating and armature reaction for equal current density and equally favorable wave shape. Just how much this amounts to is difficult to say, but some designs go so far as to claim that a well distributed three-phase winding gives for an equally good machine enough excess capacity to almost or quite nullify the evident loss in failing to use one set of coils. Be this as it may, in the case in hand no coils are really idle and there may well be enough use of the relatively inactive set to make the machines at least equal to single-phase machines designed for the railway work alone. With the additional gain in flexibility it is not difficult to see the reason for the choice. It would be interesting to know exactly the effect of the high rotative speed (1500 r. p. m) upon the elements of design of the generators. Speaking broadly, a two-pole alternator is a troublesome thing to lay out and is apt to give an e. m. f. wave very rich in harmonics. When it comes to using the lower frequency of 15 cycles, often of late advised for commutating motors, the turbine speeds will have to come down to 900 r. p. m., which, while it can be managed, particularly with more stages than are now standard, will be still more awkward in the matter of generator design.

The present work on the New Haven road will probably throw considerable light upon the question of the proper frequency. If the performance of the locomotives is all that is hoped and claimed for them, it will be apparent that a lowered frequency will be of value principally in increasing motor capacity, a condition which in cases of light service might involve some difficulties for small gains. On the other hand, if the commutation can be considerably improved by coming down to 15 cycles, this will constitute another reason for doing so.

The Expansion of Auxiliary Power Plant Equipment

In the majority of the better class of power plant designs at the present time ample provision is made for the expansion of the main generating units along symmetrical lines, both in the boiler room and the engine or turbine section. Plants built on the isolated unit idea with each group of boilers serving one or two engines, and so on to the switchboard, often are designed without a symmetrical arrangement of auxiliaries, however, the result being a mixed layout when the inevitable growth of equipment takes place. The importance of symmetrically adding new auxiliary equipment may well be emphasized at this time, for the increasing volume of business which faces railway plants in growing cities and towns justifies careful planning in advance of the contract awards for augmented capacity.

Obviously the proper place to provide for subsequent auxiliary additions is in the original plans of the plant, but in a good many instances the problem is one of adding auxiliaries to an old station which is unfavorably arranged for any logical development. Individual conditions vary so much that it is hard to lay down any detailed scheme in these suggestions, but there is good ground for encouragement in the fact that, on the whole, power plant auxiliaries take up a small space individually in proportion to their output. A small unused piece of land at one side of the power plant can therefore be pressed into service, or a section of the basement remodelled if the original layout of condensers, pumps and piping is not too intricate. The original installation is, as a rule, left intact in the main, for it would scarcely pay to rip it out unless improved machinery is to be substituted for the old apparatus. The addition of new apparatus, however, in the line of increased capacity, ought to take place along symmetrical lines.

Appearance is vastly improved by the addition of auxiliaries on a predetermined scheme, but the question of looks is not the controlling factor. The point is simply that the regular increase enables the first cost of the installation in labor and material to be reduced over that of a heterogeneous installation, and the operating problem is also simplified. Piping is shortened, losses in steam lines through radiation, conduction, and in some cases from convection, are decreased; space is economized, clearance between pumps and condensing units can be made adequate, accessibility for inspection and repairs may be improved, safety made more certain, and the fire risk diminished. Apparatus planned for logical expansion can be disposed in locations accessible to the engine room crane; feed pumps, sump pumps and auxiliary motors can be located in places where they will not have to be torn up and relocated because of standing in the direct line of advance when the boilers are extended or the coal pockets enlarged. And, finally, the wiring cost will be reduced in a symmetrical layout, and the auxiliary plant as a whole will be more immediately under the eyes of the operating shifts than if no special symmetry were followed in the plant expansion. The problem is quite as important in the reciprocating engine as in the turbine plant, though the multiplication of auxiliaries in the latter installations needs to be handled with great care if the piping is to be cut to the lowest initial cost consistent with flexibility of operation. In the electrical side of the modern power-plant designers are straining their wits to produce switchboards which minimize blunders and facilitate control at a glance. Power-plant wiring is much simpler on the whole than it used to be, if we leave the back of the switchboard as a debatable question. The piping and auxiliary arrangement in general should be simple and straightforward in the same way.

Valuations and Rates

Nearly everyone who is interested in street railway properties and who read the President's speech at Provincetown last week, and that of Secretary Taft a day earlier at Columbus, must have been struck with the similarity of street and steam railroad problems in some respects and their antithesis in others. The burden of both of these addresses, so far as they concerned railroad companies, related principally to the present anti-monopoly and anti-rebate policy of the Government, and its effect upon the operation and management of the transportation companies. In this connection Secretary Taft devoted considerable attention to the subject of physical valuations. Such a valuation, it has been argued, in the case of both steam and street railway companies, is necessary to determine whether the corporation is overcapitalized, and whether it properly can reduce its rates.

Now the valuation of a railway property is an extremely difficult undertaking to complete satisfactorily, because of the variety of ways in which the work can be done, no two of which will produce the same result. If we should take either the original cost, or the cost less the usual allowance for depreciation, in other words, the replacement value, we lose sight entirely of the earning power, which itself depends partly upon the location of the road and its connections, and partly upon the ability of the management to secure from the property its maximum earnings. On the other hand, if we take as a basis the market price of all of the securities issued against the property, a value which might be considered to be founded upon its earning power, we face the other horn of the dilemma; what is the market value? Is it that of to-day or of yesterday or of to-morrow?

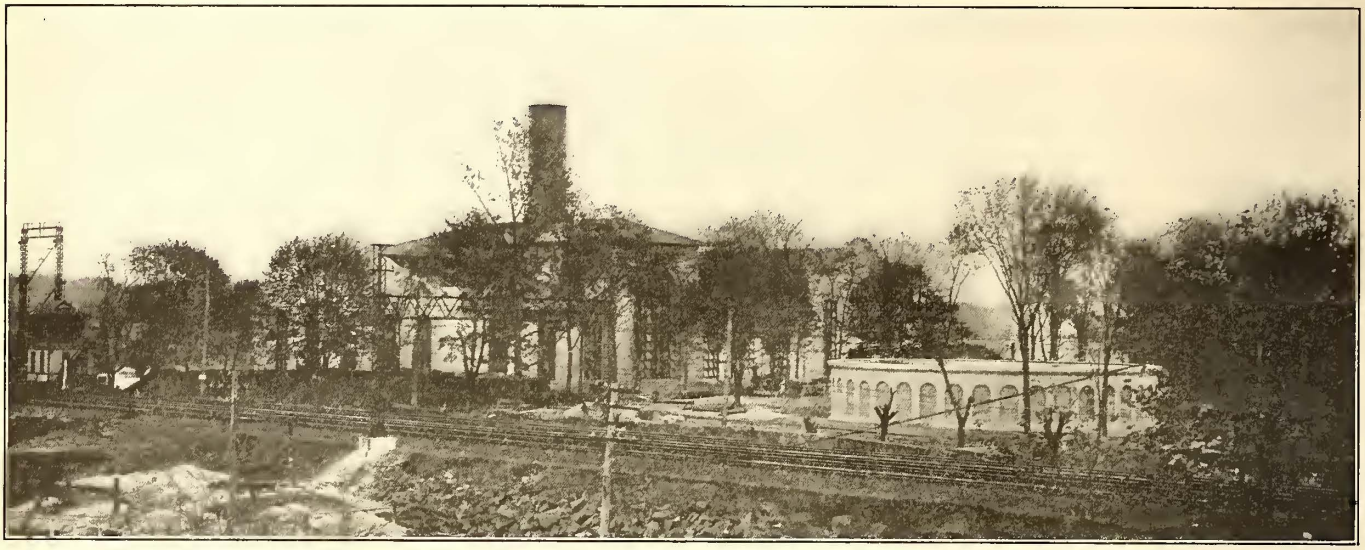
Again, the values at which a road may be appraised will, and should, vary according to the purpose for which the appraisement is made. This is a point not often realized by tax assessors. Expenses, for instance, connected with the organization of the company, outlay for apparatus now obsolete and in use or discarded, payments for city paving or other improvements required by the franchise but not the property of the company; all are legitimate charges against the cost of the property, but can not properly be included in its assessed value for taxation purposes. Moreover, the real value of a property, assuming it to be either its replacement value or some multiple of its earning power, will vary from year to year, even from day to day, depending upon actual or potential competition, the cost of material and labor and a thousand other factors which concern the cost of construction and operation or affect the receipts. The only State valuations that have never been successfully combatted, so far as we know, are those of the New York State authorities, and the reason in that case is that the assessors have never divulged the methods employed by them. So far as the public or the companies are concerned, these assessments have been absolutely arbitrary. The Secretary of War evidently recognized these difficulties and also points out that a valuation is, after all, of small benefit in deciding what is a fair profit upon the investment. That is, the proper relation between the rate and the total net profit of operation is so complicated with an infinite variety of other circumstances that it is most difficult in rate fixing to use the latter to affect the former.

There is then a similarity between the steam and street railroad, so far as the relation between valuation and rates is concerned, but a striking difference in the monopoly feature, if we agree with the President and his Secretary. This was the second point to which both gave attention. It is not new, as the present administration has gone on record as opposed to permitting a company engaged in interstate traffic acquiring stock in a competing line.

Without going into the merits of the case with the trunk lines of the country, it is safe to say that the interests of the public lie in the direction of street railway monopolies. The economies of operation are so great, and the facilities which can be offered the public are so numerous that consolidation within well defined geographical limits has been well nigh universal. How far this principle can be extended to include connecting interurban railways, and whether proper limits can be fixed, are still questions to be determined by railway economists. We recognize the fact that the conditions presented in the case of large territory are different from those in the case of a smaller area, but doubt whether the best boundaries of corporate enterprise are necessarily coincident with those of the State. They have not proved so in many cases, and inability on the part of an electric railway company to operate contiguous lines, as well as extensions, would often restrict the service which it could furnish the public.

COS COB POWER STATION, NEW YORK, NEW HAVEN & HARTFORD RAILROAD COMPANY

The power house of the New York, New Haven & Hartford Railroad Company, at Cos Cob, Conn., which has just been completed, is of interest as being a part of the first installation of single-phase electric equipment for the operation of trains over a trunk line railway system whose overhead and motor equipment has been described in the last two issues of this paper. The station, in addition to furnishing single-phase current for the operation of electric trains over the New Haven Railroad, also delivers three-phase current to the Port Morris power house of the New York Central to compensate for the energy required to operate the New Haven trains over the line of the New York Central system.



GENERAL VIEW OF THE COS COB POWER STATION

POWER-HOUSE BUILDING

The power house is located adjacent to the main line of the railroad and on the bank of the Mianus River at a point on the river about 1 mile from Long Island Sound. The location is such that coal can be delivered either by water or rail, and an unlimited amount of salt water for condensing purposes is available from the Mianus River. By the erection of a dam in this river at a point about a mile upstream from the power house an abundant supply of exceptionally pure boiler feed-water was also readily obtained.

The general style of architecture of the power house building is Spanish mission; the walls being constructed of plain-faced concrete blocks, the color of which forms a pleasing contrast with the red Spanish tile roof.

The entire area of the site selected was practically solid rock with but a few inches of earth above it, and necessitated blasting the excavation for the basement and the condenser intake and discharge flumes.

COALING BRIDGE AND APPARATUS AT THE COS COB POWER STATION

The material excavated was a gneiss rock, which proved excellent for concrete aggregate; furnishing, after crushing and screening, all the broken stone required for the building, and sufficient quantity of crusher screenings in lieu of

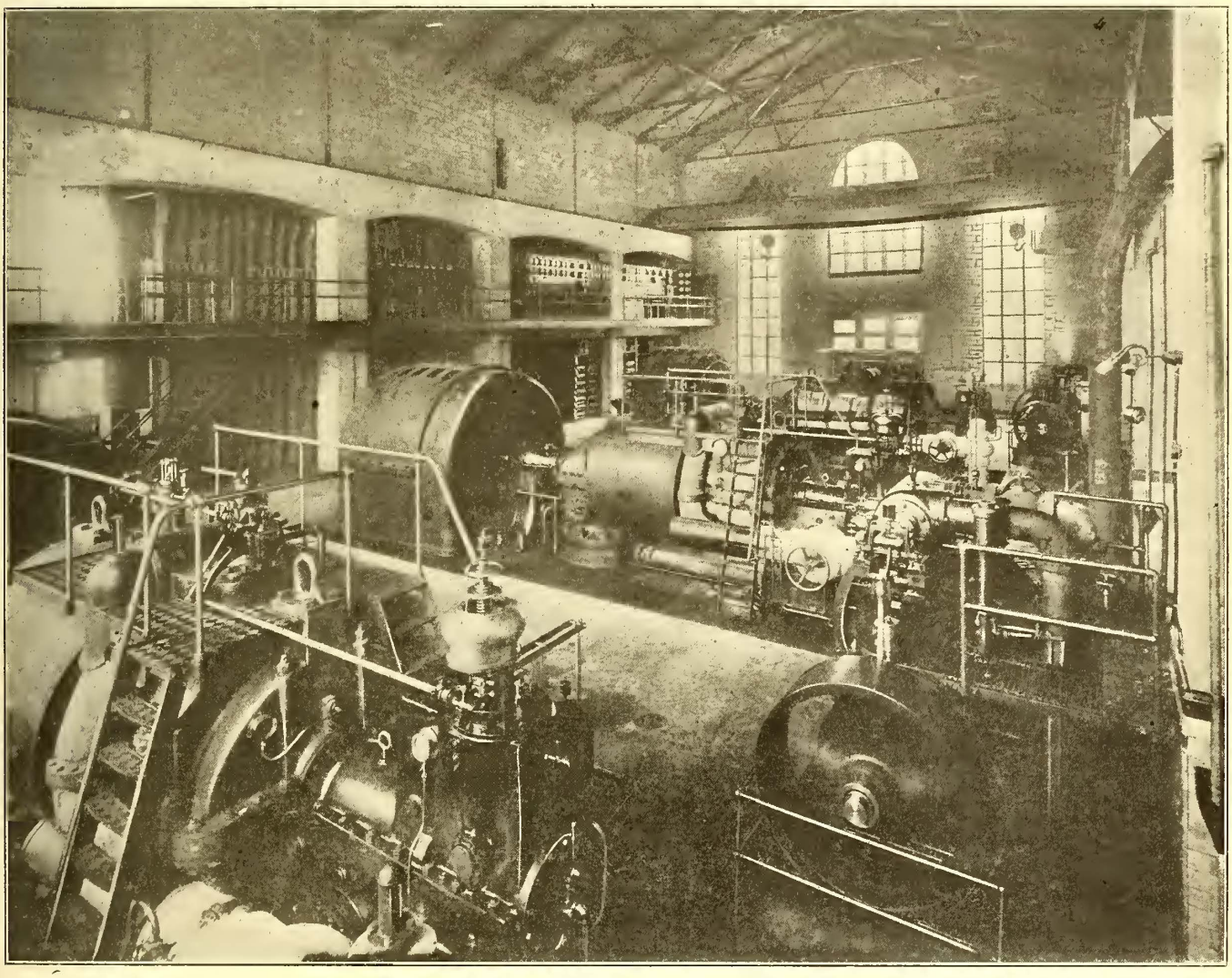
sand for the concrete of the exterior walls. The building walls, below the water-table, and the machinery foundations are monolithic concrete. The water-table and the walls above it, including the window arches and coping, are of concrete blocks. Below the water-table the walls where exposed have a "bush hammered" finish. The interior columns in the boiler room are of structural steel, but all other columns required in the building are of concrete blocks. The steel roof trusses over the turbine room are supported on concrete block pilasters formed in the building walls, while over the boiler room they are carried by the pilastered

A monitor, provided with windows for light and ventilation, extends lengthwise over the boiler room.

A self-supporting steel stack 13 ft. 6 ins. in diameter, extending to a height of 100 ft. from the engine room floor, is carried by the steel columns which support the fan room floor, leaving the space below, on the boiler room floor, entirely clear.

The building is exceptionally well lighted by large windows glazed with wire glass set in cast-iron sash.

The turbine room is 60 ft. wide by 112 ft. long, and the switchboard occupies a space next the turbine room which



PART INTERIOR VIEW OF THE COS COB POWER STATION

building walls and by the interior steel columns, which also support the boilers, the mechanical draft equipment and the stack. The front of the switchboard gallery, at the south end of the turbine room is carried on concrete block columns, which also support a reinforced concrete girder forming one of the crane runways. The other crane runway is formed by another reinforced concrete girder built into the partition wall between the engine room and boiler room, and is supported upon pilasters formed in this wall. The column footings below the engine room and boiler room floors are of monolithic concrete.

The basement floor is of concrete, laid upon the foundation rock. All other floors in the building are of reinforced concrete; and the roof, which has a pitch of 4½ ins. per foot, is of reinforced cinder concrete finished on the exterior with Ludowici tile.

is 25 ft. wide by 110 ft. long. The boiler room is 160 ft. long and 110 ft. wide.

The reduced head room needed for horizontal turbine equipment is shown by the fact that the distance from the floor to the top of the crane runway rail is but 27 ft. 2 ins., and the height from the turbine room floor to the bottom of the roof trusses is but 39 ft. 2 ins. The interior walls of the engine room are finished with a wainscoting of Faience tile 6 ft. in height.

TURBO GENERATORS

The initial generating equipment of the power house consists of three multiple-expansion parallel-flow Parsons steam turbines direct-connected to single-phase Westinghouse generators. Provision has been made for the installation of a fourth unit of corresponding size. The turbines

are rated at 4500 bhp each, and the generators at 3000 kw each, at 80 per cent power factor.

The turbines are operated at 1500 r. p. m. by steam at 200 lbs. pressure and 100 degs. superheat. The continuous overload capacity of the units is 50 per cent, and momentary overloads of 100 per cent can be taken care of when operating condensing. The turbines are equipped with the latest accessories in the way of automatic safety stops water-packed glands for the turbine shaft, and adjustable water-cooled bearings equipped with a continuous circulation oiling system.

As the requirements necessitated the generation of three-phase current for delivery to the New York Central system as well as single-phase current for the operation of the electric locomotives over the New Haven Railroad, the generators are wound for three-phase current, but arranged for the delivery of both three-phase and single-phase current.

The generators are entirely enclosed by a casing, into which air is drawn through suitable ducts from a fresh air chamber under the switchboard gallery, and from which the air is discharged through other ducts into the basement. This system of generator ventilation renders the operation of the generators practically noiseless.

The excitation of the generator fields is provided for by two 125-kw direct-current generators, direct-connected to Westinghouse engines; and one motor-driven exciter.

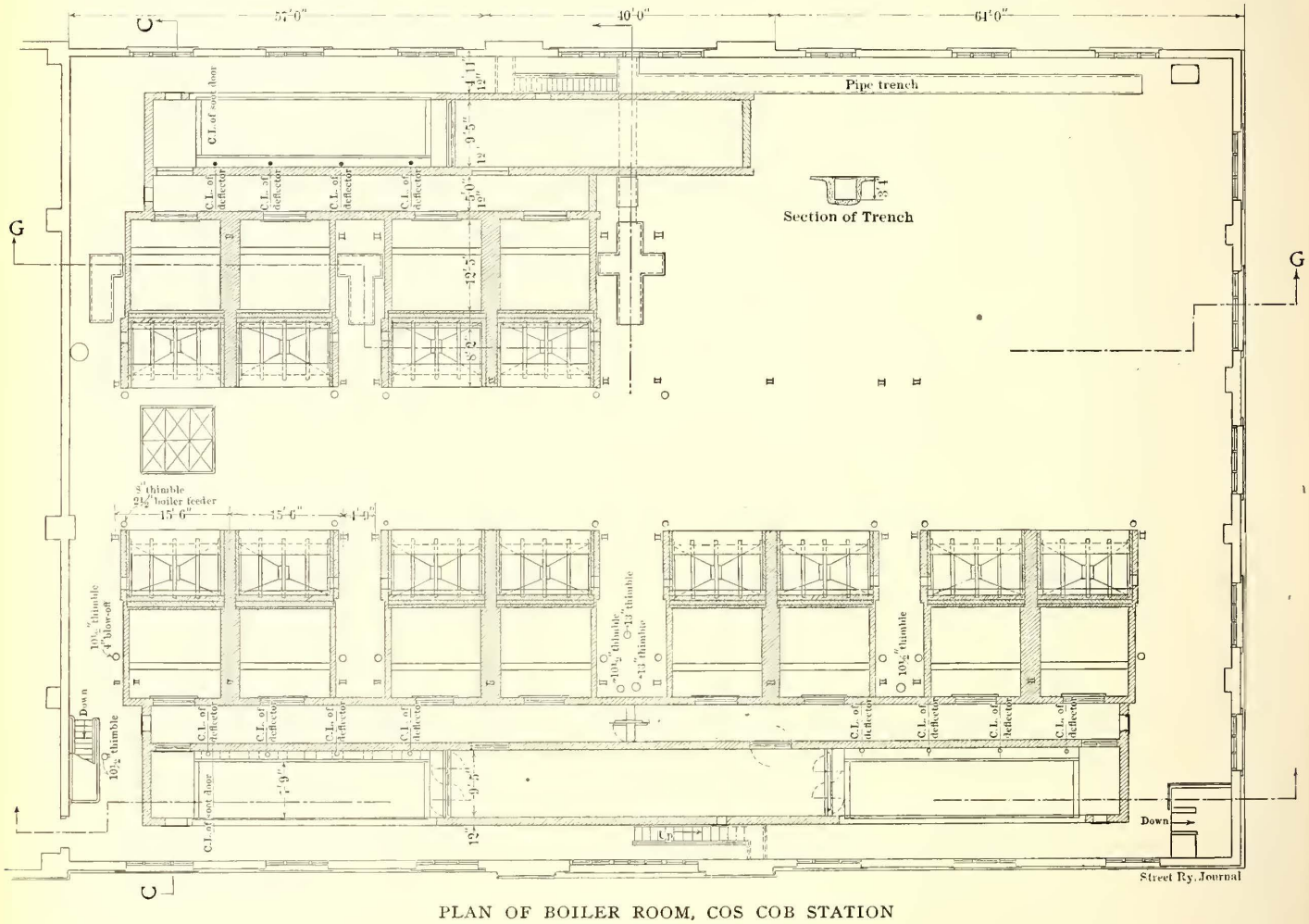
CONDENSERS

A separate condensing outfit is provided for each turbine consisting of an Alberger three-phase counter-current surface condenser, a two-stage dry-air pump, a centrifugal circulating pump direct-connected to a Westinghouse engine, and a Monitor hot-well pump, the speed of which is automatically controlled by a float.

Condensing water for all the condensers is furnished by a single flume, which is constructed of timber having a lining of creosoted lumber from the intake at the face of the dock to the shore line, and of concrete for the remainder of its length to and under the generator room. A discharge flume of similar construction parallels the intake flume under the turbine room, and then diverging from it discharges the condensing water into the river. Each condenser is installed directly beneath the corresponding turbine and over the discharge flume, while the circulating pumps are located over the intake flume, thus making all the connections as short as possible.

The pipes leading from the condenser to the discharge flume have a submerged discharge, thus decreasing the head under which the circulating pumps work.

To prevent the rapid deterioration of the brass condenser tubes by the galvanic action which usually occurs where salt water is employed for condensing purposes and which is often aggravated by stray currents passing through the water pipes into the station, and from thence to the condensers and out through the pipes leading into the intake and discharge flumes, a motor generator set has been installed and provided with suitable controlling apparatus for maintaining in each condenser a counter electromotive force slightly in excess of the electromotive force due to the galvanic action and the stray currents.



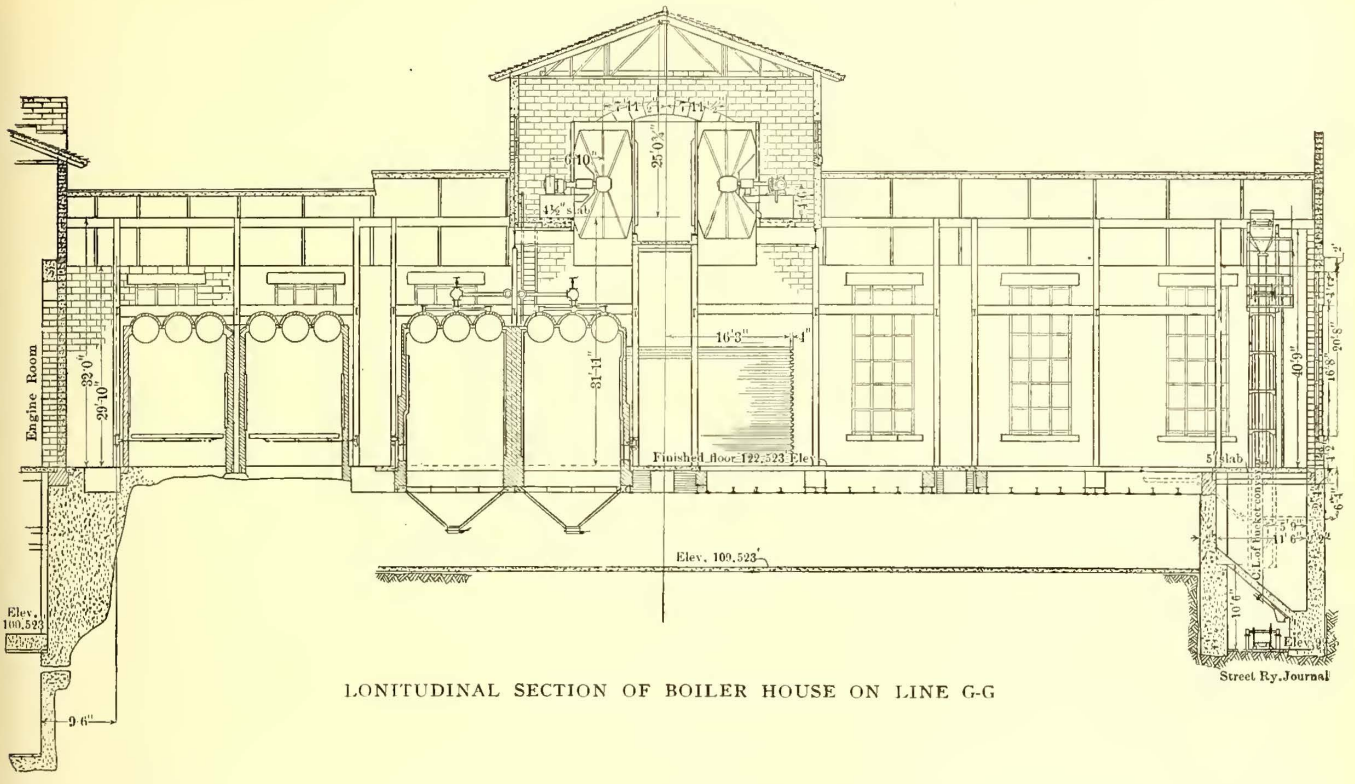
PLAN OF BOILER ROOM, COS COB STATION

BOILERS

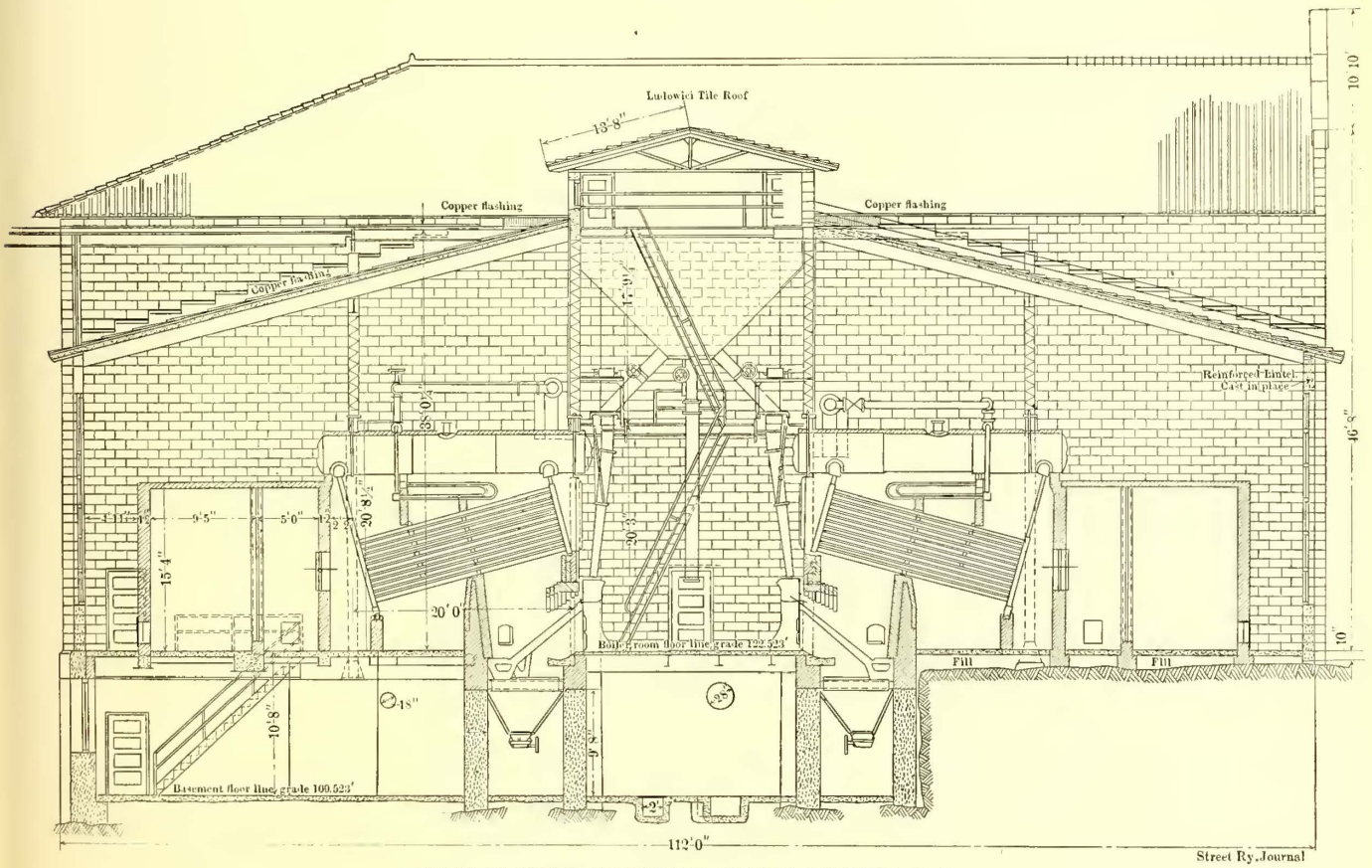
The initial installation consists of twelve 525-hp Babcock & Wilcox water-tube boilers set in batteries of two boilers

each, and arranged with eight boilers on one side and four boilers on the other side of the boiler room, separated by a 21-ft. firing floor. Provision is made for four additional boilers to take care of the fourth turbo-generator unit when installed. These boilers are equipped with Roney mechanical stokers and Babcock & Wilcox superheaters and deliver steam at 200 lbs. gage pressure and 125 degs. superheat.

A novel feature of the boiler settings is the installation of an external steel casing entirely enclosing the brickwork, thus rendering the settings impervious to air leaks.



LONITUDINAL SECTION OF BOILER HOUSE ON LINE G-G



CROSS SECTION OF BOILER HOUSE ON LINE C. C.

ECONOMIZERS

Three Green fuel economizers are provided, and the boiler flues leading to the economizers are arranged with by-passes so that one or all of the economizers can be cut out

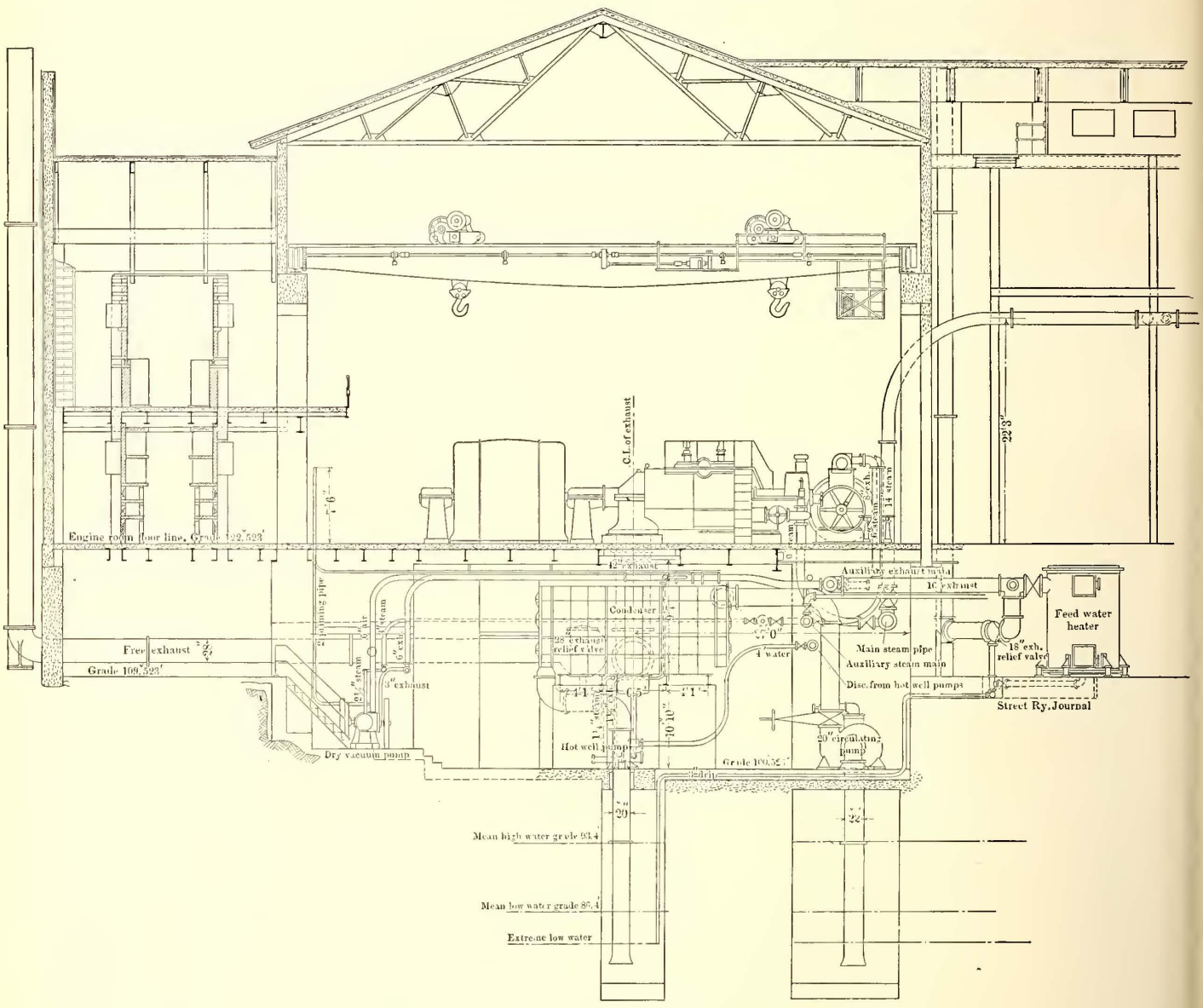
and the flue gases from either two or four batteries may be passed through either one or two of the economizers, thus adapting the economizer installation to the changing demand upon the boilers. The economizers are enclosed by means of metal sectional covering insulated with prepared asbestos blocks.

FEED-WATER SYSTEM

Under ordinary conditions the boiler feed-water is delivered from the pump house at Mianus through a 10-in. main to a concrete reservoir of 600,000 gals. capacity situated just outside the power house. From this reservoir the make-up water flows by gravity to two 13,000-gal. feed-water tanks located in the boiler room basement. These tanks also receive the discharge from the hot-well pumps. The water is then drawn from these tanks by the feed pumps and delivered through the feed-water heaters and the economizers into the boilers. An auxiliary source of feed-water supply is provided for by a connection to the mains of the Greenwich Water Company.

The feed pumps, which are three in number, are of the compound direct connected duplex outside-packed plunger type. Provision is made for connecting either source of feed-water supply direct to the suction side of the feed-water pumps, and also for by-passing the feed-water heater or the economizers. An emergency feed-water supply system is also provided, consisting of two Hancock inspirators, taking water from either source of supply and delivering it through an independent line to the boilers.

The pumping equipment at Mianus comprises two single-acting vertical triplex plunger pumps, geared to Westinghouse three-phase motors. One of these is of sufficient capacity to meet the requirements of the plant running non-condensing, and the other to supply all the fresh water needed when running condensing. These pumps are operated by current obtained from the power house.



CROSS-SECTION OF STATION THROUGH TURBINE ROOM

INDUCED-DRAFT SYSTEM

After leaving the economizers the flue gases pass through sheet-iron flues to the fan chamber over the center of the boiler room. Here four 14-ft fans, direct connected to horizontal high-speed engines, deliver the flue gases to the stack, which is only of sufficient height to carry the gases away from the building. The speed of the fans is adjusted to the demand on the boiler by automatic regulating valves controlling the fan engines.

COAL-HANDLING INSTALLATION

All coal received by water is unloaded from the barges by a steel derrick operating a clam-shell bucket and delivered

into a hopper of 15 tons capacity at a height of 55 ft. above the dock. This bucket is operated by an engine on the dock, supplied with steam from the power house. From this hopper the coal is fed by gravity into a coal crusher, and from the crusher it drops into steel cars where it is weighed. The cars are then drawn by cable up an inclined single-track railway of 13 per cent grade and into the boiler room through an opening near the roof. This track is supported upon structural steel towers and is designed so that two cars can be operated upon it, passing each other through an automatic turnout at the center. The cars discharge the coal into a hopper, from which it is delivered into two flight conveyors extending the length of the boiler room. Openings in the bottom of the flight conveyors discharge the coal into spouts leading to the stoker hoppers of the boilers. The capacity of the flight conveyors is in excess of the amount of coal required to operate the boilers, and the surplus coal is discharged at the further end of the boiler room into a concrete storage bin below the boiler room floor.

Coal received by rail is dumped from the car directly into a chute leading to this same storage bin. When the boilers are to be supplied from this source, the coal is discharged from the bin by gravity into a coal crusher and from that into a bucket conveyor located in a tunnel underneath the bin, by which it is delivered to the flight conveyors above the boilers and thence through the chutes to the stoker hoppers.

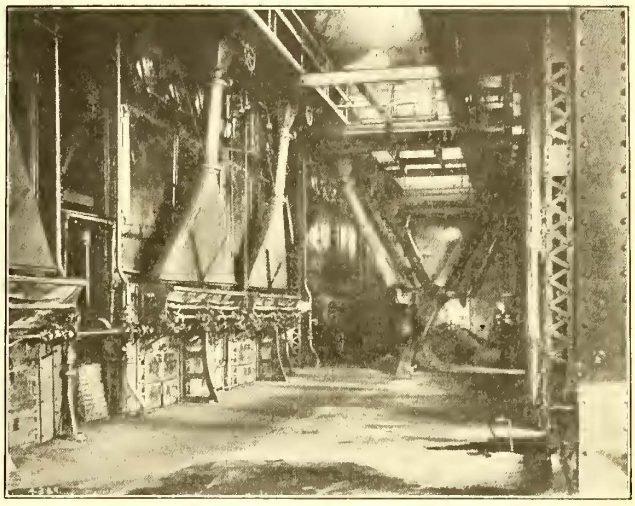
The cable railway and the flight and bucket conveyor are operated by three-phase induction motors taking current from the "station service" line.

The ashes are disposed of by gravity from the dumping grates of the stokers into chutes leading to narrow-gage cars in the basement, by which they are at present carried to the low ground in the neighborhood of the power house and used for filling in.

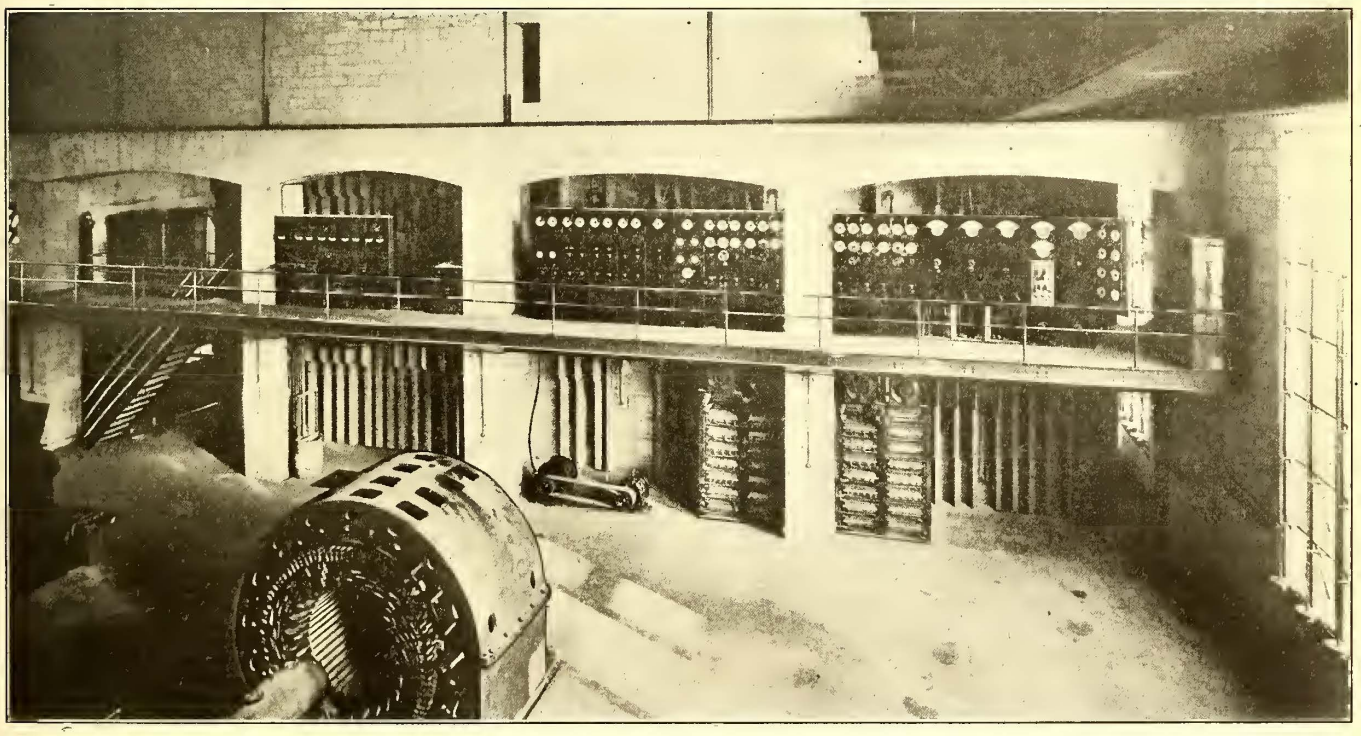
PIPING

A steam main is carried over the boilers on each side of the boiler house, each of the two mains crossing over to the opposite side at the center of the boiler room. Provision is made for cross-connecting these two mains. From the boiler room the mains extend through the partition wall into the turbine room, thence downward into the basement, connecting to a header under the floor. From this header connections are made to each turbine. In addition to the throttle valves and the automatic stop valves, shut-off valves are provided for each turbine under the boiler room floor. These valves are controlled by hand wheels mounted on stands in the turbine room. A separate steam main is provided for the steam-driven auxiliaries, which are all designed to use superheated steam. Steel pipe with extra heavy welded flanged joints is used for all high-pressure steam lines, contraction and expansion being provided for by the use of long radius bends.

An exhaust line leads from each turbine directly down to its condenser and is connected by an automatic relief valve to an individual outboard exhaust line, which passes through



BOILER ROOM IN THE COS COB POWER STATION



SWITCHBOARD GALLERY IN THE COS COB POWER STATION

the engine room basement to the outside of the building and thence to a point above the roof.

The piping from the pumps to the feed-water heaters and economizers is of cast iron, while that from the economizers to the boilers, with the exception of a cast-iron header below the floor, is of brass.

FEED-WATER HEATER, SERVICE PUMPS AND FIRE PUMP

A closed feed-water containing 2000 sq. ft. of surface and utilizing the exhaust from the steam-driven auxiliaries is provided.

A suitable service pump furnishes the water necessary for toilet purposes, wetting down ashes, etc., while a standard Underwriter's steam pump of a capacity of 10,000 gals. per minute is installed in the basement for fire protection.

AIR-CLEANING SYSTEM

For cleaning generators, switches, etc., compressed air is furnished throughout the engine room and switchboard gallery by means of a Westinghouse Air Brake Company's locomotive type of air compressor, supplying air at 100 lbs. pressure.

OILING SYSTEM

A continuous circulating oiling system for the turbine and generator bearing is installed. The oil is elevated by a small steam pump into a tank situated in the fan room and flows from this tank by gravity to the various bearings. After passing through the bearings it is discharged into a filter, and from the filtered oil passes to a receiving tank in the engine room basement to which the suction of the oil pump is connected. Taps are placed in this line at convenient points for filling the oil cups on the auxiliary engines and pumps.

HIGH-PRESSURE DRIPS

The drips from the high-pressure steam line are returned to the boilers by a Holly gravity return system, the receiver of which is located in the engine room basement, and the discharge chamber, at the highest point of the boiler room.

TRAVELING CRANE

The turbine room is equipped with an electric traveling crane, provided with two 37½-ton trolleys, operated from the exciter circuit.

MACHINE SHOP

A large room in the basement of the boiler room has been furnished with a full machine equipment of lathes, shapers, drill-presses, planers, etc., for general repairs. The machinery is driven from an overhead line shaft operated by an induction motor.

TOILET ROOMS, ETC.

Separate toilet rooms are provided in the basement for the fire room and engine room forces, each containing individual lockers, shower baths, wash basins, etc.

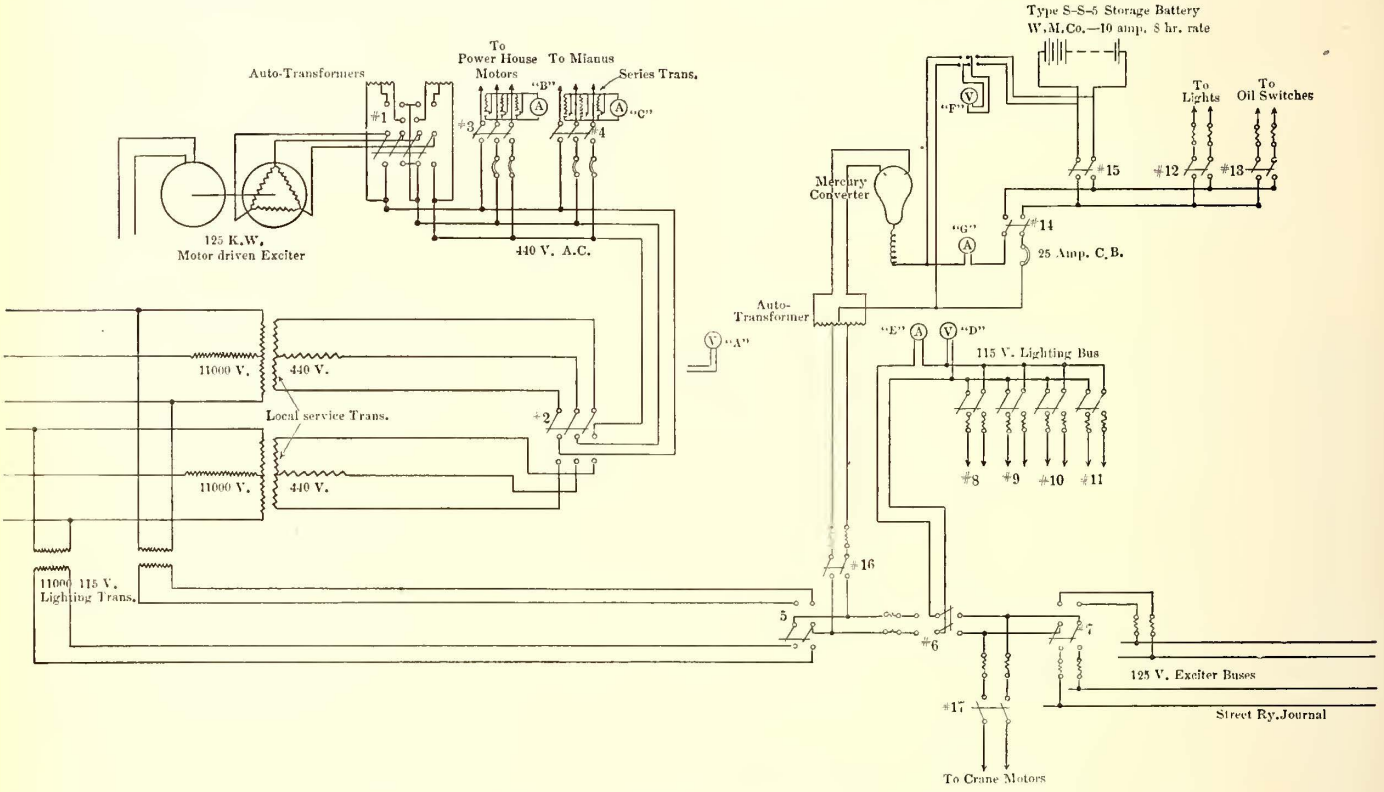


DIAGRAM OF CONNECTIONS OF LOCAL-SERVICE SWITCHBOARD

ELECTRICAL DISTRIBUTION

The main cables from each generator are run in the air chamber under the turbine room floor, up to the switchboard gallery and thence through selector oil-circuit breakers down to the high-tension buses under the switchboard gallery. These circuit breakers are electrically interlocked so that the buses cannot be paralleled.

The two high-tension buses, with their accompanying switching equipment are interchangeable and are arranged so that each can be used separately: one supplying three-phase current to the Port Morris feeders, and the other supplying principally single-phase current for the locomotives. Each bus is further divided by knife switches into three sections; each end section containing generator leads and propulsion feeders, and the center section containing the Port Morris feeders, so that in an emergency a still further subdivision can be affected.

When a bus section, or the entire bus, is used for supplying single-phase propulsion current, one leg is grounded

directly to the track rails of the right of way through suitable switches; another leg supplies the outgoing feeders, which are run in duplicate, connecting directly to the trolley and thus completing the single-phase circuit. The third leg of this bus is connected to a feeder which is carried along the right of way for the purpose of supplying power for local purposes. This gives three-phase circuit along the line. The capacity of the generators is, of course, somewhat reduced by the unbalancing of the circuits. If there is current on only one leg of a three-phase generator the theoretical capacity is, of course, only 57.7 per cent of that with balanced three-phase operation. On the New Haven system, however, the power taken from the third conductor tends to increase this percentage considerably.

The voltage of each high-tension bus is maintained constant by a Tirrill regulator controlling the exciter field circuits.

LIGHTNING ARRESTERS

The arresters used in the generating station are of the multigap non-arcing low-equivalent type, in which respect they do not differ essentially from standard arrester equipments. An unusual feature resides in the use of a double auxiliary series of non-arcing gaps which are connected to the ground through fuses, as shown in the illustration herewith. Considering the arrester in detail, it is to be noted that the main series of gaps is connected between the line wire and the ground with a resistance in series on the ground side; an additional resistance is placed in shunt to certain of the main gaps. The two series of auxiliary gaps with their separate fuses are joined in series with the main gaps on the ground side, and hence are in parallel with the resistance which is in series with the main gaps. It will be observed that if only one of the fuses blows, the other continues to be in operative condition; while if both fuses blow, the arrester is merely converted into a protective device of the low-equivalent type. It is expected that minor discharges will pass across the arrester without damaging the fuses, and that the fuses will blow only in the case of excessive discharges, which with the more usual arrester arrangement would probably cause the station to

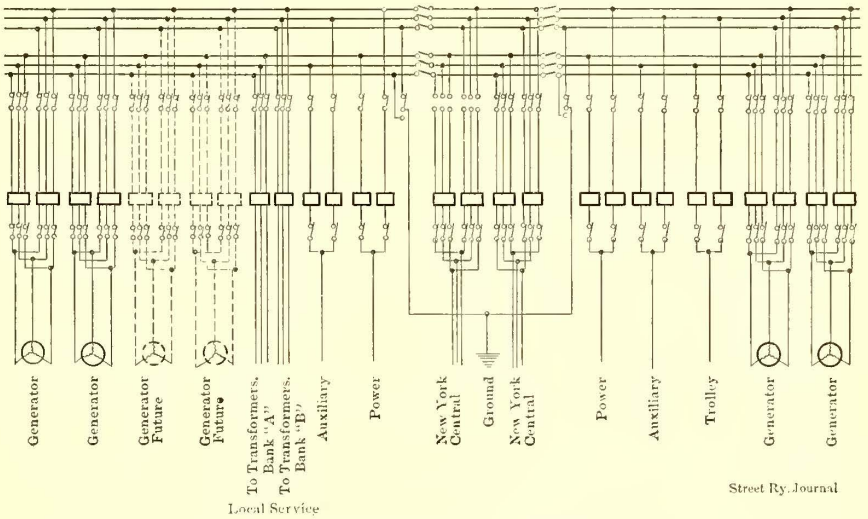
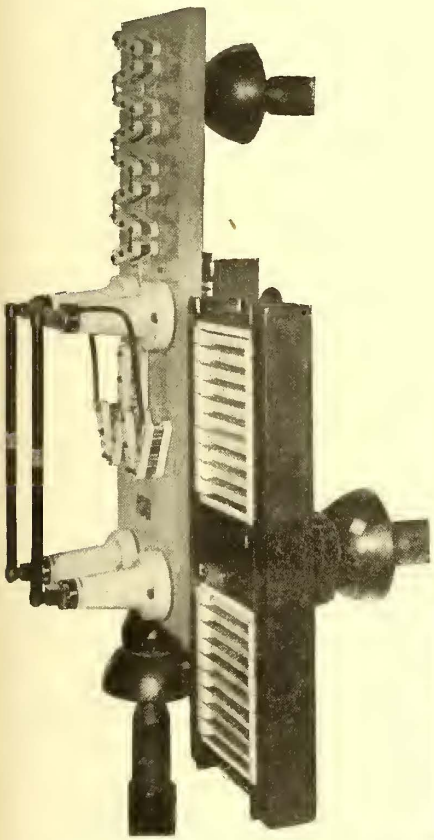
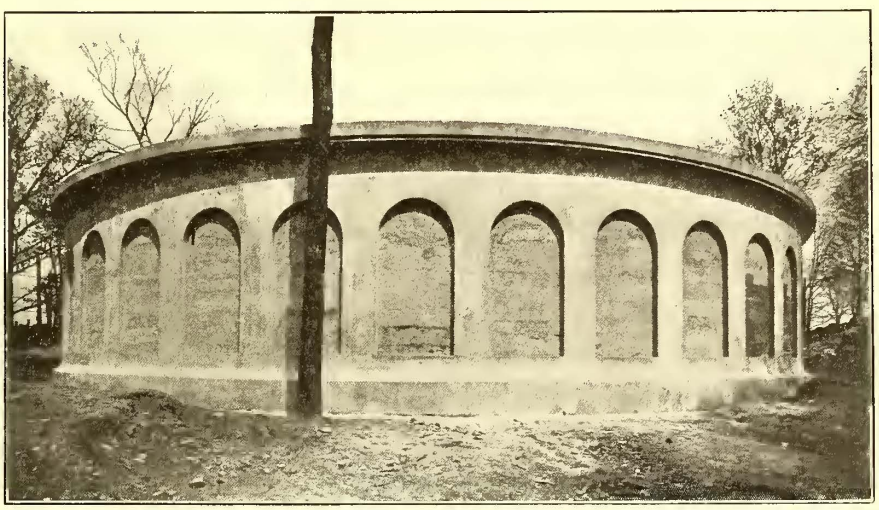


DIAGRAM OF HIGH-TENSION CONNECTIONS



FUSED LOW-EQUIPMENT LIGHTNING ARRESTER FOR NEW HAVEN POWER STATION



FERRO-CONCRETE WATER TANK

Each leg of the high-tension bus, consisting of two 3-in. x ¼-in. copper bars, is enclosed in a separate masonry compartment composed of pressed brick and soapstone, and is supported on porcelain pillars and bushings projecting from the side wall of the compartment, the bushings providing for cable connections to the bus. Removable glass doors are provided in the bus compartments at small openings opposite all connections and supports. The connections between the bus-bars and the circuit breakers consist of insulated cable and are carried up in separate brick septums on the back of the bus-bar and oil circuit breaker structure. Each oil circuit breaker can be disconnected from the bus and circuit by hook-type knife switches located on the rear of the structure.

The feeder cables pass along the top of the circuit breaker structure, thence to choke coils in the arrester gallery and through special windows to the line.

be thrown out of commission due to the opening of circuit breakers.

SWITCHBOARD

The main switchboard is made up of marble slabs carrying Westinghouse instruments and switching apparatus. It contains four panels for the operation of the generators, three panels for the control of the exciters, two panels for the Tirrill regulators, one load panel, one inclined station panel for the synchroscope and a. c. voltmeters, and five panels for the apparatus controlling the outgoing feeder system and the local high-tension circuits.

Each generator panel is equipped with instruments indicating the current per phase, the power factor, the indicated watts, and the field current. Receptacles are also provided on each generator panel for making connections with the synchroscope and the voltmeters on the inclined panel. This panel contains the main field switch and rheostat hand wheel, together with an electric governor controller for changing the speed of the generators from the switchboard gallery for the purpose of synchronizing when it is desired to throw two or more generators in parallel. The oil circuit breakers between the generator and the buses are also electrically controlled from these panels. Watt-hour meters are placed in the bus sections in such a way as to register the total output of the generators or of any group of feeders.

Each feeder is equipped with an ammeter, overload relay and controllers for its oil circuit breakers. Colored lamps on the switchboard indicate the position of the circuit breakers.

An interesting detail of the switchboard equipment for the feeders is found in the time-limit feature of the overload relay. Each overload relay is shunted by a fuse, which must blow before the fuse can act. The impedance of the fuse is so small compared to that of the relay that most of the current passes through the fuse. It will be seen, therefore, that the relay mechanism as a whole possesses a "time limit" exactly equivalent to a fuse. If for any reason it is desirable to operate without a "time limit," the fuse can be omitted. Moreover, the relay can be reset at any time without inserting a fuse, and yet the apparatus will be adequately protected.

STATION CIRCUITS

For supplying power to the various motors throughout the station, duplicate sets of two transformers each are used. They are T-connected and supply three-phase current at 440 volts.

For the control of the station circuits a local service switchboard is installed containing apparatus for controlling the motor of a motor-driven exciter, the station lamp circuit, the motor circuit and the storage battery circuit. The storage battery, which is located in the basement below the switchboard gallery, consists of fifty-five cells of the Westinghouse Machine Company's 5-S-5 type of 10 amps. capacity for 8 hours, and is used for operating the control circuits of the circuit breakers and the switchboard signal lamps. The battery is charged through a Cooper-Hewitt mercury converter, taking current from the alternating current lighting circuit.

LIGHTING

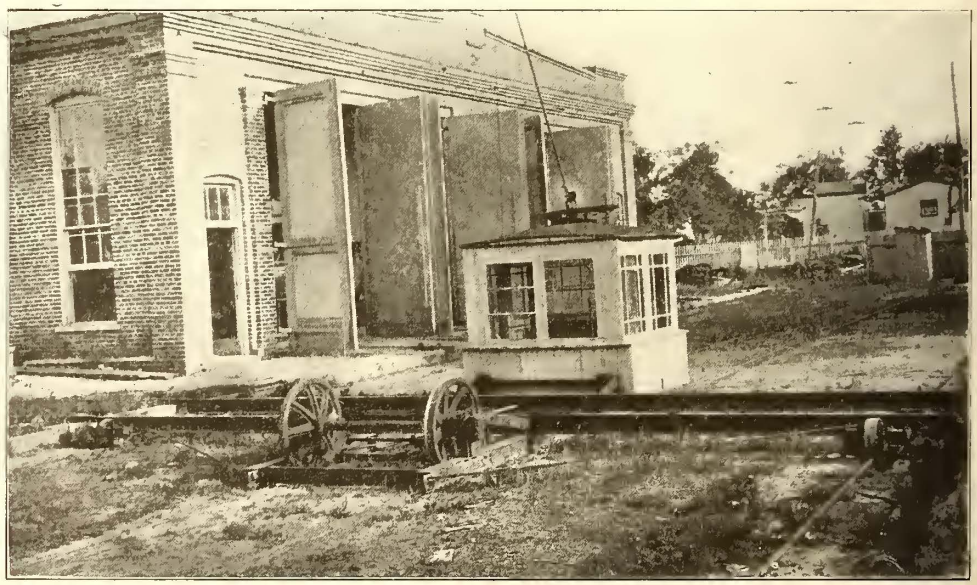
Cooper-Hewitt mercury arc lamps are used for general illumination and incandescent lamps for restricted locations. Alternating current for these lamps is supplied by duplicate single-phase 75-kw transformers delivering current at 115 volts.

ENGINEERING AND CONTRACTING

The power plant was designed and constructed under the administration of the engineering department of the New Haven Railroad Company. The regular engineering facilities of the road were supplemented by the services of Westinghouse, Church, Kerr & Company, who were associated in the design of the plant, and who, in behalf of the road, erected the building and installed the equipment with the exception of the turbo-generators and exciters. These machines were assembled in place by the Westinghouse Electric & Manufacturing Company.

A HOME-MADE TRANSFER TABLE

A transfer table made in the shops of the Mobile Light & Railroad Company largely out of materials found about the shops is shown in the accompanying reproduction. It consists primarily of a four-wheel truck supporting the track rails which are further supported at the ends. The track rails are 30-ft. 7-in. rails. The truck was made by suspending from the two axles a frame made up largely of T-rails. To one axle is geared in the usual manner a discarded W. P. 50 motor. This is controlled by means of the old type rheostat and reverse. The truck is equipped with a brake rigging similar to that found on a single truck car. The house protecting the motor carries the customary type of trolley stand. The table was designed and built by S. M. Coffin, master mechanic. In its design effort was made to keep down the height as much as possible, and it may be noted that at the center the depth of the pit is only deep enough to allow two 7-in. rails to be placed one on top of another and clear the ground.



TRANSFER TABLE MADE OF DISCARDED MATERIALS

CITY TRACK CONSTRUCTION AT MILWAUKEE

In all its new construction in paved streets the Milwaukee Electric Railway & Light Company has adopted a method of letting the paving brick or block project under the inside of the head of the T-rail instead of beveling the ends of the brick or block or using specially molded brick so as to form a groove alongside the rail. The argument for the construction adopted is that when the wheels of a wagon or other vehicle is traveling in the flangeways and attempt is made to turn out the wheels do not have to climb out over a shoulder on both sides.

TRACK CONSTRUCTION IN MILWAUKEE STREETS

In the construction a 7-in., 95-lb. rail is used. The ties are completely immersed in concrete, the bed extending down about 6 ins. or 8 ins. below them. For brick paving a sand cushion is placed above the concrete. In asphalted streets granite blocks are used adjacent to the rail.

Where traffic is heavy, special work with hardened centers is used. In suburban municipalities where the single-truck cars are used, or where the cars are run under a headway of 15 minutes or more, special work built up in the company's shops is employed.

LOST ARTICLE TAG AT NASHVILLE

When turning lost articles in to the office at Nashville, the conductor or motorman attaches to them and fills out a blank giving facts which are often useful when having patrons identify the property. The card is signed by the motorman or conductor and the dispatcher who receives it. When the article is returned the owner is requested to receipt for it on the card.

5m-12-06 FORM 279

NASHVILLE RY. & LIGHT CO.

LOST ARTICLE

Car No......

Time Found.....M.

Date.....190.....

Line.....

Signed

.....Cond
Motr

Received by

.....Dis

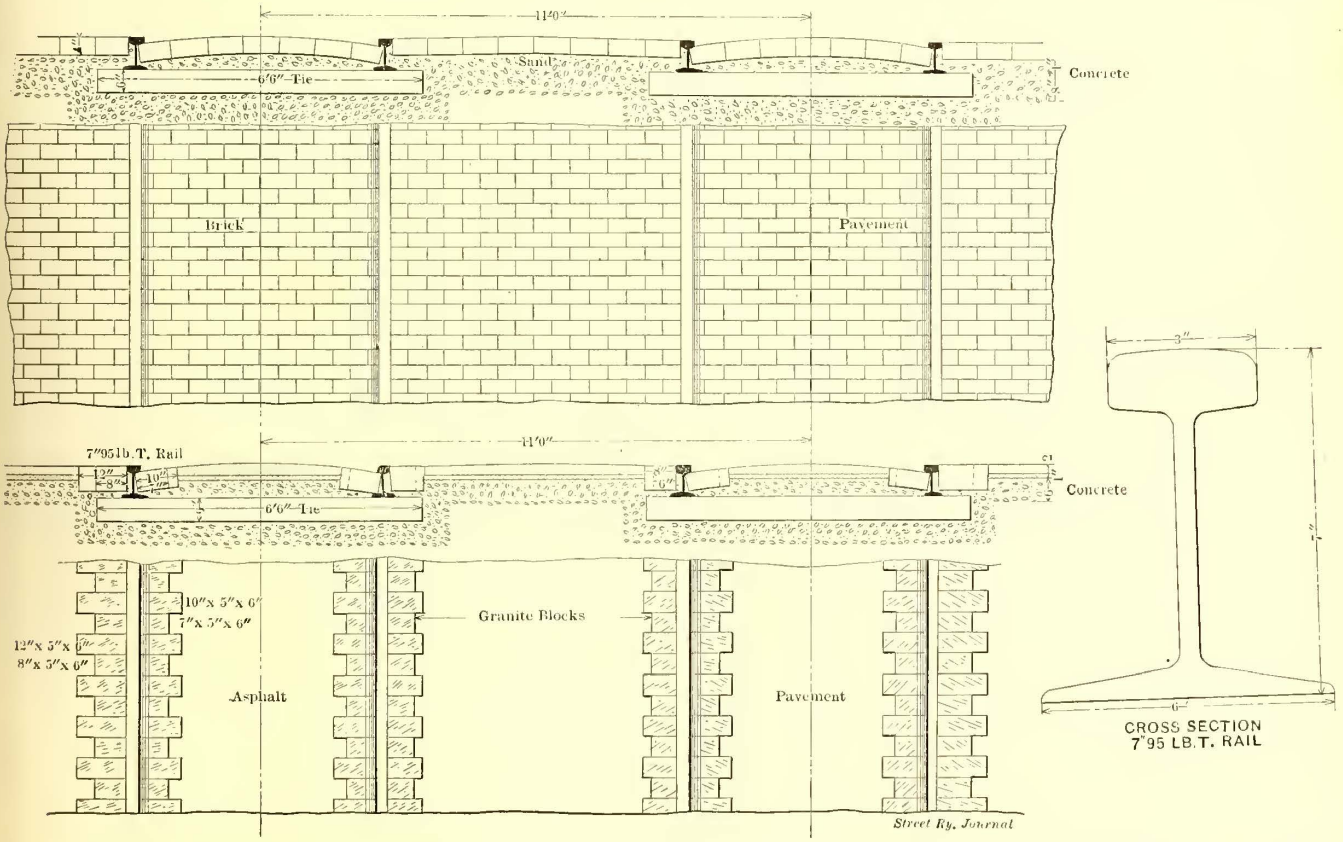
Received.....M.

.....190..... By

.....

OWNER.

LOST-ARTICLE TAG



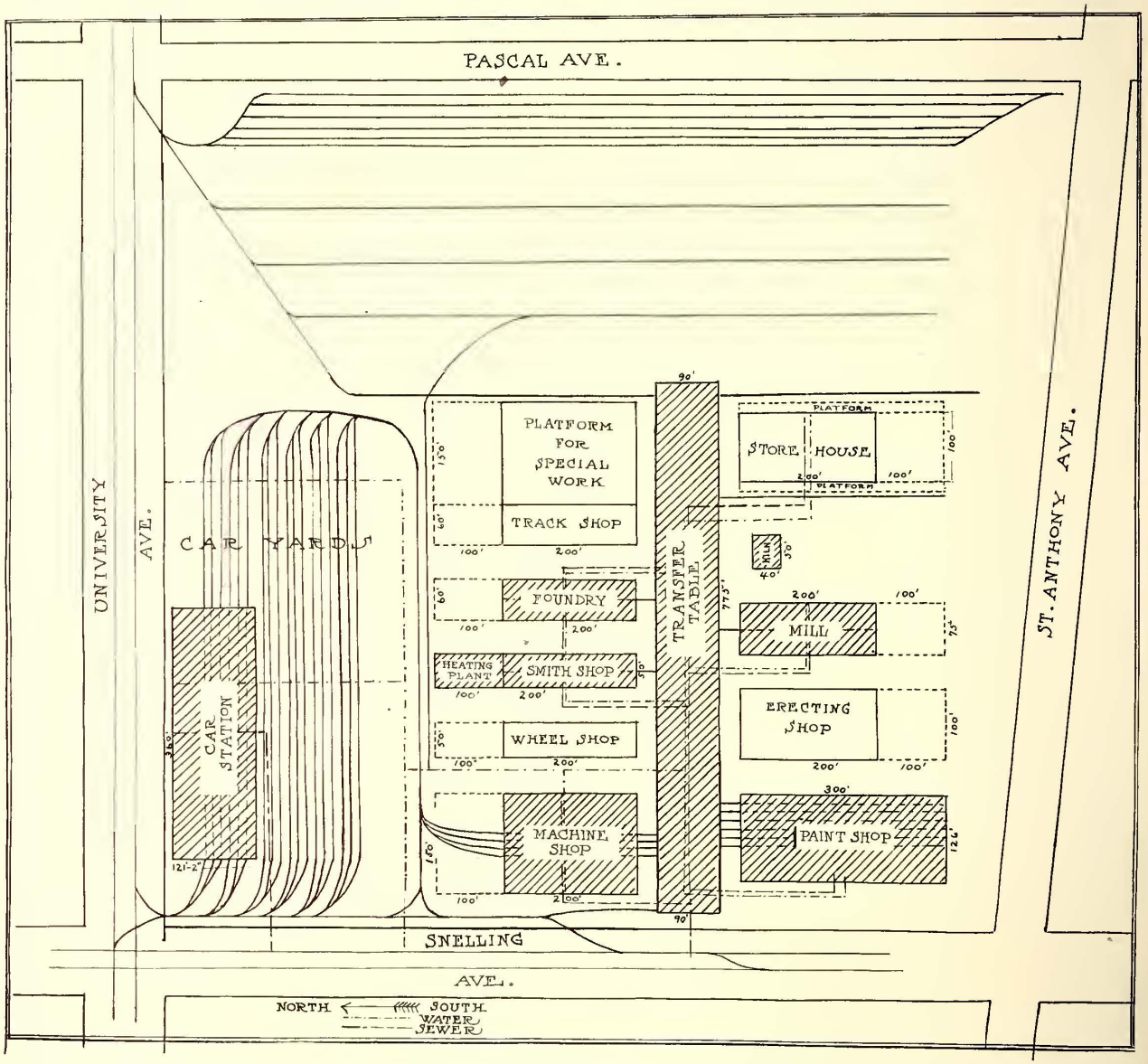
SECTIONS AND TOP VIEWS OF MILWAUKEE T-RAIL CONSTRUCTION FOR BRICK AND FOR ASPHALT PAVEMENT

TWIN CITY RAPID TRANSIT COMPANY'S NEW SHOPS

The Twin City Rapid Transit Company, of Minneapolis and St. Paul, has recently been engaged in building a large new shop system almost in the heart of the district it now serves, and that which will be served when future extensions now in contemplation have been made. The structures are not only large enough for the demands of to-day and of the immediate future, but are so arranged as to leave room for ample enlargement without impairing the efficiency of any part of the plant as it now stands.

The site of the new plant is almost exactly midway between Minneapolis and St. Paul, on the main electric line between the two cities, and at the junction of a cross-town line which connects by about a 5 minutes' run with two other trunk lines between the cities. It is, therefore, easily accessible from every part of the system, despite the fact that the company's lines are spread over a large area. The company was fortunate in being able to obtain the site—forty acres in all—while it was still wholly unoccupied and required only a moderate amount of grading to bring it to the street level.

Almost before the grading was done, the company set to work on six of the eleven large buildings that are to make up the completed plant as at present planned. These six buildings are now almost completed and are being equipped, a seventh is well under way, and the remaining four will be pushed along as rapidly as circumstances will permit. A plan of the shops is presented herewith. The structures already completed or nearing completion are indicated by the diagonal lines. The buildings outlined merely are yet to be built. The parts of buildings indicated by dotted lines are additions to be made as needed. The water system as arranged at present is shown by the dot and dash lines, and the sewer system by the short and long dash lines. Solid lines, except where indicating parts of buildings, stand for trackage. The plant as mapped covers forty acres, the diagram being drawn to a scale of 250 ft. to the inch.



GENERAL PLAN OF THE TWIN CITY RAPID TRANSIT COMPANY'S NEW SHOP AND CAR HOUSE

The buildings up and those to be put up are, or are to be, of reinforced concrete throughout. The foundations are of monolithic construction and the superstructures of hollow cement blocks and cement brick, made on the grounds as needed. The designs for the buildings and the plans for the grouping of the buildings were prepared after careful consultations by the heads of all the departments in any way interested. Practically every department of the system, therefore, had some part in deciding the character of the plant, for it has long been the policy of the company not

only to make all of its own repairs, but to build all of its own rolling stock after patterns peculiar to its needs as determined by experience and climatic conditions. Throughout, in both designs and groupings, the aim has been to obtain a maximum of efficiency with a minimum of expense, time and energy in operation.

The plant may be considered in two main divisions—the car station and trainmen's headquarters, and the supply storage facilities and shops proper.

The car station, with the trainmen's headquarters, stands just at the corner of the plant at the intersection of the University Avenue trunk line between Minneapolis and St. Paul and the Snelling Avenue cross-town line. In the men's quarters, which open on University Avenue, are lockers, shower baths, toilet rooms, a dormitory, and a large lounging room, which opens into the office of the head of the lines centering at this station. At the front of the building, opening on Snelling Avenue, is a large room used as a converter sub-station. Men's quarters, office and converter station occupy about one-third of the building. The other two-thirds are taken up with space for cars.

The car station, which differs from a car house, as it is not used exclusively for storage, is 360 ft. in length and contains accommodations for forty-two cars. This may seem like a limited space, but outside and to the south and east of the building are storage tracks for three or four times as many cars, and distributed through the two cities are several large car houses. All of the tracks in the car station are provided with pits, which extend the entire length, and light repairs will be made there. If extensive repairs are needed on trucks or motors they are sent to the machine shop, and all the work of the car station is under the eye of one foreman.

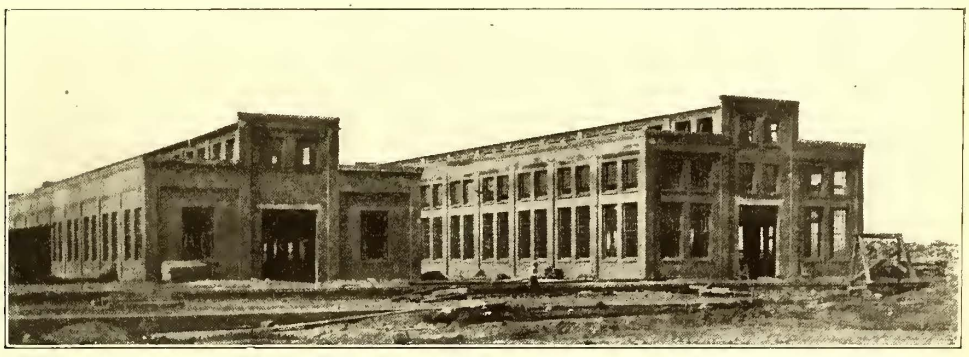
The truck interchange system used by the company has proved thoroughly successful and has been the more feasible because of the uniformity of the equipment used.

MACHINE SHOP, WITH PAINT SHOP IN THE REAR

Another plan that contributes to efficiency is the weekly shift of cars from regular to trip service and vice versa. By this plan cars that one week are on regular duty and put into the station only at night, and therefore get only night inspection and repairs, the next week are put on trip service, being out only two or three hours at a time and getting day inspection and repairs at the car station.

If a car body needs considerable repairs, not admitted of in the station proper, it is run to the erecting department in the paint shop, the separate erecting shop not yet having been begun, and there lifted from its trucks, which are run out for use under other car bodies, or, if they need repairs, to the machine shop. Under the truck interchange system either car body or trucks go into service as soon as ready and demanded.

The machine shop is equipped for heavy work, such as the use of unusually large cars demands and is provided with three traveling cranes of 12,000 lbs. capacity each. These command the entire central bay, 50 x 200 ft., which is given up wholly to motor and truck repair and construction work. No pits are used as the motors employed are designed for top inspection. On the second floor the lighter work is done—armature winding and air-pump work. Access to the second floor is provided by two stairways and two electric elevators on opposite sides of the building.



THE NEW FOUNDRY AND BLACKSMITH SHOP OF THE TWIN CITY RAPID TRANSIT CO.

The machinery of the machine shop, as of the entire plant, is electrically driven at 230 volts d. c. Machines of less than 3 hp are grouped. Others are run on independent motors.

Just east of the machine shop is the site of the wheel shop, as yet not begun, its work for the present going to the machine shop. Next up the row is the smithy, with the usual equipment of such a shop, but on a large scale to meet the demands of a manufacturer as well as a repair plant.

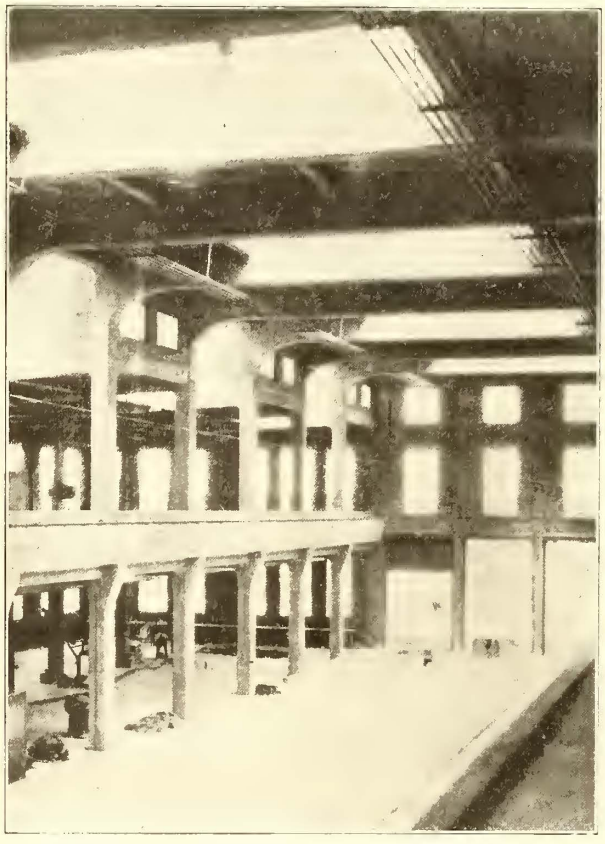
The foundry is a structure of special interest as a part of a street railway shop system. It is being equipped for the manufacture of all of the company's castings except those of malleable iron and wheels. The regular demand of the company for castings such as it will hereafter manufacture for itself, as shown by last year's record, runs: brass 90 tons, steel 300 tons, gray iron 900 tons. With the increase in the company's business and the expansion of its territory already alluded to, these figures are likely soon to be largely increased.

Beyond the foundry is the site of the track shop for the manufacture of track special work, and a large paved yard for the laying out of such work. This yard will have direct trackage facilities and will adjoin the supply yards and sheds, giving both paved yard and track shop ready access to the material they will use.

In the rear of the smithy is the heating plant for the

whole layout, saving only the car station, which has a heating system of its own of the fan type. The general system, however, is of the vacuum type. The radiation pipes for the different buildings are placed for the most part overhead, out of the way and saving in the aggregate much valuable space.

Across the transfer table, along which the buildings



INTERIOR OF MACHINE SHOP JUST AFTER COMPLETION

named are lined up, is another group of buildings. First, on the east, adjoining the supply yard tracks is to be a large storehouse two stories in height and 100 ft. x 200 ft. in area at first, and eventually 100 ft. x 300 ft. exclusive of platforms. This will be provided within and without with cranes for the handling of heavy material, as will the track shop and yard across the way. Next to the storehouse, toward Snelling Avenue, stands the dry kiln, now building, and to the south of that is the site of the lumber yard. Heat for the dry kiln will be supplied from a steam coil, and fans will give circulation. Further to the west comes the site of the erecting shop, yet to be built, and after that the paint shop, for the present to serve, as stated, both as paint and erecting shop.

The arrangement of the buildings on both sides of the transfer table will at once be seen to be logical and natural, whether for repairs or for the construction of new rolling stock. First on the east are the sources of supplies, the open yards, the sheds and the storehouses. From these may be sent to any of the buildings with facility and dispatch, materials needed for repair work. Likewise, if large construction work is in order, supplies go down along the line to the foundry, the smithy, the wheel shop, and the machine shop, the place of the final assembling of the heavy work, or, on the other side of the transfer table, materials go from storehouse and dry kiln to the mill for the manufacture of all of the woodwork of the cars, thence to the erecting department, and thence again to the paint shop, where the cars receive their final touches and are shunted out to the car station. The transfer table itself is 90 ft. wide and has a run of 775 ft. Power is taken from a wire carried against the side of the pit and protected by a projecting ledge of concrete and wooden guard.

At the side of the transfer table pit are 30-ft. planked platforms extending each side of the pit for its full length. These make possible the trucking of material or work from one shop to another without calling upon the transfer table.

An office building and men's room is to be added to those shown in the plan on page 318. It will probably be placed along the Snelling Avenue side of the machine shop. The feature of special interest in this is the contemplated men's room. This is to be provided with lockers, toilet facilities in addition to those in the separate buildings, chairs and tables. It is, in short, to be the lunch room of all the employees of the shops; the company is considering the plan of serving, along with the lunches brought by the men, hot soup and coffee.

OBSERVATION CAR RESULTS IN MONTREAL

The Montreal Street Railway Company operates two fine observation cars on what is known as the Round-the-Mountain line. The cars run every afternoon and evening, Sundays and holidays, weather permitting. They pass the corner of Peel and St. Catherine Streets on the hour, but also stop at other points when signaled. The trip is through some of the most attractive parts of the city and then around Mt. Royal. The time is 1 hour, and the cost 25 cents. The cars are built entirely open, and this, with the step arrangement of the seats, give the passenger an unobstructed view from any position. Arches of colored incandescent lamps make the car attractive also for evening tours.

The construction cost of the cars was about $5,500 each, and the total income for the summer months of 1906 was

BUILDING FOR CAR STORAGE, OFFICES, TRAINMEN'S QUARTERS AND SUB-STATIONS

$6,645, or about $3,323 per car. The total wages paid for the operation of both cars was approximately $753. The average income on ordinary days is about 45 cents per car-mile, but as high as 60 cents on Sundays and holidays. As the cars have been in use but a short time, the cost of maintenance and repair has been negligible, and is likely to remain so for years to come because they are very substantially constructed.

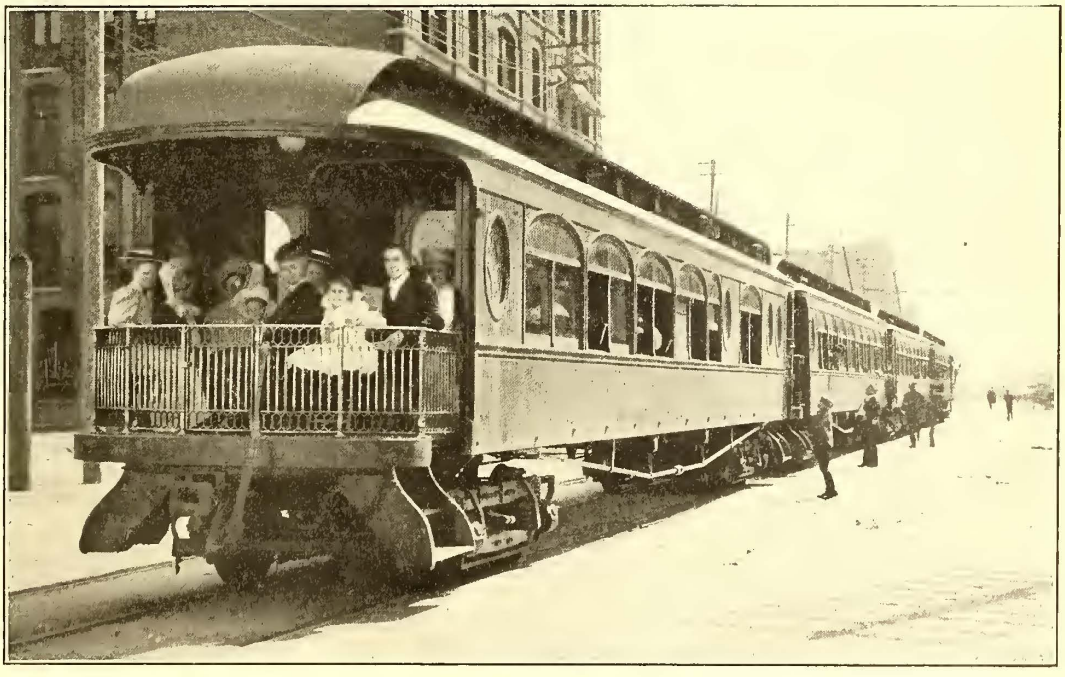
EIGHT-CAR TRAINS ON THE BOSTON "L"

The Boston Elevated Railway Company has filed its plans and petitions with the Railroad Commission for the operation of eight-car trains. When the new Washington Street tunnel is completed the eight-car train will be used exclusively, and the Tremont Street subway will be devoted to surface cars only. The company hopes by this change to avoid congestion at the stations. The change will also benefit greatly passengers who enter the cars at the Dudley Street transfer station. It necessitates that every platform along the line be lengthened and new structures be erected. At the South station a new stairway is in contemplation for the approaches, as the present stairway is hardly wide enough to accommodate the crowds. Especial attention will be given to the elevated road in Charlestown, and the City Square station will, to an extent, be remodelled.

EXTENDING THE INLAND EMPIRE SYSTEM

The Inland Empire System, of Spokane, Wash., has recently made a very material addition to its mileage and has inaugurated a number of new and interesting operating features, among them a splendid parlor car service. On Aug. 1, as previously noted in the STREET RAILWAY JOURNAL, passenger and freight service was begun between Rosalia and Colfax on the Spokane & Inland division of the Inland Empire System. The distance between Rosalia and Colfax is 30 miles, and with this additional trackage the Inland Empire System's lines now aggregate 200 miles. The Spokane & Inland division is now operating between Spokane and Colfax and Spokane and Palouse, a distance of 76 miles to either southern terminal, and an extension is being graded from Palouse, Wash., to Moscow, Idaho, a distance of 16 miles, and will be in operation about Jan. 1. On the Coeur d'Alene Hayden Lake and Liberty Lake divisions of the Inland Empire System, traffic is showing a very large increase over last season. Parlor car service was inaugurated on the Coeur d'Alene division June 29, and has proved a decided success. The first trip out of Spokane the parlor car was oversold six seats, and the second trip twenty-nine out of thirty chairs were taken. A view of the "Shoshone Flyer," which carries the parlor car, is presented herewith, also a view of the interior of the car. They show the general character of the equipment. The parlor cars are especially elaborate, the equipment including individual rattan seats with plush cushions and plush at the back where contact is made with the chair. The observation end is a feature that has appealed to the public and has been, in a large measure, responsible for the extraordinary popularity of the cars. Four trains run in either direction between Spokane and Coeur d'Alene daily, with parlor car attached, one of these trains known as "The Campers' Limited," operating through to Hayden Lake, which is one of Spokane's popular summer resorts.

INTERIOR OF SHOSHONE FLYER



THE SHOSHONE FLYER

SERVICE TESTS ON COLUMBUS CITY CARS OPERATED SINGLY AND IN TWO-CAR TRAINS WITH MULTIPLE UNIT CONTROL

A little over a year ago the Columbus (Ohio) Railway & Light Company started a two-car train service to reduce the congestion on its High Street line. Instead of attaching a trailer to a motor car, or coupling two straight motor cars, the company resorted to the then novel expedient of placing two motors on each car, but using type M multiple-unit control on the leading car, and a K-10 controller on the rear car. This was done to save the cost of an additional multiple-unit equipment, as it was found that regular train control could be obtained by tapping the usual leads for motors Nos. 3 and 4 into a common bus line, connected to the second equipment and making a few other changes. A full description of the company's practice with the corresponding wiring diagram was published in the STREET RAILWAY JOURNAL of June 30, 1906, and brief reference made to it also in the Oct. 13, 1906, issue.

This practice of the Columbus company led to the interesting comparative service tests of train and single-car operation by the Ohio State University's Department of Electrical Engineering, of which a summary is presented in this article. The tests were made for thesis purposes under the direction of Prof. F. C. Caldwell, by F. F. Sheldrick, H. D. Cranston, E. S. Zuck and C. P. Galleher.

The experiments were carried out on the High Street line, which is about 6.6 miles long. The leading car used both in the single car and train tests is specified by the following: weight of body, 20,185 lbs.; trucks, 6175 lbs.; motors and gearing, 4920 lbs.; air and electric equipment, 3176 lbs.; total weight, 34,366 lbs.; seating capacity, 40; length over the vestibules, 40 ft. 8 5/16 ins.; length over the body, 28 ft. 8 5/16 ins.; width over the posts, 7 ft. 11¼ ins.; height, 9 ft.; wheel diameter, 33 ins.; Brill maximum traction trucks; two GE-67 motors, 40 hp each and geared 67:17. The trail car was similar to the leading car except that its platforms were each 1 ft. shorter. Both cars were in ordinary operating condition and picked at random.

On the type M car, power is consumed in the motor, control and air compressor circuits; on the K-10 car, power is consumed only in the motor and air circuits. The general scheme of the test was to place the proper power-recording instruments in these circuits in addition to several special instruments for recording speed, etc.

After preliminary runs on April 4, 1907, the two-car train was tested on April 5, and the single car on April 6. The test car left the North High Street car house at 6:10 a. m. and made its regular schedule on the High Street line until about 11 a. m., when three round trips were completed. Some extra trips were made, however, to secure additional data.

The following tables Nos. 1, 2, 3, 4, 5 and 6, summarize the calculated results of all tests.

The data for the individual runs differ somewhat, but the discrepancies are very small when the varying conditions of load, track, etc., are considered. The fact, however, that both the train and single car were operated over the same route and on the same general schedule facilitates comparison.

In comparing the results, several interesting conclusions are obtained.

1. The kw-hours per car-mile (motor circuit only) were 2.20 on Friday, April 5, and 2.01 on Saturday, April 6 (Tables 4 and 5); the respective watt-hours per ton-mile (motor circuit) were 122.6 and 103.4. The results show that 52 watt-hours per car-mile were consumed on Friday, and 50.6 on Saturday. In this connection it should be noted

TABLE No. 1.—CALCULATED RESULTS OF TESTS.
Two-Car Train, Friday, April 5, 1907.

Number of Run	(1)	(2)	(3)	(4)	(5)	(6)
1. Average amperes	147	158	136	158	151	143
2. Average volts	509	508	513	521	524	528
3. Average watts	75000	80300	69800	82200	79400	75400
4. Length of time power is on (seconds)	1366	1402	1351	1317	1343	1313
5. Total watt hours	28450	31300	26250	30050	29670	27500
6. Length of run (miles)	6.63	6.63	6.25	6.63	6.63	6.63
7. Kw-hours per car mile	2.14	2.36	2.10	2.27	2.24	2.07
8. Total number passengers	102	101	63	90	85	84
9. Average number on car	35.2	40.8	26.2	29.3	29.1	23.8
10. Weight of car and live load (tons)	36.15	36.50	35.50	35.75	35.72	35.41
11. Watt hours per ton mile	118.6	129.5	118.4	126.8	125.2	117.2
12. Total number of stops	55	56	48	54	57	54
13. Stops per mile	8.3	8.4	7.2	8.2	8.6	8.2
14. Total time of stops (seconds)	248	215	185	230	252	220
15. Average time of stop	4.5	3.8	3.8	4.3	4.4	4.1
16. Average speed (m. p. h.)	11.10	10.90	11.04	10.70	11.11	10.36
17. Schedule speed (m. p. h.)	9.95	9.94	10.03	9.71	9.95	9.60
18. Kw-hours per car mile	2 21	2.43	2.16	2.33	2 30	2.14
19. Watt hours per ton mile	122.2	133.1	121.9	130.4	129.0	120.8
20. Watt hours per passenger (total)	287	319	429	343	359	338

NOTE.—"Kw-hours per car mile" and "Watt-hours per ton mile" (items No. 5, No. 7 and No. 11) do not include the energy used in the air nor control circuit. Items No. 18, No. 19 and No. 20 take these quantities into consideration.

TABLE No. 2.—RESULTS FROM RECORDING WATTMETERS

Number of Run	(1)	(2)	(3)	(4)	(5)	(6)
1. Total watt hours	29900	31900	24900	25900	28900	29900
2. Watt hours (air circuit)	550	560	440	520	600	490
3. Watt hours (control circuit)	340	380	340	330	300	360
4. Watt hours (motor circuit)	29000	30960	24100	25050	28000	29050
5. Kw-hours per car mile	2.19	2.33	1.82	1.89	2.11	2.19
6. Watt hours per ton mile	121.0	128.0	108.6	105.8	118.2	123.8

TABLE No. 3.—CALCULATED RESULTS OF TESTS.
Single Car, Saturday, April 6, 1907.

Number of Run	(1)	(2)	(3)	(4)	(5)	(6)
1. Average amperes	67	70	81	69	67	71
2. Average volts	507	504	519	527	538	531
3. Average watts	34000	35300	41800	36400	36100	37700
4. Length of time power is on (seconds)	1343	1353	1386	1265	1271	1176
5. Total watt hours	12690	13300	16090	12800	12740	12300
6. Length of run (miles)	6.63	6.63	6.63	6.63	6.63	6.63
7. Kw-hours per car mile	1.91	2.00	2.43	1.93	1.92	1.86
8. Total number passengers	76	88	98	82	74	55
9. Average number on car	33.2	35.6	36.8	27.7	34.0	24.0
10. Weight of car and live load (tons)	19.52	19.67	19.73	19.15	19.56	18.91
11. Watt hours per ton mile	98.0	101.8	123.0	100.8	98.3	98.4
12. Total number of stops	47	51	58	45	46	40
13. Stops per mile	7 1	7.7	8.8	6.8	6.9	6.0
14. Total time of stops (seconds)	173	222	247	299	200	193
15. Average time of stop	3 7	4.4	3.3	6.6	4.4	4.8
16. Average speed (m. p. h.)	10.91	10.48	10.18	11.35	10.84	11.44
17. Schedule speed (m. p. h.)	10.11	9.60	9.32	9.95	9.95	10.48
18. Kw-hours per car mile	2.03	2.10	2.54	2.03	2.01	1.94
19. Watt hours per ton mile	104 0	106.9	128.6	105.9	103.0	102.8
20. Watt hours per passenger (total)	177	158	172	164	180	234

NOTE.—"Kw-hours per car mile" and "Watt hours per ton mile" (items No. 5, No. 7 and No. 11) do not include the energy used in the air and control circuits. Items No. 18, No. 19 and No. 20 take these quantities into consideration.

TABLE No. 4.—RESULTS FROM RECORDING WATTMETERS.

Number of Run	(1)	(2)	(3)	(4)	(5)	(6)
1. Total watt hours	20900	18900	19900	15900	11900	12900
2. Watt hours (air circuit)	330	310	400	290	300	290
3. Watt hours (control circuit)	420	310	340	340	310	290
4. Watt hours (motor circuit)	20150	18280	19160	15290	11330	12360
5. Kw-hours per car mile	3.05	2.76	2.89	2.31	1.71	1.86
6. Watt hours per ton mile	156.5	140.3	146.5	120.4	87.3	98.6

TABLE No. 5.—AVERAGE LOG SHEET FOR FRIDAY, APRIL 5, 1907.
Two-Car Train.

Condition of track	Dry and clean.
Route	Entire length of High Street.
Length of single run	6.63 miles.
Number of runs	6.
Time of runs	From 6:10 a. m. to 10:39 a. m.
Passengers carried	Total per trip, 88; average number on the train, 30.6.
Stops per mile	Average per trip, 8.1.
Voltage measurements	Average per trip, 517 volts.
Current measurements	Average per trip, 149 amperes.
Power measurements	Average per trip, 77000 watts.
Time measurements	Time power is on; average per trip, 1349 seconds.
Energy measurements	Average per trip, 28900 watt hours; kw-hours per car mile, 2.20; watt hours per ton mile, 122.6.
Control circuit	Watt hours per car mile; average per trip, 52.0.
Air circuit	Watt hours per mile; average per trip, 80.5. Watt hours per car mile; average per trip, 40.3.
Total energy per trip	Including motor, air and control circuits, 2.29 kw-hours per car mile.
Total energy per trip	Including motor, air and control circuits, 345 watt hours per passenger.
Total energy per trip	Including motor, air, control and heater circuits, 3.04 kw-hours per car mile.

that the average stops per mile were 8.1 on Friday, and 7.4 on Saturday.

2. The energy charged against the heater is based on the measured resistance of the heater circuits and on the assumption that if continuously operated they would have used .75 and .73 kw-hours per car-mile respectively, for Friday and Saturday.

3. The total energy per trip, including the motor, air control and heater circuits, was 3.04 kw-hours on Friday, and 2.84 kw-hours on Saturday. The watt-hours per ton-mile on Friday were 146, and on Saturday 169.8; watt-hours per passenger were 345 on Friday, and 177 on Saturday.

TABLE No. 6.—AVERAGE LOG SHEET FOR SATURDAY, APRIL 6, 1907. SINGLE CAR.

Condition of track	Dry and clean.
Route	Entire length of High Street.
Length of single run	6.63 miles.
Number of runs	6.
Time of runs	From 6:10 a.m. to 10:36 a.m.
Passengers carried	Total per trip, 79; average number on the car, 31.9.
Stops per mile	Average per trip, 7.4.
Voltage measurements	Average per trip, 521 volts.
Current measurements	Average per trip, 70.8 amperes.
Power measurements	Average per trip, 36900 watts.
Time measurements	Time power is on; average per trip, 1299 seconds.
Energy measurements	Average per trip, 13300 watt hours; kw-hours per car mile, 2.01; watt hours per ton mile, 103.4.
Control circuit	Watt hours per car mile; average per trip, 50.6.
Air circuit	Watt hours per car mile; average per trip, 48.2.
Total energy per trip	Including motor, air and control circuits, 2.11 kw-hours per car mile.
Total energy per trip	Including motor, air and control circuits, 177 watt hours per passenger.
Total energy per trip	Including motor, air, control and heater circuits, 2.84 kw-hours per car mile.

It is seen from the foregoing that the two-car train is the more economical on the ton basis, but from the standpoint of energy per car-mile and passenger, the single car shows a decided advantage, and especially in regard to the watt-hours per passenger. The traffic conditions, however, were such that the two-car train was not worked at the same relative load, the number of passengers being about the same for both days. If there had been the same number of passengers on each car in the two-car train as there were in the single car on Saturday, the results would have been quite different; instead of the watt-hours being 345, they would have been nearly halved. The watt-hours per ton-mile would also have been still lower on Friday than on Saturday, and the two-car train would then show up better than it does. This leads to the conclusion that the trains should be operated only when traffic is dense enough to fill both cars. Only the power consumption has been considered in this connection and no account is taken of any differences in other operating expenses such as labor and maintenance.

It will be noticed from tables Nos. 2 and 3 that the data from the recording wattmeters do not check with those from the voltmeter and ammeter measurements; neither are they consistent. For these reasons their indications were not regarded as reliable. As the wattmeters were carefully calibrated before and after the test, the discrepancies are attributed to the conditions of the test, since recording wattmeters are constructed with jewel bearings and should be mounted free from vibration. Evidently the frame of a moving car does not fulfil this requirement.

TEST OF THE CONTROL SYSTEM

The control system was tested to determine definitely how much power it required. A wattmeter was placed in the control circuit, the resistance of the contactors measured and the current consumption determined for each step. This test was comparatively short and simple, but proved the statement of the control manufacturer that the current taken by the master controller is about 2.5 amps. for an equipment of 400 hp or less. The power measurements are found in tables Nos. 2 and 4 and show that the power taken by the control apparatus is very small.

TEST OF THE AIR-BRAKING EQUIPMENT

The air-brake trial was also a service test and was taken principally to learn over what distance a car passed from the brake application until standstill; to compare the performance of a single car with a two-car train; and to determine the power used in braking.

The brake equipment was made by the General Electric Company. The cylinders were 8 ins. in diameter and the compressor motor took 4 amps. at 500 volts. The ratio of the brake levers was 8½ ins to 10½ ins., the 10½-in. end being connected to the rod from the brake cylinder. On the two-car train all the air was supplied from the reservoir of the leading car and the trail car reservoir was cut out to be used only in emergencies.

The results of the tests, which were made with the usual stop-watch, speed indicator, etc., were averaged and then plotted as curves in the following manner. In averaging, the results for each run were recapitulated by placing in one column all the time readings which lay between values differing by unity, as, for instance, all readings between 10 and 11 seconds; the corresponding readings of distance,

TABLE No. 7.—POWER CONSUMPTION OF BRAKES.
CAR No. 524. APRIL 6, 1907. CONDITION OF TRACK, GOOD.

Number of Run.	Number of Stops.	Watt Hours.	Watt Hours per Stop.	Weight in Tons.	Watt Hours per Ton.	Watt Hours per Ton per Stop.
1	47	330	7.02	19.52	16.90	.360
2	51	310	6.07	19.67	15.75	.309
3	88	400	6.90	19.73	20.25	.349
4	45	290	6.45	19.15	15.15	.337
5	46	300	6.52	19.56	15.33	.333
6	40	290	7.25	18.91	15.32	.383
CARS NOS. 524 AND 452. APRIL 5, 1907. CONDITION OF TRACK, GOOD.						
1	55	550	10.00	36.15	15.20	.276
2	56	560	10.00	36.50	15.32	.274
3	48	440	9.17	35.50	12.39	.258
4	54	520	9.63	35.75	14.55	.270
5	57	600	10.51	35.72	16.80	.295
6	54	490	9.07	35 41	13.81	.256
					Average...	.272
CAR No. 524. APRIL 4, 1907. CONDITION OF TRACK, WET.						
4	48	300	6.25	18.08	16.60	.346
5	46	310	6.74	18.97	16.35	.356
6	48	300	6.25	17.86	16.80	.350
					Average...	.351

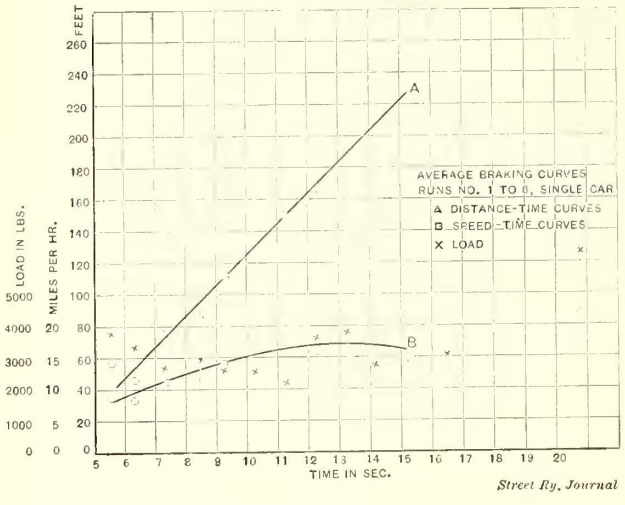
speed and load were arranged in three other columns and all were then averaged, securing an average time with the corresponding average speed, distance and load. Then curves for each run were plotted with these values between time and distance as well as time and initial speed. The average load also was indicated on the same sheet.

To enable comparison of single cars with two-car trains, average curves were plotted by averaging all the runs with the single car and with the train. These averages of averages then were plotted in the same way as the others.

The following results were obtained from the power readings of the recording wattmeter in the air-brake circuit: Total watt-hours, watt-hours per stop, watt-hours per ton and watt-hours per ton per stop. It was also possible to compare the work of the single car on both wet and dry track. To obtain the watt-hours per stop, the total watt-hours were divided by the total number of stops in the particular run.

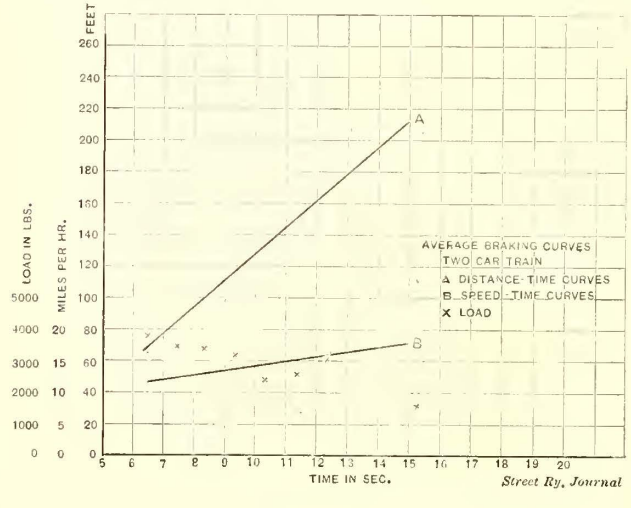
So far as the performance of the two-car train is concerned, the curves show that it gives more uniform braking, namely, the distances covered in different stops do not vary over as wide a range as the single car. Neither does the time of braking vary as much in the case of the train. The average curves show little difference in the performance of the two cases. On the average, it takes about the same time to stop a two-car train as a single car, and the distance also is about the same for similar speeds.

The greater uniformity of the results with the two-car train can be explained as follows: All the air used in brak-



BRAKING CURVES FOR SINGLE CAR

ing the two-car train was stored and drawn from the reservoir on the leading car only, but the air was received by the brake cylinders on both cars. Hence, it is evident that the motorman has no more energy available for braking with two cars than with the single car, but he has approximately twice as much kinetic energy to destroy. In other words,



BRAKING CURVES FOR TWO-CAR TRAIN

the ratio of energy available for braking to the energy destroyed is much smaller for the two-car train than for the single car, and therefore the range over which the motorman can vary the braking characteristics of the two-car train is limited.

The value of the braking curves lies in their showing the average performance of the equipment tested when in normal service. No emergency trials were made.

It appears that the load does not affect the results noticeably nor do the low grades of the track seem to have any bearing on them.

In general, the condition of the track was good throughout the test, excepting three runs over wet track on Thursday, April 4. Readings were taken for these runs to obtain comparative data for the two conditions. Only the power reading data of these runs were worked up and they show little difference in the power consumption per ton per stop, which was .351 watt-hours, as against .345 watt-hours for dry track.

In the case of the two-car train versus the single car, the results show a marked difference in the watt-hours per ton per stop, averaging .272 for the train and .345 for the single car. In the energy required for braking, the two-car train is more economical by about 27 per cent.

THE CLEVELAND SITUATION

For the past week attorneys and accountants for Charles S. Thrasher have been going through the books and records of the Forest City Railway Company in an attempt to discover the source of the cash resources upon which it has existed. Attorney Harrison B. McGraw and a stenographer undertook the work, but later on the Audit Company of Cleveland was employed to do the work. This investigation is being made by Mr. Thrasher as a stockholder.

Attorney McGraw stated that, while Secretary Fred C. Alber of the company owned only 147 shares of stock in the beginning, he had later voted 633½ shares. He said there was evidence that Mr. Alber had in his possession $1,900,000 stock at one time, and that there still remains about $1,000,000 in his name. There is nothing to show that anything was paid for what he still holds. The $900,000, Mr. Alber is said to have stated, was sold for cash, and the proceeds used to build and equip the road. The $1,000,000 remaining, Mr. Alber stated, could be sold and the proceeds used for the same purpose.

Another block of $200,000 stock was found to stand in the name of Max J. Rudolph, who is associated with Attorney Westenhaver, an attorney for the low fare companies. Albert E. Greene, who first obtained the franchises for the Forest City Railway Company, is supposed to have received this stock for his services and to have turned it over to Mr. Rudolph. The point here is that the amount paid for such services is excessive, even if Mr. Rudolph shared attorney's services with Mr. Greene.

As the property of the Forest City Railway Company is leased to the Municipal Traction Company, Mr. Thrasher, as a stockholder in the former, made a demand to be allowed to investigate the books of the leasing company also, but Secretary W. B. Colver refused on the ground that Mr. Thrasher is not a bona fide stockholder of the Forest City, but acquired stock for the purpose of making such a demand and investigation. He said any stockholder or citizen would have the right to make an examination of the company, but that Mr. Thrasher and his attorneys are disqualified. Thereupon Charles A. Otis, owner of the "Cleveland News," and well known as a broker and business man, accepted the offer, as a citizen, and employed expert accountants to go over the books.

City Clerk Peter Witt, and Ernest Bitterlich, an accountant, have been engaged for some days in going over the books and records of the Cleveland Electric Railway Company. Mr. Witt, who owns one share of stock in the company, says he will give out nothing until he is through with the work.

SOUTHERN PACIFIC TO CONSIDER ELECTRIFICATION

The important announcement was made this week that the Southern Pacific Railroad Company, through Vice-President Kruttschnitt, director of maintenance and operation of the Harriman lines, has requested Frank J. Sprague to associate himself with Allen H. Babcock, the electrical engineer of the company, in a study of all the data bearing upon the question of the feasibility of electrifying the Sacramento division of the Southern Pacific system, i e., the section from Rocklin to Sparks. For some three years past Mr. Babcock has been devoting his attention to this problem, while the engineers of the great electrical manufacturing companies have also made a special study of the subject. It is now proposed to refer Mr. Sprague's report on this subject to a board of five engineers, of whom Mr. Sprague and Mr. Babcock will be two members. The other three members will be appointed from the staff of the company. The duties of the board, it is understood, will be to go over the data upon this subject compiled by Mr. Babcock and Mr. Sprague, and to prepare detailed information and a general plan of electrification, without reference at present to details of installation. This board will submit its report to Mr. Kruttschnitt, and his recommendations as to final action, with the report of the engineering board, will be passed upon by the directors of the company. If the decision is in favor of electricity, Mr. Sprague will continue as consulting engineer during the period of installation, which would naturally be carried on by the railroad company's organization.

In many respects the problem of increasing the capacity of the division in question is one of the most important in the railroad world. It is over this division that the entire freight and passenger traffic of the transcontinental Union Pacific system, for Central California, is carried, and likewise the eastbound traffic. Some idea of the difficulties may be judged from the fact that in a distance of 83 miles there is a rise of nearly 7000 ft., this section forming a part of the division on the west and east slopes respectively. The distance between Rockline and Sparks is about 136 miles, it is single track, has very sharp curves, and over 31 miles of tunnels and snow-sheds, the latter in winter being the equivalents of tunnels. The traffic, while heavy, is very irregular, and is made more difficult of maintenance in the winter by the heavy snows, often 15 ft. to 20 ft. deep. The present service of traffic, both passenger and freight, is maintained by means of very powerful oil-burning locomotives of the best type extant, with which good results are obtained; but although the road is kept up to a high degree of efficiency, it is only with difficulty that the traffic is maintained; and at times there is absolute blockade. Moreover, at some periods the traffic is so great it had already reached the limits of the present capacity of the system.

The New York Central and the New Haven installations have come very naturally to be looked upon as not only the largest, but the most important electric railway installations, not only undertaken, but even considered; but here is a case where the distance is almost the same as between New York and Albany, where the elevation to be surmounted is greater than that of the highest peak in the White Mountains above sea level, and where the difficulties presented by the topography of the country, the temperature and the snowfalls are tremendous. Nevertheless this link of the Union Pacific transcontinental system is the throttle on the entire traffic, and an increase of capacity is vital either by new construction with lower grades, perhaps tunneling the Sierra Nevadas, by the construction of a second track, which would be very expensive, or by a change of motive power This latter has seemed likely to be effective, and derives some special significance because of various published comments by Mr. Harriman to the effect that inasmuch as widening the gage of railways was impracticable, electricity seemed the obvious general solution of the problem of increase of capacity of railroads.

Mr. Sprague, when seen, said he was not prepared in any way to make a statement on the subject, other than confirm the news of his appointment, which he had accepted. He believed it altogether feasible and possible to operate the division electrically, but as to methods applicable to the unique conditions involved, he approached the subject with an open mind, and the best solution of the problem would depend upon the existing or probable development of the art when details were taken up. The vital questions were whether the existing and probable traffic would warrant the cost of an electric equipment, and whether the adoption of electric operation would solve the problem of increase of capacity more satisfactorily than some other method.

QUESTION BOX OF ENGINEERING ASSOCIATION

The secretary of the American Street and Interurban Railway Engineering Association has issued the Question Box for the 1907 convention. It is as follows:

POWER HOUSES

1. Is the use of jet condensers on turbine installation advisable?
2. Have you had any trouble with stripping of blades in a turbine of either the Parsons or Curtis type? If so, to what did you lay the cause? What do you suggest as a remedy?
3. Have you had any trouble caused by deposits of foreign matter forming on the blades of the turbine? How do you remedy this?
4. What success have you had with motor-generators wound for 6000 to 16,000 volts on the a. c. side? Is any difficulty experienced due to direct exposure of windings to lightning?
5. What is the smallest size of boiler plant or minimum coal consumption which warrants the use of automatic stokers?
6. Is it advisable to use gaskets for superheated steam headers?
7. In a small or medium size plant what is the best method of increasing boiler capacity during heavy peak loads? Give details and results obtained.
8. What schemes are there for inducing firemen to take greater interest in their work? Please give details and results secured.
9. How can coal pile fires be prevented?

SHOP CONSTRUCTION

10. Allowing for additional cost, is it not advisable to have creosote blocks, or a wood floor, on concrete foundation, in the machine, blacksmith and wheel section of a shop, in preference to ordinary concrete floor, which becomes uneven quickly and is hard on workmen walking about?
11. Owing to the breaking of concrete around pit tracks, the inability to secure a safe jacking base and the possibility of shocks to workmen, is not a plank floor preferable to concrete?
12. What is the most desirable construction for an operating car barn, considering cost, maintenance, operating and insurance?
    (1) Brick walls, mill construction roof.
    (2) Brick walls, roof iron trusses—2-inch boards, tar and gravel.
    (3) Brick walls, reinforced concrete roof.
    (4) Brick walls, reinforced concrete walls and roof.

TRACK

13. What is the life of ties or timber imbedded in concrete?
14. Is there a standardized specification for track and roadbed?
15. Which is the best material for ballast on interurban lines, gravel, crushed rock or stone?
16. What is the best method of handling weeds on interurban roadbeds?
17. Has the sprinkling of crude oil on the roadbed been

tried to lay the dust and kill weeds, and have the results been satisfactory?

18. Some companies have laid their tracks with joints directly opposite one another, and as they continue the practice, it must have some advantages; what are they?

OVERHEAD WORK

19. Is there a standard and reliable specification form for overhead trolley construction?

20. What should be the dimensions of a substantial lightning arrester ground plate for the purpose of grounding station arresters?

21. What experience have you had with a fuse arrester, viz.: an arrester of the type composed of one or more pieces of 18 to 20 d. c. c. m. w., 16 inches or 18 inches in length, bared at one end and suspended over the positive bus to ground?

22. What is the most efficient method of preventing short circuits by reason of low tension feeders coming in contact with trees?

23. Can sleet be prevented from forming on the trolley by greasing the wires? Has such an idea ever been tried?

CAR BODIES

24. What is a good form of monitor deck ventilator for suburban cars, one that will change the air in the car sufficiently and yet not allow annoying draughts in winter?

CAR EQUIPMENT

25. What is done to prevent brush and brush holder troubles by operators of fast and heavy equipments?

26. Will controller blow-outs be reduced if the fields are connected ahead of the armatures, and why?

27. Which are preferable, solid or split gears, and why?

28. What are the best methods of wiring on open city cars?

29. Which is the most economical, all things considered, hot water or electric heating for cars?

30. What in your opinion should be the requisites and general design for a car coupler for interurban car service?

31. Are the results obtained from the use of a high grade brass motor bearing so much more satisfactory than a babbitted bearing to warrant the additional cost?

32. Is there any motor lid for the railway motor that can be removed and replaced daily without any danger of losing in streets or into motor?

33. Is there any method by which carbon brushes for railway motors can be tested without a running test to determine whether they are of the same grade as before used?

34. Has anyone experienced trouble with loose field coils in the newer types of motors, and what can be done to prevent it?

35. What is the best way to straighten armature shafts that are sprung between pinions and bearings without removing the winding or shaft from the core?

36. Should armatures rewound or repaired be balanced before being put in service?

37. Which is the more economical for finishing armatures, the higher priced, smooth, hard oil-proof varnish at about $1.50 per gallon, or a grade costing about 75 cents per gallon, and which has not all the qualities mentioned above?

38. What is the average cost of equipping double-track cars with four motors and air brakes, including the wiring, mounting motors, piping, etc.?

39. Give formula of babbitt used for your own journals.

40. Give formula of material used in trolley wheels.

41. Is it practical to use the same kind of a fender on city and interurban cars?

42. What are the arguments in favor of a pilot for purely interurban service?

WHEELS AND AXLES

43. Why are chilled iron wheels preferable in interurban service to steel tired wheels?

44. What causes car axles to crack and break?

45. Is a drop test sufficient to detect flaws in axles, provided it is calculated to be about equal to service conditions plus a proper factor of safety?

46. What is the average life of 4, 4¼ and 5-inch cold rolled steel axles under cars having four motor equipments, ranging from 15 to 27 tons?

47. What is the chief factor in determining when a steel wheel should be turned down in the lathe, *i. e.*, is it flange wear, tread wear, diameter or what? About how often is it found necessary to turn them?

INSPECTION

48. How often should clearance of motors be taken?

49. In maintaining rolling stock, what is a fair average in cars per man for the maintenance of trucks and electrical equipments at car houses?

50. What is a fair average in motors per man?

LUBRICATION

51. What is the most economical depth of oil to use in the oil wells of the armature bearings of the G. E. 80 or 101-B motors? State length of time between oilings for the various depths to be mentioned.

52. Which gives the best results for lubrication of gears, grease or a heavy oil?

53. What is the best simple shop test of lubricating oils and greases, including gear grease?

MISCELLANEOUS

54. What is the best way of cleaning cars?

55. As the operating department deals with and receives complaints from the public as to the cleanly condition of the cars, why is not best to have our cleaning come under the operating end, provided the advice of the master mechanic is adhered to regarding the use of proper cleaning compounds which will not prove injurious to the paint?

56. What systematic and periodic method have you for taking up with the general manager or transportation department a record of the cars turned in off the road due to the fault of negligent operation on the part of the trainmen? What is done to prevent a repetition of the faults?

57. On a belt line, cars weighing 23,000 lbs. loaded, and having two G. E. 67 motors, pass one way around a 50-ft. radius spiral curve on an unpaved street, no grade, at a 10-minute headway. A curve having a 60-ft. radius would decrease the operating expenses for current, car and motor repairs and wear on curve. What prices could be paid for enough of the corner property to construct a curve 60-ft. radius, so that interest on the cost of the property at 6 per cent would be offset by the saving in operating expenses, assuming feed wire and return was sufficient and assuming both curves to cost the same?

58. Is a long or short pull register preferable, and why?

59. What is the best method for checking motormen on the operation of controller with reference to care of equipment and saving of power?

60. What is the best manner of instructing student motormen in the mechanical operating of both city and interurban cars?

61. In how great detail should the mileage of parts of equipment be kept?

62. What should be the angle between trolley pole and wire?

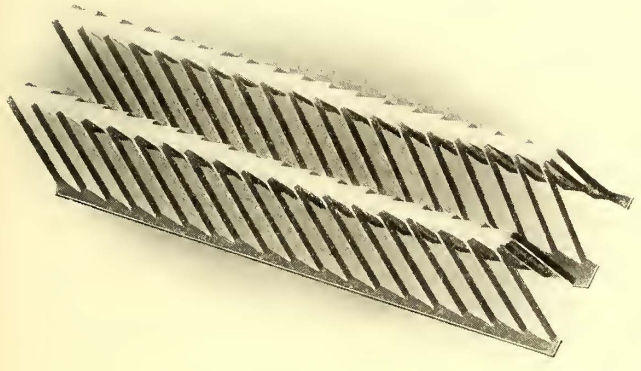
FREE TROLLEY EXCURSIONS FOR CHILDREN IN MONTREAL AND QUEBEC

The Montreal Street Railway Company, through Managing Director W. G. Ross, inaugurated last summer a system of free trolley excursions for children under the care of different public institutions. During July and August of 1906, fully 50,000 youngsters were taken on the picturesque line around Mt. Royal, with several hours' stop-over to give the children a chance to disport themselves in the public park on the mountain. The trips are usually made between 9 and 12:30 a. m. to interfere as little as possible with the regular service. Similar excursions are being given this year on an even larger scale. On Aug. 26, for example, an eleven-car excursion was made to Dominion Park. It goes without saying that the liberality shown by the company in arranging these trips is highly appreciated by both the children and their guardians. Thus the company secures the good feeling of the present generation and is in a fair way to obtain the good will of the rising one.

What has been said here of the Montreal Street Railway Company applies with equal force to the Quebec Railway, Light & Power Company, where similar excursions are provided by Manager E. A. Evans.

A NEW FORM OF ROOF CONSTRUCTION

The question of material best suited for durable fireproof roof construction has always been one hard to settle. In recent years, the application of concrete to building construction has overcome many of the disadvantages of former methods of construction, but two considerations were left that in some cases worked materially to its disadvantage. These were the great weight of the reinforced material and the necessity for centering it. Since the non-inflammability and permanence of concrete make it valuable as a satisfactory roofing material, the problem remaining for solution was how to design a form of construction that would retain these features and still meet the demand for a light and strong roof which could be put up without centering. Among those who took up the detailed study of this question was the General Fireproofing Company, of Youngstown, Ohio, with the result that it now offers what it calls Trussit reinforcement. In this system the design is expanded from light steel and is trussed as shown in the accompanying illustration. Erected on 4-ft.



NEW TRUSSED-ROOF CONSTRUCTION

centers and plastered on both sides, it does not separate the upper and under coats of the concrete into two layers; in fact, there are no upper and under coats, except as these terms indicate the method of application. Concrete keys through the mesh of the reinforcement completely envelop it and sustain the trussed formation of the steel. This construction results in a light reinforced concrete slab very strong in proportion to its weight, as clearly indicated in the following report on the behavior of Trussit under severe strain. The tests were made on four slabs reinforced with the General Fireproofing Company's cold-twisted lug bar. In the case of slab No. 1, for instance, which was tested to destruction, it went down under a load of 464 lbs. per sq. ft. This slab was 1-3-5 gravel concrete and was 1⅞ ins. thick. Inasmuch as snow load on a roof is figured as 35 lbs. per sq. ft., this indicates how light a slab will meet all roofing requirements and permit a considerable saving in the steel of the roof trusses and purlins.

As previously stated, the usual practice is to erect this reinforcement on 4-ft. centers, and it may be attached to the purlins either by bolts, wire or clips. There are quite a variety of methods of waterproofing a roof of this character, but any of them satisfactory on the ordinary types reinforced concrete roofs works equally well with the new construction. This material also has been used for the erection of solid partitions without the use of studding; that is, temporary studding is used to sustain the metal until one coat of plaster has been applied, then the studding is removed and the plastering is completed. The result is a very rigid wall and yet an extremely light one. The material comes in sheets, the stock size of which is 15½ ins. x 96 ins., but 4, 5, 6 and 7 ft. lengths may be had at a slight increase in cost.

ANNUAL MONTREAL PICNIC

One of the great carnival events in Montreal is the annual celebration for the Benefit Association of the Montreal Street Railway Company's employees, as the popularity of the company has made these occasions of wide public interest. The fourth annual picnic, which was held at Dominion Park from Aug. 19 to 25, inclusive, created even more interest than the previous affairs, and over 150,000 10-cent general entrance tickets were sold. Dominion Park is the biggest pleasure resort in Montreal and offers a wide variety of attractions from scenic railways to automobile "leaps of death."

By arrangement between the managements of the Benefit Association and Dominion Park, all members and employees received a ticket of admission to the park for themselves and lady, good on any one afternoon or night during the picnic. All employees in uniform were admitted free to the park at any time during the picnic. Conductors selling thirty tickets, and all other employees selling twenty tickets of admission to the park received in addition to the ticket of admission mentioned above, a ticket for themselves and lady to fifteen attractions in the park for use at any one time the holder desired during the week of the picnic. Conductors and motormen were not required to be in uniform when making use of the tickets.

Fifteen tickets were given to each employee to sell, and as soon as these were paid for, fifteen more could be had and so on. The tickets were secured by conductors and motormen from their respective depot clerks; by car house employees from their respective foremen; by power house employees from the clerk at the power house; by employees in the Hochelaga shops from the purchasing agent, and by men in the construction department from the rail inspector.

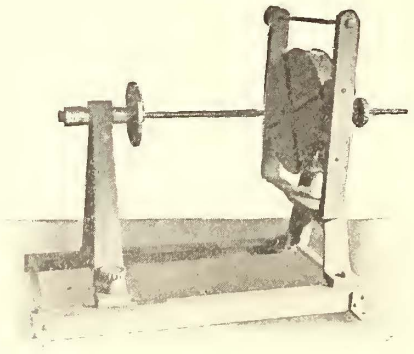
There will be a general distribution of prizes on Sept. 6. All employees selling fifteen tickets are entitled to draw for fifteen valuable prizes, the first prize being $15. Those selling thirty tickets may draw for ten valuable prizes, including the right to draw in the first mentioned drawing, the first prize being $20. Those selling sixty tickets may draw for ten valuable prizes, including the right to draw in the first two drawings before mentioned, the first prize being $25, and it is understood that any employees selling 1000 tickets are entitled to ten different chances in drawing of $5 each, an employee selling 900 tickets is entitled to nine different chances in drawings of $5 each, 800 tickets to eight different chances in drawings of $5 each, and so on down the list, in addition to the chances in the drawings previously mentioned. All money prizes are in gold.

The following prizes are also given to employees selling the greatest number of tickets: First prize, a gold watch or $50 in gold; second prize, $25; third prize, $15, and fourth prize, $10. The depot selling the greatest number of tickets is given $100 in gold, which is divided in money prizes as may be mutually agreed between them.

The management of the Montreal Street Railway Company has always given enthusiastic support and encouragement to the Benefit Association, and this co-operation with the rank and file, combined with the good feeling of the company's patrons, has made this event so popular with all classes.

A NEW REEL STAND AND BRAKE

To facilitate field and armature coil winding the Device Improvement Company, of Hanover, Pa., has designed a special stand which it calls its Peerless, upon which to mount reel holding magnet wire. This stand will accommodate a reel 30 ins. in diameter and any reasonable width, and is equipped with a brake to produce a tension easily regulated as the wire is reeled off. Thus the wire can be used for winding field coils, or if passed over large drum on the Peerless tension machine the stand acts as the retard brake for the wire around the large drum exactly as the band wire is retarded in the tension machine. This method produces a uniform tension throughout the whole operation of winding the



REEL STAND AND BRAKE

field coil irrespective of the varying depth of the wire on the reel. The stand and brake will, however, produce an exceedingly reliable tension alone. The device consists of two standards mounted on angle steel sills, one standard bolted stationary at one end, the other quickly adjustable for any width reel. The brake is wide-faced and contains two pointed pins which engage the wooden reel for the braking effect. The stand may be bolted solidly to the floor or wall; all adjustments are made by hand nuts, obviating the use of a monkey wrench. The brake-shoes are leather-faced, giving long life with little wear.

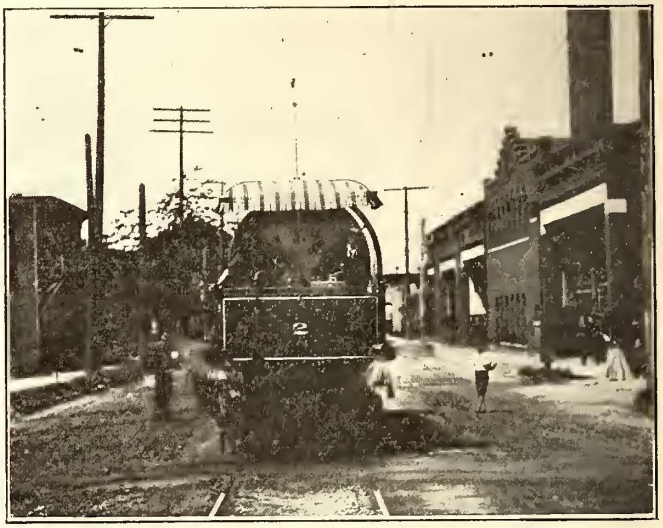
INCREASE IN FARE ON THE COLUMBUS, DELAWARE & MARION

An advance in fare over certain portions of the line has been announced by the Columbus, Delaware & Marion Company, to take effect Aug. 31. The change will apply to points between Columbus and Glenmary. The fare between Columbus and Worthing, which has been 10 cents, has been advanced to 15 cents, or the round trip for 25 cents. The management says that the Market Street line in Columbus receives 2½ cents of each fare for carrying passengers between North Columbus and the corner of Gay and High Streets, and that no money can be made at 10 cents for the trips named.

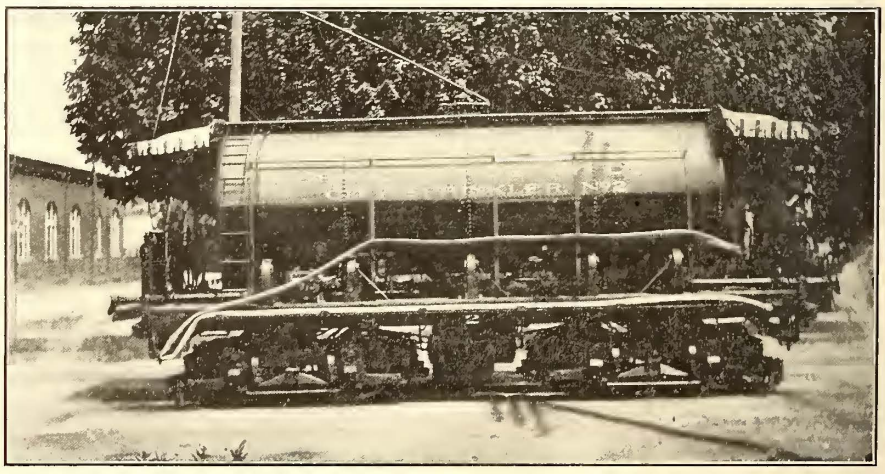
Superintendent Akin, of the Los Angeles Railway Company, has announced that hereafter no transfers are to be issued by the conductor unless they are asked for at the time the fare is paid. Heretofore it has been customary for conductors to issue transfers whenever and wherever requested.

DOUBLE-TRUCK CENTRIFUGAL SPRINKLER FOR GRAND RAPIDS

Although the streets of Grand Rapids, Mich., average about 46 ft. in width, the Grand Rapids Railway Company, with its 2480 gal. single-truck Brill centrifugal sprinkler, with a range of 50 ft., purchased last year, has averaged 50 miles of sprinkling per day. With a new machine, which has a 6-ft. x 20-ft. tank with a capacity of 4224 gals., a better record still will be established since the fillings will be less frequent. The Grand Rapids Railway Company has the contract for sprinkling all of the streets over which cars operate for a period of three years on a mileage basis for each sprinkling, all streets to be sprinkled twice daily and as many more times as the city officials may direct. The weight of this new centrifugal sprinkler with trucks, including the entire equipment with the exception of the truck and pump motors, is 30,600 lbs.; the weight of 4224 gals. of water is 35,150 lbs. The type of truck is the Brill No. 27-G2 with 4-ft. 6-in. wheel base; four motors of 40-hp capacity each were installed. The York Street Railway and the Long Island Company have lately received double-truck centrifugal sprinklers of about the same capacity. The Lehigh Valley Traction Company and the Interborough Railway Company, of New York, also are among the users of these centrifugal sprinklers, but the ones used by these companies are of the single-truck type. This sprinkler has also been successful abroad, especially in Milan and Malta.



FRONT END VIEW OF SPRINKLER



A SIDE VIEW OF THE SPRINKLER

FINANCIAL INTELLIGENCE

Wall Street, Aug. 28, 1907.

The Money Market

There has been a decided change for the better in the monetary situation during the past week, due largely to the action of the Secretary of the Treasury in deciding to render substantial relief and thus end the stringency in money that has existed for more than a month past. According to the plan of the Treasury Department, government funds will be deposited in the national banks at New York, Boston, and at the other principal centers. Deposits will be made weekly, the amounts to be deposited to be determined by the conditions prevailing at the various points. It is expected that this arrangement will afford substantial relief and will guarantee in a measure that the money will go into mercantile, rather than speculative, channels. It is generally expected that the deposits will begin this week, and while nothing definite regarding the amount of money to be deposited with the New York banks weekly has been made, it is believed in banking circles that upwards of $5,000,000 will be placed here for the next three or four weeks. The improvement in the situation is reflected in the willingness of local bankers to come to the relief of the City of New York and to take up a large amount of the bonds which will enable the city to continue its work of improvements, etc. Within the last two months the City of New York has made two unsuccessful attempts to sell a large amount of bonds, but assurances are said to have been given that the $40,000,000 4½ per cent bonds to be offered on Sept. 10 will be taken care of. Inquiries for these bonds have been received from out of town sources, and there is a possibility that a part of the issue will be placed abroad. The demand for money from Stock Exchange houses has been comparatively light, and in some instances prospective borrowers have withdrawn their bids in anticipation of lower rates. Corporations, however, continue in the market, and during the past week the American Light & Traction Company announced its intention to offer to its shareholders the opportunity to subscribe for $1,500,000 short term notes. The foreign situation is somewhat improved, although the demand for gold continues, especially at Berlin. During the week $1,000,000 has been exported to Germany, but these transactions have been of a purely special nature, and were made regardless of the exchange situation. The foreign exchange market has displayed decided weakness during the week, rates for sterling falling more than 1 cent on the pound as a result of the more liberal offerings of foreign capital in the local market. Money on call has loaned at 3 and at 1¾ per cent, the average rate for the week being about 2¼ per cent. Rates for time loans have declined ½ and ¾ per cent, and the situation at the close may be said to be more encouraging than at any previous time for more than a month past.

The bank statement published on last Saturday was rather better than expected. Loans decreased $8,070,100, and deposits decreased $11,073,700. Cash has decreased $2,086,100, but owing to the heavy decrease in deposits, which lessened the reserve required by $2,768,425, the reserve was increased by $382,325, and the surplus now stands at $9,976,400, against $1,290,075 in the corresponding week of last year, and $8,978,175 in 1905.

The Stock Market

Confidence in the stock market has in a measure been restored during the past week, partly as a result of the action of the Secretary of the Treasury in offering to deposit government funds with national banks in the larger cities during the period of crop moving, but more particularly perhaps by the later announcement that the $40,000,000 bond issue of the City of New York would all be taken up by a syndicate of large capitalists. Of course, the fact that the city had raised its interest rate to 4½ per cent had very much to do with the offering of the bankers alluded to. Nevertheless, it indicated that large investors were disposed to place their surplus funds in any security which is immune from attack by executive or legislative authorities, whether State or Federal. Rumors of impending failure among banking, brokerage and commercial houses served to keep the market in a more or less unsettled condition throughout the greater portion of the week, especially as the stories were accompanied by talk of a coming reduction or suspension of dividends by certain railroads, which, needless to say, was given more than ordinary credence on account of the cutting of the dividend on Southern Railway preferred from a 5 to a 3 per cent annual basis. In the gossip concerning curtailed or suspended dividends the New York Central and Erie figured most conspicuously, and in consequence the shares of these roads have been especially depressed. In common with pretty much all other stocks, however, they displayed a rallying tendency toward the close of the week under the influence of the factors above set forth, though when buying was almost wholly to cover short contracts, there were renewed purchases on the part of many small investors who were tempted by the unusually large returns now being offered by the general run of stable railway and industrial stocks. There was a moderate relaxation in the time money market, so far as short dates are concerned, and this in conjunction with evidence that buyers and sellers in the copper metal trade are gradually getting closer together, had something of a reassuring effect. However, the prospect that money will continue dear for some time to come, and that we may be called upon to ship greater or less quantities of gold to Europe to help out the situation there, especially at Berlin, offset these influences in a considerable degree, and while as before stated, a little more confidence prevailed at the end of the week, a great deal of doubt existed as to the permanency of the rally, particularly as the Administration shows no disposition whatever to recede from its avowed policy of proceeding against all railroads and officials thereof that have been guilty of violating existing statutes. At the close of the week the Erie directors declared the usual dividend on the first and second preferred stocks, payable in dividend warrants to carry interest at 4 per cent.

Developments among the local traction shares during the week have been more than ordinarily interesting. In at least two instances—Metropolitan Street Railway and Third Avenue—stocks in this category were sold at the lowest figures on record and all have been under heavy pressure, though recovering moderately from the extreme low points in sympathy with the late general rally in other stocks. Brooklyn Rapid Transit continues to pile up large earnings, but for the time being the discussion of a possible dividend on the stock of that company has been suspended, and it has acted very much in sympathy with the other members of the group.

Philadelphia

The depression prevailing in all quarters of the securities market was reflected to a great extent in the local traction issues during the past week. Trading was not very active, but such transactions as were recorded were at generally lower prices. Philadelphia Rapid Transit was again the leader of the group in point of activity, the stock declining to 15½, the lowest price on the present movement, on sales aggregating 5,000 shares. United Companies of New Jersey fell 5 points to 240, although at the close there was a partial recovery to 241½. Union Traction was unusually active and irregular. After an early advance from 53½ to 54, it subsequently lost all the improvement. Philadelphia Traction sold at 90 and 91, Philadelphia Company common at 39 and 38½, American Railways at 48, and Consolidated Traction at 68.

Chicago

Very little interest was manifest in the local traction issues during the past week, and apart from a sale of small lots of Chicago City Railway stock at 155 and 150, the trading was without noteworthy feature. South Side Elevated sold at 80, and Metropolitan Elevated common brought 22¾.

Interests friendly to the proposed reorganization of the Chicago Union Traction Company are urging the deposits of securities under the terms of the plan, and while appeals from the awards of the arbitrators are likely, it is generally believed that unless something unforeseen develops the plan will go through.

Other Traction Securities

Trading in the tractions of Baltimore, while not very active, was accompanied by a higher range of values. The United Railway issues were firm on reports that the company's earnings for the month of July will show an increase of 12½ per cent over those for the corresponding month of last year. The 4 per cent bonds advanced from 85 to 85⅞ on light purchases, while the incomes sold at 50½ and 50¼, and the funding 5s at 78. The stock was about steady at 11¼. Other sales included Baltimore Traction 5s at 108, and Lexington Street Railway 5s at 99. There were no important developments in the Boston market. Trading was quiet, and price movements were more or less irregular. Boston Elevator declined a point to 129. Massachusetts Electric lost ½ to 12, while the preferred declined a point to 50. Boston and Worcester rose from 19¾ to 20¼. West End sold at 85, and the preferred at 101 and 100.

Security Quotations

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

	Aug. 21	Aug. 28
American Railways	47	51
Boston Elevated	a130	a130
Brooklyn Rapid Transit	41½	42⅞
Chicago City	150	150
Chicago Union Traction (common) certificates	2½	—
Chicago Union Traction (preferred) certificates	—	—
Cleveland Electric	46	a49
Consolidated Traction of New Jersey	67	67
Detroit United	62¼	63
Interborough-Metropolitan	8⅞	9¼
Interborough-Metropolitan (preferred)	23	25½
International Traction (common)	42	—
International Traction (preferred), 4s	a67	—
Manhattan Railway	117	118
Massachusetts Elec. Cos. (common)	12	12¾
Massachusetts Elec. Cos. (preferred)	50	50
Metropolitan Elevated, Chicago (common)	21½	21½
Metropolitan Elevated, Chicago (preferred)	62½	63
Metropolitan Street	25	39
North American	53½	54½
North Jersey Street Railway	40	40
Philadelphia Company (common)	38½	38
Philadelphia Rapid Transit	16⅜	15¾
Philadelphia Traction	—	41
Public Service Corporation certificates	64	62
Public Service Corporation 5 per cent notes	92	92
South Side Elevated (Chicago)	80	80
Third Avenue	68	50
Twin City, Minneapolis (common)	85¾	90½
Union Traction (Philadelphia)	53¼	53½

a Asked.

Metals

The principal anxiety of producers of iron and steel is that of collections, and these appear to be more unsatisfactory the closer the buyer is to the railroad interests. The financial situation is dominating the industry, yet there are surprisingly few concellations. The great majority of sellers are not forcing the market, but there are a sufficient number, particularly in the territory east of the Allegheny Mountains and north of the Potomac, to cause a crumbling away of prices. Some Southern makers reduced their asking prices to $19 at furnace for the balance of the third quarter and to $18.50 for the fourth quarter.

The deadlock between producers and consumers is unbroken. Lake sold at 18¼c. and electrolytic at 17½c. during the week.

ARKANSAS INTERURBAN LINE READY FOR BIDS

The Little Rock & Pine Bluff Traction Company is ready to receive figures from railroad contractors upon the grading in sections, bridging, track laying, overhead construction and erection of power house, either in part or as a whole, etc., for its proposed line, and is also ready to receive estimates from manufacturers and supply houses for wire, structural steel, for bridges, overhead construction material, power house equipment, cars, etc. The company plans to build approximately 50 miles of electric interurban railway between Little Rock and Pine Bluff, Ark. The company may be addressed at suite 8 and 9, 501½ Main Street, Little Rock, Ark.

CLEVELAND ROAD SEEKS SUBURBAN GRANT

A twenty-five-year franchise along the Wooster Pike from the city limits to Depot Road in Strongsville Center has been asked for by the Cleveland, Brooklyn & Elyria Railway Company. From there to the county line on the west a private right of way will be used. Consents of property owners were filed with the County Commissioners. The Parma & Brooklyn Plank Road Company sold its road to the county some time ago in order that the electric railway might be given a franchise over the route. Two years ago Charles H. Hubbell was granted a franchise over the same route, but this was allowed to expire.

THE NEW ENGLAND STREET RAILWAY CLUB OUTING

The September outing of the New England Street Railway Club will take place Thursday, Sept. 5, at the Pomham Club House, on Narragansett Bay, near Providence, R. I. A most interesting itinerary is being arranged.

SCHOEPF COMPANY INCREASES CAPITAL

The Ohio Electric Railway Company, which was incorporated in May, 1907, to take over the Schoepf traction properties, including the Columbus, London & Springfield, on Aug. 27 increased its capital stock from $100,000 to $25,000,000, half of which is preferred.

The original incorporators of the company were E. H. Berry, D. J. Downing, S. M. Murray, W. H. Shunert and C. Wilson, most of whom are connected with the Cincinnati Traction Company. The Schoepf lines are divided into three groups. The Indiana, Columbus & Eastern controls the roads about Columbus and Springfield, to the west from Dayton and northwest by way of Lima and Defiance; the Lima & Toledo is in the extreme Northern part of the State, and the Cincinnati Northern commands the situation between Cincinnati and Dayton.

TOLEDO, ANN ARBOR & DETROIT RAILROAD TO BE SOLD SEPT. 16

The property of the Toledo, Ann Harbor & Detroit Railway Company is to be sold at receiver's sale, under the orders of the courts of Michigan and Ohio, Sept. 16.

Briefly, the property consists of 50 miles of line, 2¾ miles in Ohio, and the remainder in Michigan. Of this, 46 miles have been graded. The abutments for bridges are of concrete, and are all in place except one across a small stream at Milan, Mich. A power house, of cement and brick, is so far advanced that it is within a few feet of the roof. The floors in the basement and the foundations for the machinery are of concrete. The right of way has all been purchased and paid for, except about a mile. The entire length of the line, except where the railway passes through villages, is built upon private right of way, 32 to 100 feet in width, according to location and conditions. The track is constructed to one side of the right of way, in order to make room for an additional track when necessary. In addition to the right of way, the company owns 16 acres of land at Petersburg, for power house and car barns and yard purposes. Nineteen to twenty miles of main, side and supply tracks have been constructed with 60-lb. T-rails, with oak and chestnut ties. This distance includes the entire line from Toledo, Ohio, to Petersburg, Mich., and side tracks in the latter place where connections are made with the Lake Shore & Michigan Southern Railway. Seven miles of chestnut trolley poles are in place. Twelve to fifteen miles of the line have been bonded with soldered copper rail bonds. A Lamb woven wire fence, with cedar posts, has been constructed for fully one-half of the entire line. The sale will take place at a point where the line crosses the Ohio and Michigan State line, and will be made free from all encumbrances. It would cost $350,000 to duplicate the property as it now stands, exclusive of franchises and several other valuable rights. The 2¾ miles in Ohio are appraised at $20,550, and under the laws of Ohio must sell for at least two-thirds of the appraised value, and for cash. An up-set price of $80,000 has been set on the balance of the property in Michigan. Ten per cent of the bid must be paid at the time of sale, enough more on confirmation to amount to $25,000, and balance in payments of $25,000 every ninety days thereafter, until the whole sum is paid. All deferred payments are to draw interest at 4 per cent. John O. Zabel, of Southard, Zabel & Carr, of Toledo, Ohio, is attorney for receivers.

AFFAIRS IN CHICAGO

It has been decided by the executive committee of the St. Paul Railroad to accept the ordinance passed by the City Council of Chicago, which provides for the electrification of the road from Wilson Avenue to the city limits. The fare via the new route will be 5 cents between the city limits and the loop and 10 cents between Evanston and the loop. The division of revenue under the agreement will be 50 per cent to each company. It is the intention to establish express service, making the distance from the Davis Street depot, Evanston, to the center of the loop in forty-three minutes. It is not probable that this service will be established at once for the entire distance, though all trains will run express from Wilson Avenue. In order to augment the service it will be necessary to lay a third track and relay the present tracks, so as to establish "island stations" at express stops. The cost of making the changes and buying equipment is estimated at $1,000,000. The Northwestern L will furnish the additional equipment, and the cost of electrification will be borne by both companies. At Wilson Avenue it will be necessary to construct a new four track incline, which will cost about $90,000. According to E. N. McKenna, second vice-president of the St. Paul Company, the road will be ready in ninety days.

It is officially estimated that the city's share of the net earnings of the Chicago City Railways for the year ending Feb. 11, 1908, will be $800,000. Two audits have been made, one by the company, and the other by the city, and a third audit is being made by a firm of chartered accountants. The result of the three audits will be made known within two weeks.

Two plans are proposed for the solution of the loop problem. One of them is advanced by Alderman Foreman, while the other is proposed by B. J. Arnold, head of the board of supervising engineers in charge of the surface line rehabilitation work. Mr. Foreman proposes that the loop be permitted to stand and that a subway be built. Mr. Arnold advocates taking the loop down entirely and substituting a comprehensive subway, which will take care of all "L" trains in the downtown district as well as what present surface cars will have to be put underground. Mr. Foreman also has in mind a system of "shuttle trains" on the loop, a kind of belt line which would act as a sort of temporary relief while the subway is being built. Mr. Arnold opposes this. He says the subways which would afford permanent relief can be built in three years. Mr. Foreman and Mr. Arnold unite on one proposition. Whether it be for either temporary or permanent relief, there must be no more additions to the loop structure. They would simply congest traffic in the downtown district. It is already extending to the north and west sides and as far south as Twenty-Second Street, and is interfering not only with ordinary pedestrian and street locomotion but with the prompt service by the street railway companies as well. The interests of the "L" roads which use the loop differ, The Northwestern, which virtually owns the loop, although the legal title is in an independent company, wants to enlarge the loop by the building of longer platforms, so that more cars can stop at a station, and perhaps build additions to it in Clark or some other street. It is unalterably opposed to taking the structure out entirely. The Lake Street "L" or the Oak Park road, as it is now called, is of the same opinion. The Northwestern owns it. The Metropolitan Elevated Company's attitude is different. It is a tenant of the union loop, and is now in the courts claiming it cannot get enough space on the loop to accommodate its passengers.

A call for the deposit of bonds of the several companies underlying the Union Traction Company was issued Saturday, Aug. 24, by the committee appointed to carry out the plan of reorganization lately agreed upon and approved by Judge Grosscup and Professor John C. Gray. The committee, consisting of L. C. Krauthoff and George W. Wickersham of New York, and John C. Hately, Seymour Morris and W. T. Fenton of Chicago, requests that bonds be deposited, beginning Wednesday, Aug. 28, with the Harris Trust & Savings Bank as depositary under the plan.

"By force of the decision of the United States Supreme Court in the so-called ninety-nine-year case," says the call, "we are advised that with respect to lines of railway of the various companies above named (embracing 306.04 miles) in the systems operated by the receivers of the Chicago Union Traction Company, all rights to operate 136.44 miles absolutely expired on or before July 1, 1907, rights of operation over 70.35 miles are subject to termination by the city on six months' notice and upon payment of the appraised value of the physical properties, and the rights on 99.25 miles expire from time to time, beginning in the early part of 1908. The right to operate by electrical power in the principal business section of Chicago is subject to termination on sixty days' notice at the will of the city. A sale of the various properties, thus deprived of operating rights, in the enforcement of the several mortgage liens, could hardly be expected to realize enough to discharge more than a fraction of the mortgage debts.

"An opportunity is, however, offered to the holders of the bonds and other securities of the above named companies to participate in the grant of new rights by ordinance of the City of Chicago to the Chicago Railways Company, upon the terms of a plan of reorganization and readjustment, prepared and approved in conformity with the ordinance."

A list of the several bond issues and the rate of exchange for new securities provided in the plan follows in the call. Enough stocks are in the custody of the Chicago Title & Trust Company, it is said, to assure the adoption of the plan without advertising for more shares, although the plan of reorganization ultimately will be extended to every shareholder and bondholder.

Judge Grosscup has certified to the record in the appeal from his decree ordering the receivers of the Union Traction Company to lease the lines operated by them to the Chicago Railways Company. The case will come up for a hearing on appeal Sept. 5.

The Chicago City Railway Company is now operating a new line on Ashland Avenue, between Thirty-First and Twenty-Second Streets. This line is to be an extension of the "Archer Avenue," from Archer Avenue and Twenty-First Street to Ashland Avenue and Twenty-Third Street, and is intended to give better street car transportation to the residents of the populous districts on each side of the Chicago River in the vicinity of Ashland Avenue.

SAN FRANCISCO NOTES

The new cable line of the United Railroads of San Francisco, over the Castro Street hill, has been opened from Eighteenth to Twenty-Seventh Street. A three-minute schedule is furnished and power is supplied from a cable plant near Cactro and Twenty-Fifth Streets. General Manager Thornwell Mullally states that within six weeks he hopes to have the Sacramento Street line in operation with a newly-equipped cable system over the hills from the ferry to Fillmore Street. The running of the road will be reversed, however, from the old days, as the cars will now run out Sacramento to Fillmore, back to Larkin, then to Clay and down Clay to the ferry. This is done in order to give another direct downtown line from the ferry out to the western portion of the city.

At a recent meeting of the carmen's union, President Cornelius reported that the general strike committee sinks $50,000 worth of the strike fund in maintaining the 'buses that are operated in opposition to the United Railway cars. The patronage of these 'buses has decreased perceptibly recently and the street cars are carrying an increasing number of passengers each day.

The Geary Street Railway Company desires to resume service upon its road, and through its president, Horace E. Platt, has petitioned the Supervisors for permission to begin running its cars again on the old tracks pending the use of the street by the city in carrying out the plan of municipalizing the road or the grant of a franchise to another company.

With a view to hastening the construction of the Geary Street road as a municipal system the Supervisors' public utilities committee has requested the city engineer to make a report at its next meeting on the condition of the rails and roadbed and the amount of damage done thereto; also what the cost would be to construct the road under the plans covered by last year's appropriation of $325,000, and what changes he would recommend with a view to improving the plans so prepared.

The Board of Supervisors at its meeting on Aug. 12 denied the application of the Sutter Street Railway Company, owned by the United Railways, to install the trolley on its line on lower Market Street, between Sausame and East Streets, and also notified the company that it would not be permitted to rebuild the outside tracks on Market Street. Moreover, the Supervisors have decided that all overhead wires in the business district east of Devisadero Street, must be abolished eighteen months hence.

EXHIBITS AT THE ATLANTIC CITY CONVENTION

The plans for the annual exhibits at the Atlantic City convention are being pushed forward rapidly by the American Street and Interurban Railway Manufacturers' Association. The space available on the Steel Pier, where the exhibits are to be held, is between 5500 and 6000 sq. ft., and applications are pouring in rapidly to the secretary of the association, George Keegan, Park Row Building, New York. Mr. Keegan announces that the following manufacturers have already applied for space:

Adams & Westlake Co.
Allis-Chalmers Co.
American Blower Co.
American Brake Shoe & Fdy. Co.
American Ferrofix Brazing Co.
American Locomotive Co.
American Mason Safety Tread Co.
American Railway Supply Co.
Anderson, A. & J. M., Mfg. Co.
Atha Steel Casting Co.
Atlas Railway Supply Co.
Bache, Semon & Co.
Bayonet Trolley Harp Co.
Berry Brothers.
Bishop Gutta Percha Co.
Blake Signal & Mfg. Co.
Booth, L. B., Co.
Brady Brass Co.
Briyy, J. G., Co.
Brown, Harold P.
Buckeye Engine Co.
Buhne Metal Pkg. Co.
Burroughs Adding Mach. Co.
Calman, Emil, & Co.
Carey, Philip, Mfg. Co.
Carnegie Steel Co.
Chicago Pneumatic Tool Co.
Chicago Varnish Co.
Climax Stock Guard Co.
Columbia Machine Works & Malleable Iron Co.
Consolidated Car Fender Co.
Consolidated Car Heating Co.
Cook Standard Tool Co.
Crouse-Hinds Co.
Curtain Supply Co.
Danville Car Co.
Dearborn Drug & Chemical Works.
Device Improvement Co.
Dixon Crucible Co., Jos.
Dossert & Co.
Dressel Railway Lamp Works.
Duff Mfg. Co.
Durkin Controller Handle Co.
Earll, Chas. I.
Edwards, O. M.
Electrical Review.
Electric Railway Improvement Co.
Electric Service Supply Co.
Electric Storage Battery Co.
Electric Railway Review.
Electric Traction Supply Co.
Eureka Automatic Electric Signal Co.
Eureka Tempered Copper Works.
Flexible Compound Co.
Franklin Car Heating Co.
Franklin Electric Mfg. Co.
Galena Signal Oil Co.
Garlock Pkg. Co.
General Electric Co.
Globe Ticket Co.
Gold Car Heating & Lighting Co.
Goldschmidt Thermit Co.
Gould Storage Battery Co.
Grip Nut Co.
Hale & Kilburn Co.
Hanna, J. A., Co.
Harrison, F. P., Electric & Mfg. Co.
Heany Fireproof Wire Co.
Holophane Co.
Heywood Bros. & Wakefield Co.
Ingersoll, Fred.
International Register Co.
Johns-Manville Co.
Johnson, Chas. F.
Jones & Laughlin Co.
Justice, P. S., & Co.
Kalamazoo Railway Supply Co.
Kenfield-Fairchild Publishing Co.
Keystone Brake Shoe Co.
Kinnear Mfg. Co.
Lorain Steel Co.
Lord Electric Co.
Lord, Geo. W., Co.
Lumen Bearing Co.
McCardell, J. R., & Co.
McConway & Torley Co.
MacDonald Ticket & Ticket Box Co.
Maryland Railway Supply Co.
Masury, John W., & Co.
Moran Flexible Steam Joint Co.
Morris, Elmer P., Co.
National Brake Co.
National Brake & Electric Co.
National Carbon Co.
National Car Wheel Co.
National Lock Washer Co.
New Departure Mfg. Co.
Newman Clock Co.
New York Car & Truck Co.
Norton Grinding Co.
Nuttall, R. D., Co.
Ohio Brass Co.
Ohmer Fare Register Co.
Oliver Machinery Co.
Palmetto Metal Co.
Pantasote Co.
Peerless Rubber Co.
Pennsylvania Steel Co.
Peter Smith Heater Co.
Philadelphia Air Brake & Machine Co.
Pittsburg Insulating Co.
Plomo Specialty Mfg. Co.
Pratt & Lambert.
Rail Joint Co.
Railroad Gazette.
Railway Audit & Inspection Co.
Recording Fare Register Co.
Riverside Metal Co.
Rooke Automatic Register Co.
Rubberset Brush Co.
St. Louis Car Co.
Samson Cordage Works.
Schoen Steel Wheel Co.
Security Register Co.
Sherwin-Williams Co.
Southern Exchange Co.
Speer Carbon Co.
Standard Motor Truck Co.
Standard Paint Co.
Standard Roller Bearing Co.
Standard Steel Works.
Standard Varnish Works.
Star Brass Co.
Sterling-Meaker Co.
Sterling Varnish Co.
Street Railway Journal.
Symington, T. H., Co.
Taylor Electric Truck Co.
Traction Railroad Equipment Co.
Underfeed Stoker Co.
Underwood, H. B., & Co.
Union Electric Co.
United Copper Foundry Co.
U. S. Electric Signal Co.
U. S. Engineering Co.
U. S. Metal & Mfg. Co.
Van Dorn Electric & Mfg. Co.
Van Dorn, W. T., Co.
Wallace Supply Co.
Washburn Steel Castings & Coupler Co.
Watson-Stillman Co.
Wendell & MacDuffie.
Western Tube Co.
Westinghouse Cos.
Weston Electrical Instrument Co.
Wharton, Wm., Jr., & Co.
Wheel Truing Brake Shoe Co.
Wilson, Jas. G., Mfg. Co.
Wilson Trolley Catcher Co.
Yale & Towne Mfg. Co.

NASHVILLE INTERURBAN ARRANGING TO ENTER CITY

It is understood that arrangements are being made with the Nashville Railway & Light Company whereby the Nashville Interurban Company is to enter Nashville over the lines of the former company. Under the proposed arrangements the interurban cars will enter the city over the Spruce Street line, the interurban tracks connecting with the Spruce Street line where the Spruce Street tracks cross the Franklin Turnpike. It is also stated on good authority that the interurban company will use the street railway transfer station as a depot, and power for the city run will be supplied by the railway and light company. Percy Warner, president of the Nashville Railway & Light Company, is reported to have said that while the contracts had not been signed for such arrangements between the two companies, it is quite probable that such an arrangement will be consummated. President Warner stated that the cars of the interurban company will probably enter Nashville over the Spruce Street line, which is a direct route into the city.

NEW CAR HOUSES AT LONG ISLAND CITY

The New York & Queens County Railroad will develop a tract of about ten acres of meadow land on the north side of Jackson Avenue, about an eighth of a mile west of the new Flushing bridge, which was recently purchased from the Degmon Contracting Company. It is the intention of the company to spend about $250,000 in establishing at this point a large and complete storage yard and repair shop for cars in Queens Borough. The plant is to care for the cars on the Jackson Avenue, Corona, Jamaica and College Point lines, and on the Whitestone and Bayside extensions when completed. These lines are the most important belonging to the company.

The plans for this work are in anticipation of the increase in traffic that will follow the opening of the tunnel under the East River to Forty-Second Street, New York, and is in keeping with the policy of the company for keeping up the physical property. In Long Island City and environs at present there is much territory as yet unsettled, and it is this property that it is expected will develop rapidly as a result of the better facilities which the new tunnel will afford. In addition, the new Blackwell's Island Bridge will also effect the company in the not distant future, and important developments are looked for, especially in the territory adjacent to Long Island Sound.

EARNINGS OF THE DETROIT UNITED RAILWAYS

The Detroit United Railway system reports for July and seven months ended July 31, 1907, as follows:

July	1907	1906
Gross receipts	$669,915	$598,575
Expenses and taxes	383,624	337,576
Net earnings	$280,291	$260,999
Other income	4,636	4,607
Total income	$284,927	$265,606
Fixed charges	117,009	105,463
Surplus	$167,918	$160,143
Seven Months:		
Gross receipts	$3,759,279	$3,354,729
Expenses and taxes	2,329,767	2,015,646
Net earnings	$1,429,512	$1,339,083
Other income	31,975	26,332
Total income	$1,461,487	$1,365,415
Fixed charges	796,012	710,206
Surplus	$665,475	$655,209

Figures for 1907 and 1906 include Rapid Railway system, Sandwich, Windsor & Amherstburg Railway, and Detroit, Toledo & Monroe Short Line.

TWIN CITY RAPID TRANSIT SCORES VICTORY OVER CITY

The Twin City Rapid Transit Company has won a sweeping victory in the court decision which recognizes the right of the company in the fifty-year franchise and the 5-cent fare. The court order restrains the city of Minneapolis from enforcing or publishing the six-for-a-quarter fare ordinance recently passed by the City Council. Should the city desire to continue the fight the matter would have to be taken to the United States Supreme Court. It is probable that the matter will be dropped.

The franchise with the right to charge a 5-cent fare is good for fifty years from date of issuance, July 1, 1873. President Thomas Lowry says:

"The decision just rendered by the United States Circuit Court in the suit between the Minneapolis Street Railway Company and the City of Minneapolis, holds that the ordinance granting the company the right to use the streets of the city for street railway purposes, both as to the length and exclusive character of the company's franchise and to the company's right to charge and collect 5-cent fares, is a contract which cannot be changed or modified in any respect without the consent of the company. The decision is very comprehensive and sustains every claim the company made under its charter and franchise.

"This decision, together with the one rendered heretofore in the City of St. Paul, in the United States Circuit Court, fixing the company's right for all times, in both cities, together with the right to receive and collect 5 cents for each passenger riding upon its cars is absolute and cannot be modified or changed without the company's consent."

REPORT ON ROCHESTER LINES BY UTILITIES EXPERT

Charles R. Barnes, electrical expert for the Public Utilities Commission, has made a report to the Commission as a result of his recent trip over the suburban lines about Rochester. In his report Mr. Barnes speaks in complimentary terms of the management and equipment of the lines as a whole. Mr. Barnes' report consists of six letters in all, one letter being devoted to each railway. The roads covered in his report are: Rochester & Eastern Rapid Railway, Rochester Electric Railway, or Charlotte line, Rochester & Sodus Bay Railway, Summerville division of the Rochester & Suburban Railway, Sea Breeze division of the Rochester & Suburban Railway, and Irondequoit Park Railway. The report embodies all the specifications of the different roads, both roadbed and rolling stock, under the heads cars, power, operation, track and roadbed maintenance and structures. Each head contains remarks as to the condition in which Mr. Barnes found the different structures or details, praise and censure alike being impartially distributed. At the end of each letter are recommendations made as to ways by which the railway might better its service. It is suggested in the case of certain of these recommendations that the Commission issue specific instructions to the railways; others merely request the Commission to call the attention of the officers of the roads to certain changes that would work to the benefit of the roads. None of these suggestions is with reference to radical changes. Some of them are as follows:

1. That it separate the lap track under the Clifford Street bridge so as to make a continuous double track at this point, that this work be completed not later than Jan. 1, 1908.

2. That all curves on this line be equipped with rail braces; this work to be completed not later than Oct. 1, 1907. Also that the Public Service Commission, second district, State of New York, recommend to the Irondequoit Park Railway Company.

1. That it cause all the cars operated on the line to be equipped with air brakes.

2. That all of the original ties in its track be replaced with standard ties; this work to be completed as soon as possible.

3. That the necessary legal proceedings be instituted by this company to bring about a change of grade of the highway at Helendale.

The following is suggested in reference to the Sea Breeze line:

1. That it equip all of the curves not so equipped with rail braces; this order to be fully complied with by May 1, 1908.

Suggestions by the Commission:

1. That the work of tie removals at present in progress on this division be continued, and that all curves be equipped with standard ties as soon as possible.

2. That a loop be constructed at the Sea Breeze terminal of this division.

Other statements relate to the reballasting, aligning, and surfacing of tracks. Train crews are required to register the time of their arrival at and departure from certain points. Companies are required to increase the number of their cars to provide for the "maximum requirements of traffic."

The Rochester & Eastern Company is asked to remove the high tension transmission line from the village limits of Canandaigua; to construct an additional telephone line along its entire length; to have an examination made of its bridges by a bridge engineer, and its grades reduced.

The Rochester Electric Railway is recommended to construct double lap tracks over the New York Central tracks where there is lap track at present, and to build a loop at the Charlotte terminus of its line.

CHICAGO & MILWAUKEE ROAD COMPLETE

The Chicago & Milwaukee Electric Railway Company will be operating trains between Chicago and Milwaukee on a two and one-half hour schedule by the middle of October, according to a statement made by A. C. Frost, president of the company. The time made by the steam roads is two hours. The line is completed and ballasted and all the equipment necessary for the added service has been delivered so there is nothing to prevent the inauguration of through service between Evanston and Milwaukee. When the St. Paul road is electrified to Evanston and through cars run in connection with the Northwestern L, the Chicago & Milwaukee Company will establish a connection at Evanston.

ANOTHER IMPORTANT INTERURBAN FOR MASSACHUSETTS

Another electric interurban railway company has been organized in Massachusetts, and has petitioned the Board of Railroad Commissioners for the right to build between Waltham and Marlborough, passing through Weston, Wayland and Sudbury, with a branch line running from South Sudbury to Maynard. The main line of the proposed road is 16.5 miles in length, while the branch line will be 6 miles long. The new company is styled the Boston, Waltham & Western Electric Railway Company, and it is organized under the interurban act of 1906. Its capital stock consists of 2400 shares of a par value of $100 each. Of the 16.5 miles of main line, about 12 miles will be over a private right of way, the public streets and State highway of Waltham, Weston, Sudbury and Marlborough being occupied for short distances. The running time between Waltham and Marlborough is intended to be 45 minutes, the company having found it necessary to conform to local speed regulations wherever the road runs in a public highway, and local authorities will also, under Massachusetts law, have authority to compel such stops as they desire in the public highways. The road will have only four passenger stations besides its three termini, one each in Walthan and Marlborough, one in Sudbury, and the fourth in Wayland, near the Weston line. The estimated cost of the road is $1,444,640, made up as follows:

RIGHT OF WAY		
Real estate		$38,600
CONSTRUCTION AND EQUIPMENT		
Grading, surfacing, etc.	$396,000	
Bridges	138,530	
Track and track equipment	190,300	
Passenger stations	18,700	
Fencing	9,000	
Generating station and line	296,670	
Cars and car equipment	125,840	
Car house	11,000	
Engineering, interest, miscellaneous	220,000	
		$1,406,040
Total cost		$1,444,640

The directors of the company are Atherton W. Rogers, of South Sudbury; Charles E. Stevens, of Sudbury; George A. Haynes, of South Sudbury; Winthrop H. Fairbanks, of Sudbury, and Rowland P. Harriman, of Sudbury. Charles E. Stevens, who is the treasurer of the company, has subscribed for 2375 of the 2400 shares of capital stock, the remaining 25 shares being subscribed for by fifteen others.

THE TRANSIT HEARING IN NEW YORK

At the hearing on Thursday before the New York Public Service Commission, the fact was brought out that the books of the Metropolitan Street Railway Company had all been destroyed, after the lease in 1902 of the company to the New York City Railway Company, they being considered of no further value. In this connection the authority of the Commission in the whole premises was questioned by counsel for the Interborough-Metropolitan Company, and it is said that the matter may be carried to the courts. Nothing important regarding methods of operation or plans for betterments was brought out. At the close of the hearing the date for continuing was set for Tuesday, Aug. 27, but a postponement was agreed upon for a week or ten days on account of the death of Prof. Root, the father of Oren Root, Jr., vice-president and general manager of the New York City Railway Company, whom it was proposed to make a witness.

The Public Service Commission proposes to take up for serious consideration a scheme to turn the Second Avenue elevated line into a purely express road, at least during the rush hours, and to let the Third Avenue line take care of the local traffic below the Harlem River. It is proposed that the Second Avenue trains shall run as they do now between South Ferry and Chatham Square. From Chatham Square north, during the rush hours at least, they shall run as expresses to 129th Street, where the Second and Third Avenue lines join. There may possibly be stops at Thirty-Fourth Street or at Twenty-Third Street and at Forty-Second Street. It is planned that at 129th Street the northbound expresses will become locals, just as the subway expresses become locals at Ninety-Sixth Street now. The whole of the trackage to the north, however, in that case will be devoted to the use of these trains, and no Third Avenue trains will run above the Harlem River. That is to say, every train that comes through the Bronx in the rush hours in the morning will be an express after it passes the 129th Street station, and will make not more than two stops at most between 129th Street and Chatham Square. Every train that starts from South Ferry on the east side in the evening rush hour will run as an express above Chatham Square, making possibly two stops between that point and the Harlem River.

Meetings of the directors of the Interborough-Metropolitan and Interborough Rapid Transit Companies were held Wednesday, Aug. 28. After the meetings the following statement was given out by the directors of the Interborough-Metropolitan Company:

"The usual meetings of the board of directors and executive committee were held at the office of the company this morning. The subject of receivership of any company was not even mentioned. It was officially announced that all such talk is entirely without foundation."

INTERBOROUGH IS EXEMPT FROM TAXES ON SUBWAY

The special franchise tax of $9,000,000 levied on the Interborough Rapid Transit Company, of New York, in 1905, by the State Tax Commissioners is declared to be in error by Justice Fitts, in a decision handed down Aug. 27. The court decides that the Interborough operates the subway as lessee, and that, in any event, the Interborough is exempt under Sec. 35 of the Rapid Transit act. Justice Fitts asserts that the City of New York is the absolute owner of the subway, including not only the tangible property, but the franchise as well, the property having been leased to the company by the city for a period of thirty-five years.

The case was begun in 1905 by certiorari proceedings to review of the decision of the State Board. In 1906 the State Commission fixed the valuation at $18,000,000, and 1907 at $24,000,000.

I have reached the conclusion that the consents and franchises under which the underground railway was constructed and is now being maintained is vested in and belongs to the city of New York.

That the contract and lease providing for the equipment, maintenance and operation of the railway by the relator is not a special franchise within the meaning of subdivision 3 of section 2 of the tax law.

But, even though it might be held that the right exercised by the relator to operate the railroad was a special franchise, the same is not taxable, as the interests of the relator therein were exempt from taxation under section 35 of the rapid transit act as amended.

DATA SHEET ON MUNICIPAL OWNERSHIP

The committee on Municipal Ownership of the American Street & Interurban Railway Association has sent a letter to the various member companies as follows:

"At the 1906 convention of the association, held at Columbus, Ohio, a committee presented a report on the subject of Municipal Ownership. Doubtless you have read this report as published in the minutes of the association. The officers of the association have seen fit to continue the same committee for this year, and have asked that another report on the same subject be presented at the convention to be held in October next.

"It has been deemed unnecessary in the making of this report to discuss to any great extent the question from an academic point of view. The literature on this subject has been so multiplied during the past year by the publication of the results of investigators of social economics, and by the reports of various committees who have made investigation of it, that the members of the association are undoubtedly quite familiar with the arguments for and against municipal socialism in any form, and especially as it would affect the interests of our particular industry. It does, however, seem desirable that the report should cover any progress made either for or against the movement in our respective fields, as well as some statement in regard to general conditions here and abroad, and to this end we are enclosing you a sheet covering a few questions designed to ascertain the condition of affairs with respect to Municipal Ownership in your immediate vicinity. The committee would be greatly pleased to receive your answers to these questions, and any statement which you may choose to make touching your individual opinion as to this Municipal Ownership proposition."

The letter is signed Charles D. Wyman, chairman; John A. Beeler, H. M. Sloan, John J. Stanley, members of the committee. The data sheet follows:

DATA SHEET

Company, City, State. Operating city or interurban line. Population served. 1. Does the company do any lighting business? 2. If so, state general character. 3. What municipality owned utilities are now in operation in your company's field? 4. What, if any, agitation or movement has arisen or been progressed during the past year for the extension of municipal public utilities? 5. Has there been any movement looking toward the municipalization of your company's business or any part thereof? 6. If any such agitation has arisen please state its cause or causes. 7. What seems to be the present status of public opinion in your vicinity touching Municipal Ownership of public utilities such as street railways and lighting companies?

STEAM RAILROAD STATISTICS FOR 1906

Poor's Manual for 1907, just issued, contains 2000 pages, and its statistics of the American railway systems for the year ending 1906 are highly interesting and instructive.

The average receipts per passenger per mile in 1906 was 2.011 cents, as against 2.028 cents in 1905. The average revenue per ton per mile in 1906 was 0.766 cents, as against 0.784 cents in 1905. Other receipts, however, have increased, as shown in the following table:

	1905	1906
Receipts per mile of track, passenger	$2,381	$2,560
Receipts per mile of track, freight	6,840	7,521
Receipts per train-mile, passenger	1.5181	1.6672
Receipts per train-mile, freight	2.6267	2.7287
Receipts per passenger	.7790	.8326

The total length of steam railroads completed on Dec. 31, 1906, was 222,635.18 miles, as against 217,341.02 miles at the close of 1905, an increase of 5,294.16 miles. The actual construction during the year was 5,516.70 miles, but the net increase was smaller owing to mileage abandoned, transferred to side track, or equipped with electricity.

The increase in bonded debt during 1906 was $425,845,877, the total funded debt of the steam railroads of the United States being $7,851,107,778 at the close of 1906, as against $7,425,261,901 at the close of 1905. The increase in capital stock was $364,452,151, total stock at the close of 1906 being $7,106,408,976, as against $6,741,956,825 at the close of 1905. The total increase in liabilities of all kinds, including stock, mortgage bonds, real estate and equipment bonds and floating debt, was $1,199,615,367.

The total assets of the steam railroads of the United States at the close of 1906 was $17,534,381,633, an increase of $1,241,500,810. The surplus of assets over liabilities was $766,014,237, an increase of $41,885,443 during 1906.

STREET RAILWAY PATENTS

UNITED STATES PATENTS ISSUED AUG. 13, 1907

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

862,891. Trolley Pole Support; Hugh W. Fellows, Cahuenga, and Ira A. Cammett, Hollywood, Cal. App. filed Sept. 12, 1906. The trolley pole has a ling support, one of the members of which is very heavy so as to move slowly, and in case of rapid upward movement of the pole, such slow movement causes its disengagement.

862,898. Fastening Device; William D. Forsyth, Pittsburg, Pa. App. filed May 11, 1907. A sleeve for the reception of rail spikes, adapted to be embedded in a concrete of metallic tie.

862,912. Metallic Tie and Rail Fastener; Joseph L. Hickle, Fairchance, Pa. App. filed April 25, 1907. Two I-beams spaced apart and having a concrete filling there between. Hock-shaped bolts engage the base of the rail and extend through the outer flanges of the I-beams.

962,934. Trolley Catcher and Retriever; Julian L. Perkins, Springfield, Mass. App. filed Feb. 21, 1906. Details of a spring drum and ratchet device for retrieving the trolley cord.

862,952. Pneumatic Track Sander; John H. Watters, Augusta, Ga. App. filed May 23, 1907. A casing having a nipple arranged for attachment to a sand-box and provided with a pair of diametrically alined discharge openings, and an air jet nozzle extending into the casing and provided with a jet opening at the end, and with a pair of openings at the side, the latter openings being diametrically opposite each other and in alinement with the lateral discharge openings of the casing.

863,148. Railway Signal; Walter W. Brown, Schenectady, N. Y. App. filed Feb. 14, 1906. Relates to mechanical details of construction of an arrangement whereby a single operating means may be employed to move a home and distant signal successively.

863,198. Car Fender and Guard; Lowell M. Maxham, Boston, Mass. App. filed Nov. 16, 1904. Details of construction.

863,237. Machine for Controlling Power-Operated Apparatus Connected with Railway Switches and Signals. Covers means for automatically moving a lever to final position after electrical locks have been actuated to release the lever.

863,238. Indication Apparatus for Switch and Lock Movements; Louis H. Thullen, Edgewood Park, Pa. App. filed March 30, 1906. Relates more especially to that class of indication apparatus used in electric interlocking railway systems and operated by alternating currents, an object being to provide means whereby the operation of the indicator is only effected by an alternating current of one predetermined frequency, the several parts or appliances comprised in the indication mechanism being so arranged as to render them neutral, and not responsive, to alternating currents of any other frequency.

863,263. Railway Signal Mechanism; John P. Coleman, Edgewood, Pa. App. filed March 13, 1907. Semaphore signals operated by liquid carbonic gas and having electrically controlled valves by which the gas is admitted to the operating cylinders.

863,267. Adjustable Brake Head; Nathan H. Davis, Philadelphia, Pa. App. filed Feb. 18, 1907. A brake head having an opening receiving the end of the brake beam and provided with locking ribs, a locking key provided with ribs and means for securing the key in fixed relation to the beam with its ribs interlocked with the ribs of the brake beam.

863,277. Non-Chattering Brake Hanger for Car Trucks; Engelhardt W. Holst, Brockton, Mass. App. filed Nov. 20, 1906. Automatic means for compensating for the wear of the different parts so that a non-chattering device can be maintained.

863,332. Electro-Magnetic Apparatus for Railway Purposes; Louis H. Thullen, Edgewood Park, Pa. App. filed March 24, 1906. Relates to electro-magnetic apparatus comprising electro-magnets and co-acting armatures, the same being so constructed and arranged as to be operable at a small or medium of potential of current and adaptable for controlling circuits through which heavy currents flow.

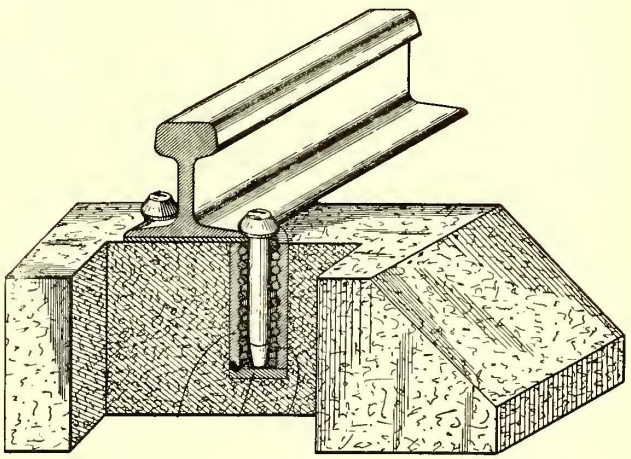
863,359. Brake; Nicholas J. Clute Schenectady, N. Y. App. filed April 23, 1907. An auxiliary emergency brake having shoes engaging the top of the car wheel and operated through the momentum of said wheels.

863,418. Railway Signal; Nicola Mucci and Alfonso Colenza, New York, N. Y. App. filed March 23, 1907. A signal apparatus for single-track railways by which trainmen are notified in case error has been made by a train improperly taking a side track. Special trolleys or conductors adjacent the track rails which are engaged by brushes depending from the locomotive.

863,475. Switch-Operating Device for Street Railways; Richard M. Van Eaton and Julia M. Van Eaton, Pueblo, Col. App. filed Jan. 7, 1907. Two horizontally movable levers in the roadbed, one of which operates through suitable connections, when actuated from an approaching car, to open the switch and the other to close the same.

863,509. Electric Railway Signaling System; Charles M. Cleveland, Wausau, Wis. App. filed April 8, 1907. Special trolley wires or conductors are laid between the track rails and means are provided for completing circuits to the trains for automatically operating the train controller.

863,531. Rail-Bond; Marshall Hawkins, Gypsy, W. Va. App. filed Nov. 7, 1906. A U-shaped link, the ends of which are received in holes in the webs of the rails and which are grooved to receive pyramidal drift pins with "opposite cutting edges."



PATENT NO. 862,898

863,540. Train Controlling Apparatus; Joseph L. Jones, Kizer, Tenn. App. filed Dec. 10, 1906. A wireless system by which trains approaching a danger zone will be warned, or when trains continue to travel after receiving one or more warnings, the brakes or controlling mechanism will be actuated to stop both trains.

863,569. Signal Mechanism; Ellsworth E. Flora, Chicago, Ill. App. filed June 18, 1906. An apparatus for exploding a torpedo in the path of a train when a switch is open. An electrical circuit positions a depressible plate in the path of the wheel flange so that it is operative to detonate a torpedo.

12,680. Original No. 715,088, serial No. 144,533. Automatic Release Mechanism for Air Brakes; reissue; Leopold Krimmelbein, Baltimore, Md., assignor to Westinghouse Air Brake Company, Pittsburg. A valve mechanism for air-brake systems designed to provide means whereby the train pipe pressure acting to release the brakes can never become so depleted as to fail to effect a quick release of the brakes. A further object is to provide means to recharge the auxiliary reservoirs of the several cars of the train nearly to the maximum pressure while the brakes are applied and without releasing them.

PERSONAL MENTION

MR. GEO. A. STANION, formerly with the Brooklyn Rapid Transit Company, has been appointed superintendent of the new plant of the Lake Shore Engine Works, at Marquette, Mich.

MR. C. F. BRYANT has resigned his position as auditor of the Mohawk Valley Company, of New York. Mr. Bryant was formerly assistant treasurer of the Connecticut Railway & Lighting Company, of Bridgeport, Conn.

MR. GEO. E. MORINE, of the Electrical Installation Company, of Chicago, has been appointed general superintendent of the new "Ben Hur" line, the Indianapolis & Crawfordsville Interurban Railway, running between Indianapolis and Crawfordsville.

MR. L. C. SHIPPERD, formerly of Cleveland, Ohio, and for several years treasurer of the Evansville Electric Railway, has been appointed superintendent of the Evansville, Princeton & Mt. Vernon Traction Company, to succeed Mr. W. P. Larcey, formerly roadmaster of the Southern Railroad.

MR. H. H. DE PEW, for several years superintendent of the Penn Yan, Keuka Park & Branchport Electric Railway, has resigned that place, owing to failing health. Mr. William Tylee, who has been connected with the road in a clerical capacity for about ten years, is acting superintendent.

MR. WILLIAM WALKER COLKET, of Philadelphia, is dead, in his 68th year. Mr. Colket was at one time president of the old City Passenger Railway, now the Chestnut and Walnut Streets division of the Philadelphia Rapid Transit Company, and president of the old Chestnut Hill Railroad, of Philadelphia.

MR. WILLIAM G. YOUNG, of Port Chester, who for several years has been assistant superintendent of the New York & Stamford Electric Railway, has been appointed superintendent of the company in place of Mr. George W. Pierce, resigned. Mr. Young is a native of Port Chester and has been in the employ of the company eight years.

MR. NELSON MORRIS, of Chicago, a prominent stockholder of the Chicago City Railway Company and formerly a director of the company who took an active interest in its affairs, is dead. Mr. Morris was a member of the packing firm that bore his name, and was connected with many local Chicago commercial and industrial enterprises.

MR. JOHN HANF has been appointed master mechanic of the Southern division of the Public Service Corporation, with headquarters at Camden, N. J. Mr. Hanf formerly was master mechanic of the International Railway Company, of Buffalo, and previous to his connection with that company was with the Philadelphia Rapid Transit Company, Wilmington City Railway Company, and the J. G. Brill Company.

MR. J. C. HOFFMAN has retired from the position of electrical engineer of the Oneonta & Mohawk Valley Railroad, with headquarters at Hartwick, and the electrical department is now in charge of Mr. Charles Stanton, who has been the engineer in charge of the company's power station, while Mr. M. J. Bogardus, the purchasing agent, is temporarily in charge of the mechanical department. Mr. Bruce Robinson, of the company, who has been agent at Mt. Vision, has been appointed to succeed Mr. John Wallaban as dispatcher.

MR. W. J. RAMSEY has been appointed to succeed Mr. Albert Eastman, resigned, as superintendent of employment of the Public Service Corporation. Mr. Ramsey has been connected with the street and electric railway operation since 1886, during which time he has been continuously connected with the operating end of the business, filling different positions. His connection with the Public Service Corporation dates from December, 1893. Until his appointment to succeed Mr. Eastman, Mr. Ramsey had represented the auditing department in the shops.

MR. WILLIAM DARBEE, for the past year general manager of the Albany & Hudson Railroad, was presented with a handsome diamond pin and a traveling bag by the employees of the company and the attaches of Electric Park on Friday, Aug. 23, as a token of their esteem. As previously stated in the STREET RAILWAY JOURNAL, Mr. Darbee leaves Albany for Baltimore, Md., where he is to become assistant general manager of the Consolidated Gas, Electric Light & Power Company. Mr. Raymond H. Smith succeeds him as manager of the Albany & Hudson system.

PROF. OREN ROOT, D. D., L. H. D., of Hamilton College, and father of Mr. Oren Root, Jr., vice-president and general manager of the New York City Railway Company, died at his home in Utica, N. Y., Aug. 26. Prof. Root was graduated from Hamilton College in 1856, and was prominent in Central New York State as a clergyman and also as an educator, having been professor of mathematics and physics at Hamilton College since 1880. He was also a high degree Mason and grand chaplain of the Grand Lodge of F. and A. M., N. Y. Prof. Root was a brother of Mr. Elihu Root, Secretary of State.

MR. CHARLES T. MORDOCK, formerly manager of the Terre Haute Traction & Light Company, at Terre Haute, Ind., for Messrs. Stone & Webster, has been appointed a permanent member in the field of the board of expert engineers of the Stone & Webster Engineering Corporation, of Boston, owing to the increased demand for the services of its expert engineers and the large amount of development work now contemplated and in course of construction in the West and Middle West. Mr. Mordock will make his headquarters in Boston. The Engineering Corporation is now actively engaged in the construction of many important electric railway, power and lighting systems.

MR. W. J. WILGUS, vice-president of the New York Central & Hudson River Railroad, under whose direction, as chairman of the Electric Traction Commission of the company, the electrification of the lines out of New York has been carried out, has been asked by Mayor Busse, of Chicago, to make a study of the problem of electrifying the trunk lines out of Chicago, and to report to him on the subject. The whole matter will be brought to the attention of the Council by Mayor Busse at once, as Mr. Wilgus, after Oct. 1, when his resignation from the Central Company takes effect, will be at liberty to entertain any proposition to act in a consulting capacity that may be made to him. Chicago's trunk system embraces twenty-three lines, all of which are now being elevated to avoid grade crossings.

MR CHARLES E. MARLOW, secretary and treasurer of the Chicago Consolidated Traction Company, is dead. Mr. Marlow was born in Philadelphia, Pa., and was educated in the public schools of that city. In 1879 he entered the employ of the freight department of the Pennsylvania Railroad, where he remained until 1893. Then he was for a year a clerk in the employ of William Wharton, Jr., & Company, of Philadelphia. In 1896 he became assistant treasurer of the Siemens-Halske Electric Company in Chicago, and in 1898 auditor of the street railway properties controlled by the late Mr. C. T. Yerkes. When the Chicago Consolidated Traction Company was organized, in February, 1899, he became its secretary and treasurer, a position he held until his death. Mr. Marlow is survived by a widow and one son.

MR. ALBERT EASTMAN has resigned as superintendent of employment of the Public Service Corporation of New Jersey to assume charge of the express and freight business on certain of the lines of the Andrews-Vanderbilt syndicate in Central New York, including the electrified division of the West Shore Railroad, between Utica and Syracuse. Mr. Eastman was originally engaged in steam railroad work, in which he served from 1892 to 1901, first for a long period with the Grand Trunk Railroad, as freight and ticket clerk and telegraph operator at Detroit, and later with the Michigan Central Railroad, as assistant agent at Detroit. It was from the latter position that he resigned in November, 1901, to become traveling express and passenger agent on the Detroit United Railways. In December, of the following year, Mr. Eastman resigned from the Detroit Company to become general express agent of what now is the Utica & Mohawk Valley Railway, under Mr. C. Loomis Allen. Returning to Detroit in May, 1903, Mr. Eastman became a division superintendent on the Detroit United system, and in November, of the same year resigned from the Detroit Company to accept the position of superintendent of employment of the Public Service Corporation under Mr. Albert H. Stanley, with whom he had been associated in the management of the Detroit property.