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*Of this issue of the Street Railway Journal, 8000 copies are printed. Total circulation for 1906 to date, 237,100 copies, an average of 8175 copies per week.*

## Concerning Time Standards

The practice of requiring motormen and conductors to compare watches with a standard clock located at some prominent point on their route is constantly growing in favor among operating companies that take a broad view of their responsibilities. No argument is needed to prove the importance of a time standard on either a street or interurban railway; it is a self-evident proposition that schedules can not be maintained properly unless such a standard is provided in one or more places accessible to every employee of the operating department. It is by no means necessary that every road should buy Western Union Observatory service for every point on its system where a clock is needed, although it is frequently the case on large systems that standard time is purchased in this way for all the car houses, power plants, shops and executive offices.

The main point about the time problem is to see that whatever clocks are maintained are first of all in mutual agreement; and second, that they are correct in comparison with the standard time clocks of the community served. A few days ago we noted a difference of five minutes on the late side between a large illuminated electric clock located conspicuously on the front of the principal offices and shops of a city street railway system of nearly 150 miles trackage and the standard time clocks of the town. Such a large error as this opens the door to no little confusion among motormen and conductors who pass the clock, introduces great possibilities of accident on single-track lines, and tends to create a feeling in the operating department—by no means always justified—that the management is inclined to be slip-shod. The public is also inconvenienced if cars are run on inaccurate time, particularly in the matter of meeting appointments and connecting with railroad trains. Few persons realize the chain of disastrous consequences which the loss of two or three minutes often entails in matters of great personal moment. It is better to rely on some one large public clock than to maintain an inaccurate standard. On a steam railroad, accurate time is an absolute necessity; on many interurban and city lines it is scarcely less so, considering the vast number of people concerned. If a standard clock goes wrong it is better to cover the dial until repairs can be made than to permit its false indications to be accepted as a basis of operation.

## Armature Bearing Sizes

Two methods of fitting armature bearings to shafts are in common use by electric railway companies. One method is to keep in stock only the rough babbited bearings and have a machinist turn out these bearings to fit whatever armature journal is to be run in them. This involves the calipering of each armature journal at the time the bearings are renewed and a certain amount of special work on every armature bearing that is turned. While this method insures accurate fit if the machinist is skilful and careful, it does not permit of the rapid production of bored armature bearings, as each is a special case by itself. The other method in common use is to maintain two or three standard sizes of armature journals and bore out armature bearings to fit these two or three sizes, designating them as sizes A, B, C, etc. These various sizes are kept in stock, so that they can be taken out at any time

to fit on corresponding journals. The advantage of this system is that armature bearings can be bored out in large quantities with boring tools set permanently for certain sizes of bearings. Thus the amount of special machine work is reduced to a minimum and the company always has armature bearings which can be obtained on short notice without waiting for a machinist to turn up the proper size. Where a system of this kind is in use the number of sizes of bearings required will depend somewhat upon the age of the motor equipments and amount of wear that has taken place on the oldest journals. For example, the new journals would be classed as size A. Size B would be one thirty-second or one sixty-fourth inch smaller, and size C a corresponding amount smaller than size B. When the motor journal has worn sufficiently to be too small for the third size of bearing, a sleeve is shrunk on the journal so as to bring it up to the size of the new journal, and it is again classed where it started. The latter plan is evidently best adapted to large companies, where it is desirable to perform operations on a large scale, and where there are enough motors with a given diameter of journal to make it feasible to carry a stock of various sizes.

## Private Car Courtesy

The connecting up of many interurban links in the States of the Central West, making it possible to travel by electric lines between points several hundred miles apart, has been responsible for a great deal of interline special car tours. Many managers, for instance, in attending meetings of the Central Electric Railway Association, have taken parties long distances in their own cars. There have also been numerous trips of inspections and pleasure trips. Newspaper men and others whom roads have been desirous of favoring have been treated to long excursions, sometimes to open up pleasure resorts, or perhaps to be present at the inaugural of new extensions. As a rule, where these excursions have not been for profit it has been the practice of the managers of the roads visited to extend the courtesies of a pilot and the power consumed without making any charge for the services. Steam roads frequently haul private cars gratis for officials of other roads, and no very great expense is attached to the courtesy so long as it is not carried to excess.

The situation is rather different on electric roads, however. It is impossible, under present conditions at least, to attach the private or special car to a regular car, so that it must go over the road as a "special." Where it is sent over a road as a second section of some limited train and kept on the limited's time, no difficulty would occur, but where, as frequently occurs, the special is too slow to keep up with the limited, or where it is put into a schedule as an "extra" or "special," it frequently causes a great deal of confusion for the despatchers and trouble for the manager of the road. Both the manager and the despatcher usually make an effort to give the visitors a "good ride," and they attempt to put the car over the road as fast as possible. Those who are familiar with train despatching on interurban roads, however, appreciate that to run a special over a road at high speed and keep it out of the way of regular cars is no small task. The majority of the high-speed single-track interurban lines to-day are operating pretty close to what would be considered a dangerous headway on steam roads. We know of single-track lines operating half-hourly local cars, limited cars every two hours and four express runs a day, not to mention occasional work cars and line cars. This means in all a car over a given piece of single track every ten or twelve minutes, a frequency of train service which would appall the average operator of a steam road. Then, if in addition a special is put in with orders to give it a fast run, the result is apt to be very trying to the nerves of the most skilful train despatcher.

Therefore, if the man in charge of the visiting car appreciates the golden rule, he will not express a desire to break records, but he will arrange for a schedule which his car can reasonably make, and will stick to it if it is possible to do so. But if he does not do this, or if he shows up an hour or so after he had agreed to leave and does not attempt to carry out the schedule laid out for him, he imposes a burden of responsibility upon the train despatchers. Regular cars must be held up to allow the special to make sidings, cars are made late, with inconvenience to patrons of the road, and there is a general breaking up of schedule which may continue for hours after the special has left the road. Besides all, there is an added element of danger which may cost lives and destruction of property. Courtesy in matters of this kind should be considered when traction men go visiting in special cars.

## How to Read This Paper

The electric railway field has grown so in extent that we no longer expect every subscriber to this paper will be interested in every article that is in it. Our subscription list comprises not only those actively engaged in the operating, mechanical, accounting and legal departments of city and interurban electric railways, but many other interests as well, such as designers and manufacturers of street railway apparatus, consulting engineers, bankers and individual stockholders of electric railway companies. During the last few years a great many steam railroad men who foresee the application of electricity to many of their own lines and who wish to become conversant with electric railway practice, have also been added to our subscription list. To cover each department in electric railway operation thoroughly we have therefore been obliged greatly to increase the size of the paper. Obviously we cannot publish articles relating to every department in every issue, but during at least every three months we aim to give as much space to each department as opportunity offers or as its importance compared with that of the rest of the field deserves.

As our readers have noticed, the arrangement of the articles in the paper follows a regular rule which should assist the reader in making such selections as he may desire. Thus the articles immediately following the editorials are usually devoted to a description of the construction or operating practice of some important company. These descriptions are followed by contributed or unsigned articles upon special branches of railway practice, and these by correspondence, when we are in receipt of letters for publication. Following these departments of the paper are descriptions of any new mechanical appliance or apparatus which has been brought out recently and which seems to the editors of sufficient novelty and value to warrant consideration in these pages. The matter in small type is devoted practically in its entirety to news of the week. This department commences with a report of the markets and other financial information. This is followed by accounts of other events

which are considered of more importance than those contained in the briefer news notes, which are classified alphabetically by States in the mixed advertising and reading pages in the back part of the paper. In the legal department, which appears once a month, the department editor discusses some important legal topic connected with street railway operation which is of present interest. This editorial is followed by the syllabi of decisions on street railway cases delivered by the courts of last resort in the several States. This department is always bound in between the technical and news sections of the paper.

Each reader must elect for himself which portion of the field he is most anxious to follow. These articles can be selected by himself, or, if he is too busy for that, they can be brought to his attention by some subordinate to whom he has given the necessary explanation. There is one suggestion, however, which we should like to make in this connection. The departments in electric railroading are so interconnected that no one actively engaged in the industry can safely confine his knowledge to any one or two of them. While he need not be a specialist in every branch of the business, he should know, at least in a general way, the progress being made in all of them, and this can best be accomplished by reading what is being done in other departments. A young man in an operating company, especially, cannot safely specialize in one branch of the service to the exclusion of other branches. If he has ambitions of a managerial character he must be acquainted with other portions of the work as well as that in which he is at the moment engaged. He will find that a wide knowledge of the business will not only broaden his views, but he will also be fitting himself to understand other street railway problems which may be brought up to him in the future, whether they are of a financial, accounting, engineering, legal or mechanical character.

## The Subway Discussion

There have recently appeared in the transactions of the Rapid Transit Commission, as published in the "City Record," two more contributions to the somewhat acrimonious debate on the virtues and failings of the metropolitan Subway. One of these is from Mr. Sprague, dealing with the difficulties of maintaining the proposed schedule and virtually putting it up to the commission to say whether it approves the existing shortcomings. The other is a polite but forcible rejoinder by Mr. Stillwell, defending the decisions that have resulted in the present experiment. As in previous discussions along this line, the question hinges mainly upon the multiple-unit system. Mr. Sprague holds that much of the responsibility rests upon the failure to adopt this system in its entirety as he had advised, and Mr. Stillwell takes the position that changes in this system have been such that if the commission had adopted Mr. Sprague's system in 1900 it would have found it necessary to replace it *in toto* before now. This much is clear, that the existing equipment is not entirely satisfactory under existing conditions. But how far the situation would have been improved by taking up Mr. Sprague's system as it was laid out in 1900 is still on the face of the question somewhat uncertain. Probably no scheme arranged to meet the situation as it existed six years ago would have remained satisfactory up to the present time.

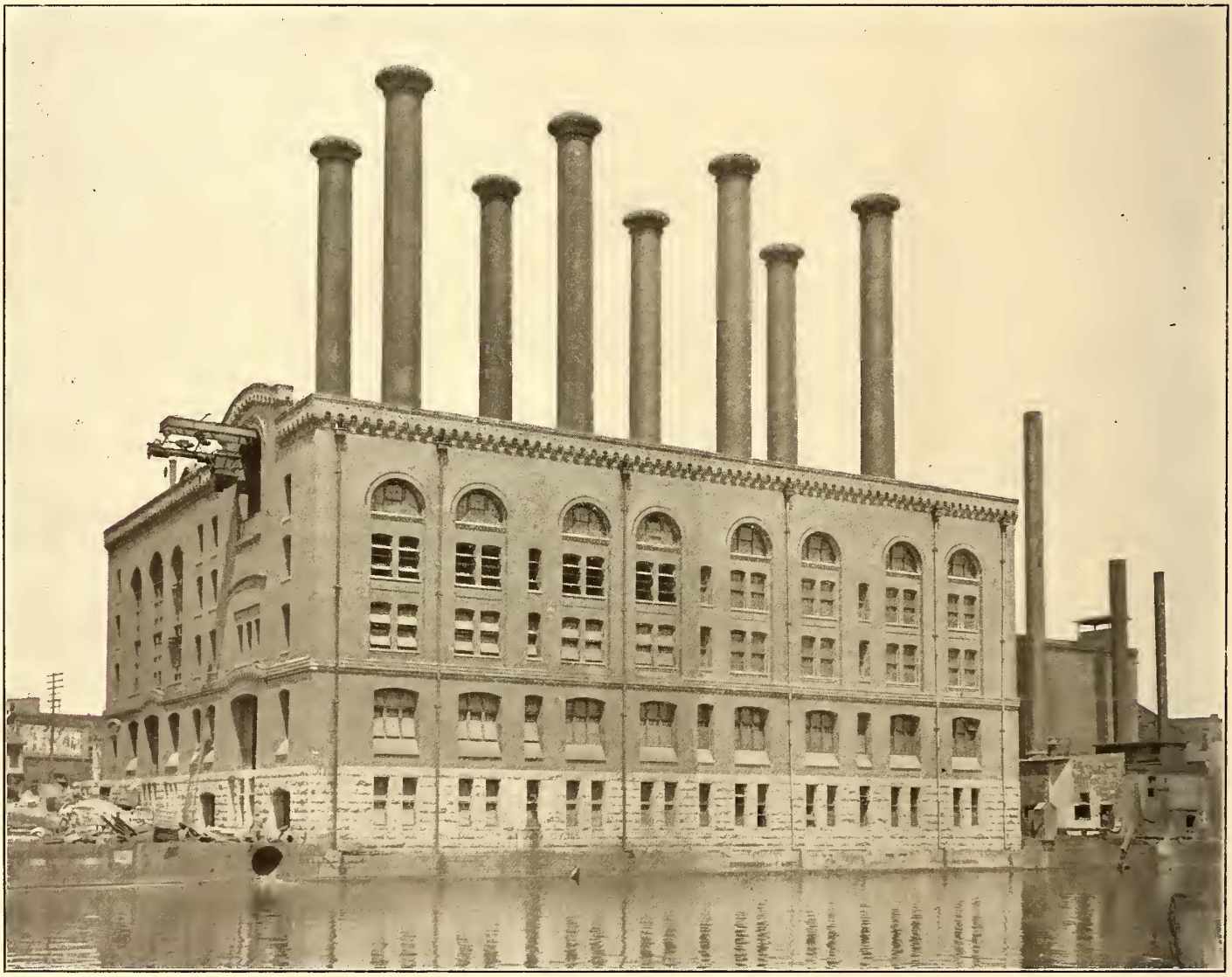
In view of other experience both here and abroad, it would be putting the case too strongly to say that a system in which all cars are motor cars is necessary to successful rapid transit. The gain in acceleration by such a course is theoretically obvious, yet the vital question as to whether the amount of acceleration safe and advisable in the New York Subway requires such practice has not been answered. As Mr. Stillwell pertinently remarks, the multiple-unit system is extremely complex. If an equally good result can be obtained without adopting it in full, the simpler way would be preferable, and it seems to us that the situation is so far complicated by conditions quite apart from the connections of the motors that a decision upon the facts is singularly difficult. In the general specifications quoted by Mr. Sprague there was one slip which seems to us to have led to serious results. This was the assumption of ten seconds as the normal duration of stops on the express service. Just how this figure was reached it is difficult to state, but it certainly has proved to be wide of the mark. In the first place, a very inadequate allowance was made for the number of people who wish to transfer between express trains and locals at express stations, with the result that the time required for stops has been greatly increased. This is independent of the general augmentation of traffic itself, which, as usual, was underestimated. If the express stops were actually ten seconds, instead of from forty-five to sixty seconds, as is now often the case during the rush hours, the schedule could be maintained much more easily than is now possible. Whatever the cause of the ten-second assumption, it was an incorrect starting point for working out an equipment for the Subway.

It is not impossible that this interval may have been derived from estimates where there was less congestion so that the crowds upon the platforms could circulate more easily. Or it may have been based on results obtained with types of car different from that finally adopted. The ideal car for rapid transit purposes would be one which could be discharged and loaded in the minimum time. Experience has shown that the early Subway cars with narrow platform doors were very far from this ideal, and the later modifications still leave much to be desired. Large door spaces and large platforms are absolutely necessary to rapid handling of passengers, and these are neither provided nor denied by variations in the motor equipment. Hence it seems to us that any tacit assumption which in comparing motor systems implies adequate facilities of entrance and exit is at fault. Let these be provided first, and then consider the residual difficulties. Another point to be considered is the effect of shortened headway and quickened service on congestion. That these elements tend intrinsically to improvement is doubtless true, but we question whether they produce as great results as might be expected. The task of a rapid transit system is not only to accommodate a given number of passengers daily, but to do it for the most part within a very limited space of time. If quick service is provided for the rush hours only there is a certain tendency to increase congestion at the very time when every effort is bent toward reducing it. The finer strategy of the subject has been little studied adequately. We are inclined to think, however, that minimum headway alone does not mean maximum efficiency. We shall have something further to say of the technical points raised in the Sprague-Stillwell controversy. It is merely intended here to point out some of its features upon which traffic conditions have a bearing.

## COMMERCE STREET POWER PLANT OF THE MILWAUKEE ELECTRIC RAILWAY AND LIGHT COMPANY

About four years ago the Milwaukee Electric Railway and Light Company began the erection of the Commerce Street power plant, which supplies practically all of the current required to operate the extensive street and interurban railway system in and about Milwaukee. In many features, notably in the methods of handling the coal, of feeding the boilers, and of securing independence of the several units, the plant is distinctive and departs from the usual design of power plants of this size.

It was designed and constructed by the engineering department of the operating company under the general direction of John I. Beggs, president and general manager of the company. The erection of the generating plant as a whole was in charge of C. J. Davidson, chief engineer of the company, who now has charge of its operation, while the installation of the wiring and the switchboards was under the general supervision of O. M. Rau, chief electrician of the company.



THE COMMERCE STREET POWER STATION AS SEEN FROM THE MILWAUKEE RIVER

### GENERAL PRINCIPLES OF DESIGN

In designing the plant two ideas might be said to have predominated. These were that the machinery should be systematically grouped and placed as closely together as consistent with the convenient and economical operation of the plant and accessibility for inspection and repairs, and that the separate units should be so equipped as to secure independent operation in case of derangement of any of the apparatus.

Up to the switchboard the Commerce Street plant consists practically of eight separate plants installed in one building. In the alternating current portion of the plant the sectionalizing is carried still farther, that is, through the switchboard and out to the outgoing feeders and sub-stations. The manner of sectionalizing the several boiler and generating units and portions of the switchboard will be brought out in the description to follow.

Although construction was begun several years ago, the last unit, which is a 1000-kw Curtis steam turbine, has just been installed, and the general plan and total capacity has been increased from time to time as the requirements for current demanded. The southern half, which contains the alternating current generators, was erected and operated for about a year before construction work was begun on the latter portion, and later the Curtis turbines were installed. The generating units now consist of four 1500-kw a. c. generators driven by Allis-Chalmers cross-compound engines, four 2000-kw, 600-volt d. c. generators driven by Allis-Chalmers cross-compound engines, and two 1000-kw Curtis steam turbines, having a total of 16,000-kw rated capacity.

### LOCATION

The location of the plant at Commerce and Poplar Streets and the Milwaukee River is but a few blocks from the business center of the city, and was chosen mainly because of

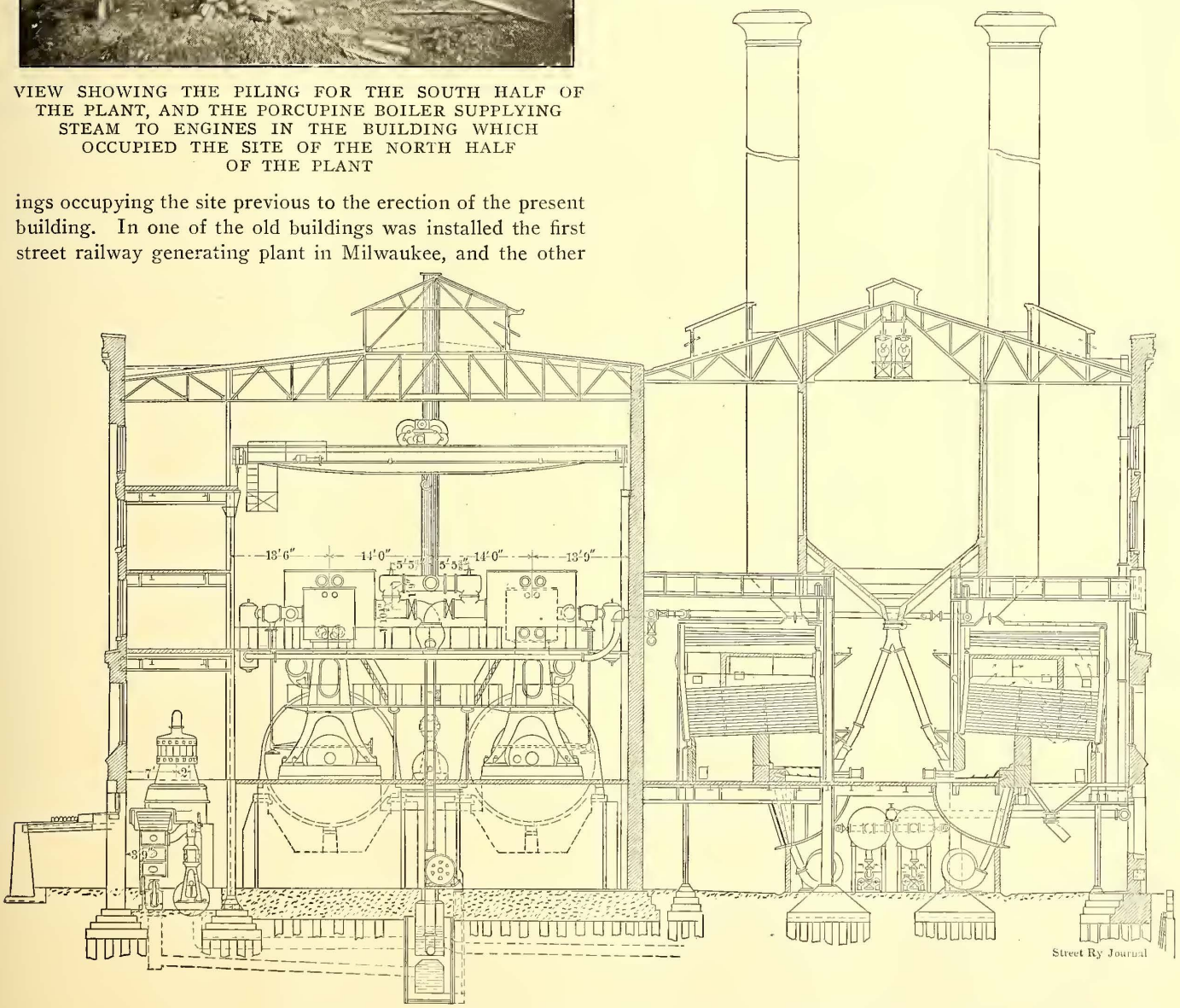
its central location and the abundance of water easily obtained from the river. Railroad facilities are also favorable at this point. Power plants were installed in each of the two buildings occupying the site previous to the erection of the present building. In one of the old buildings was installed the first street railway generating plant in Milwaukee, and the other contained the first Allis-Chalmers compound engine ever constructed. Difficulties of building the new plant were increased by reason of the fact that it was necessary to keep a portion of the old plant in operation during the construction of the new one. In fact, a vertical porcupine boiler of the old plant was kept in service until the installation of one of the boilers of the new plant. One of the illustrations shows this condition; the old boiler generating steam in the center of the building operations, and the steam piping from it carried over the work.

VIEW SHOWING THE PILING FOR THE SOUTH HALF OF THE PLANT, AND THE PORCUPINE BOILER SUPPLYING STEAM TO ENGINES IN THE BUILDING WHICH OCCUPIED THE SITE OF THE NORTH HALF OF THE PLANT

### STRUCTURE

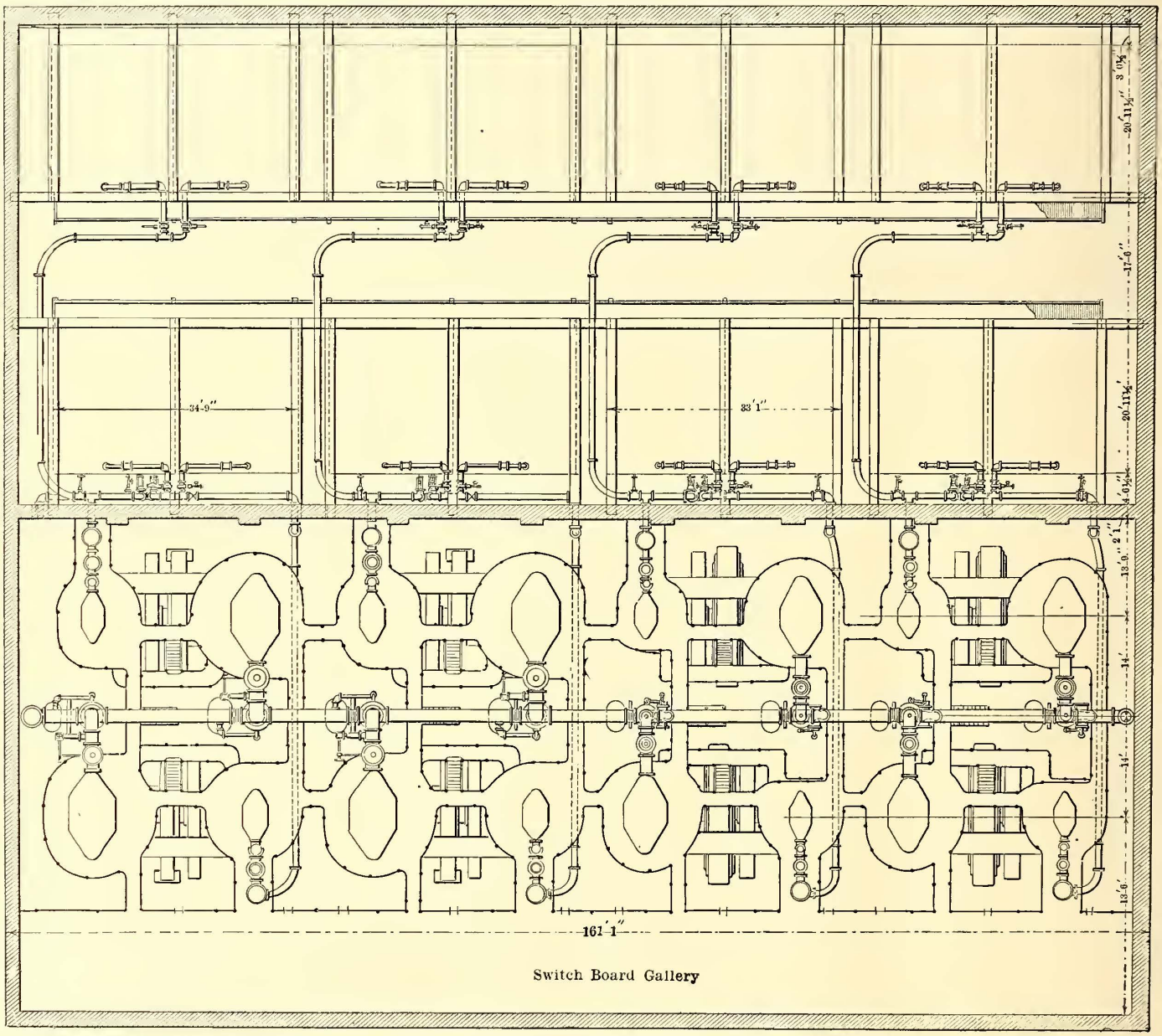
The building housing the present plant is a brick and steel structure resting on foundations of cut stone, which in turn is built on concrete capping over wood piles. The roof, which is comparatively flat, is liberally provided with ventilators and skylights, and is supported upon a steel framework. The whole structure measures 161 ft. 1 in. long by 143 ft. 6 ins. wide, and as the station has a capacity of 16,000 kw, it will be seen that, although reciprocating engines of comparatively small size have been installed, the floor space per kilowatt is only 1.43 sq ft.

The building contains a boiler room and an operating room of about equal sizes, divided by a brick wall extending a few feet above the roof. The boiler room is on the east or river side of the wall. Underneath the main floor on which all the boilers are installed is a basement containing auxiliary apparatus, and above are the coal bunkers. A series of galleries along the west wall of the operating room, and served by an elevator, contains switchboards, office, machine shop, and storage space for supplies and repair parts. On the main




CROSS SECTION OF NORTH EXTENSION OF COMMERCE STREET POWER PLANT

floor underneath the south end of these galleries are a motor-driven exciter and three motor-driven frequency changers, while the two Curtis turbines previously mentioned are located underneath the north end of the galleries. In the basement between the foundations of the two rows of generating units are the condenser pumps and other auxiliary machinery for the generating units. The high-tension buses, distant-control electrically operated oil switches and other high-tension apparatus are installed in the basement in an isolated compartment partly under the south end of the galleries and partly under the sidewalk. In the basement are also toilet rooms which contain shower baths and lockers and are finished in Tennessee marble.

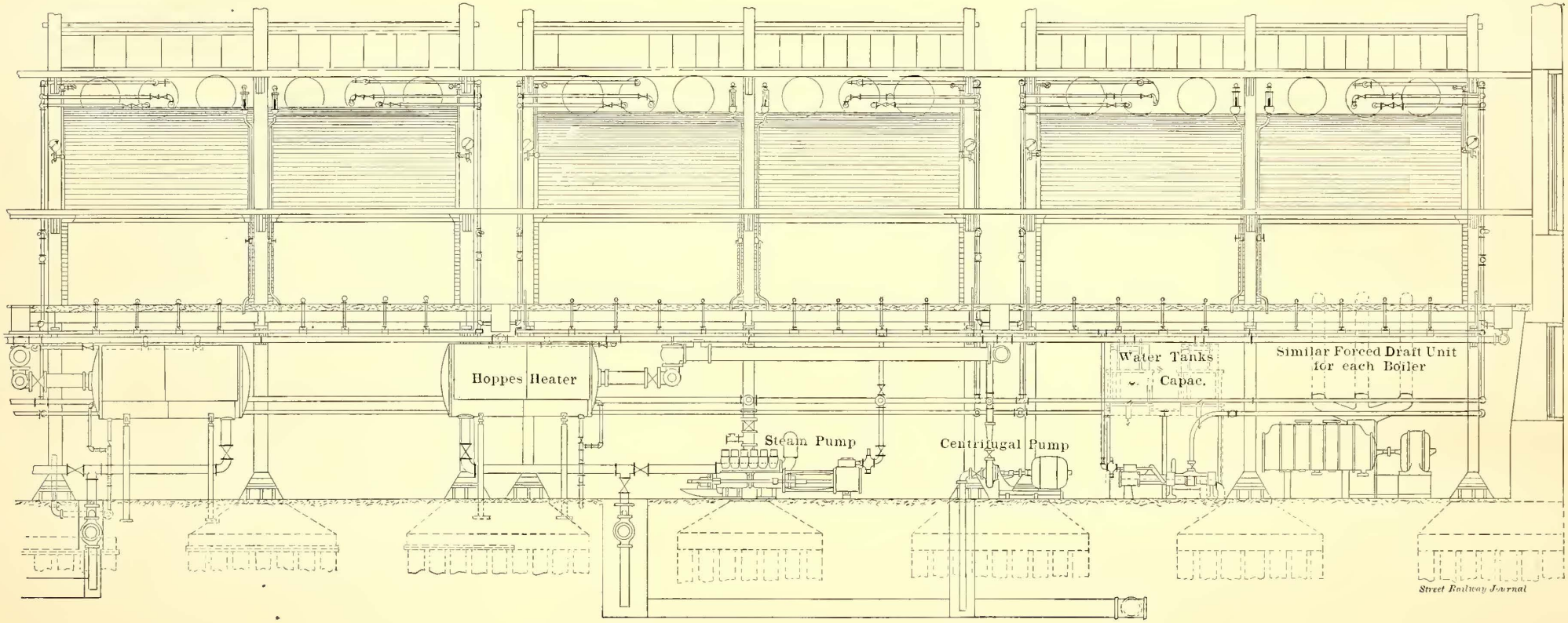



PLAN OF THE COMMERCE STREET POWER STATION, MILWAUKEE

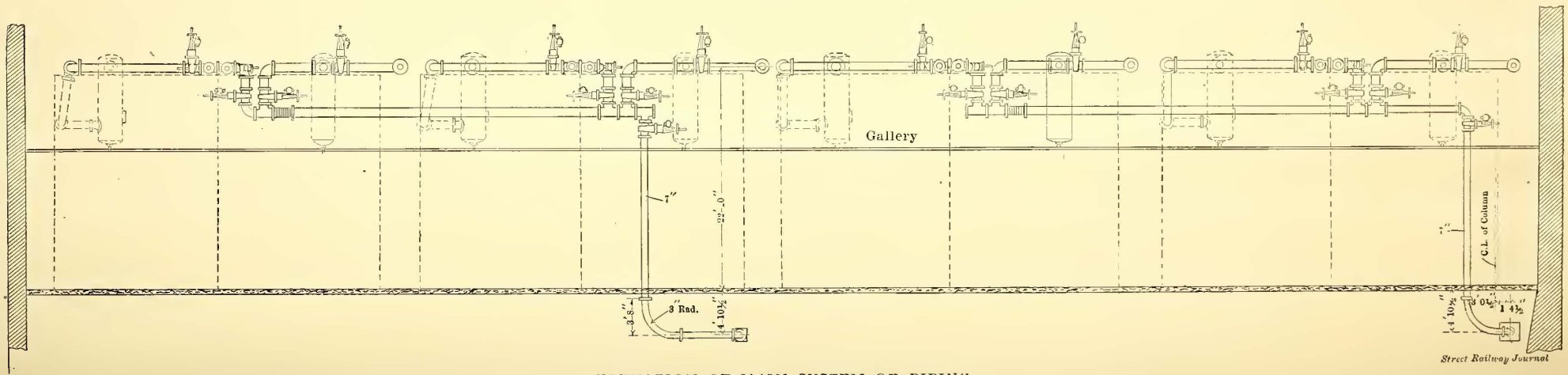
### BOILER PLANT

The boiler plant consists of eight units, each made up of two Edgemoor boilers equipped with a stack and auxiliary apparatus independent of the other units and piped separately to one of the eight large generating units in the operating room. Each boiler is equipped with a Monitor injector, four Jones underfeed stokers, a Squires feed water regulator, and a motor-driven centrifugal fan for supplying pressure for forced draft. Those boilers in the older portion of the plant have 6500 sq. ft. of heating surface, while the remaining eight are somewhat larger, having 7000 sq. ft. No economizers are installed, but the boilers are provided with superheaters consisting of five rows of 4-in. tubes which give about 60 degrees of superheat to the steam. The boilers are operated at 160 lbs. pressure. The boiler steam gages, as well as all of the other steam and vacuum gages in the plant, are graduated from zero pressure absolute. This was done to eliminate the necessity of reducing pressures above the atmosphere to absolute pressures in working up indicator cards, as well as to avoid the necessity of referring to vacuum in speaking of condenser pressures. The space immediately above the boilers and on each side of the coal bunkers has been reserved for economizers, but with coal at its present price it has not been deemed advisable to install them.

The method of setting the boiler may be observed in the drawing of the cross-section of the station. The fan supplying forced draft, and which is driven by a 20-hp motor, is installed underneath the front portion of the boiler. The air supply is controlled by a Spencer damper regulator. Running the full length of the building under the rear of each

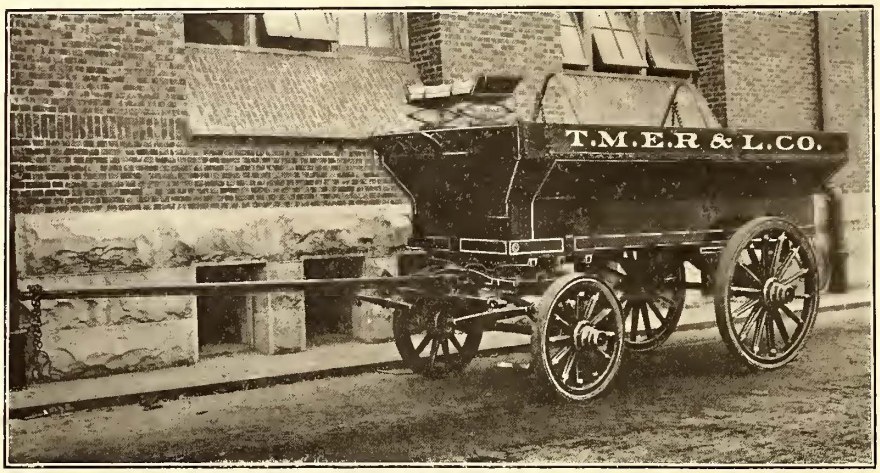



LONGITUDINAL SECTION OF PART OF THE BOILER ROOM




ELEVATION OF MAIN SYSTEM OF PIPING

line of boilers is a passageway built large enough to accommodate standard gage ash cars, but at present wagons are utilized to remove the ashes. The ashes drop down from the furnace of each boiler into a hopper immediately below, and are discharged into the wagons through a door which forms the rear wall of the hopper and is opened and closed by air. A soot hopper back of the bridge wall, built of steel and lined with fire brick, permits the accumulation of soot which is discharged through an opening controlled by a slide door into a wagon or car directly underneath. The eight steel stacks, each 7 ft. 6 ins. in diameter, and which rise 75 ft. above the roof of the boiler room, are supported on cross girders above the boilers. The bases of the stacks are about 30 ft. below the roof, and the support offered by the trusswork of the roof removes the necessity of guy wires or other braces. With the exception of the lower one, which is ⅜ in. in thickness, the steel plates of the stacks are ¼ in. thick. That portion of the boiler room above the boilers and between the two rows of stacks is taken up by the coal bunkers, which have a total capacity of 1000 tons. The side walls of the bunkers, which are of concrete, rest upon the same girders that support the stacks, while the bottom of the bunkers is V-shaped and opposite each boiler opens into down-takes which feed the coal into the hoppers of the stokers.




SPECIAL WAGON WITH REMOVABLE BED FOR HAULING COAL TO THE PLANT

### HANDLING OF FUEL

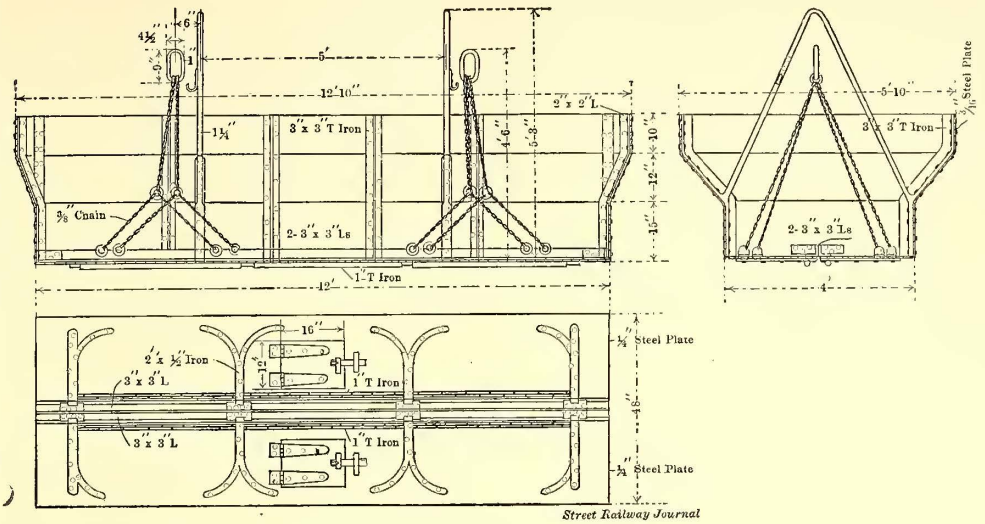
One of the most noteworthy features of the whole plant is the method of elevating the coal to the bunkers. The method is entirely original with Mr. Davidson, and is in fact such a departure from the usual practice that many visiting engineers when shown the plans doubted its practicability. It has, however, proven a most successful method both from the standpoint of economy and reliability. Two 24-inch I-beams over the center line of the bunkers and immediately under the roof carry traveling trolley cranes of special design which run the full length of the boiler room and at one end project out through a door several feet beyond the wall of the building. Coal is hauled to the plant in wagons provided with beds of special design, as shown in the drawings on the opposite page. The wagon is run over a pair of scales immediately under the projecting I-beams. After being weighed a crane on one of the I-beams overhead lifts the bed containing the coal from the wagon by means of the chains attached to the hinged doors forming the bottom of the bed, and carries it into the building and over the bunkers. When in a position to be dumped, heavy hooks attached to the crane are spread and engage in the iron braces riveted to the sides of the bed, so that when the crane is lowered the weight is taken off the bed and the bottom is allowed to swing open. The two cranes traveling on the separate I-beams work independently. One of them will lift a six-ton load of coal, dump it and return the empty bed to the wagon in three minutes. As the crane is operated by an apprentice boy, and moreover as the expense of maintenance of the crane is practically nothing, it may readily be seen that this method of handling coal offers many advantages. The cranes were employed during the installation of the boilers and other apparatus in the boiler room, and their use during the erection of this apparatus lessened the cost of installation an amount sufficient to warrant their erection for this purpose alone. These cranes are of special design and were built by Pawling & Harnischfeger, of Milwaukee.

A WAGON BED LOADED WITH COAL BEING ELEVATED BY THE CRANE

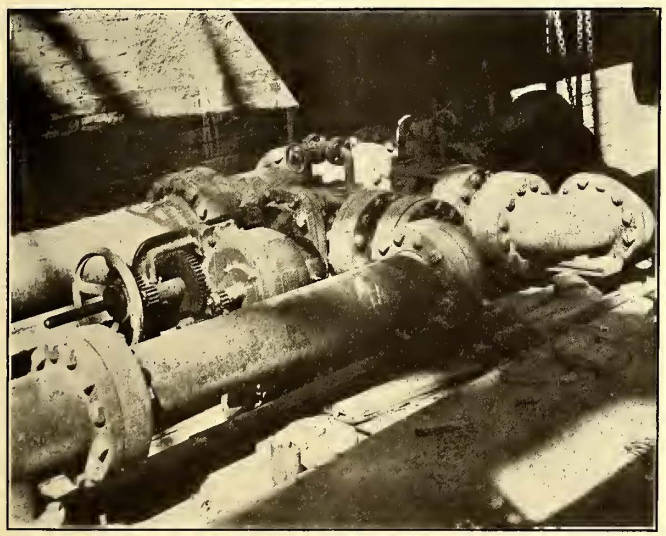
### BOILER FEEDING

That portion of the basement of the boiler room underneath the firing alley or central passageway between the boilers is termed the pump room, and contains four motor-driven rotary pumps, four double-acting, steam-driven boiler feed pumps, and four Hoppes heaters. The two rotary pumps, two steam-driven pumps and two heaters in each half of the station may be operated independently of the set in the other half, and each set of rotary, steam pump and heater may also be used separately. This gives four independent sets of pumps for feeding the boilers. Failure of the feed supply is made a more remote possibility by the fact that three methods of feeding may be employed. The usual method is to pump

the feed water by means of the motor-driven Lawrence centrifugal pumps from the hot wells into the Hoppes heaters placed overhead in the pump room. The hot wells are connected by 18-in. pipes to the tunnel under the operating room into which the condensers discharge. The double-acting, steam-driven Prescott outside-packed feed pumps draw the water from the heaters and force it into 4-in. mains which run the full length of the boiler rooms and from which the feed pipes to the separate boilers are tapped off. In case of failure of the centrifugal pumps or of the heaters, the feed water may be drawn direct from the hot wells and forced into the boiler by means of the steam-driven pumps. The third method does not require the use of the steam-driven pumps or of the heaters. The centrifugal pumps supply small reservoirs into which the suction pipes of the injectors on each boiler terminate, and the boilers are fed by means of the injectors. As the feed pumps are the most vital parts of a plant, pumps of such a size have been installed as to insure their not being overworked and the consequent possibility of their being in constant need of repair. The cylinders of the steam pumps are in fact 18 ins. x 10 ins. x 18 ins., and at the maximum capacity of the plant two of the four installed will feed all of the boilers. No feed water purifying apparatus is installed at present, but provision has been made for it, and it is the intention of the company to install feed water purifiers within a short time.




DETAILS OF COAL WAGON-BOX



PIPING IN THE REAR OF THE BOILER DURING CONSTRUCTION, SHOWING THE ELECTRICALLY OPERATED VALVES

### STEAM PIPING

In laying out the main steam piping, endeavor was made to secure independence of the separate units and the two halves of the plant, to place the least amount of piping necessary in the engine room, and to provide for shutting off any section to which accident might occur. The drawing on page 126 shows the arrangement decided upon. Each set of two boilers feed into a common main which goes direct to a generating unit. Arrangements are also provided so that the main from each set of boilers may be connected to the steam header of that half of the station in which the boiler is located. The piping in the engine room was simplified by reversing end for end one line of engines and thereby bringing the throttle valves of the engines reversed next to the boiler room wall. At the same time reversing the engines avoided the necessity of any of the pipes crossing over each other in passing to their respective engines. It may be noted that the steam is taken out of the front of that line of boilers farthest from the operating room. While this reduced amount of piping in the boiler room it also lessened the required size of the building because the rear wall of the building could be constructed closer to the boilers.

Motor operated valves of the Chapman type are placed in the steam mains, and it may be noted here that this was the first installation of these valves in high-pressure systems of steam piping. While the valves can be closed from the switchboard, they are so connected electrically that they must be opened by hand. This arrangement was carried out to avoid the possibility of the distant switchboard operator accidentally or otherwise opening a valve at a time when the piping was disconnected and when workmen might be injured by so doing. The stop valves in the pipes from the individual boilers are of the motor operated type, as are also the valves in the mains from each set of two boilers and all the valves in the connections to the headers previously referred to.

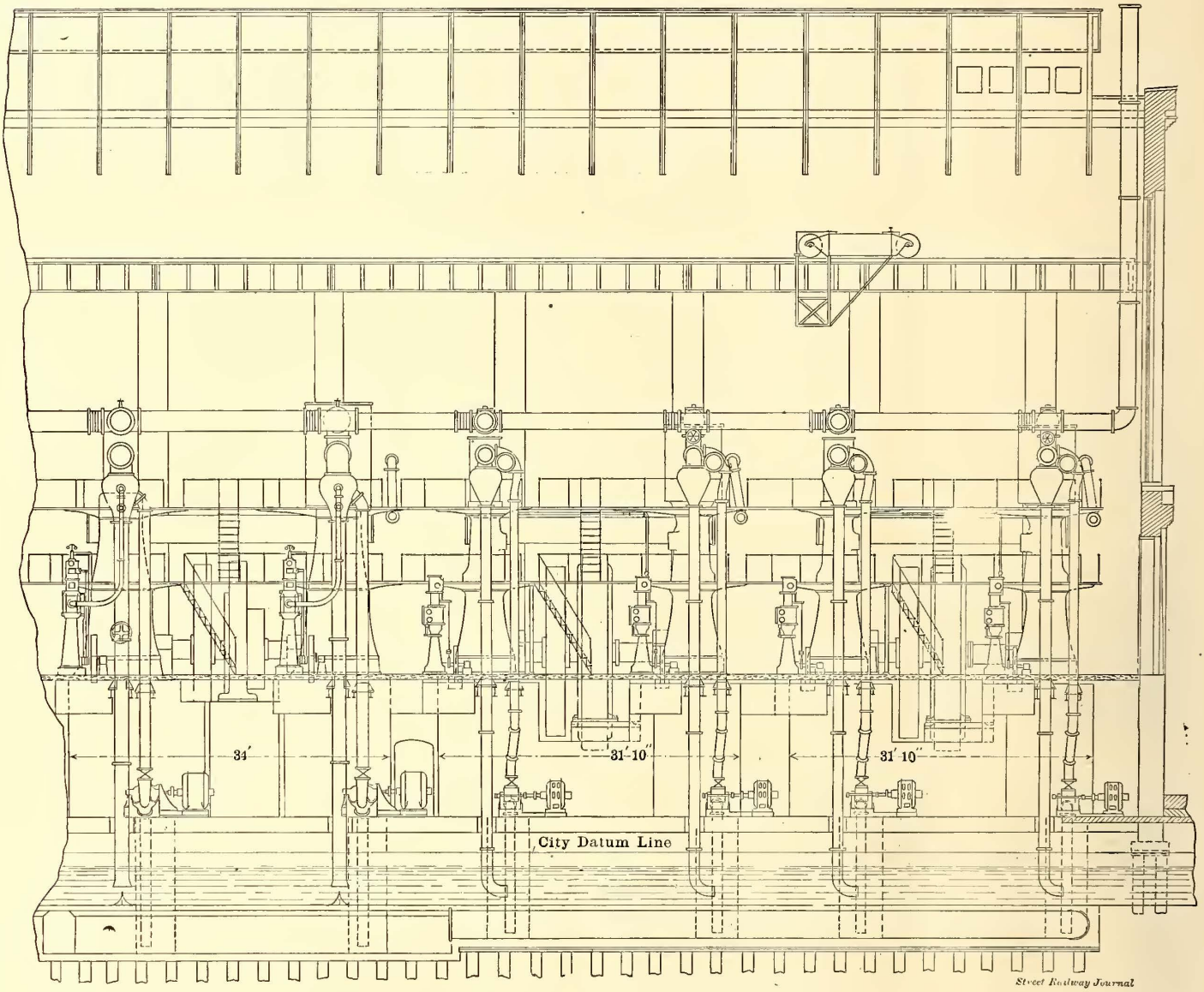
There is no connection whatever between the headers in the north and south halves of the boiler room. While such connection might at times facilitate the operation of the plant, it was thought best to provide no means of connection between them and thereby reduce the dependence of one-half of the station upon the other half. Although they are termed headers, these lines connecting the mains of all the boilers in each half of the plant are not headers in the usual sense. In ordinary operation the supply of steam to each engine does not feed through them, and they serve simply to balance the pressure of the boilers and to provide for connecting any engine in half of the plant to any boiler in the other half. In fact, all of the reciprocating engines can be operated independently of them so that they may be disconnected for repair without affecting the operation of the plant other than putting the Curtis turbines out of service. These turbines are supplied with steam from the headers through mains which drop down from the north end of each header and pass along the boiler room walls and under the floor of the operating room to their respective turbines.

### THE ENGINES AND GENERATORS

In building the concrete foundations for the generating units a practice somewhat out of the ordinary was followed. The foundations for all of the units are built in a monolithic mass, and are not separated from each other as is usually the custom. Reference has already been made to the fact that the generating units have been erected with very little clear floor space between them, and a good idea of their nearness to each other may be obtained when it is considered that eight units with a total rated capacity of 14,000 kw are installed in a space measuring 55 ft. 3 ins. x 156 ft. 11 ins.

could be employed and preserve the symmetry of the two halves, which was considered highly desirable.

Two galleries are provided around the engines. The lower one permits of access to the cross-heads and rocker arms, while the upper one just below the cylinders is at the same height as the switchboard gallery, to which it is connected by frequent passageways. The same practice is followed in the erection of the galleries surrounding the engines as in the construction of the foundations of the generating units, in that they are all bolted solidly together. Passageways are open from the gallery of one engine to that of another, so




LONGITUDINAL SECTION OF PART OF THE ENGINE ROOM

All of the engines are of the Allis-Chalmers vertical cross-compound type, with a speed of 94 r. p. m., while the generators were built by the General Electric Company. The rating of all of the generating apparatus is based on specifications drawn up by Mr. Beggs, which provide for a temperature of 40 deg. C. in the operating room instead of 25 deg. as allowed by the American Institute of Electrical Engineers. The four generators erected in that half of the plant first constructed are of 15,000-kw capacity, generating three-phase current at 13,200 volts and 25 cycles. The four installed later are 2000-kw, 600-volt direct-connected machines. The units first installed were the largest that could be obtained within the limited time in which it was necessary to have them and those in the second half of the plant were the largest that

that an operator can pass from one engine to another without being compelled to climb up and down the stairways.

The independence of each of the eight separate units of which the whole plant may be said to be composed is further secured by an independent exciter unit for each 25-cycle generator. Each of these units consists of a 25-kw machine driven by a Curtis horizontal steam turbine, and is mounted on an extension of the bed plate of its respective engine. Usually the turbine set is employed, but the generators may also be excited from the motor-driven exciter installed under the south end of the switchboard gallery, or exciting current may be obtained from the Oneida Street plant which supplies direct current for city lighting service.

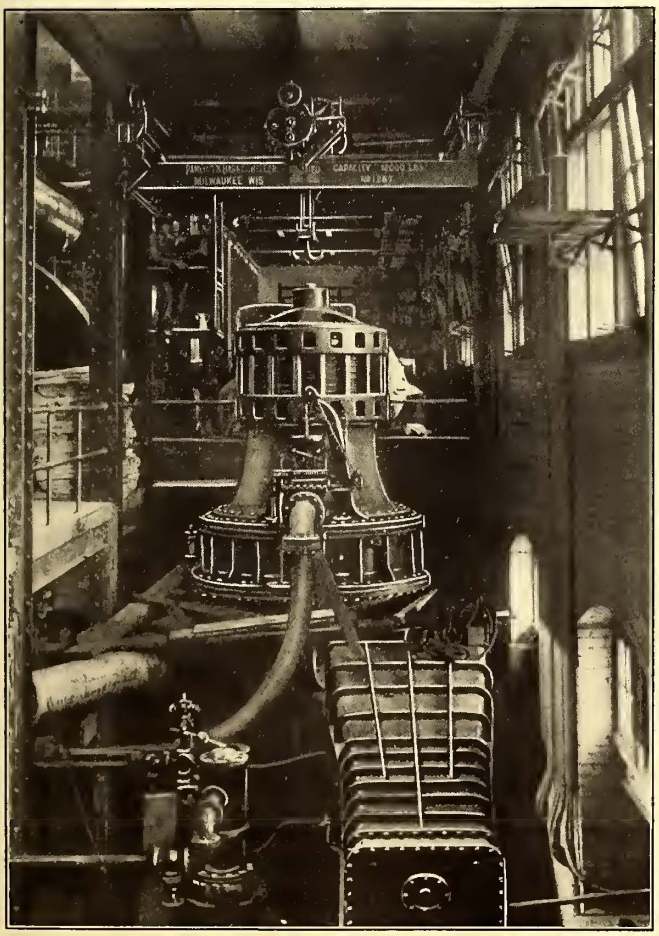
An illustration is presented of the two 1000-kw Curtis turbo-

generators installed under the north end of the switchboard gallery. Steam for these is not superheated to a greater amount than that supplied the reciprocating engines, as it is taken from the steam headers in the boiler room as already described. The condensing apparatus for each of the turbines consists of a surface condenser supplied with a 30-hp, 60-cycle, three-phase induction motor-driven centrifugal circulating pump and a vertical steam-driven dry vacuum pump. The water of condensation is removed from the condensers by a centrifugal pump driven by a 3-hp, 60-cycle, three-phase induction motor.

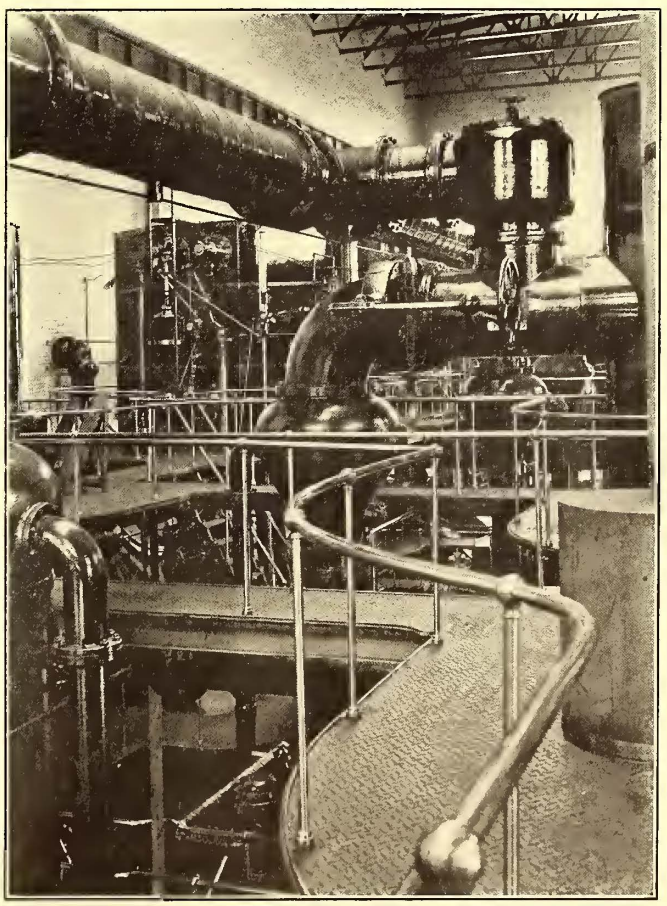
### CONDENSERS

The position of one row of the larger generating units is reversed, as already described. This was done partly to simplify the steam piping, but primarily because it made possible the placing of all the condensers in the space between the two rows of generators. The condensers are all of the barometric type except those receiving the exhaust from the two 1000-kw Curtis turbines. These latter condensers are surface condensing; each has 4000 sq. ft. of 1-in. tubing. Those in the older portion of the plant are of Worthington manufacture, while those installed later, including those used with the turbines, were made by the Fred M. Prescott Steam Pump Company, of Milwaukee, after designs furnished by Mr. Davidson. The condenser, of which a cross-sectional view is shown, combines the principles of the ordinary jet siphon with that of the barometric type condenser. The velocity of the particles of water in the inner pipe tends to entrain the air and draw it out of the condenser. In case of a surplus of water the opening at the top of the inner pipe provides means for the surplus overflowing into the outer pipe. With this type of condenser it is possible to maintain a vacuum of about 27 ins. without the use of the air pump; in

CONSTRUCTION VIEW OF PASSAGE-WAY UNDER THE BOILERS

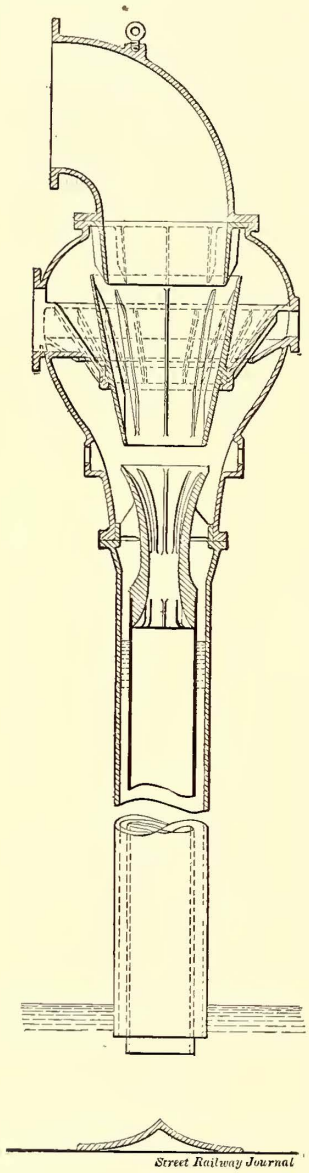


CONSTRUCTION VIEW, SHOWING ONE OF THE TWO CURTIS TURBINES UNDER THE NORTH END OF THE SWITCHBOARD GALLERY



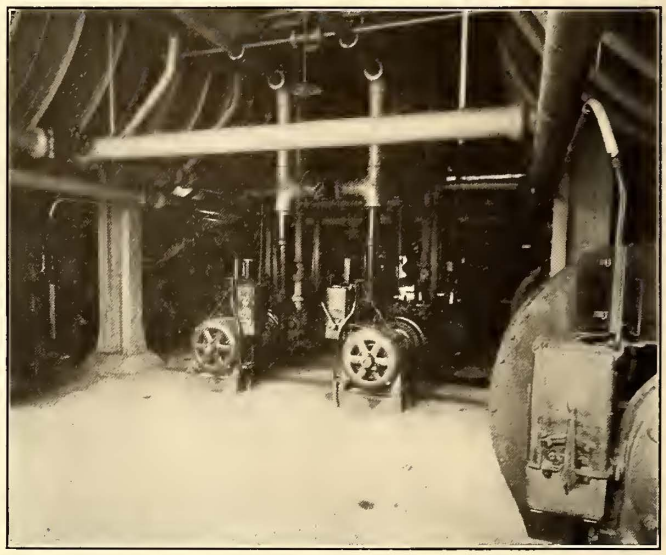
VIEW IN ENGINE ROOM, SHOWING PLATFORMS, CONDENSERS AND ATMOSPHERIC EXHAUST CONNECTION

fact, the air pump is not used under ordinary operating conditions. In the winter season a 28-inch vacuum is frequently obtained. A vacuum of 27 inches in the locality of Milwaukee is, of course, equivalent to one almost an inch higher in cities which are practically at sea level, as New York. For supplying condensing water two tunnels are run from the river under the boiler room and connect with a tunnel running the full length of the operating room and about 10 feet below the basement floor. Immediately above this is the tunnel into which the condensers discharge. This upper tunnel has an outlet into the river at one end and is also connected to the two hot wells under the boiler room basement floor. As the water level in this discharge tunnel is determined by the level of the water in Lake Michigan, which is practically constant, there is no danger of the condenser seals being broken.

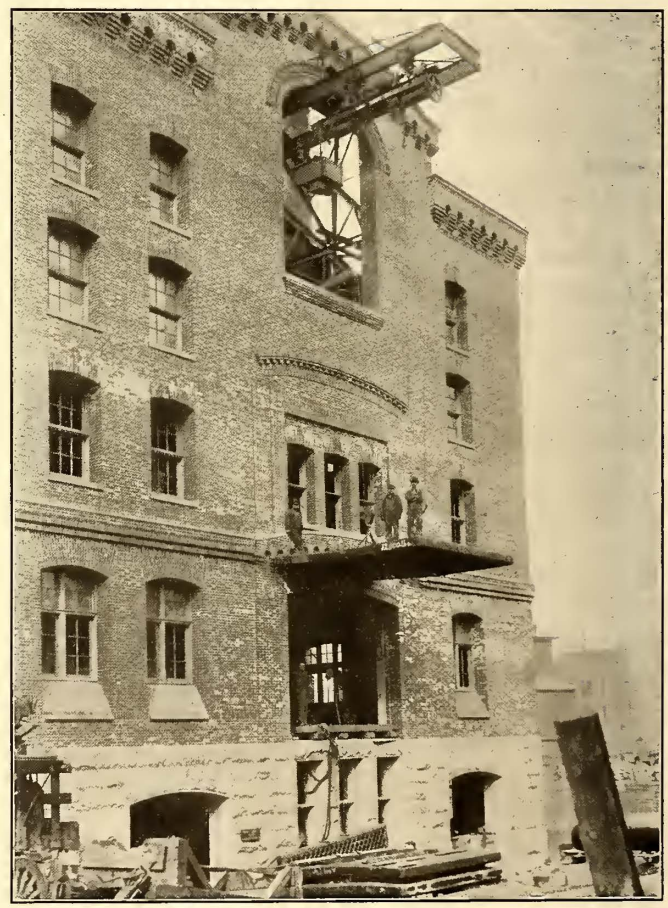



BAROMETRIC CONDENSER

Water from each condenser is drawn from the lower tunnel by means of a 12-in. centrifugal pump located in the basement and driven by a 50-hp motor which is provided with a double-throw starting switch. In starting the motors the switch is thrown down and the motors are put on the station bus-bars. After having attained speed the switch handle is thrown upward and this connects the motors to the terminals of the generator driven by the engine to which the condenser is connected. While this method of connection provides for the automatic stopping of the condenser pump in case the field circuit of the generator should be accidentally broken or the voltage of the generator drop for any other reason, it was devised primarily to avoid the shutting down of the condenser pumps in case the current should be cut off the bus-bars, through the blowing of all the machine breakers or otherwise. Atmospheric exhaust is provided for all of the engines by an exhaust line varying in size from 20 to 24 ins. which runs the full length of the building between the engines and immediately over the condensers. The arrangement of the connection of the engine exhaust with this line as well as with the condensers is well shown in an accompanying illustration. At each end of the plant the exhaust main is carried up along the wall and out through the roof of the building, which arrangement gives a clear space overhead for the operation of the 30-ton Pawling & Harnischfeger crane spanning the operating room. At the north end of the exhaust line a main drops down to receive the exhaust from the Curtis turbines whenever it is desired to run these non-condensing. The exhausts from all of the dry vacuum pumps, exciter turbines, boiler-feed pumps, and other steam-driven auxiliary apparatus is piped to the Hoppes heaters under the boiler room, and an outlet leading from this heater passes out the boiler room roof at the northeast corner of the building. In the design of the plant the division between steam and electrically driven auxiliaries was so made that all the exhaust from the steam-driven auxiliaries would be condensed in the feed-water heater. Under ordinary operating conditions practically no steam passes out of the heater exhaust.



PUMP ROOM IN THE BASEMENT OF THE BOILER ROOM, SHOWING THE MOTOR-OPERATED CENTRIFUGAL PUMPS

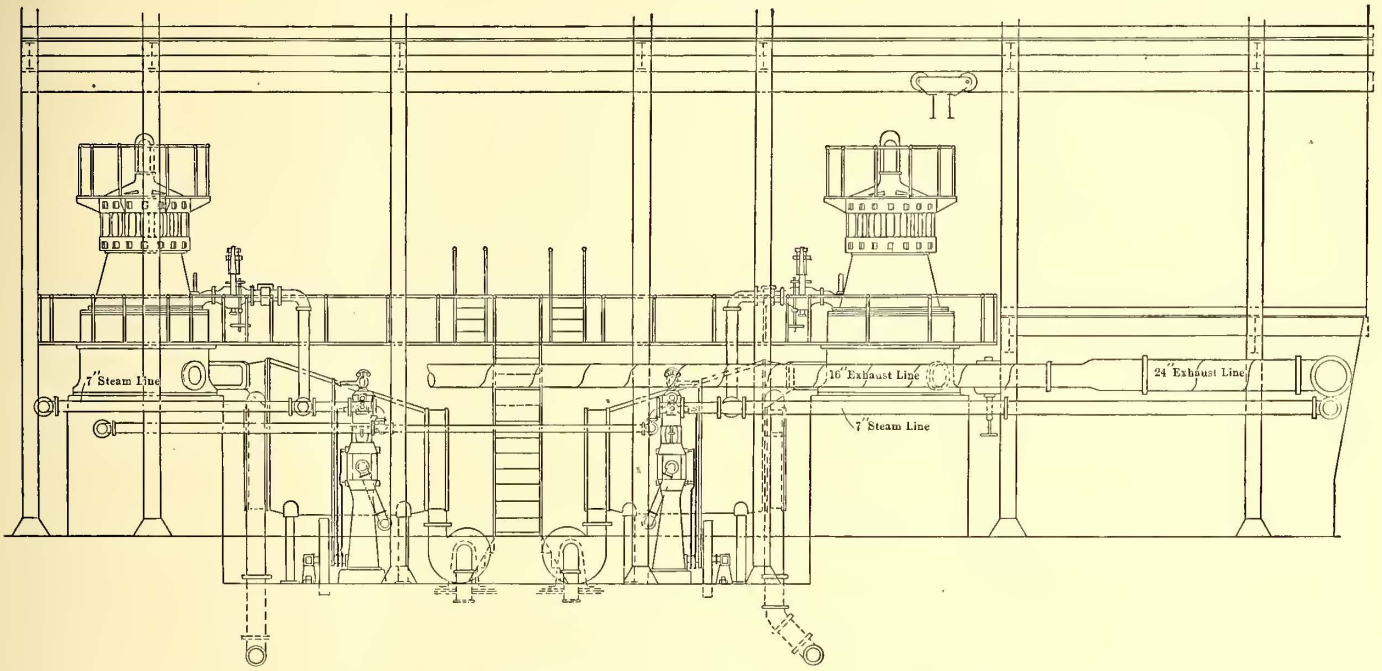


CRANES IN USE AT THE COMMERCE STREET STATION IN ERECTING THE BOILERS

### OILING SYSTEM

A central oiling system consists of tanks in the basement, filters of special design, storage tanks on the third or top gallery floor, and pumps for elevating the oil from the tanks

in the basement to the filters. The tanks in the basement are long, rectangular in shape, and so built that a barrel can be rolled on skids over them. In this way the contents of the barrel can be discharged into the tank by simply knocking out the bung and rolling the barrel over. The barrels can be unloaded directly from the wagons bringing them to the plant onto the skids over the tanks. The oil is filtered by allowing it to flow through muslin bags. The small pumps which raise the oil to the reservoirs are submerged in the oil tanks in the basement. The neglect usually accorded small oil pumps in a large plant, and their consequent unsightly appearance and constant need of repairs, was responsible for Mr. Davidson's plan to immerse them in oil and operate them by compressed air. Pending the installation of the compressor and piping they were connected to the steam piping. It was then found that the radiation from the cylinders heated the oil just about warm enough so that it would filter well, and the steam connections have been allowed to remain. All wear and the necessity of repairs to the pumps has been practically eliminated by installing them in the oil. The connecting pipes are fitted with unions so that the pumps may be removed for inspection at any time.




TURBINE LAYOUT IN COMMERCE STREET POWER PLANT

### GROUNDING OF MACHINES AND INSTRUMENTS

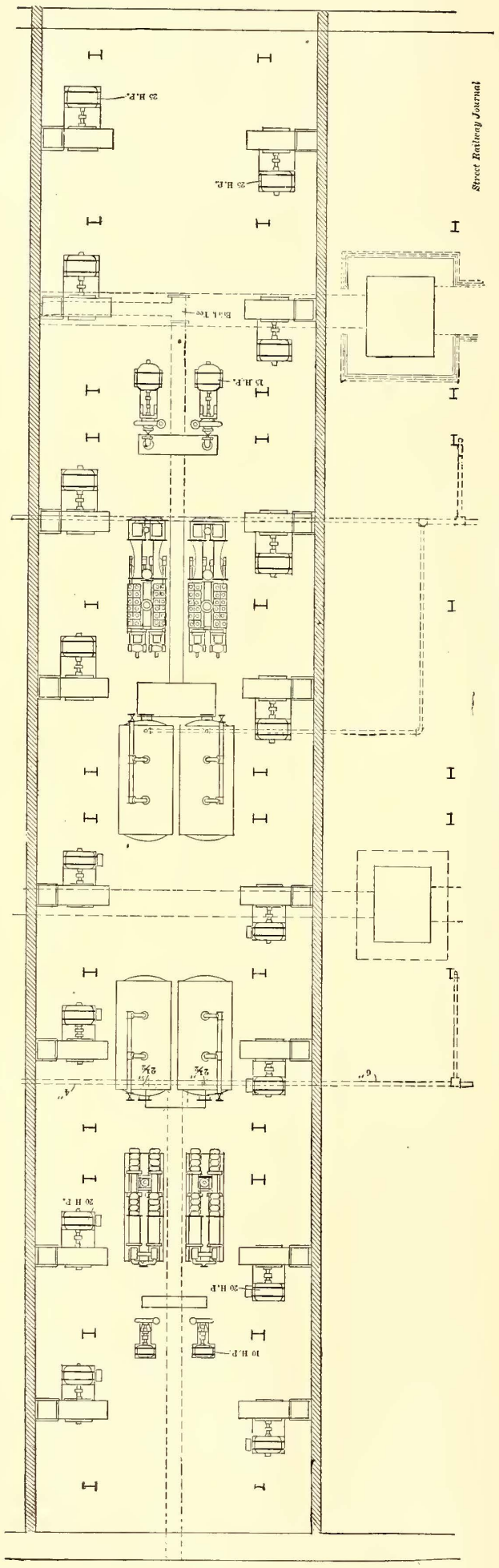
All of the machinery and apparatus is grounded to a common ground bus in the basement of the building. The large alternating current generators which are star connected have their neutral points grounded through rheostats. Grounding of the direct current machines is effected through a switch and circuit breaker, which are located in the basement but are controlled from the switchboard in the gallery. The framework of all the bus and switch structures in the basement is well grounded, as is also the framework of the alternating current switchboards. On the direct current board, however, the framework is insulated from the ground.

### CLEANING WASTE

Complete apparatus for cleaning waste is installed in the basement of the engine room. The dirty waste is thrown into a chute opening into the engine room and falls into a bin below. It is first put through a steam-driven centrifugal separator similar to those found in laundries for drying clothes, and all the surplus oil removed. It is then boiled in a solution of soda, after which it is put through a second separator which frees it of surplus water. Finally it is placed on the steam pipes and dried. About 70 or 80 per cent of the oil is removed by these processes and the waste is left in good condition to be used again.

### COMPRESSED-AIR SYSTEM

Two 75-ft. motor-driven Christensen compressors in the boiler-room basement compress air which is piped through



PLAN OF PUMP ROOM IN THE COMMERCE STREET POWER PLANT

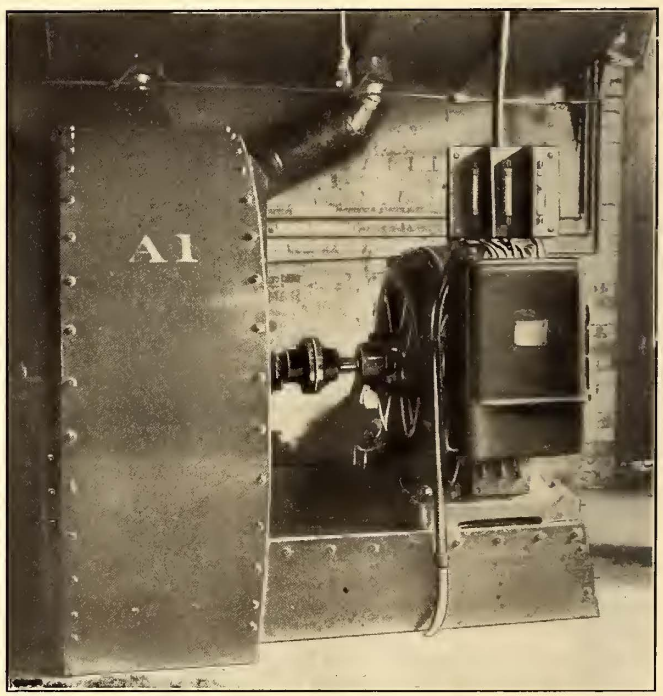
the building and is used for operating the air-lift doors of the ash hopper, blowing out machines and for operating pneumatic hammers, drills, and other tools.

### TESTING APPARATUS

Frequent calorimetric tests of coal are made, and coal is also tested frequently by burning the sample to be tested under the boilers. To aid in making these latter tests two large weighing tanks have been installed in the basement of the boiler room and a separate feed pump has been provided for feeding the boiler to be tested. There has also been installed in the same basement a surface condenser into which the exhaust from any of the auxiliary apparatus can be turned when it is desired to test any piece of this apparatus.

### MACHINE SHOP AND REPAIR EQUIPMENT.

All the repair parts for the plant are made in the machine shop located on the second gallery floor. Here is installed a complete equipment of machine tools consisting of several lathes, shaper, drill presses, tool grinder, gas forge, buffers,




MOTOR-DRIVEN BLOWERS SUPPLYING FORCED DRAFT TO THE BOILERS

and others, all of which have individual motor drive. When the north half of the plant was erected many of the fittings and other parts necessary were constructed in the shop. Among those parts made were the air lifts for the ash hoppers under the boilers, the turbine galleries and stairways, the coal down-takes in the boiler room, and the extra heavy pipe flanges used on the larger piping. In addition to this work all piping construction about the plant was done by the company.

### MOTOR-DRIVEN AUXILIARIES

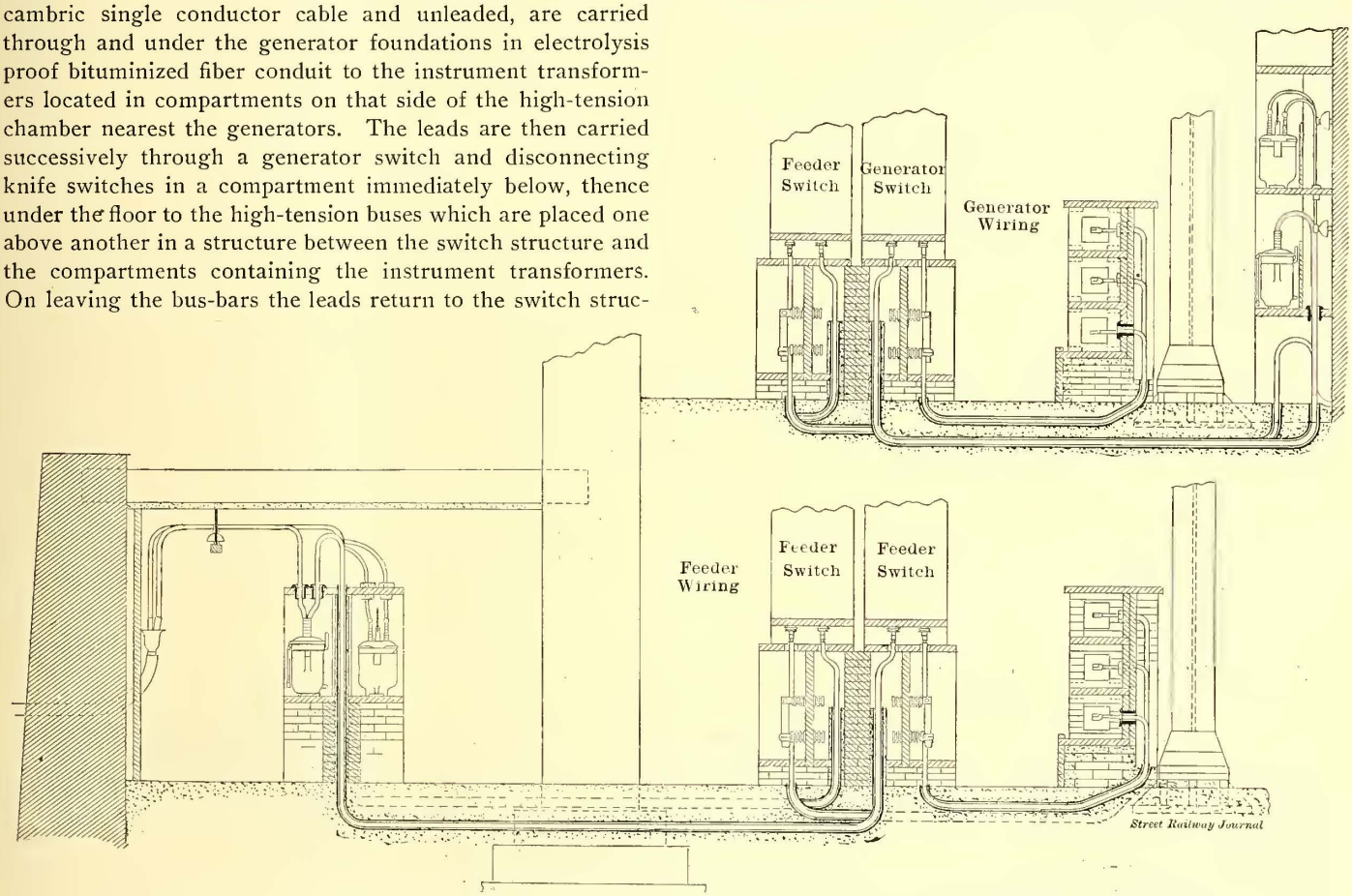
The motor-driven auxiliaries, to which reference has been made occasionally in the previous description, are arranged as follows: In the 25-cycle portion of the plant, 25-cycle induction motors are used; in the direct current portion, direct current motors are used, and in the 60-cycle portion, 60-cycle induction motors. Their plan prevents an accident to one part of the plant shutting down the auxiliaries and thereby disabling other portions of the plant.

### THE SWITCHBOARD SYSTEMS

The station contains three separate switchboard systems, one for the direct current apparatus, one for the 25-cycle alternating current machines, and another for the 60-cycle machines. The 25-cycle alternating current switchboard system comprises the apparatus in the high-tension chamber in the basement under the south end of the switchboard galleries and the controlling and instrument panels, or the switchboard proper, in the gallery above. The plan of sectionalizing the different machines, so prominent in other parts of the plant, is followed in the 25-cycle switchboard apparatus by placing all of the high-tension apparatus located in the basement in four groups, one for each generator. Practically the only connection between the four groups is through the high-tension bus-bar sectionalizing switches. The three leads from each generator, which are of varnished cambric single conductor cable and unleaded, are carried through and under the generator foundations in electrolysis proof bituminized fiber conduit to the instrument transformers located in compartments on that side of the high-tension chamber nearest the generators. The leads are then carried successively through a generator switch and disconnecting knife switches in a compartment immediately below, thence under the floor to the high-tension buses which are placed one above another in a structure between the switch structure and the compartments containing the instrument transformers. On leaving the bus-bars the leads return to the switch structure and pass successively through disconnecting knife switches and an oil break feeder switch, and thence under the floor and up through the middle of the structure containing the feeder instrument transformers. On leaving this structure they are carried overhead for a distance of about 3 ft. and into the terminal bells of the lead-covered paper-insulated cables of the underground conduit system. As a safety precaution two feeders are run to each sub-station. These feeders are taken off of different generator bus sections and are, moreover, carried to their destination by routes which diverge just outside the plant. It may be noted that the only visible portion of the high-tension cables is that between the feeder instrument transformer structure and the terminal bells leading into the underground system. Moreover, the instrument leads and controlling wires connected to the transformers and to the switch motors are carried in iron conduit, so that there is practically no visible wiring in the compartment. Although the wiring is well concealed, there is ample provision for getting at any part of it for repairs or inspection. The bus and switch structures are of glazed brick, and are so constructed that the Alberene stone lining and barriers are readily removable.

It was stated that the switch and bus structures are in separate groups, one for each generator. The switch structures proper are built six switches in a group. One of these, which is centrally located in the group, is the generator switch, while the remaining five around it are in the feeder circuits. By building the switches back to back as shown in the drawing much room was economized, and since the manner in which the interlocking barriers are put together permits access to all the cables in the rear of the disconnecting knife switches, no serious drawbacks were introduced.

The high-tension buses are of 5/8-in. copper rods supported by panels of plate glass, which in turn are supported and held in position by specially designed porcelain feet. On top of the long bus structure are mounted the three oil break switches controlled from the switchboard in the gallery above for sectionalizing the bus-bar into four sections, one for each of the large a. c. generators. As a protection to workmen, disconnecting knife switches are placed in each bus on each side of each oil switch. The only high-tension leads that enter any other portion of the plant than the high-tension chamber are three sets of cables passing from feeder switches to the three 500-kw frequency changers located on the main floor immediately above. These leads, after passing through starting compensators, go direct to the 12,200-volt synchronous motors direct connected to 2300-3980-volt, 60-cycle, three-phase generators which supply current for residence lighting. Field excitation for these machines is regularly furnished by a 150-kw motor generator set installed near by. The frequency changers and the turbines which comprise the 60-cycle generating apparatus are operated in multiple and



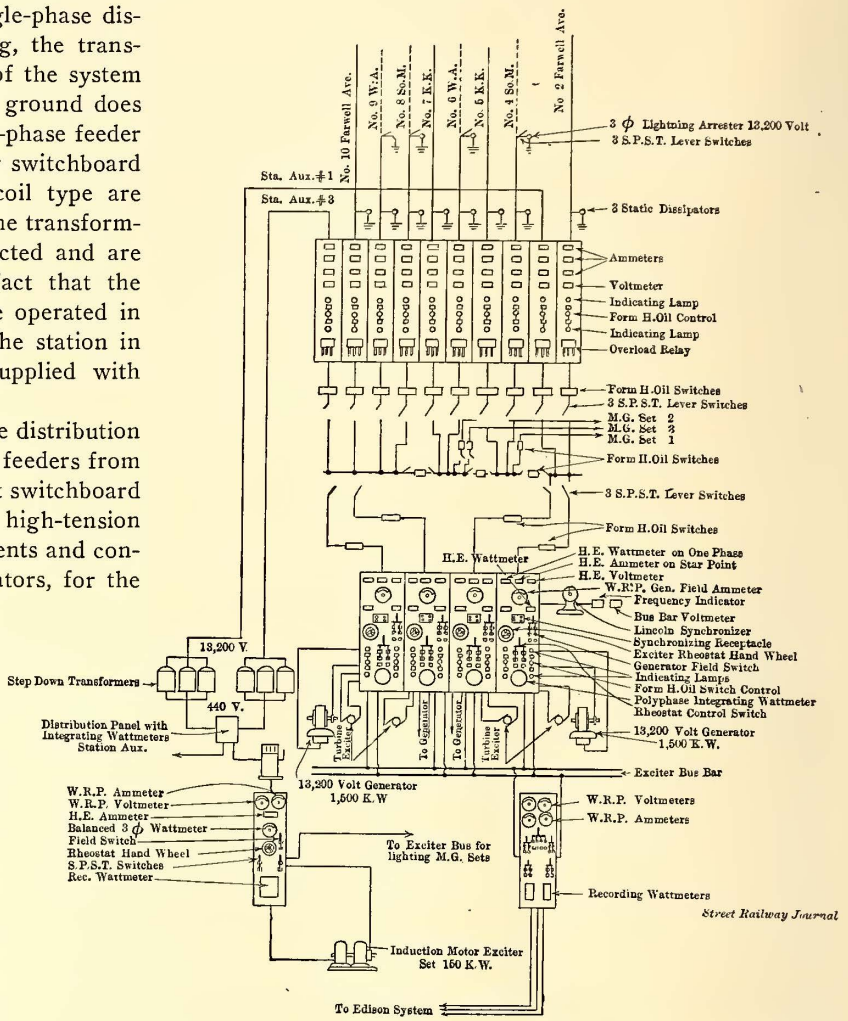

CROSS SECTION, SHOWING HIGH-TENSION WIRING IN BASEMENT OF COMMERCE STREET STATION

are employed for residence lighting and for supplying arc light transformer sub-stations with current. The 60-cycle generators are star-wound and the neutral points of all of them are connected to a common ground which branches out through the residence portion of the city. Single-phase distribution is employed for the residence lighting, the transformers being connected between the one leg of the system and a branch from the common ground. This ground does not return to the switchboard, so that the single-phase feeder panels control but one cable, as in street railway switchboard practice. Voltage regulators of the floating coil type are employed in the single-phase feeder circuits. The transformers in the arc light sub-stations are star-connected and are fed by three-phase transmission lines. The fact that the Curtis turbines and the frequency changers are operated in multiple throws all of the a. c. generators in the station in multiple, since the frequency changers are supplied with current from the large 25-cycle generators.

In addition to the feeder panels for the 60-cycle distribution system and a. c. exciter feeder panel controlling feeders from the Oneida Street station, the alternating current switchboard in the gallery includes the feeder panels for the high-tension feeders in the basement, panels carrying instruments and controlling switches for the four large a. c. generators, for the frequency changers, for the Curtis turbines, and for the motor generator exciter.

The 600-volt direct current switchboard is located in the north end of the switchboard gallery opposite the direct current generators. In addition to twenty-four feeder panels, and two panels controlling heavy feeders from the Oneida Street plant, it contains four generator panels and one transfer panel which is employed in connection with a transfer or extra bus to carry the load around a generator circuit breaker which may be out of order or which is being repaired. This bus in connection with the switches of the Oneida Street feeder panels may also be employed to throw any number of the feeders on the Oneida

heavy cast clamps, which construction avoids the necessity of drilling the bus-bars. The copper car connection between the switch and the circuit breaker on each panel is utilized




WIRING DIAGRAM OF THREE-PHASE, 13,000-VOLT SYSTEM

DIRECT-CURRENT SWITCHBOARD IN NORTH END OF SWITCHBOARD GALLERY

Street railway plant. The rear of the direct current board presents an exceptionally clean appearance. The buses are supported by and are connected to the switch terminals by as a shunt for the ammeter on the front of the panel, and the leads to this meter and the circuit breaker alarm wires are the only ones on the rear of the board.

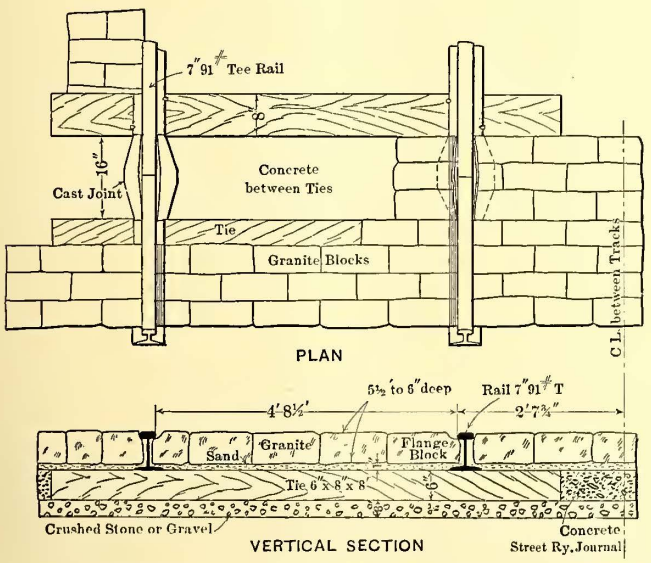
SUB-STATIONS

There are four sub-stations supplied by the Commerce Street plant. Sub-station No. 1, on Kinnikinnick Avenue, contains a 1000-kw General Electric and a 1000-kw National Electric rotary converter. No. 2 sub-station, at Farrell Avenue, contains two 500-kw General Electric rotary converters. The third sub-station is at South Milwaukee and contains a 500-kw General Electric rotary converter and a 150-kw, 440-volt, three-phase induction motor belted to a two-phase, 2400-volt generator which supplies the lighting system of South Milwaukee. Two 1000-kw rotary converters, together with a motor-driven generator similar to that in South Milwaukee, are installed in sub-station No. 4, at West Allis. In this station there will shortly be installed several 33,000-volt, three to two-phase transformers for furnishing current to operate a new single-phase extension of the railway system.

In addition to the a. c. feeders to the separate sub-stations, the Commerce Street plant is connected to all of the sub-stations by heavy feeders going direct to them and also by the trolley system which is interconnected. This interconnection places all of the generating apparatus in the Commerce plant in multiple operation, since the a. c. and d. c. generators are connected through the sub-stations and feeder systems.

## TRACK CONSTRUCTION IN MINNEAPOLIS AND ST. PAUL

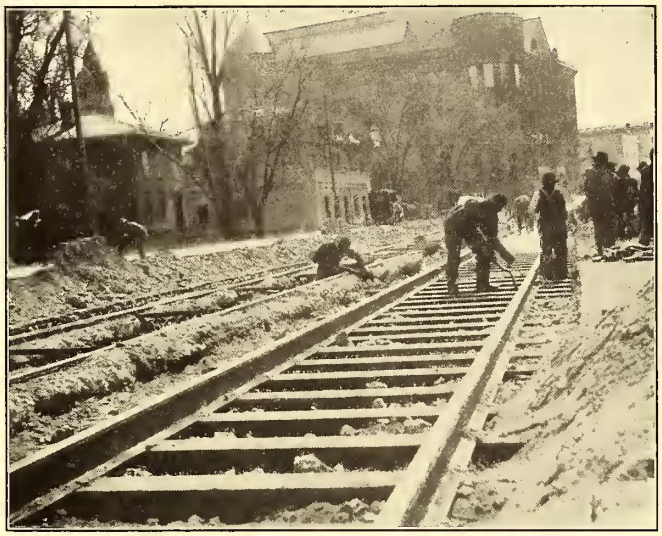
During the past two years the Twin City Rapid Transit Company, of Minneapolis and St. Paul, has been making extensive improvements in its track construction in the two cities in which it operates. Quite a lot of the track has been built after the construction shown in the accompanying drawing. The rails are laid on 6-in. x 8-in. x 8-in. ties resting on crushed




T-RAIL CONSTRUCTION BY THE TWIN CITY RAPID TRANSIT COMPANY

stone or gravel. About 35,000 ties have been creosoted for the new work. On straight track 7-in, 91-lb. T-rails bonded with cast joints are used. The rails of the special work are 110-lb and are of the grooved type. In the cast welding no attempt is made to keep the ball of the rail cool. George L. Wilson, engineer and roadmaster of the system, under whose direction the new work is being carried out, states that no trouble has been experienced with the softening of the ends of rails cast welded several years ago by the method at present in use. On straight track the rails are tied together every 10 ft. by 1-in. tie rods, and special work which is not cast welded is tied with ¼-in. rods. The spaces between ties and beyond each end of them is filled with concrete. Upon this is laid a 1-in. layer of sand, and this underlies granite blocks 5½ ins. to 6 ins. thick. After the blocks are laid, cement is poured between the cracks.

The half-tone illustration accompanying shows a portion of the new track, on Hennepin Avenue, Minneapolis, near the



NEW TRACK CONSTRUCTION ON HENNEPIN AVENUE, MINNEAPOLIS

offices of the company, under construction, and also some of the old track which is being torn out. In building the new track on double-track lines, to interfere with traffic as little as possible, temporary cross-overs are put in about two blocks apart, and one track is used between the cross-overs while the other is being reconstructed.

## CINCINNATI COMMERCIAL MEN ADMIRE ELECTRIC INTERURBAN PROGRESS

About twenty-five members of the Cincinnati Commercial Club made a tour a couple of weeks ago by electric lines from Cincinnati to Dayton, Indianapolis, Muncie, Anderson, and other points in Indiana. This was the annual trade-inducing trip of the organization, and this year it was decided to make the trip on traction lines. The party was under the special charge of D. G. Edwards, of Cincinnati, traffic manager of the Schoepf-McGowan interurban lines in Ohio and Indiana. The traction terminal station at Indianapolis was a revelation to the Cincinnatians, and it was agreed that the business men of the city should use every effort to enable the interurban lines to enter the heart of the city, something that is impossible at present, owing to the use of broad-gage tracks by the city lines of that place.

Of interest to street railway companies throughout Pennsylvania, and indirectly to companies in other States, is the plank in the Pennsylvania State Democratic platform adopted at the recent convention at Harrisburg, at which Lewis Emory, Jr., was nominated for Governor, Jeremiah S. Black for Lieutenant Governor, William T. Creasy for Auditor-General, and John J. Green for Secretary of Internal Affairs, which declares that trolley companies should be given the right to carry freight and express matter. Another feature of the platform is the declaration that all grants of franchises to corporations should be limited to time, purpose and power, and should be reclaimable by the Commonwealth when public interest requires.

## HAULING OF FREIGHT AND OTHER OPERATING FEATURES OF THE INTER-URBAN RAILWAY COMPANY, DES MOINES, IOWA

A number of interurban roads have taken up the matter of hauling of freight in a half-hearted way, but H. H. Polk, president and general manager of the Inter-Urban Railway Company, of Des Moines, Ia., regards the handling of freight of almost as much importance as taking care of passenger traffic, and as a consequence a freight business has been developed from which 30 per cent of the gross receipts of the road is derived. It is due largely to this fact that the road, which passes through a rather sparsely-settled country, is


THE 30-TON LOCOMOTIVE AND CABOOSE USED BY THE INTER-URBAN RAILWAY COMPANY

able to show satisfactory earnings. The general features of the system were described in the Street Railway Journal for June 20, 1903.

The system centers at Des Moines and extends east to Colfax, 23 miles; south to Fort Des Moines, about 5 miles; east to Valley Junction, about six miles, and at the present time northwest to Granger, 18 miles. The Granger division, however, is being extended to Perry, 35 miles, and to Woodward, 27 miles from Des Moines.

The road is one of the few interurban systems in the country having freight agreements with steam roads. Agreements on joint freight rates exist between the company and the Chicago & Great Western, the Iowa Central and the Minneapolis & St. Louis Railroads. These agreements provide for the interchange of cars and enable the road to ship car-load lots from any station along its line to foreign points. The system is well equipped for handling freight, and owns seventy coal cars, twelve box cars, two electric locomotives, and one 50-ton steam locomotive. The passenger stations along the line have been designated to include freight rooms. A terminal freight yard with capacity for 28 cars, with a freight house in connection, has been laid out in Des Moines, and stock yards and other facilities for shipping the products of the farms have been erected along the line. Moreover, several coal mines, tile mills and brick yards are so located that all their output must be handled by the Inter-Urban Railway.

The electric locomotives referred to were built in the shops of the Des Moines City Railway Company, which company is closely connected financially with the Inter-Urban Railway. The larger of the locomotives was completed in the summer of 1905, and was built under the immediate supervision of J. E. Welch, master-mechanic of the shops. It weighs 60,000 lbs. and is equipped with four General Electric 73 motors. The bottom framing is of steel I-beams and of angle bars. In fitting these beams together, the ends of one beam where it butted up against the side of another were accurately machined to a perfect fit. The cab is large and roomy, and in addition to the control apparatus contains the air pump. One of the illustrations shows the interior of the cab, and the master controller of the type-M multiple-unit system with which the locomotive is equipped. Space between the trucks would not permit the contactors and rheostats to be hung under the car, and these are installed above the floor under one of the sloping ends. Access to them is gained through the sliding door shown in the interior view, and the compartment in which they are located is well ventilated by openings in the floor. This locomotive is equipped with both automatic and straight air engineer's valves. Usually the brake cylinder of the locomotive is shut off from the automatic air valve, and automatic air is used only on the freight cars in the train. In this case, straight air is used on the locomotive.

The locomotives handle trains up to fifteen cars in length without difficulty. The box cars and gondolas belonging to the company are of the same construction as used on steam roads. The former are of 40,000 and 50,000 lbs. capacity and measure 34 ft. in length inside. While the company uses cars of steam roads, it does not permit its own gondolas and box cars to leave its line, as much difficulty is experienced in getting them back again. One car has now been gone for more than a year, the company being unable to get it returned. As in steam-road practice, a caboose built similar to those used on steam roads is always drawn in the rear of a freight train. Three men, a motorman, a conductor and a brakeman, constitute a train crew. One of these is required to remain at the rear end of the train, and the caboose is employed largely because of this, as it affords a shelter for the brakeman in cold or inclement weather. It is also utilized to carry tools.

The freight hauled over the line may be divided into two classes, car-load lots and less than car-load lots, the latter being handled chiefly by what are termed express cars. Two of these are in service. One makes two trips per day from

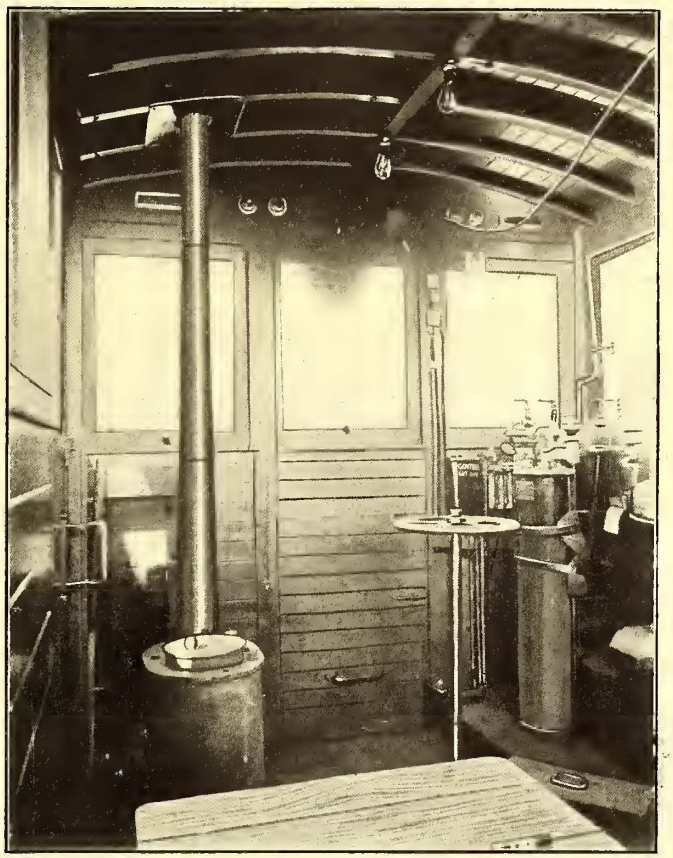
A FREIGHT TRAIN ON THE INTER-URBAN RAILWAY

Des Moines to Colfax, leaving Des Moines at 8:00 a. m. and 3:00 p. m., while the other leaves Des Moines for Granger at 8:00 in the morning and in the afternoon and makes one trip to Valley Junction and one to Fort Des Moines. Car-load lots are handled by the two freight locomotives. One of these is employed almost exclusively for local switching in Des Moines, while the larger ones handle the output of the brick and tile mills and coal mines about Des Moines and

hauls trains to Altoona, Mitchellville and Colfax. The daily capacity of the five mines depending entirely on the Inter-Urban Railway is about five cars each. The handling of the output from these mines, together with that of the Flint Brick yards with a capacity of 100,000 brick per day, and of the Des Moines brick and tile company, serves to keep one locomotive busy a considerable portion of each day. The greater part of the output of all of these is hauled to Des Moines and is distributed to several yards in the city. All the coal for the power plants of the railway systems and of the Edison Electric Light Company, as well as the freight to and from Fort Des Moines, is handled by the road. All deliveries to the Fort are made into the grounds of the reservation, and passenger coaches containing troupes en route to the fort are transferred from the Chicago & Great Western and are hauled inside the reservation. In addition to the freight from manufacturing industries, quite a volume of business is obtained from the farmers. The agreement with the Great Western Railroad enables the Inter-Urban Railway to ship stock in car-load lots from any point on its line direct to Chicago, and to facilitate the loading of stock four stock yards have been built on the line to Granger. The company employs a traveling freight agent to work among the farmers continually. The solicitor makes it his business to associate with the farmers and to get thoroughly acquainted with them. He learns what stock or produce each farmer expects to ship, and about the time these shipments will be made, and as the time for the shipments of stock grows near he makes arrangements to have a stock car at the nearest stock yards at an appointed time. Shipments of hay and grain are taken care of in a similar manner. The solicitor frequently has great difficulty in persuading the farmers to use the line. The farmer must be shown where time will be saved or cost lessened before he will consent to changing over from the steam road. In the matter of shipping stock, the Inter-Urban Railway has a decided advantage over the steam road in that by using it a shorter time is required in getting the stock from the farm to Chicago or into the market where shipment is made. Stock loses weight rapidly after being removed from its accustomed haunts. Often when the steam roads are used a stock car will stand loaded on a siding for several days, due to some error. The Inter-Urban Railway, however, moves the car as soon as the farmer is ready, and this, added to the fact that the long drive to the nearest point on a steam road is avoided, makes the time in transit between the farm and the market several hours shorter. The freight solicitor often obtains business by sending buyers favorably disposed toward the road to farmers who have produce to sell. In addition to soliciting car-load freight business he does much toward increasing the use of the passenger cars by farmers. When it is necessary for the average farmer to go to the city it does not occur to him that it is cheaper in the long run to go on the interurban line, spend probably 75 cents and get back home in two or three hours, than to hitch up a team and consume a day's time for himself and his team in making the same trip. It is the solicitor's duty to impress upon the farmer the fact that his own time as well as that of his team is of such value that it is to his advantage to use the line.

Considerable revenue is derived from carrying small freight packages to the farmers. The fact that telephones are found in almost every farmhouse has been of great assistance in developing this business. Should goods be required from the city the farmer can either telephone his wants direct to the merchant in town or he can save toll by telephoning to the nearest freight agent. This agent in turn will repeat the message over the company's wires to the freight agent in Des Moines, who in turn delivers it to the merchant. When the merchant delivers the goods to the freight house, the farmer is notified through the agents on what car his goods will arrive, so that he can be at the stop nearest his home to receive them.

The line has been of great convenience to the farmers in obtaining repair parts of farm machinery. On one occasion an accident occurred to a threshing machine at work about fifteen miles from Des Moines. Ordinarily a day would have been required to make the repairs. As there were about fifteen men employed the inconvenience and cost attending such a delay would have been considerable. On this occasion, however, the number of the broken part was obtained and the machinery dealer in Des Moines was notified by telephone to send a duplicate part on the Inter-Urban Railway. The result was that the threshing machine was ready



INTERIOR OF LOCOMOTIVE CAB, SHOWING ARRANGEMENT OF CONTROL APPARATUS

for operation in a little more than an hour after the accident.

The company also handles a great deal of milk. Milk tickets are sold at 10 cents for a 10-gallon can. The ticket has a stub attached which pays for the return of the can when empty. The tickets are sold in quantities to the farmers, who simply tie them on to the cans and leave the cans on platforms along the track. No special milk trains are run, but F. S. Eberhart, superintendent of the system, to whom acknowledgment is made for much of this information, states that such trains will most probably be put on in the near future.

Secretary Swenson, of the American Street and Interurban Railway Association, has issued data sheets Nos. 7 and 8, relating respectively to "Promotion of Traffic" and "Municipal Ownership." These sheets are being mailed to the member companies to secure information for the reports of the standing committees on these subjects to be presented at the Columbus convention next October.

## SHOP KINKS AT TOPEKA, KAN.

The new construction work and general features of the Topeka Railway Company, of Topeka, Kan., were described at some length in the Street Railway Journal for Nov. 11, 1905. No mention, however, was made of the shop practice, or of several devices that have been developed in the shops by S. T. French, foreman of the shops, and others of the shop employees.

One of the most interesting of the devices is probably that by which power is employed to operate a hand driven wheel press. The press is of the screw type and was made several years ago by a local machine shop. While the press is required occasionally, it is not used to an extent that would warrant the purchase of a power driven hydraulic press of the later type. Formerly when wheels were removed or pressed on it it was necessary to call all of the shop employees, and sometimes several track men, to work at the lever. To avoid this inconvenience the apparatus shown in Fig. 1 was devised. A rope attached to the press lever passes up over a pulley near the roof and then down and around the drum shown. The drum is keyed to a short shaft, the bearing on one end of which has a vertical motion of a few inches. Pressing down the lever shown pulls this end of the shaft down and the belt is tightened on the driving pulley and the lever of the wheel press is pulled up. Releasing the operating lever allows the wheel press lever to fall by its own weight. The device, while rather crude, results in considerable saving of time and labor.

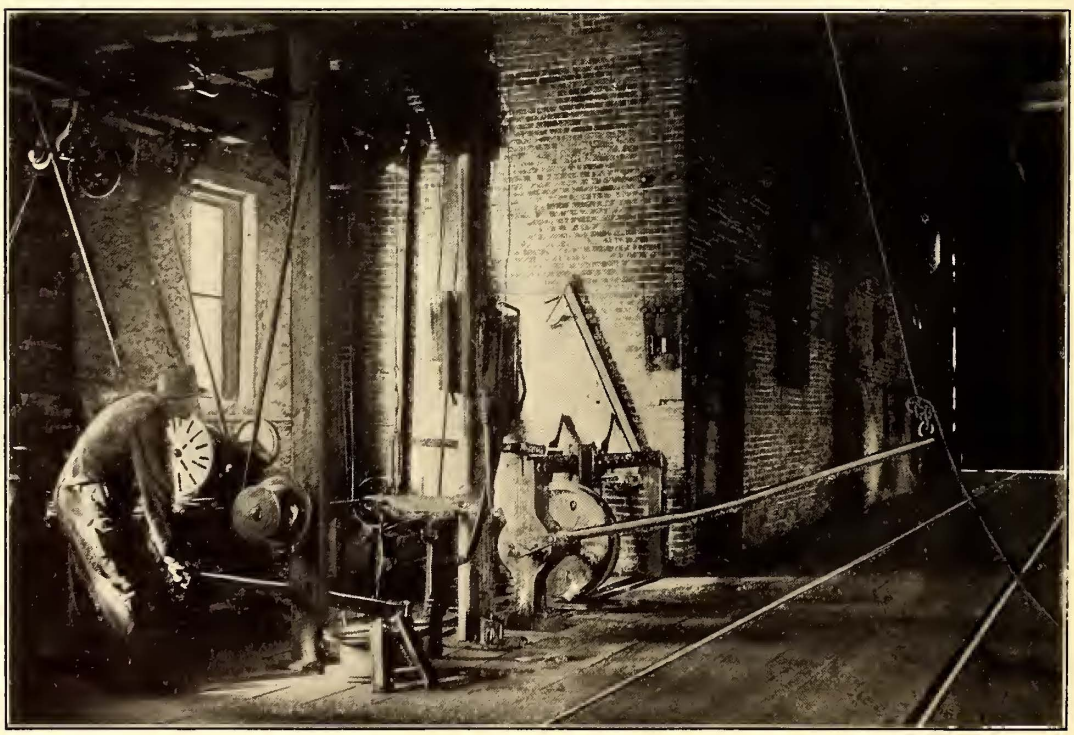


FIG. 1.—DEVICE FOR APPLYING POWER TO A HAND-OPERATED WHEEL PRESS

Some devices for babbitting bearings are shown in Fig. 2. Those for half shells, as well as those for commutator end armature bearings, are made in several sizes. The method of clamping the half shells can be seen in the reproduction. The shell is placed on the half mandrel, the lugs are placed in the oil ways and the cap is then placed over the bearing. The bearing is raised a sufficient amount above the lower block to allow the proper amount of metal to flow over the end and the whole is then clamped in position by throwing the lever down.

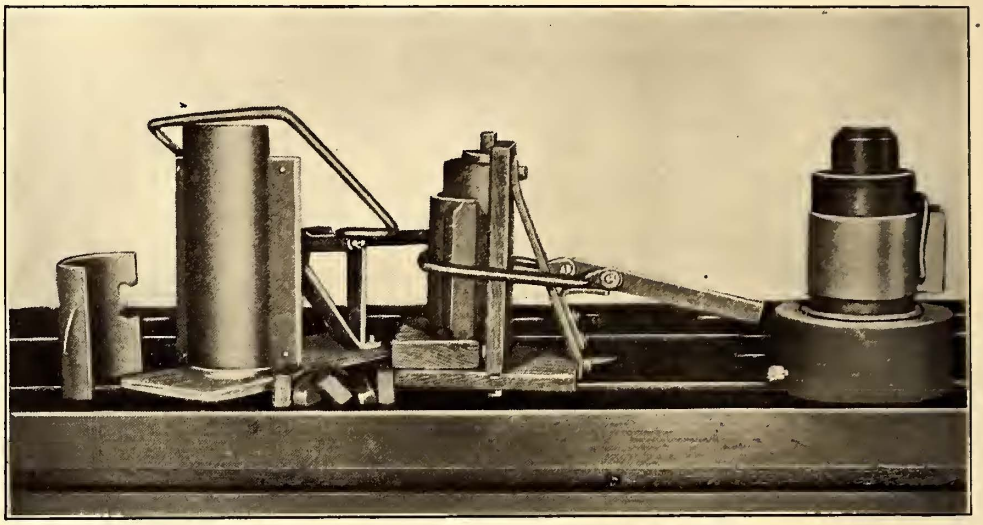


FIG. 2.—DEVICE FOR BABBITTING BEARINGS

For babbitting round bearings a cast-iron block is turned to receive the head of the bearing. A mandrel with a slight taper fits snugly in a hole through the center and is held in position by a set screw. The oil-ways are filled with lugs which are held in position by a sheet iron band. After the babbitt has been poured the set screw is loosened and one or two slight taps with a hammer drives the mandrel down through a hole in the support for the cast iron block. The bearing can then be removed.

The Topeka shop is equipped with two drill presses, one of which was very seldom used. This has been fitted in the manner shown in Fig. 3, with a jig for boring bearings. Several collars or bushings of different sizes are provided, so that one base block receives all the different diameters of bearings used. The bushings extend around the bearing more than half the circumference and this enables them to hold the two halves of split bearings in the proper position. The cutter bar fits snugly through the center hole in the table of the drill press and is thereby held firmly in position. After the tool boring the inside of the bearing to the proper diameter has been run through the bearing, the cutter bar is lowered a few inches more and the face of the bearing is trimmed by

the upper and longer tool shown in the illustration.

A rather unusual but effective method of testing the wear of armature bearings is practiced by means of the device shown in Fig 4. This gage is clamped over the flange of one of the I-beams, extending across the pit in such a manner that

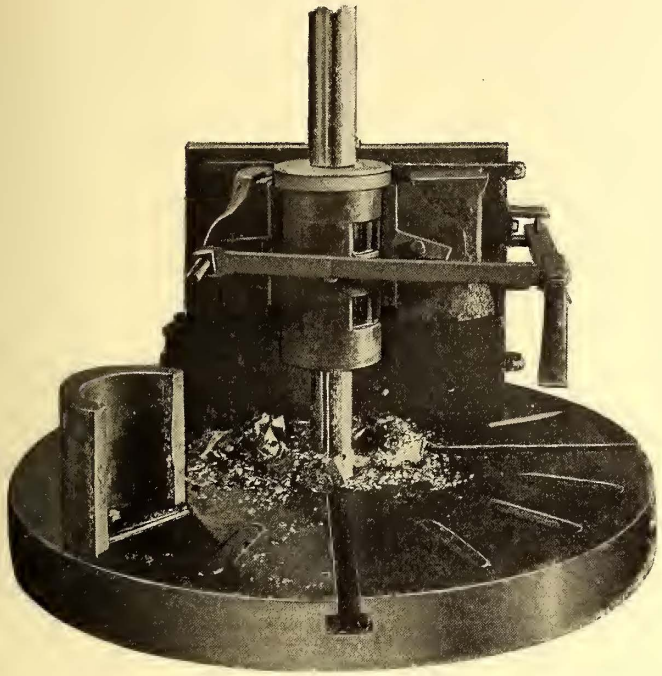


FIG. 3.—JIG AND CUTTER BAR FOR BORING BEARINGS ON A DRILL PRESS

it can be slid from one side to the other of the pit. The car upon which the bearings are to be tested is run so that the armature shaft is immediately over the device, and the head of the upright is placed under the shaft. On moving the lever and raising the armature the amount of play in the bearings can be determined. By placing the head under the collar of the bearings themselves and operating the lever it is easy to

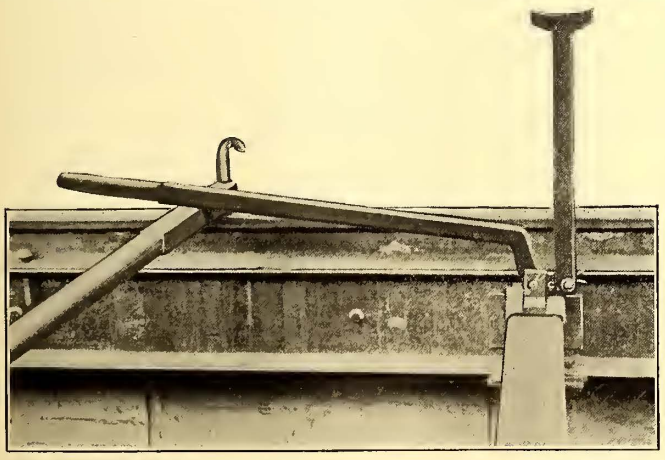


FIG. 4.—APPARATUS FOR TESTING ARMATURE BEARINGS

determine whether or not the bearings are loose in their housings.

The end of the lever of the gage illustrated in Fig. 4 is shown as resting upon a bar with a peculiarly shaped hook on the end. This bar is used to close the lower shell of the motors. The hook is caught in the handle of the shell which is nearest the hinges. The bar passes under the shell and extends out beyond a sufficient distance to give the proper leverage. When the lever is raised and the shell is closed a pit plank placed under the bar holds it in position until a bolt can be inserted. The use of the bar displaces the slower method of raising the lower shell by means of chain falls.

Armature pit jacks of various kinds have frequently been illustrated in these columns, but one of unusual design is employed in Topeka. The jack consists of a wagon mounted on a truck with three wheels. It is intended for use in the pit only, and as the pit has a concrete floor there is no necessity for a track. Armatures are carried to and from the winding room by a cart which is run over the pit. The jack of the armature wagon is raised to receive the armature in the basket at the head. After the jack is lowered, the truck is run under the motor. The armature is then raised to its position in the motor. All lifting of armatures is thereby avoided. The armature wagon is provided with a brake by means of which the wheels may be locked when an armature is being raised or lowered.

## PROFIT-SHARING ON FRENCH RAILWAYS

Consul J. C. Covert reports from Lyons that a profit-sharing system has been adopted by the street railways of that French city. The amount distributed will be $500 for each franc (19.3 cents) dividend earned by the company over 35 francs ($6.75) per share. The shares are 500 francs. This year the company earned 40 francs per share. As a consequence $2,500 will go to the employees, two-thirds of the sum to their general relief fund, and one-third to personal relief for sickness. The company also makes other stipulated contribu-

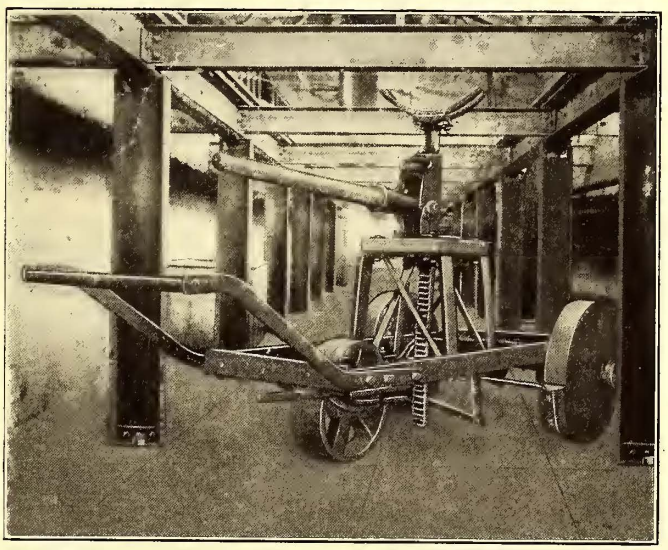


FIG. 5.—WAGON FOR HANDLING ARMATURES IN THE PIT

tions to the relief funds, the full details of the agreement being on file at the Bureau of Manufactures. The employees bind themselves not to ask for increase in wages for three years. Heretofore there have been frequent strikes.

The Old Colony Street Railway Company has redistricted its system, dividing it into two districts and appointing a superintendent over each, to have absolute control of his territory, in place of the former system of having the whole system looked over by one man, with assistants. John T. Conway, who has been assistant superintendent of the Old Colony system, was appointed superintendent of District 1, which is everything north of turnout No. 4, half-way between Brockton and Taunton and north from Bridgewater Center. George F. Seibel, who has been superintendent, was appointed superintendent of District No. 2, with headquarters in Taunton. The new title gives Mr. Conway official jurisdiction over the Brockton, Quincy and Hyde Park divisions.

## A NOVEL WHEEL-HANDLING DEVICE FOR PIT WORK

To facilitate the removal of wheels from trucks, C. M. Feist, master mechanic of the Sioux City Traction Company, Sioux City, Ia., has designed and built the device shown in the illustrations. This tool is mounted on a frame about 14 ft. long, which is provided with wheels and runs on a track built in the pit. A crank provided with a pinion operates a gear wheel by means of a shaft running the full length of the frame. Turning the crank winds up on each end of the shaft a chain attached to a system of levers and raises the carrier on which the wheels are placed. The lever arrangement is of a rather unique design. The arm at each end of the carriage which is pulled down by the chain is bolted to a second arm at an angle of about 135 degs. The framework, which consists of the two arms, is supported by and turns on a rod at the outer end of the second arm. To the other end of this second arm on each side of the machine is hinged a bar, the upper end of which is attached to the carrier supporting the wheels. The carrier is braced laterally by hinged braces underneath. When a pair of wheels is to be changed, the wheels to be removed are run on to a removable section of the track and the truck jacked up to such a height that the wheels clear the removable section. The carriage is then run under the car and the carrier raised by means of the crank until it supports the axle to be taken out. The sections of the track are then allowed to slide outward to clear the wheel and the end of the axle. After the proper bolts have been removed, the carrier is lowered with the wheels and the wheels are turned on the pivoted carriage as shown in Fig. 2, so that they clear the pit timbers. The carriage with the wheels is then pushed out from underneath the car and the wheels, after being raised and turned in the proper position, as shown in Fig. 3, are set upon the track. The new pair of wheels may then be picked up and elevated into position under the car by means of the device.

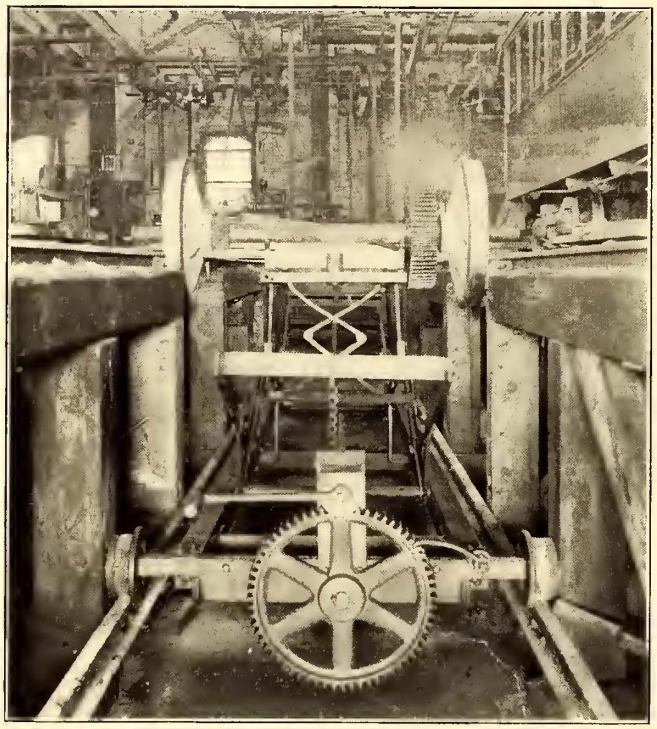


FIG. 1.—WHEEL-HANDLING APPARATUS IN PIT

Danger to the operator is avoided by the fact that he is 7 ft. from the wheels being handled. The gear wheel is provided with a dog, which holds the wheels at any height desired. The movable section of the track has been so built that no bolts are required to hold the short rails in place. They can be removed only by being slid back from the pit, and are ordinarily held in place by a trap door in the floor immediately behind them. The device, Mr. Feist states, has greatly facilitated the removal of wheels, and has well paid for itself in the reduction of the time required to change wheels. The time ordinarily required to drop a pair of wheels, after the necessary truck parts have been removed, and set them on the track ahead of the cars, is about 3 minutes. One feature recommending the device strongly is that a wide range of lift is obtained without any portion of it extending beneath the floor of the pit.

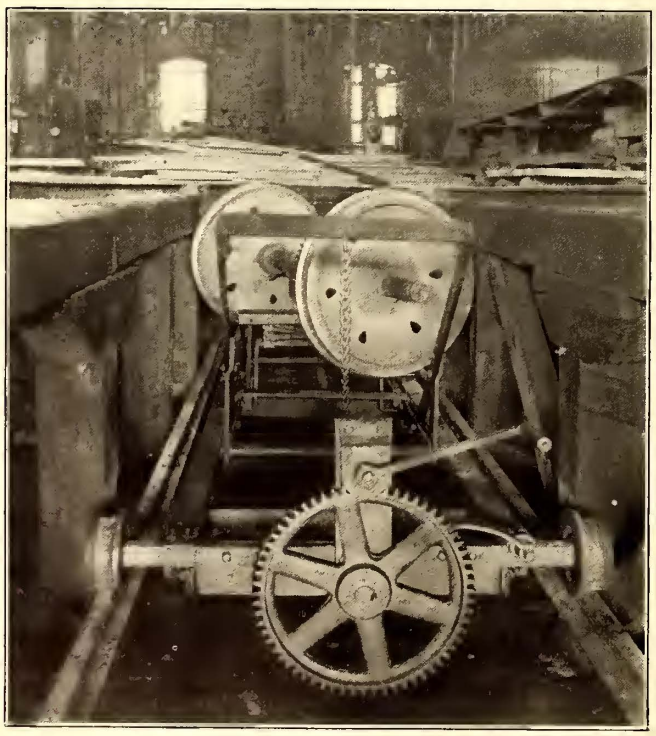


FIG. 2.—WHEELS TURNED ON THE PIVOTED CARRIAGE

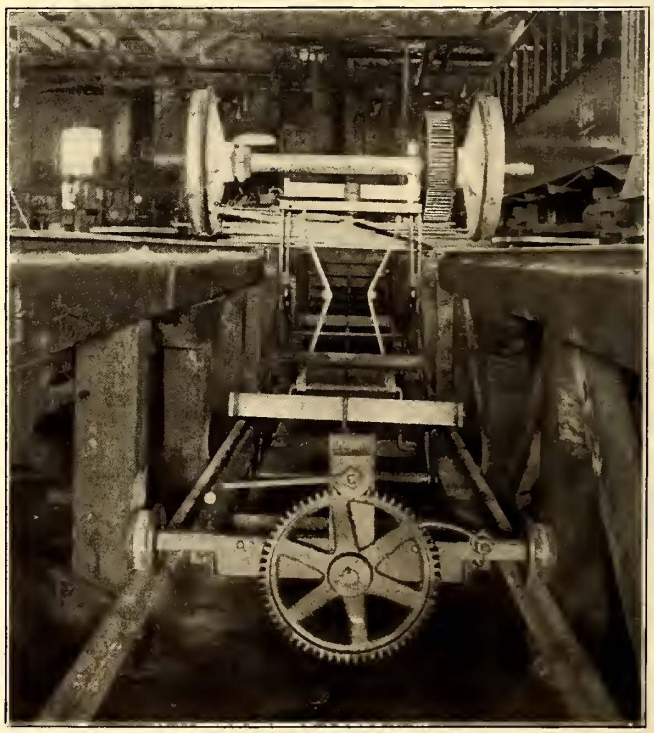


FIG. 3.—WHEELS SET UPON THE TRACK

## AN INTERURBAN CAR TEST ON THE BOSTON & WORCESTER STREET RAILWAY

An exhaustive car test for thesis work was performed on the Boston & Worcester Street Railway in April of this year by Messrs. Leroy S. Ford and W. Chester Redding, post graduate students in the department of electrical engineering, Worcester Polytechnic Institute, under the general direction of Prof. A. S. Richey. The tests were unusually successful and conclusive. The only similar tests that have been run in New England were those conducted by the Boston Elevated Railway Company on its lines in January, 1905. Other tests have been run by taking two-second readings, but this method has caused no little confusion, and a large amount of time was consumed in plotting curves and working up results. The continuous semi-autographic method of testing was therefore adopted.

The Boston & Worcester line is doubtless familiar to the readers of this journal as the principal high-speed electric trunk line of New England. It connects the cities named in its title by a forty-mile route, which is covered in regular service in about 2 hours and 15 minutes. The entire line is double tracked with the exception of about 5 miles between Framingham Junction and White's Corner, and this single-track section is now being double tracked by the company's construction forces. As a whole the road contains too many grades and curves conducive to a very high-speed line. There are only five stretches of level track, each about 1000 ft. in length, the longest of these being 1700 ft., located west of Milk Street, Westboro. The road also contains seventeen grades of 5 per cent, seventeen of 6 per cent, eight of 4 per cent, and three of 8½ per cent on the route. Power is generated at a central plant in South Framingham, sub-stations being located at Wellesley, South Framingham and Wellesley Hills. Current is generated at 13,200 volts and delivered to the cars through the usual rotary conversion, at 625 volts.

The car tested was No. 101, a regular closed car of the company. Its length over all was 92 ft. 6 ins., and its seating capacity fifty. The car was equipped with four GE-57 motors, rated at 50 hp each. Each motor weighs 2972 lbs., and the gear ratio was 21 to 64, or 3.04. The car wheels were 34 ins. in diameter. The weight of the car was 25 tons, making, with fifteen operators and instruments, 26.5 tons. About 1000 lbs. of apparatus was used in making the tests. General Electric type-M control was used, and also straight air brakes, the normal reservoir pressure being 80 lbs. per sq. in. Ten runs were made in all, and the motorman and conductor were instructed to handle the car in a manner which would correspond as nearly as possible to an actual service run, keeping to the regular schedule speed. The track was dry and in good condition, with fair weather and an average temperature of 15 deg. C.

The most important results desired were the car motor power consumption per car mile and per ton mile, together with the air-pump motor consumption per car mile, and the consumption of the control system for all the runs; the speed of the car at all points, and the current at all points, voltage of the trolley and that applied to one motor; a brake cylinder pressure record, time and location of observations. Acceleration was calculated from the speed curves. About 300 definite locations were recorded on each run. The record paper was fed from a roll by an electromagnetic notching mechanism driven through relay contacts by one of two sets of six dry cells. One set of cells was allowed to recuperate while the other set was on duty. Indicating instrument readings were in the main followed by operators recording to the disc and pencil method which has now become generally familiar in car tests. A General Electric recording ammeter, time marker clock, Weston magneto for speeds, and voltmeters and ammeters were used, together with two Thomson recording wattmeters, one for total power, and the other for the $I^2R$ losses in the field of No. 3 motor. Two small wattmeters were also used in the central circuit and air motor circuit respectively. The magneto was calibrated from the speed curves of each run by calculating from portions of the curves where the distance traveled was known.

The tests covered a total distance of about 386 miles. The highest speed reached was 56 m. p h., 40 m. p. h. being the highest speed attained on the level under power. The average acceleration on the city service was 1.47 m. p. h. per second, and on interurban runs 1.63 m. p. h. per second. Corresponding values of retardation are 2.12 and 2.77 m. p. h. per second. The calculated temperature rise by resistance for the fields of No. 3 motor was 24 deg. higher than the thermometer readings, showing that the latter values are much lower than the actual temperature of the copper. The control system consumed only 0.66 per cent of the total power. On the whole, the apparatus worked very satisfactorily. At 40 m. p. h. when running on level track the car required 150 amp. at 555 volts.

In the acceleration tests on level track, when it required 18 seconds to reach the last point of the controller, full speed was reached in from 4 to 79 seconds, the distance varying from 0.53 to 0.57 miles. Full speed varied from 34.2 to 37.2 m. p. h., and the power consumption in kw-hours varied from 1.96 to 2.04.

A summary of the power consumption for different sections of the run for the ten tests is given in Table I.

TABLE I., SHOWING POWER CONSUMPTION

| | | City Hall to Lake Junction | Lake Junction to Westboro Car Barn. | Westboro Car Barn Tremont No. 3. (Fram.) | Tremont No. 3 to Wellesley Car Barn. | Wellesley Car Barn to Chestnut Hill. | Chestnut Hill to Park Square, Boston. |
|---|---|---|---|---|---|---|---|
| Distance | Eastbd. | 3.06m; | 5.2 m. | 11.39m. | 11.35m. | 4.22m. | 3.83m. |
| | Westbd. | 3.56m. | | | | | |
| Kw h. per car mile. | Eastbd. | 3.69 | 2.91 | 2.67 | 2.30 | 3.13 | 2.37 |
| | Westbd. | 3.79 | 3.37 | 2.94 | 2.67 | 2.84 | 3.87 |
| Watt hrs. per ton mile | Eastbd. | 139 | 109 | 98 | 87 | 118 | 89 |
| | Westbd. | 143 | 119 | 111 | 103 | 120 | 127 |
| $\sqrt{\text{mean}^2 I}$ No. 3 motor | Eastbd. | 56.9 | 56.9 | 52.8 | 50.0 | 61.3 | 51.8 |
| | Westbd. | 59.1 | 64.1 | 56.3 | 50.8 | 58.6 | 59.1 |
| Average speed m. p. h. | Eastbd. | 11.8 | 25.2 | 21.3 | 20.7 | 20.1 | 11.6 |
| | Westbd. | 12.0 | 23.0 | 20.3 | 20.2 | 18.3 | 11.4 |
| Per cent total power, air pump mtr. | Eastbd. | 1.91 | 1.91 | 0.75 | 0.94 | 0.57 | 1.63 |
| | Westbd. | 1.52 | 0.79 | 0.87 | 1.01 | 2.28 | 0.91 |

At Coolidge Avenue, on runs into Boston, the control system is changed for slow running time. On low speed there are only two running points on the controller, namely, four motors in series and two sets of motors in parallel. As the car approaches Boston the trolley voltage becomes much more constant, on account of the greater number of feeders tapped in on the trolley. The kw-hour consumption per car mile is higher on the city section than on the interurban, on account of the schedule speed being too slow for the equipment.

A summary of the stops, brake and power applications for the ten runs is given in table II.:

TABLE II.—SUMMARY OF STOPS

| Run No. | Worcester City Hall to Lake Junction. | | | Lake Junction to Chestnut Hill. | | | Chestnut Hill to Park Square, Boston. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Complete Stops. | Brakes Applied. | Power Applied. | Complete Stops. | Brakes Applied. | Power Applied. | Complete Stops. | Brakes Applied. | Power Applied. |
| 1 | 14 | 27 | 55 | 40 | 84 | 106 | 14 | 37 | 57 |
| 2 | 12 | 27 | 43 | 37 | 71 | 103 | 29 | 41 | 55 |
| 3 | 15 | 32 | 46 | 17 | 74 | 94 | .. | .. | .. |
| 4 | 4 | 26 | 34 | 26 | 58 | 85 | .. | .. | .. |
| 5 | 10 | 33 | 38 | 26 | 71 | 103 | 20 | 47 | 53 |
| 6 | 8 | 23 | 33 | 40 | 77 | 111 | 24 | 41 | 65 |
| 7 | 7 | 32 | 38 | 24 | 68 | 87 | .. | .. | .. |
| 8 | 5 | 26 | 39 | 19 | 54 | 83 | .. | .. | .. |
| 9 | 5 | 34 | 34 | 25 | 83 | 102 | 15 | 36 | 48 |
| 10 | 4 | 23 | 57 | 27 | 70 | 102 | 10 | 35 | 33 |

Between the Worcester City Hall and Lake Junction, the car under test was operated upon the tracks of the Worcester Consolidated Street Railway Company, and between Chestnut Hill and Park Square upon the system of the Boston Elevated Railway Company. The Boston & Worcester operates over its own tracks for a distance of 31.16 miles.

As a part of a thesis upon "A Study of Train Resistance from Data of Electric Car Tests," Charles H. Gilbert analyzed the Boston & Worcester curves obtained by Messrs. Ford and Redding, tabulating his results between speeds of 21.5 and 39.5 m. p. h. These average values were as follows:

| Miles per hour | 21.5 | 29. | 32.5 | 35. | 36. | 37.5 | 39.5 |
|---|---|---|---|---|---|---|---|
| Lbs. per ton | 13.3 | 19.15 | 22.16 | 22.9 | 21.5 | 21.6 | 21. |

Mr. Gilbert pointed out that from the tables of results drawn from the Boston & Worcester car runs it may seem as if the values of train resistance were very erratic for the same speeds. A large number of factors enter the problem, and the grades in particular are a very important feature of the calculations. Even a slight mistake in the plotting of these on the run sheets would make considerable difference in the value of train resistance, as the power required for a 1 per cent grade is 20 lbs. per ton. The very variable alignment and grade of the Boston & Worcester made it especially difficult to secure the fixed conditions necessary to accurate results. Figures of closer consistency were secured by Mr. Gilbert in analyzing a large number of car runs upon the system of the Indiana Union Traction Company.

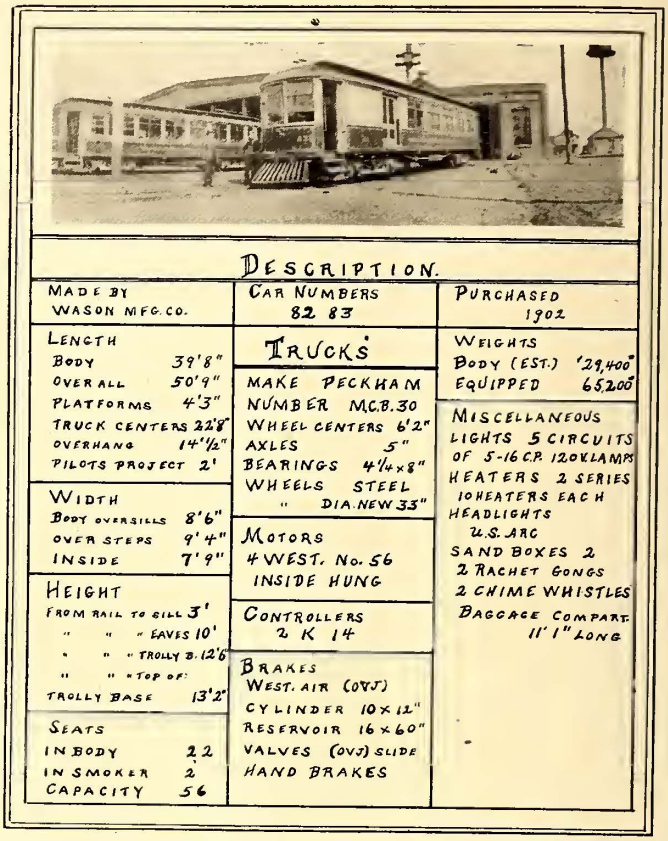
## KEEPING CAR RECORDS

If a road has a number of different types of rolling stock, it becomes desirable to keep descriptions of each type of car in some form for quick reference so when information is wanted concerning the measurements, type or appearance of any particular car the data can be readily furnished without looking up the original plans.

A correspondent submits a method for keeping these data that it is believed offers a satisfactory means not only of filing in convenient shape descriptions of the rolling stock, but also of showing at a glance "what the car looks like."

The scheme is to keep blue print sheets for each type of equipment in the form shown herewith. The sheets are 8¼ ins. x 10½ ins. It will be noticed each sheet contains a condensed description of the car, but the new feature of the suggestion consists in placing at the top of the sheet a blue-print photograph of the particular equipment. This photograph is not pasted onto the sheet, as it is believed the record becomes too bulky if the actual photographic prints are attached to the sheets. The method of getting the prints on the records is as follows. The descriptions as shown are first made out on tracing cloth, and a space is then cut from the tracing at the top of sufficient size to accommodate the picture. The photographs are taken on film negatives, preferably with a panorama kodak (to get the full length). After the film is developed, the film itself is pasted into the open space on the tracing and a blue print is then made of the tracing and film at one operation, giving the complete descriptive and photographic record on one sheet. It required considerable experimenting to get just the right development in the films for this purpose, as very dark film, or a film too light, will not make a satisfactory blue-print picture. The best results are secured when the film is a trifle undeveloped; that is, it is taken out of the bath before it is as dark as would be required for an ordinary solio or velox print.

The same correspondent also suggests the importance of keeping "individual car records" showing separate accounts of the maintenance expenses of each car, and each part of the car. For this purpose he enters the individual records on a sheet which is divided into fourteen sections as follows: One section for each of the four motors; one section for each of



DESCRIPTION.

| | | |
|---|---|---|
| MADE BY WASON MFG. CO. | CAR NUMBERS 82 83 | PURCHASED 1902 |
| LENGTH<br>BODY 39'8"<br>OVER ALL 50'9"<br>PLATFORMS 4'3"<br>TRUCK CENTERS 22'8"<br>OVERHANG 14'½"<br>PILOTS PROJECT 2' | TRUCKS<br>MAKE PECKHAM<br>NUMBER M.C.B. 30<br>WHEEL CENTERS 6'2"<br>AXLES 5"<br>BEARINGS 4¼x8"<br>WHEELS STEEL<br>" DIA. NEW 33" | WEIGHTS<br>BODY (EST.) 29,400#<br>EQUIPPED 65,200# |
| WIDTH<br>BODY OVERSILLS 8'6"<br>OVER STEPS 9'4"<br>INSIDE 7'9" | MOTORS<br>4 WEST. No. 56<br>INSIDE HUNG | MISCELLANEOUS<br>LIGHTS 5 CIRCUITS OF 5-16 C.P. 120 V. LAMPS<br>HEATERS 2 SERIES 10 HEATERS EACH<br>HEADLIGHTS U.S. ARC<br>SAND BOXES 2<br>2 RACHET GONGS<br>2 CHIME WHISTLES<br>BAGGAGE COMPART. 11'1" LONG |
| HEIGHT<br>FROM RAIL TO SILL 3'<br>" " " EAVES 10'<br>" " " TROLLY B. 12'6"<br>" " " TOP OF TROLLY BASE 13'2" | CONTROLLERS<br>2 K 14 | |
| SEATS<br>IN BODY 22<br>IN SMOKER 2<br>CAPACITY 56 | BRAKES<br>WEST. AIR (OVJ)<br>CYLINDER 10x12"<br>RESERVOIR 16x60"<br>VALVES (OVJ) SLIDE<br>HAND BRAKES | |

SAMPLE SHEET, SHOWING METHOD OF KEEPING CAR DATA

the two trucks; two sections for controllers, and one section for each of the additional items, brakes, body, trolleys, miscellaneous mileage and totals.

For a year's record the same blanks can be used, and the totals for each month of the year entered thereon, thus giving the cost for each particular part of a car for the entire year. Although this takes considerable labor and for a large road would occupy the time of one clerk, it gives the management an accurate idea of the cost of every car on the line, and is believed to be of sufficient value to warrant the expense.

It is a well-known fact that no two cars "stand up" under ordinary service exactly alike, even though they are built and equipped in duplicate. This may be due in some measure to the men who operate the cars, but it very frequently happens that it is due to some defect in the equipment which is not easily located. In such cases the record referred to will show weak places, as the maintenance items, repeated several months in succession and covering the same part of the car, will naturally lead to investigations as to the particular cause of the high figures.

The Detroit, Monroe & Toledo Short Line, acting in conjunction with the Detroit United Railways, has commenced the operation of through limited trains from Toledo to Mt. Clemens, Mich., by way of Detroit. Some very fine new cars have been ordered for this service. The double tracking of the Short Line is being pushed and will be completed this year. It will be the first double-track line in the district.

## TRUCKS FOR THE HUDSON COMPANIES' CARS

The American Locomotive Company is preparing designs for fifty motor and fifty trailer trucks ordered from it by the Hudson Companies. The preliminary specifications from which the designs are being made were prepared by L. B. Stillwell, consulting engineer of the Hudson Companies, having this matter in charge, and the designs of these trucks will be made in consultation with him. Each motor truck is designed to carry two General Electric Company's No. 76 motors. The motor suspension will be of the nose type, and a motor will be geared to one wheel on each axle, the wheel hub being extended to take the gear for the motor. Both motor and trailer trucks will be of the bar frame swinging bolster type. The bolsters of rolled steel float between transoms of channel iron with freedom to move vertically, and are suspended by four three-point (or stable equilibrium) hangers. The long three-point hangers allow the bolsters a good lateral motion and utilize the weight of the trucks to restore the hangers to their proper position without the use of springs. In this way that pendulum motion of the car body which is so distressing to passengers is eliminated. The trucks will be very similar in design to those built by the American Locomotive Company for the Schenectady Railway Company which have been so satisfactory. The specifications for the trucks are as follows:

MOTOR TRUCKS

Gage of track, 4 ft. 8½ ins.
Wheel base, 6 ft. 6 ins.
Length over all, 10 ft. 6½ ins.
Transverse center of frame, 6 ft. 4 ins.
Load carried at center plate, total, 28,000 lbs.
Weight of truck without motor, about 10,500 lbs.
Wheels, 34¼ ins.
Journal bearings, 5 ins. x 9½ ins.
Transoms, 10-in. channel iron.
Bolsters, rolled steel.
Frames, wrought iron.

TRAILER TRUCKS

Gage of track, 4 ft. 8½ ins.
Wheel base, 5 ft. 6 ins.
Length over all, 8 ft. 5 ins.
Transverse centers of frames, 6 ft. 4 ins.
Load carried at center plate, 28,000 lbs.
Weight of truck, about 9000 lbs.
Wheels, 30 ins.
Journal bearings, 4¼ ins. x 9½ ins.
Frames, wrought iron.
Transoms, 9-in. channel iron.
Bolsters, rolled steel.

## STANDARDIZATION OF BRAKE SHOES BY THE AMERICAN STREET & INTERURBAN ENGINEERING ASSOCIATION

The committee on standardization of the American Street & Interurban Engineering Association has issued a circular on the subject of brake shoes, upon which data are desired. The circular is being sent to all members of the association by Secretary Swenson, to whom replies should be directed. The circular states that committees from both the "American" and the "Engineering" Associations were appointed at the 1905 conventions to investigate the general problem of standardization and to undertake such work of this nature as might be considered advisable at the present time.

The active work of making the standards devolves upon the Engineering Association committee. This committee has decided to devote its attention at present to the standardization of brake shoes, journals and journal boxes, tread and flange wheels, and rails for street and interurban railways. Considerable work has been done along all four lines of standardization, but the present communication relates only to the subject of brake shoes. The information secured from the data sheet will be carefully collated by the engineering committee, and, together with other material upon this subject, will form the basis of the report of this committee on the standardization of brake shoes. The letter is signed by H. Wallerstedt, chairman; H. A. Benedict, W. H. Evans, H. B. Fleming, J. M. Larned, F. H. Lincoln and Paul Winsor, members of the Engineering Association committee on standardization.

The data sheet follows:

American Street and Interurban Railway Association
60 Wall Street, New York

Office of the Secretary

American Street and Interurban Railway Engineering Association

Committee on Standardization

Brake Shoes

Data Sheet No. 9. July, 1906.

1. Company .....
2. City .....(3) State .....
4. Diameter of Wheels:
   Motor Trucks.
   On motor axle (a) New.....(b) Worn out.....
   On pony axle (a) New.....(b) Worn out.....
   Trailer Trucks.
   (a) New .....(b) Worn out .....
   (Give outline sketch with dimensions of wheel tread and flange.)
5. Brake Shoes:
   Average Weight.
   Flanged (a) When new.....(b) When removed.....
   Unflanged (a) When new.....(b) When removed.....
   Combined Head and Shoe, Flanged (a) When new.....
   Combined Head and Shoe, Flanged (b) When removed.....
   Combined Head and Shoe, Unflanged (a) When new.....
   Combined Head and Shoe, Unflanged (b) When removed.....
   Percentage Scrap.
   Flanged .....Unflanged .....
   Combined Head and Shoe, Flanged.....
   Combined Head and Shoe, Unflanged.....
   Outline Sketch. Give outline sketch or blue print showing full sized dimensions of combined brake-shoe and head. If separate, show sketches with dimensions for both brake-shoe and head. If key is used, give separate sketch of key, with dimensions.
   Dimensions (in inches).
   (a) Length.....(b) Width (over all) Flanged.....
   (c) Width (over all) Unflanged.....(d) Depth of groove in Flange.....
   (e) Thickness when new.....
   (f) Maximum thickness that clearances will permit on new wheel—
   (1) Inside hung .....(2) Outside hung.....
   Manner of Hanging.
   Motor Trucks (a) Inside hung.....(b) Outside hung.....
   Trailer Trucks (a) Inside hung.....(b) Outside hung.....
6. Brake Head:
   Kind of Metal (a) Motor Trucks.....(b) Trailer Trucks.....
7. Suggested Standard. Kindly send dimensioned sketch showing what you consider would be a good standard form of brake-shoe and head.
   Remarks. Kindly put additional data and suggestions on a separate sheet and attach it to the data sheet.
   Signed .....
   Title .....

Notice.—This information blank is sent you in duplicate form. Please fill in the information asked for at your earliest convenience, and return one copy to Bernard V. Swenson, secretary, American Street & Interurban Railway Association, 60 Wall Street, New York City. You will receive a bulletin later announcing the results of this investigation.

## TROLLEY BASEBALL LEAGUE FOR WESTERN OHIO

The Western Ohio Railway Company is taking an active interest in the promotion of a trolley baseball league to include teams in Lima, Findlay, Wapakoneta, St. Marys, Delphos, Piqua and Sidney. All the towns mentioned are located on the company's system, and the company has agreed to furnish free transportation which will permit the players to return to their home city nightly if they desire. It is the intention to have a fall circuit, and many of the games will be played in connection with the circuit of county fairs operated in these towns each year.

## NEW FORM OF CONVERTIBLE CAR FOR SYRACUSE

The type of car adopted last year by the Cleveland Electric Company, after much experimenting, has caused a great deal of interest on account of its embodying a number of features differing radically from standard practice. It has evidently met the requirements in Cleveland, as a second lot of fifty cars has lately been put on the lines. Within the last few weeks the Syracuse Rapid Transit Company has put in operation ten cars nearly identical in design and dimensions. The cars were built by the G. C. Kuhlman Car Company, of Cleveland, under the Brill patents. They are convertible on one side only, as they are intended for operation

CONVERTIBLE CAR FOR SUMMER SERVICE

in one direction. The Brill Company has designed and built a number of styles of cars with the convertible system on one side only, but the type built for Cleveland and Syracuse seems to be the most successful form, for the reason that it includes a seating arrangement which is a combination of the longitudinal and transverse seats. The left side of the car, or the side opposite that which has the sliding sashes and panels, has the standard type of built-in panels and drop-window sashes; against this side are placed longitudinal seats in sections accommodating three passengers each. The distance between the ends of the transverse seats and the cushions of the longitudinal seats is 33 ins.; in other words, there is a gain of about 15 ins. over the aisle width of a car with transverse seats on both sides.

When the convertible side is opened, the longitudinal seats are swung around into line with the transverse seats and securely connected thereto, forming continuous seats across the car and accommodating five passengers each. The seating capacity when the car is opened is 65 passengers. This includes seats across the doors at the ends. The convertible feature is of the "grooveless-post" type, which has frequently been described in these pages, and includes a modification of the "Narragansett" type of sill step. The arrangement is somewhat different from that which was described in an article on the Cleveland type of car in the STREET RAILWAY JOURNAL of July 1, 1905. Instead of the step treads being composed of metal plates screwed to the flange of the Z-bar sill and nearly all within the line of the posts, as heretofore, the new arrangement consists of step treads which fold up individually and on which the panels in their lowered position rest; this arrangement does away with the necessity of cover plates for the step openings when the car is closed, such as were formerly used, and although devised entirely for utility, adds much to the appearance of the car, especially when closed, as will be seen in the illustration. The curtains may be drawn entirely to the floor if needed for protection during stormy weather, and as the windows on the opposite side are always available for use, the interior is well lighted; therefore on rainy days it is as comfortable as a closed car.

Attention is directed to a novel feature of these cars, which consists of a water board placed longitudinally along the side roof on the convertible or entrance side, including the part of the roof which extends over the platforms. One of the pipes which carries off the water from the trough formed by the water board is placed beside the body corner post at the forward end of the car and is utilized as a grab handle, the other pipe at the rear of the car is utilized as a hood support. The vestibule at the forward end has no doors at the platform step, but has a partition with sliding door extending diagonally across the platform from the vestibule corner post to the body door post at the center of the body end. This door at the body end is of the "semi-accelerator" type, and the door at the rear end is of the same style; these doors are set close to the platform steps, facilitating ingress and egress. The suitability of this arrangement will also be readily understood in connection with the form of vestibule at the front end and the "Detroit" platform at the rear. The grab handles on the side posts will be seen in the illustration to be turned backward, for the reason that a passenger leaving the car will only see the one at the left, and therefore is made to face forward, an arrangement which should largely obviate one of the commonest causes of accidents.

The dimensions are as follows: Length over the end panels, 35 ft. 6 ins., and over the vestibules, 45 ft.; from the end panels over the vestibule (front end), 4 ft., and at rear end, 5 ft.; width over the sills, including the plates, 7 ft. 11¼ ins. The width over the posts at the belt is 8 ft. 2¾ ins.; the height from the floor to the ceiling is 8 ft. 6¼ ins., and from the track over the trolley board 12 ft.; the sweep of the posts is 1¾ ins., and the distance between the centers of the posts 2 ft. 9 ins.; the thickness of the corner posts is 3⅝ ins., and of the side posts 2¾ ins. on the closed side and 3⅜ ins. on the convertible side. The side sills are 4¾ ins. x 7¾ ins. on the closed side and 2½ ins. x 7¾ ins. on the convertible side. The end sills are 4¾ ins. x 7¾ ins. The sill plates on the closed side are 8 ins. x ⅝ in. on the sill angle iron; on the convertible side, 8 ins. x 6 ins. x ⅞ ins. The length of the seats on the convertible side is 36 ins., and of the movable seats 53 ins. The type of truck is the No. 27-G, and the weight of car body is about 21,000 lbs., and of the car and trucks, without the motors, about 33,000 lbs.

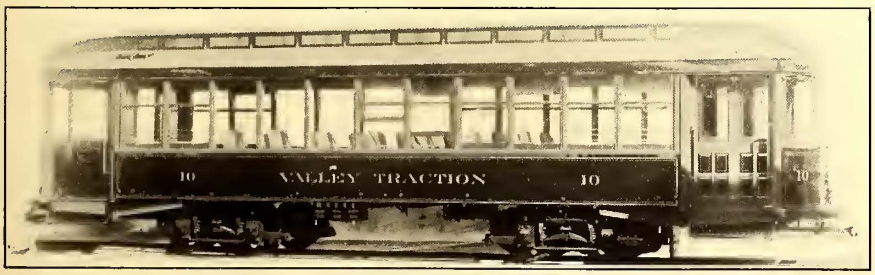
SYRACUSE CONVERTIBLE CAR, CLOSED

The cars will be used on the main line in the city of Syra-

cuse, running from the northern extremity of the city across town to Onondaga Valley, where the company's summer theater is located, a distance approximately of 6½ miles. This is a line of very heavy travel, and a five-minute service is maintained throughout the day; in the evening cars are run to the resort every two and one-half minutes.

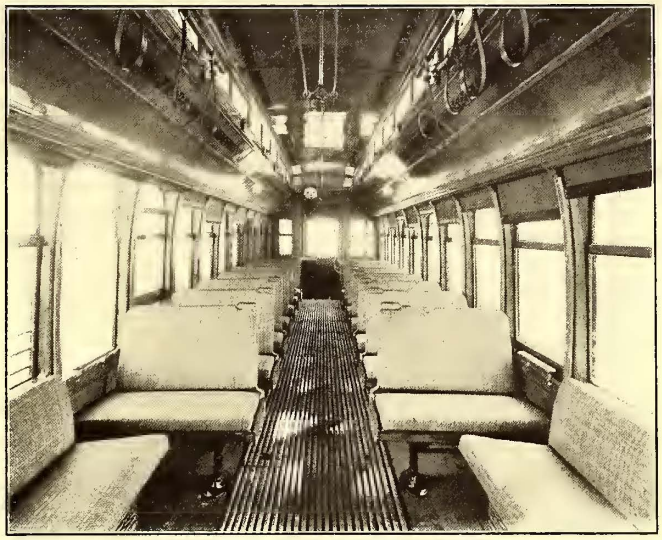
## SEMI-CONVERTIBLES FOR VALLEY TRACTION COMPANY

The car shown in the illustration is one of a number of Brill grooveless post semi-convertible cars that have recently been shipped to the Valley Traction Company. The Valley Traction Company operates about 40 miles of electric street railway system, having an entrance via the Peoples Bridge into Harrisburg, Pa., and running through the suburban district in Cumberland County on the west side of the Susquehanna River. The lines run through Wormleysburg, Fairview and Enola, reaching Marysville, 9 miles north; Lemoyne, White Hill and New Cumberland, 3 miles south, and Carlisle, 19 miles west of Harrisburg; the line to Carlisle paralleling the Cumberland Valley Railroad and passing through the residence districts of Camp Hill, Shiremanstown, Mechanicsburg, and an attractive picnic ground and park at Boiling Springs, about 5 miles east of Carlisle. All-day hourly service is operated to the extremities of the Marysville and Carlisle lines, with half-hour service all day to the nearer intermediate points, but to the farther ones during the denser traffic of the morning and evening hours only. An all-night hourly service is maintained between Harrisburg and the freight terminal of the Pennsylvania Railroad at Enola, about 4½ miles north of Harrisburg. The company operates twenty-eight cars, of which thirteen, including those which have just been delivered, are double-track cars with four-motor equipments, mainly of 40 hp. The lines run through an attractive and populous country, and for 11¾ miles are built on private right of way, few grade crossings of steam or other electric roads being encountered, the only ones being four with the C. V. R. R. and one with the G. & H. R. R. in the borough of Carlisle, and one on the Dillsburg branch of the C. V. R. R., for all six of which safety derailing devices are provided. The cars are operated with 550 volts direct current furnished by steam-power plants at Lemoyne, which is situated just across the Susquehanna River from Harrisburg, and at Carlisle. This summer it is intended to close down the steam plant at Carlisle and operate the road by means of rotary converter sub-stations, one in the present power plant at Carlisle and the other in a new building now being erected west of Mechanicsburg, about 9 miles from Harrisburg, these sub-stations being fed with three-phase, 25-cycle alternating current of 13,200 volts, generated in the main station at Lemoyne.




DOUBLE-TRUCK, VESTIBULED CARS FOR THE VALLEY TRACTION COMPANY

A feature of these attractive-looking cars is the generous length of platform provided, namely, 6 ft. The cars will seat forty-four passengers, the longitudinal seats at each corner of the car accommodating four persons each, and behind which are three-bar window guards, which is a good feature if somewhat unusual. All three sashes in the vestibules are arranged to drop into pockets. The interiors are finished in ash with ceilings of birch, decorated. Numerous of the car maker's specialties are employed throughout the car, namely, alarm gongs and signal bells, sand boxes, step fenders closing the entire opening in the back of the steps, and channel iron radial drawbars. The chief dimensions of the car are as follows: Length over the vestibules, 42 ft. 8 ins, and over the end panels 30 ft. 8 ins.; width over the sills, including the sheathing, 8 ft. 4 ins.; centers of the posts, 2 ft. 8 ins.; height from rail over the trolley boards, 11 ft. 11⅝ ins.; size of side sills, 4 ins. x 7¾ ins.; size of end sills, 5¼ ins. x 6⅞ ins.. The No. 27-G1 is the type of truck used, having a wheel base of 4 ft. Four motors are used per car.



LONGITUDINAL SEATING AT END OF VALLEY TRACTION COMPANY'S CARS

## DEEP-TONED AIR WHISTLE

Considerable annoyance has been caused both passengers and dwellers in suburban towns by the shriek of the ordinary air whistle used on interurban cars. A new whistle designed on organ-pipe principles has recently been placed on the market by the General Electric Company which does away with this trouble.

ORGAN TIMBRE AIR WHISTLE

Herctofore air whistles have been designed along the same lines as a steam-blown whistle. It is well known that steam whistles operated by air give a very different tone, the cause being due in part to the condensation of the steam as it issues from a restricted orifice, which increases its density. No such condition exists with air, so that the tone of an air-blown steam whistle is harsh and shrill. The whistle manufactured by the General Electric Company is designed with center partitions located so as to prevent a transverse flow of air across the ports, which would tend to distort the effective column of air. The tone is deep, clear and agreeable, and can be heard at a considerable distance.

Aside from the agreeable tone given by the new whistle, the operating details are carefully worked out. It is substantially constructed of non-corroding metal, and should last indefinitely. The standard whistle operates most efficiently at an average air pressure of 55 lbs. per sq. in. It operates satisfactorily, however, on pressures varying from 50 to 130 lbs. per sq. in. A convenient operating valve of the adjustable lever type is used with this whistle.

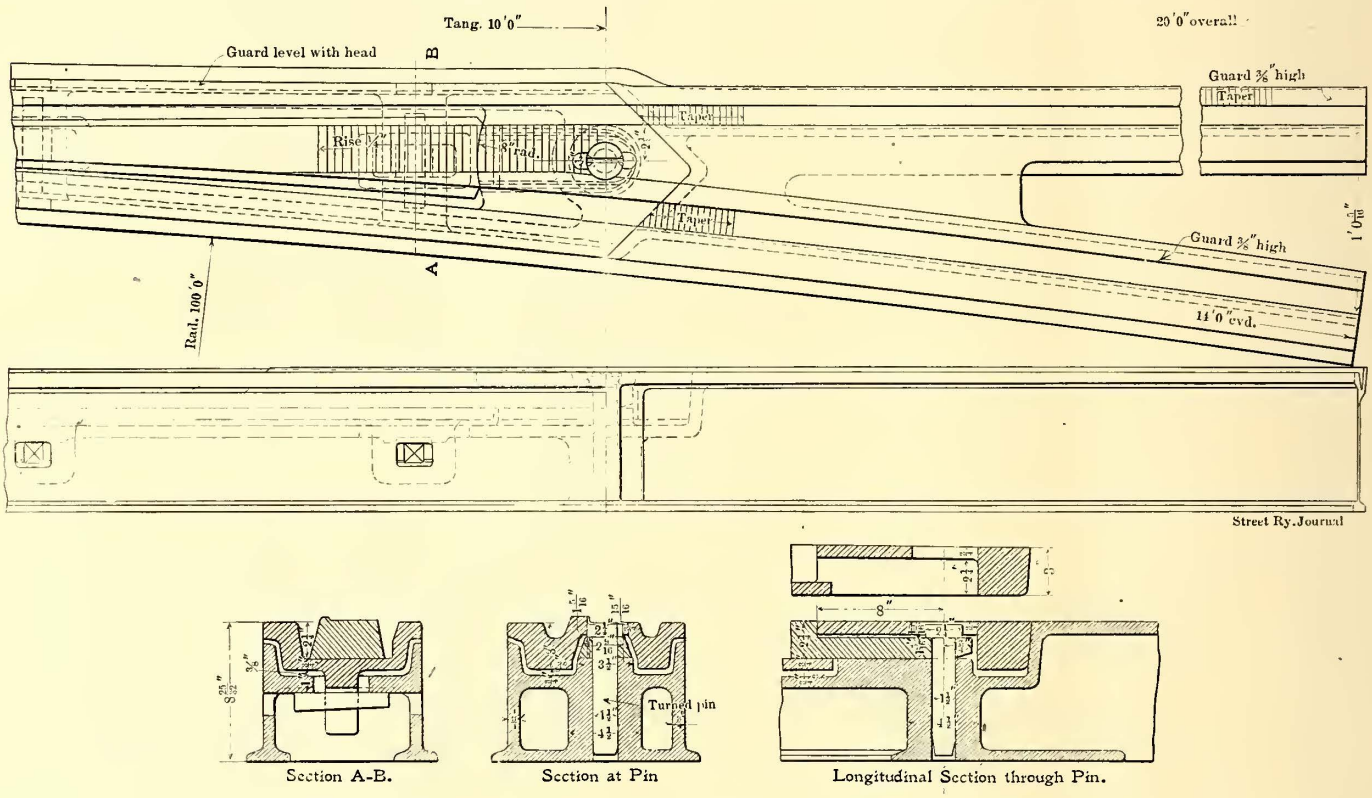
## NEW PROTECTED HEEL SWITCH

A new type of protected heel switch has recently been invented by Ernest B. Prior, roadmaster of surface lines of the Brooklyn Heights Railroad Company, and has been put in service in a number of different places on the Brooklyn Rapid Transit System. As is well known, in the ordinary type of switch it is customary to employ a plate separate from the rest of the structure and secured thereto over the heel portion of the tongue, and this plate must be removed to take out the tongue. Some difficulty has also been found in securing these plates rigidly in the structure and with their track surfaces in alignment with the adjoining track surfaces.

In the Prior switch the heel is protected by an integral portion of the structure, which, together with the tongue and its pin, is so constructed and arranged that the tongue may be readily removed. The accompanying engraving shows a plan of the switch, side elevation, sections on lines *AB* and through the pin, and a longitudinal section through the heel portion of the switch. As will be seen, the bed plate, which is of guaranteed steel, is cast with a pocket 8 ins. long measured to the center of the pin, and into this pocket the heel of the tongue fits. The pin is 1½ ins. in diameter, extends through the heel of the tongue in the pocket, and its head is protected from wear by the guaranteed steel of the bed plate, as shown in the longitudinal section through the pin. The bed plate is attached to the switch casting by pins and spelter in the usual way. The tongue can be readily removed by raising the pin, and slipped out. It can be as quickly replaced.

Of these switches nine are now in use on the lines of the Brooklyn Heights Railroad Company. One of them has been in service for two years at Flushing and Morgan Avenues, and during this time no complaints have been received about its being out of order and no repairs have been made to it. At Sands Street and the south roadway of the Brooklyn Bridge, one of the busiest locations on the system, eight more have been recently installed.

All of these switches were made by the Lorain Steel Company under the Prior patents.




CONSTRUCTION DETAILS OF PROTECTED HEEL SWITCH USED IN BROOKLYN

## WASHINGTON EMPLOYEES' OUTING

The annual outing of the Washington Railway & Electric Company's Employees' Relief Association, of Washington, D. C., was given June 30 at River View. Ten thousand members, their friends and relatives, attended, and the steamers Queen Anne, Arrowsmith, St. Johns, Harry Randall and Wakefield each made several trips to the resort. Amusements were provided in plenty, and the entertainment committee had arranged many athletic events. Valuable prizes were given in each. In the afternoon a baseball game was played between the Columbias and Mechanics, which was called in the fourth inning because of darkness. The score was 5 to 4 in favor of the Columbia. The evening was devoted to dancing and cake walking.

The Ft. Wayne, Van Wert & Lima Traction Company has received from the Cincinnati Car Company two new parlor buffet cars, the "Van Wert" and "Lima," for limited service between Lima and Ft. Wayne. These cars are 65 ft. long and are duplicates of the cars for the Ft. Wayne & Wabash Valley system which were described and illustrated in the Street Railway Journal of June 16. Cars of similar char acter are also being built for the Lima & Toledo Traction Company for limited service between Lima and Toledo.

## FINANCIAL INTELLIGENCE

WALL STREET, July 25, 1906.

### The Money Market

The money market has worked somewhat easier during the past week, the principal influences being the extremely heavy gain in cash by the New York clearing house banks and the falling off in the demand for funds from stock commission houses. Heretofore short-time money has been firmly held around 4½ per cent, but during the past week sixty and ninety-day maturities have been freely offered at ½ per cent below that rate without takers. The demand is principally for the over-the-year period, and while concessions are looked for, bankers generally continue to hold the market firm at 5½ per cent. It is understood that many of the large stock houses have taken on ample supplies of long-time money, but in some quarters there still exists a disposition to hold off for lower rates. The general opinion seems to be, however, that there will be no appreciable decline in the rate for six months' money in the near future. One of the most favorable developments of the week was the successful flotation of the $30,000,000 2 per cent Panama Canal bonds. There were 2970 separate bids for the issue, aggregating $445,000,000, and the average price was a trifle better than 104. This transaction was made without the slightest disturbance in the money market, the announcement being made by the Secretary of the Treasury that he would deposit about $25,000,000 of the proceeds with the national banks. Gold imports for the week amounted to $450,000, all of which was engaged in the Australian market. The importation of gold from the European markets has been temporarily arrested by an advance of 75 points in the price of sterling exchange. The European markets have been unsettled, owing to the disturbances throughout Russia, and rates for both money and discount have shown a tendency to harden at the principal centers. The bank statement published on last Saturday was highly satisfactory, inasmuch as it showed a gain in cash of $11,762,000, which was considerably larger than indicated by the preliminary figures. Loans expanded $9,435,300, and deposits were $20,807,200 larger than in the preceding week, thus increasing the reserve required by $5,201,800. The surplus, therefore, was increased by $6,561,200. The total surplus now stands at $19,391,000, and compares very favorably with the surplus reserves held by the New York banks in the corresponding periods of previous years. In the corresponding week of 1905 the surplus was $14,949,950, against $50,609,600 in 1904, $18,915,400 in 1903, $15,502,400 in 1902, $23,128,575 in 1901, and $24,081,900 in 1900.

Money on call during the week has loaned at 3 and 2 per cent, the average being about 2½ per cent. Time money for the short dates ruled decidedly easier, sixty-day and ninety-day contracts being offered freely at 4 per cent and at 4½ per cent respectively. Four months' money was obtainable at 5 per cent, five months' at 5¼ per cent, and six months' at 5½ per cent. Mercantile paper has remained quiet and unchanged at 5 and 5½ per cent for the best double names.

### The Stock Market

The sentiment has undergone a rather favorable change so far as the securities market is concerned, and while indications of this improvement were noticeable in the early part of the month, they did not take practical shape until this week, when a heavy buying movement set in and carried prices up in a very substantial manner, the gains on the active stocks ranging anywhere from 2 to 9 points. Heretofore the market has been restricted by uncertainty regarding the monetary outlook, and by the disturbing possibilities of the Russian situation. As a matter of fact the market has been under unfavorable influences since the culmination of the bull movement in January, and while occasional rallies occurred these were followed by another selling movement and lower prices. The result was the creation of a pessimistic sentiment, liquidation of all weakly-held stocks, and the bringing into existence of a very substantial short interest. The banking interests and the more important operators were apparently indifferent to what the market was doing, and it was not until some very unfavorable rumors affecting the standing of a prominent London banking house that they came into the market and gave it aggressive support. This was followed by further buying, and on Monday when the Russian news was bad the large interests took control of the situation, and by forced short covering and some aggressive buying carried prices up sharply. This eliminated a large part of the floating short interest, and with the recurrence of unfavorable Russian advices the market suffered severe reaction. The very favorable bank statement of last Saturday was a direct influence in bringing about a better feeling, as was also the announcement that the Secretary of the Treasury had deposited $25,000,000 in the national banks as an offset to the withdrawals in connection with the Panama Canal bond issue. The heavy bidding for these bonds was one of the encouraging features for the week, and indicated that investors are willing to take good securities. The features have been the Harriman stocks, in which the buying has been exceptionally good and apparently from inside sources. The upward movement in Southern Pacific has been stimulated by persistent rumors that early and favorable action will be taken regarding dividends on the common stock, and it is also intimated that the directors may issue more preferred stock, which would give valuable rights to holders of the common. The Copper shares were advanced sharply on buying credited to important interests, and on reports of further favorable developments in connection with these properties. There was very good buying for both accounts of the anthracite coal stocks, especially of Reading. The Steel stocks ruled quiet until about the middle of the week, when there was a sharp advance in the preferred, with good buying of the common. The sharp gains in the Hill stocks was due to the belief that the return of Mr. Hill to New York will be followed by the consummation of the deal for the lease of the Great Northern ore lands to the Steel Corporation.

The local traction stocks were comparatively quiet, but they advanced materially until near the close, when a sharp break in Brooklyn Rapid Transit took place, on what appeared to be aggressive speculative selling. Aside from the agitation for a 5-cent fare on the Brooklyn Rapid Transit lines, all the conditions in connection with these properties are favorable to higher prices for them. It is expected that the Brooklyn Rapid Transit report will show a very substantial surplus for the stock.

### Philadelphia

There has been a decided improvement in the local traction issues during the past week. The number of issues traded in has been comparatively small, but the individual transactions were considerably larger than in the previous week, and prices generally displayed strength. Philadelphia Rapid Transit was again the most active feature, about 6000 shares changing hands at from 29 to 31 and back to 30¾, a net gain for the week of 1½ points. Philadelphia Traction was unusually active, nearly 1000 shares changing hands from 98½ to 99. Union Traction rose from 63 to 63½, on the purchase of 1300 shares. Philadelphia Company common, after declining to 47¾, advanced to 49½, and closed at the highest, while small lots of the preferred sold at 50¼ and 50⅜. United Companies of New Jersey changed hands at 255½ to 254, a loss of 4 points. American Railways sold at 51½.

### Baltimore

Trading in the traction issues at Baltimore has been broader, but it has been attended with a very irregular price movement. United Railway issues furnished the overshadowing features, both in point of activity and price fluctuations. At the beginning these issues showed strength on the announcement that the Income Bondholders' Association had accepted the company's plan for refinancing the company, but subsequently there was rather heavy selling, especially of the stocks and the income bonds. The free stock sold from 16⅞ down to 16, with a subsequent rally to 16½, about 1800 shares changing hands, while the pooled stocks sold from 17 to 16¼, and closed near the lowest, on transactions of about 1500 shares. The income bonds opened at 74¾ and advanced to 75, but later broke to 73, on dealings aggregating $230,000. The certificates representing income bonds deposited were comparatively quiet, about $40,000 selling at from 73¼ to 72⅞. The 4 per cent bonds were quiet but firm, with sales at 92 and 92¼. Norfolk Railway & Light 5s sold at 99¼ for $15,000, and $11,000 Lexington Street Railway 5s sold at 101⅝ and 101¾. Memphis Street Railway 5s changed hands at 102¾ for $20,000.

### Other Traction Securities

The Chicago market has remained quiet during the past week, and prices generally showed very little change. Metropolitan Elevated advanced from 26½ to 28, on renewed talk of a merger of the various elevated lines. South Side "L" held steady at 95⅝, and the 4½ per cent bonds sold at 102¼. Northwestern Elevated 4s sold at 91, and North Chicago brought 34 for an odd lot, and sales of West Chicago were recorded at 25. The Boston market was more active and generally strong, the feature being an advance of a point in Boston Elevated to 153 on light purchases. Massachusetts Electric issues were quiet but firm, the common selling at 19 and the preferred at 69 and 68¾. Other transactions included Boston & Suburban common at 20, Boston & Worcester common at 27, the preferred from 80 to 77, and back to 79, West End common at 96 and 95¾, and the preferred at 110.

Cincinnati Street Railway was rather active in Cincinnati last week, several lots selling at 143½ to 143. Cincinnati, Newport & Covington common advanced fractionally to 73¼. Toledo Railways & Light advanced from 32¾ to 33½, on news of a fine report for last month. Cleveland Electric continues the active feature in Cleveland. It went up to 75 on the announcement of a definite proposition to the city, and then dropped to 73½ on news of the proposition made by the low-fare company. Northern Ohio Traction & Light dropped to 29¼, in spite of the report of the biggest month in the history of the company. Western Ohio receipts sold at 13. Although this road is making good gains and the security is made much better by the decision to acquire the Findlay-Lima road, the stock seems to continue to decline. Apparently this is due to the fear that the Schoepf syndicate will acquire the Dayton & Troy, the southern connection, and cut the Western Ohio out of Dayton. Columbus Railway & Light has been in strong demand at Columbus, and it has been advancing gradually until this week it sold at 86¾, a high mark for the stock; about 900 shares changed hands on the upward movement. There are more rumors that the property is to be taken over by the Schoepf syndicate.

### Security Quotations

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

| | July 18 | July 24 |
|---|---|---|
| American Railways | 52⅛ | 52 |
| Boston Elevated | 152 | 151 |
| Brooklyn Rapid Transit | 73½ | 74⅛ |
| Chicago City | 160 | 160 |
| Chicago Union Traction (common) | 3⅝ | 4 |
| Chicago Union Traction (preferred) | 12 | 12 |
| Cleveland Electric | — | 73½ |
| Consolidated Traction of New Jersey | 78 | 78 |
| Detroit United | 90 | 90½ |
| Interborough-Metropolitan, W. I. | 35¾ | 36⅝ |
| Interborough-Metropolitan (preferred), W. I. | 73⅛ | 74⅞ |
| International Traction (common) | a54 | 54½ |
| International Traction (preferred), 4s | 79 | 78½ |
| Manhattan Railway | 148 | 147 |
| Massachusetts Electric Cos. (common) | 18½ | 18½ |
| Massachusetts Elec. Cos. (preferred) | 68 | 68¼ |
| Metropolitan Elevated, Chicago (common) | 26 | 27 |
| Metropolitan Elevated, Chicago (preferred) | 66 | 67 |
| Metropolitan Street | — | — |
| North American | 93 | 93 |
| North Jersey Street Railway | 27 | 27 |
| Philadelphia Company (common) | 47¾ | 49 |
| Philadelphia Rapid Transit | 29 | 30 |
| Philadelphia Traction | 98¾ | 99 |
| Public Service Corporation certificates | 67¼ | 67½ |
| Public Service Corporation 5 per cent notes | 95½ | 95½ |
| South Side Elevated (Chicago) | 95 | 95 |
| Third Avenue | 124 | 124 |
| Twin City, Minneapolis (common) | 113 | 112¾ |
| Union Traction (Philadelphia) | 63 | 63¼ |
| West End (common) | — | — |
| West End (preferred) | — | — |

a Asked.

### Metals

The iron and steel markets continued active and strong. Advices from the West report a growing scarcity of pig iron for immediate delivery, and from the South comes the announcement that Southern foundry irons have advanced to $14 at Birmingham, thus putting the price back to where it was before the cut of last month. Sales of finished steel are reported well up to the rate of distribution in the previous months. Railroads are laying in large quantities of track supplies, and the large equipment companies report a very heavy volume of business, which is taken as an indication of a continuance of the present conditions for some time to come. The copper metal market has ruled somewhat easier, but quotations have not changed materially. Lake, spot, is quoted at 18⅜ and 18⅝c., electrolytic at 18 and 18¼c., and castings at 17¾ and 18c.

## BALTIMORE TRACTION REFINANCING

The United Railway & Electric Company, controlling and operating all the lines in Baltimore and suburbs, has announced its plan for refinancing the system and making extensive improvements. It provides for funding back interest on the income bonds and using the charter of the Maryland Electric Company as a basis for future improvements, with an $8,000,000 bond issue. It is proposed to consolidate the Maryland Electric Company with the Baltimore & Annapolis Short Line, the latter to be operated by electricity. Alexander Brown & Sons have been named the fiscal agents. The plan has been approved by the income bondholders' committee. The income bondholders will receive 5 per cent thirty-year coupon bonds, dated June 1, 1906, at par for the income coupons from June 1, 1904, to June 1, 1906.

## INDIANAPOLIS TRACTION & TERMINAL COMPANY'S EARNINGS

Hugh J. McGowan, president of the Indianapolis Traction & Terminal Company, appeared before the Indiana tax board a few days ago and stated that during the last fiscal year the company earned a total of $2,207,578.72, and that the net earnings were $216,330.01. The gross earnings a mile of track were $17,024.59 and the net earnings per mile $1,663.31. The total operating expenses of the road for the year, Mr. McGowan said, were $1,060,490.62, constituting the following items: Maintenance of way and structures, $57,147.66; maintenance of equipment, $117,297.36; conducting transportation, $533,309.55; general miscellaneous expenses, $352,736.05.

In its report filed with the tax board the company puts a total valuation on all its property of $922,349.49. This includes the traction terminal station building at $568,710; other buildings, $8,720; 12 miles of track, $84,854; 134 motors, $79,800; cars, etc. The value of the equipment is given at $178,085.

## REPORT OF THE UNITED RAILWAYS OF ST. LOUIS

The United Railways Company, of St. Louis, reports an increase of $13,389 in the net income for June, 1906, over the net income for June, 1905, and an increase of $323,061 in the net income for the first six months of 1906 over the net income during the corresponding period of last year. This showing is made against an increase in the expenses. The gross earnings and other income for the first six months of 1906 were $4,400,267, as compared with $4,046,088 during the corresponding period of 1905, an increase of $348,179. The expenses, taxes and depreciation for the first six months of 1906 were $2,724,282, as compared with $2,699,179 for the first six months of 1905, an increase of $25,103. The net earnings on June 30, 1906, were $1,675,985, as compared to $1,346,909 on June 30, 1905, an increase of $329,076. The charges, to be deducted from the net earnings, were $1,189,322 for the first six months of 1906, as compared to $1,195,337 for the corresponding period in 1905, a decrease of $6,015. The net income on June 30, 1906, was $486,663, as compared to $151,572 on June 30, 1905, an increase of $323,061.

The comparative statement for June is: Gross earnings and other income, $791,402 in 1906, as compared to $746,101 in 1905, an increase of $45,301; expenses, taxes and depreciation, $483,854 in 1906, as compared to $451,128 in 1905, an increase of $32,726; net earnings, $307,548 in 1906, as compared to $294,973 in 1905, an increase of $12,575; charges, $198,026 in 1906, as compared to $198,840 in 1905, a decrease of $814, and net income, $109,522 in 1905, as compared to $96,133 in 1905, an increase of $13,389.

## AN IMPORTANT ROAD CONTEMPLATED FOR INDIANA

J. G. White & Company, of New York, have completed estimates and surveys for an important addition to the traction system centering in Chicago, which will be an electric railway 70 miles long from South Bend, Ind., to the Illinois-Indiana State line in the city of Hammond, to be known as the Chicago, Lake Shore & South Bend Railway. It is reported that the road will be financed by the Transit Finance Company, of New York, and it is expected that the line will be completed by the Illinois Central from Hammond northwest into Kensington, there making connection with the Central tracks for a continuous route into Chicago. The Illinois Central is bound by traffic agreements not to build east of the State line, which accounts for the rather unusual construction conditions.

From Hammond the new road will run eastward into the new United States Steel Corporation city of Gary, crossing the Grand Calumet River just before entering the city. From Gary east to Dunne Park the electric line will practically parallel the tracks of the Lake Shore & Michigan Southern, crossing them as well as the tracks of the Baltimore & Ohio Railroad from the south to north at Miller. From Dunne Park to Michigan City the route of the electric road will lie between the tracks of the Michigan Central and the shore of Lake Michigan. The route from Michigan City is almost straight east to South Bend, a distance of about 30 miles. The tracks of the Lake Erie & Western Railroad and of the Pere Marquette will be crossed about a mile east of Michigan City. From New Carlisle into South Bend the electric road will be exactly parallel to the Lake Shore & Michigan Southern for a distance of 14 miles. It is anticipated that a steamer service from Michigan City to Chicago will be run in connection with the new road, giving the residents in the district from Michigan City to South Bend, inclusive, a particularly quick and convenient route into Chicago. The road will be for both passenger and freight traffic, and that it will be thrown into direct competition with the steam roads in the district is at once apparent. Indeed, the situation now obtaining on the south shore of Lake Erie between Cleveland and Toledo will be practically duplicated on the completion of the new road. It is not as yet determined whether the line will be single or double track.

The construction will conform to the best interurban standard and track will be laid with 75-lb. rails. The specifications in the case of the single-track line call for a width of 18 ft. on the fills and 21 ft. in cuts, with side slopes 1½ to 1. All bridge structures, except the one over the Calumet River, will be of concrete or steel, and two trolley wires will be included in the overhead equipment. In case the single-track road is decided upon, eight sidings, each 2700 ft. long, will be provided. Specifications for double-track road provide for a width of 31 ft. on the fills and 34 ft. in cuts. The conditions of grade and curvature will be very moderate over the entire line. On 85 per cent of the road the grade will not exceed 2-10 of 1 per cent, and the usual maximum for overhead crossings will be 2 per cent. At two points, however, the grade on these bridges may run to 5 per cent. As approved, the total curvature for the line amounts to 1034 degs., divided between fifty-nine curves, practically all within the city limits of the various towns en route.

## STREET RAILWAY SITUATION IN SAN FRANCISCO

Service has been resumed on the Guerrero Street line of the United Railroads in San Francisco, thus adding another road for the Mission district of the company's system. As soon as the work on the Valencia Street line, which is now in progress, has been completed, the whole of the Mission will be opened up for transportation.

On the Haight Street line there are 100 men at work, and the repairs on the tracks of that line are progressing rapidly. The McAllister Street line has 125 men at work on the new rails, and it will be pushed to completion at the earliest opportunity. Work on the westbound track of the Sutter Street line is proceeding steadily, and the men are now engaged between Van Ness Avenue and Fillmore Street. The entire bed of the road is being torn up in order to get up the old rails of the cable cars and the slot. Large masses of the rock and concrete roadbed are being taken out. A rock crusher is being operated on the line to assist in making a new roadbed. The rock crusher is placed on a flat car, and the masses of concrete are lifted on the car, run through the crusher and come out through the bottom of the car finely broken for use in forming the new roadbed. This greatly accelerates the work and does away with the necessity of hauling in materials other than cement for the new construction.

Work has been started on the tracks of the Sacramento and Jackson Streets cable lines, and it is hoped to have them running in a few weeks.

The Sansome Street line, which has been waiting for the removal of a pile of debris at Bush Street, has resumed operations, and the cars are now running regularly on a 12-minute headway.

Plans are being perfected for a large loop at the foot of Market Street in front of the Ferry Building. The congestion of the traffic at that point has long made the scheme of the loop appear advisable, and the officials of the road determined that at the earliest possible opportunity it should become a reality. The designs are being made for the work and it is expected that work will begin within a few weeks and that two months will see the project completed. At present the cars are forced to switch, which seriously delays traffic, especially during rush hours.

The lack of available rolling stock will probably retard the resumption of service on some of the new street car lines that are being repaired and gotten in order for service. Every car that the United Railroads possesses is now in commission, and there is still a crying need for more. One large shipment of fifty cars is being delivered, but they are not ready for service, and will not be available for some time. In addition to these, there are eleven new suburban cars of the finest type to be finished in mahogany, which will be used on the suburban lines. Another order for 100 cars has also been placed. But none of these is ready, and it is feared that the scarcity of cars will interfere with the resumption of service on some of the lines now being opened.

It is now expected that early in August cable cars will be in operation on the California Street system. The wrecked power house is being put in shape, new cable cars have been ordered and the main line of the system from the ferry to Presidio Avenue will soon be ready for operation. The opening of this route will give ready access to Pacific Heights and that part of the Western Addition which has not been reached by a car line. It will also give a direct connection with part of the new business district and the ferries.

## YOUNGSTOWN LINES PLACE CONTRACTS

The contract for the electrification of the Youngstown & Southern Railway, which at present is operated as a steam road, has been placed with J. G. White & Company, of New York. The road was built from Youngstown to Columbiana several years ago by J. G. White & Company, and was originally designed as a third-rail electric line, but this plan was abandoned and other parties took over the road and operated it as a steam road. Recently the company made amicable arrangements with the Youngstown & Ohio River Railway, which threatened to build a parallel line, and under this arrangement the Youngstown & Southern will extend its line to Leetonia, while the Youngstown & Ohio River will build from Leetonia to Salem, Lisbon and East Liverpool. The two companies have a traffic arrangement for operating cars through from Youngstown to East Liverpool.

The Youngstown & Ohio River Company, which was financed by Will Christy, George Stanley and others of Cleveland, placed contracts last week with the Westinghouse Electric & Manufacturing Company for the entire electrical equipment of the line. The contract includes two 1000-kw 390-volt Westinghouse-Parsons turbo-generators; nine 300-kw rotary converters for four sub-stations, and Westinghouse No. 112 (75 hp) four-motor equipments for ten cars, together with air brakes for the cars. The main power station for the road will be located at West Point, between Lisbon and East Liverpool, and will be but a short distance from large coal mines, from which the house will receive its fuel supply. This house will supply the Youngstown & Southern as well as the Youngstown & Ohio River line, and one sub-station will be installed for the first mentioned line at a point near North Lima. The Cleveland Construction Company, which has the contract for building the Youngstown & Ohio River, has placed a contract with the P. J. Guthrie Construction Company, of Columbus, for 6 miles of construction work which will be done with steam shovels, as it involves a large amount of heavy work. Grading is being pushed at several points. A portion of the line will be placed in operation late this fall.

## BONDHOLDERS OF TOLEDO & WESTERN APPOINT PROTECTIVE COMMITTEE

The bondholders of the Toledo & Western Railway Company have appointed a committee composed of J. K. Secor, J. G. Mitchell and H. C. Rorick to protect the interests of the bondholders of the property. All the bondholders have been asked to deposit their bonds with the Ohio Savings Bank & Trust Company, of Toledo. It is thought that if the bond interest is not arranged for in the near future the bondholders will ask to have the bonds foreclosed. A stockholders' committee composed of W. L. Hayes, C. N. Stone and G. E. Collins has sent a communication to the stockholders urging them to deposit their stock with the Citizens Savings & Trust Company, of Cleveland, in order that the proposition of J. R. Nutt and associates of Cleveland to pay 6¼ for the entire outstanding capital stock may be carried through. The communication sets forth that the interest on the bonds together with the floating debt now due amounts to a sum equal to $25 a share, for which the stockholders would be liable should it become necessary to levy an assessment. The committee undertakes to protect the interests of the stockholders to the end that every holder shall share equitably in the proceeds of any reorganization, refinancing or sale of the property.

## ELECTRIC CARS OPERATING ON STATE STREET, CHICAGO—PLANS FOR ELEVATED RAILWAY MERGER

Electric cars are now being operated on what was formerly the State Street cable line in Chicago. The last cable train to make the trip was operated over the line early Sunday morning, July 22. Permission to substitute electric traction for cable operation was granted to the company less than one month ago. New cars for the trolleyized lines have not yet arrived, and cars of the type running on Halsted Street are being operated on State Street. The change in the motive power has enabled the running time from the downtown district to Sixty-Third Street to be cut down 10 minutes and the trip is now made in 40 minutes.

The Blair-Mitchell interests which control the Northwestern and the Oak Park elevated lines, Chicago, are reported to have made offers to the Metropolitan and the South Side Elevated companies for the control of these lines. If the plans for the consolidation of the four elevated railway systems in the city is consummated, the routeing of the trains will most probably be changed to allow trains to travel from one section of the city to the other. This would avoid the trains making a complete circuit of the loop in the business district and would reduce the congestion on this portion of the system, over which at the present time about eighteen hundred trains are operated every twenty-four hours.

Mayor Dunne has prepared a tabulated list showing the proportion of deaths per 100,000 population, due to street railway accidents in the larger cities in the United States. The report shows that there are four other cities in the United States having more fatalities than Chicago per unit of population. The cities as tabulated are: Pittsburg, 11 7-10; Cleveland, 8 8-10; Detroit, 7 3-10; St. Louis, 7; Chicago, 6 1-10; New York, 4 8-10; St. Paul, 1 8-10; Indianapolis, 1 6-10; Buffalo, 1 6-10; Washington, 1 4-10.

Contracts for lowering the three tunnels under the Chicago River were let by the receivers of the Chicago Union Traction Company July 23. The successful bidders were John P. Agnew, for the tunnel under LaSalle Street; Angus Brothers & Company for the Washington Street tunnel, and the Great Lakes Dredge & Dock Company for that at Van Buren Street.

The contracts stipulate that the portions of the tunnels obstructing navigation must be removed before the opening of navigation in 1907.

W. S. Barstow, of W. S. Barstow & Company, Inc., engineers, has just returned from Portland, Ore., after a four weeks' trip. He reports that there is in contemplation the building of several miles of railroad extensions in connection with the Oregon Electric Railway Company, for whom W. S. Barstow & Company are now building and equipping about 60 miles of road. It is expected that part of the main line between Portland and Salem will be in operation Sept. 1, and that cars will be operated between the two cities by July 1, 1907.

## NEW HAVEN TO ELECTRIFY MORE LINES

Another announcement of importance by the New York, New Haven & Hartford Railroad Company regarding the electrification of branch lines has been made. It is to the effect that it is proposed to equip with the overhead trolley the lines of the company from Middletown to Berlin and Meriden.

## ACCIDENT FAKIRS APPREHENDED

B. B. Davis, secretary of the American Street and Interurban Railway Claim Agents' Association, has just issued a circular calling attention to a coterie of accident fakirs who have acted in different cities under various aliases. The first alleged accident reported was on the Dayton City Railway in April, 1906, and they gave the names of John Hall, Rodney Hall and Earnest Carruth. On May 6, 1906, they had an alleged accident on the lines of the Indianapolis Traction & Terminal Company, Indianapolis, Ind. Through the efforts of George Harvey, assistant claim agent, two of them, Walter Carruth, alias John Heyden, alias John Hall, and Earnest Carruth were arrested. On June 20, 1906, they were tried and convicted of a felony and given an indefinite sentence in the penitentiary. They are also said to have brought alleged accident claims against the Lexington Railway Company, Lexington, Ky.; South Covington & Cincinnati Railway Company, and the Cincinnati Traction Company. Rodney Hall, who acted as witness, has not yet been apprehended.

## NOTES FROM MEXICO

The MacKenzie interests of Toronto, which own the street railway systems at Monterey, are preparing to extend the lines to El Porvenir and other suburban points up the Santa Catarina Valley. Engineer George S. Binckley has been making an investigation of the water afforded by the Pilon River, with the view of establishing the power plant of the railway system at some point on that stream.

A syndicate of Mexican capitalists with a capital stock of $500,000 has taken steps to construct an extensive street railway system in the flourishing town of Iguala. A concession has been obtained from the government of the State of Guerrero.

New York capitalists are said to have become interested in the project of building an electric railway between Saltillo and Arteaga, a distance of about 10 miles. W. H. Lilliendahl, of Saltillo, who is promoting the enterprise, has been in the United States for some time on business connected with the proposed road. Arteaga is a manufacturing town of importance, and the proposed line is to do a freight as well as a passenger business.

Ramon Fabela is making surveys for the proposed electric street railway system that is to be built at Parral by General Jose M. de la Vega and Colonel Antonio Ramos Cadena.

A number of wealthy land owners of the State of Tlaxcala have organized a company called the Ferrocarril Agricola, for the purpose of building a tramway through the richest agricultural part of the State. It is proposed that animal traction be used pending the installation of electricity.

The properties of the Puebla Tramways Company, which were recently purchased by a Canadian syndicate, comprise about 20 miles of track. C. H. Cahan, the representative of the Canadian syndicate, with headquarters in Mexico City, who conducted the negotiations, says that the 20 miles of existing track will be electrified and about 25 miles more track added to the system. The same syndicate has also purchased the properties of La Compania Anonima del Alumbrado Electrico de Puebla. The plans for improvements and extensions of these two systems call for a large expenditure. These two companies were among the interests of the firm of Werhner, Beit & Company, of London. The lines are operated by mules. The city of Puebla will soon pave a number of its streets with asphalt, and the track on several of the lines will have to be relaid. While this work is being done the lines will be practically rebuilt. The largest cotton mills in Mexico are situated near Puebla, and the new owners intend to extend the suburban lines to these plants and to handle freight as well as passengers. The Mexican Light & Power Company, which has its generating plant at Necaxa and is now furnishing electric power and lights for Mexico City, El Oro and other places, is closely affiliated with the new owners of the Puebla systems and the light and power plant of the town.

## BALTIMORE MEN RECEIVE VOLUNTARY INCREASE

Beginning with July 11, the United Railways & Electric Company, of Baltimore, voluntarily granted a liberal increase in the wages of its car men. Although this means an additional annual expenditure of about $300,000, the directors did not hesitate to carry out the recommendations of Wm. A. House, second vice-president and general manager, who told them that the conspicuous loyalty of the men was worthy of substantial reward. Coming so soon after its heavy losses in the great Baltimore fire, the action of this company is especially praiseworthy, besides indicating the determination to retain and secure the best class of men. The cordial spirit existing here between employer and employee is well shown in the following notice. Up to this time the rate of pay has been 15½ cents to Class 1, 16 cents to Class 2, and 16⅔ cents to Class 3:

THE UNITED RAILWAYS & ELECTRIC COMPANY

Office of the General Manager

General Order No. 205 to Motormen and Conductors

Since the last voluntary increase in the rate of pay of motormen and conductors on April 1, 1903, this company suffered great loss by the disastrous fire of February, 1904. It has gradually recovered from the effects of that catastrophe, but since then has had to make heavy expenditures in the reconstruction of tracks, upon its Pratt Street power house, and by the purchase of cars, all of which have been met from the daily receipts. While the company must continue to spend large sums in the further rebuilding of its system, the management feels that it is but due the motormen and conductors to recognize in a substantial way the loyalty and efficiency shown by them in the performance of their respective duties, and the board of directors, therefore, has this day authorized the following increases, effective July 11, the beginning of the second pay-roll period of the month:

Class No. 1 will comprise men who have been in the service less than two years, and will be paid 18 cents per hour.

Class No. 2 will comprise men who have been continuously in the service over two years and less than five years, and will be paid 19 cents per hour.

Class No. 3 will comprise men who have ben continuously in the service more than five years, and will be paid 20 cents per hour.

It is believed that every individual in the service will fully appreciate his dual responsibility to the traveling public and the company, and realize that while on duty he is not only a representative of the latter, but that his actions will reflect either creditably or otherwise upon his company.

July 12, 1906. WM. A. HOUSE,
Second Vice-President and General Manager.

## MR. CALDERWOOD DISCUSSES ACCIDENTS ON THE BROOKLYN RAPID TRANSIT COMPANY'S LINES

Vice-President Calderwood recently sent to the New York State Railroad Commission a report in which was given the number of fatal accidents that occurred on the Brooklyn Rapid Transit lines in the year ending June 30, 1906.

"During the year," Mr. Calderwood said, "there were 111 accidents resulting in fatal injury or death of persons. Of this number but thirteen were passengers. The members of the State board are in close touch with the local conditions and are fully cognizant of the various conditions which render the operation of trains and cars in the district we serve particularly hazardous. Some of these, such as what have become known as the 'rushes' at the bridges and the congestion of traffic on downtown streets, are peculiar to Brooklyn and are directly attributable to the topography of our city, and the very great volume of traffic forced on our lines during comparatively short periods of time.

"The proportion of accidents is naturally greater during the summer months—the time of heavy travel to Coney Island and the various other beaches—than during the rest of the year. During the year in question this company has handled 452,604,203 passengers, carrying them 63,657,323 miles. This represents, in round numbers, five times the entire population of the United States. For every four million passengers carried the life of one has been lost, or we have carried the entire population of Brooklyn three times with the loss of one life.

"We do not—it is needless to say—attempt to justify any fatalities, and are using every means in our power to avoid them. Our success in safeguarding our passengers is, in a measure, indicated by the fact that of the total of 111 fatalities, no liability on the part of the company existed in 76 cases. For the purpose of comparison, we submit corresponding figures for the fiscal year ending June 30, 1905, showing practically the same ratio of one fatal accident to each four million passengers carried. For the year ending June 30, 1905, there was a total of 96 fatalities and we carried 389,505,840 passengers, transporting them 57,742 miles."

## BOSTON ELEVATED RAILWAY PLANS NEW STATIONS FOR EIGHT-CAR TRAINS

The Boston Elevated Railway has filed with the Board of Railroad Commissioners a new set of plans of the new station at Forest Hills, which are a modification of the plans approved by the board June 21, 1905. Under the new plans there will be two separate stations at Forest Hills Square, the one on the west side of Washington Street being for cars outward bound from Boston, and the one on the east side being for inward cars. The proposed stations will accommodate eight-car trains, making the Forest Hills station the largest in the elevated system, as it will be about twice the size of the Dudley Street terminal.

The unloading platform for the southbound elevated trains will commence at Morton Street, and at its southerly end will be the loading platform for surface cars bound south, which will extend to Tower Street. The elevated loop will also extend as far as Tower Street, and to return to the northbound station on the easterly side of Washington Street it will pass over private property. All the property bounded by Morton, Washington and Tower Streets and Stony Brook will have to be taken, as well as the property south of Stony Brook, between the brook and Tower Street. The surface cars will enter the station at surface grade, and provision is made that surface cars bound in either direction may take a loop in the station and return, or continue on through the station in the same direction. The northbound surface cars will leave Washington Street at Tower Street, at which the unloading platform for northbound cars begins, and an escalator or inclined stairway will take them to the elevated platform, which will extend to Morton Street.

The company is desirous of putting on its eight-car trains as soon as possible, and all the stations in the new Washington Street subway have been constructed with this end in view. The old subway, in which the stations will not accommodate trains of more than five cars, long ago proved inadequate to handle the business of the company, and there is a possibility that it will be abandoned as soon as the new tunnel is completed. The company has also asked for authority to construct a siding on Washington Street, between Hawthorne Avenue and Dudley Street, as an extension of the existing siding between Hawthorne Avenue and Guild Street.

## ERIE GASOLINE CARS FOR SERVICE ON STEAM RAILROAD LINES IN OHIO

General Passenger Agent Wallace, of the Erie Railroad (steam), has announced that his company will utilize the first gasoline cars now being experimented with in the East, on the stretch between Cleveland, Leavittsburg and Youngstown. The business between these points is very heavy, and the Erie has found it necessary to increase its train service several times of late. This route was doubtless selected to forestall, if possible, the plans of the Eastern Ohio and the Mahoning Valley Traction Companies, which are planning to co-operate on a through high-speed service between Cleveland and Youngstown.

## NORTHERN OHIO TRACTION & LIGHT COMPANY'S STOCK TO BE INCREASED

Stockholders of the Northern Ohio Traction & Light Company will meet Aug. 15, for the purpose of voting on the proposition to increase the capital stock of the company for the purpose of taking over the Canton-Akron system and for needed improvements. The Canton-Akron Railway Company, the Canton & New Philadelphia Traction Company and the Tuscarawas Traction Company have already been formally consolidated, and the merger of this company with the Northern Ohio will be effected about Sept. 1. When the deal is consummated, the outstanding bonded indebtedness of the Northern Ohio Traction & Light Company will be $10,500,000 and the capital stock outstanding will be $7,938,000. The present preferred stockholders of the Canton-Akron Company will receive divisional lien 5 per cent bonds, while the common stockholders of the three companies will receive an equal amount of the common stock of the Northern Ohio Company, which is now on a 2 per cent dividend basis. The new company will have gross earnings of about $1,600,000.

## CLEVELAND COMPANY OFFERS SEVEN TICKETS FOR A QUARTER—MIDNIGHT RAID BY MAYOR JOHNSON'S FORCES

The Cleveland Electric Railway Company has submitted to the City Council its formal proposition for a renewal of existing franchises for twenty-five years. The proposition calls for the sale of seven tickets for 25 cents; present transfer privileges to be continued, with their extension to all subsequently constructed lines of the system; the construction of such high-speed lines, elevated or subways, as may be desired; the building of a cross-town line on Gordon Avenue, giving the people of the west side the same crosstown advantages that those of the east side now enjoy; and the submission of the entire proposition to the vote of the people at the next general election if the Council is in doubt as to the public will.

The proposition was in the form of a letter from President Horace Andrews, and this will be followed at the next Council meeting by an ordinance. In part, Mr. Andrews' letter was as follows: "The ordinance will gain for the people of Cleveland an immediate reduction in fare to the lowest point at which it has been demonstrated in this country a comprehensive street railway system can be successfully operated, allowing for the rates of wages paid in this country—a reduction in fare which amounts to over a million dollars a year to the riding public, or during the life of existing franchises from $8,000,000 to $12,000,000. The rate of fare proposed is equal to 3.57 cents per ride. It is estimated that over 90 per cent of the passengers will buy tickets; that 5 per cent will be transients or out-of-town people, and that the remaining 5 per cent will pay 5 cents cash. The proposed fare is therefore a 3½-cent fare, entitling passengers to present transfer privileges to all new lines constructed. The company stands ready to build the Gordon Avenue line and operate it as part of its general system, and submits that the passengers on this line and in this district will be better served under the rates of fare proposed with transfers than is possible by any other company. The company presents a map of the system showing the lengths of ride possible for one fare and transfer, from which it will readily be seen that the public would be much better served at the 3½-cent fare, and that immediately, than may be had for a 3-cent fare with limited rides and limited transfers in limited sections of the city. It is asked that the Council find some fair method to submit the entire question to the public for its approval or disapproval at the next general election."

Immediately upon reading the proposition Mayor Johnson announced that he would veto the ordinance if it was passed. He said he would veto an eight-ticket-for-a-quarter ordinance if it was presented. He intimated that the stock of the Cleveland Electric would immediately jump to 150, or more than double the figure at which it is now selling, if the ordinance was passed. President Andrews replied by offering to contract in advance for the sale of all the stock at a much lower figure.

Among Cleveland financial people the opinion is expressed that the company cannot afford to make such a proposition; that the stock would fall rather than advance if the ordinance passes. None of the estimates made by financial authorities shows up as favorably in the way of profits to the company as the estimates made by Mr. Andrews. One authority says that the loss in gross earnings the first year would be $1,125,000, instead of $1,000,000 as estimated by the company. In the factories, on the street and in the cars, the general comment is that the proposition is a most liberal one and that it ought to be accepted. If the people are given an opportunity to vote there is no question that the company would receive a favorable reply.

The officials of the Forest City Railway Company have signified their willingness to have the proposition placed before the public, and have announced that they will also submit a proposition. It will involve 3-cent fare on the lines it has under construction, but of course it could not offer transfers covering all parts of the city, which is the feature most desired by the majority of people.

As an alternative, the officials of the Cleveland Electric still have an opportunity of accepting the proposition made by Henry Everett and associates to lease the property on a guaranteed dividend basis. The proposition is still open, and it is understood that it involves the taking over the system on a ninety-nine-year lease with a graduated rental starting at 5 per cent on the present stock, the syndicate to put up $3,000,000 as a guarantee that the rental would be paid. Some of the directors are said to be in favor of accepting the proposition. Of course, if it was accepted the property would be turned over on the present basis, and Mr. Everett would then take up the work of securing a new franchise.

A well-informed traction man believes that the chief obstacle in the way of any plan to turn over the property to the Everett people would be Mr. Andrews' personal antipathy against withdrawing from a fight under fire after having been engaged in it for several years, and especially against turning over the fight to Henry Everett, who for many years has been Mr. Andrews' rival in the control of the property.

As this paper was on the press a telegram was received from Cleveland that Mayor Johnson, with 500 men, on the night of July 24, pulled up the Cleveland Electric Railway Company's track on Fulton Street to make way for the low-fare line to reach Public Square. A temporary injunction was secured the next morning, but the Mayor paid no attention to it, and he must now answer for contempt of court. This coup is being generally denounced as a high-handed proceeding, as the old company's franchise on this street does not expire until 1908.

## LARGE GAS ENGINE PLANTS

The Carnegie Steel Company has purchased for its Homestead works two 2000-kw alternating-current generators driven by gas engines. These units are to be furnished by Allis-Chalmers Company, of Milwaukee, and they complete an order recently given for machinery costing approximately one million dollars to be built by Allis-Chalmers Company for the Homestead plant. It includes three gas engine-driven electric units and four gas blowing engines, the aggregate capacity of these machines being nearly 30,000 hp. This follows close upon the recent million-dollar order given to Allis-Chalmers Company by the Indiana Steel Company for the electrical equipment of its new plant at Gary, Ind., where gas engines of the same type and capacities, operating on waste gas from the blast furnaces, are to serve as prime movers for electric generators supplying current to the steel mills. Other purchases of gas blowing engines and gas engine-driven electrical units made from Allis-Chalmers Company amount to practically a million dollars more, so that sales during the past few months have aggregated $3,000,000.

Now another notable sale of gas engine-driven electric generating units has just been made to the Milwaukee Northern (electric) Railway Company, whose plant will represent the largest installation of this kind on the continent. The power house of this company, which will be situated at Port Washington, Wis., is to contain three horizontal twin-tandem gas engines, each having a rated capacity of 1500 hp, with liberal allowance for overload, direct-connected to three 1000-kw, 3-phase, 25-cycle alternating-current generators. The complete units will be built and installed by Allis-Chalmers Company. The exciting units for these generators, which are to be driven by special vertical gas engines, will also be furnished by Allis-Chalmers Company. All of the engines are to operate on producer gas.

## TESTS ON THE NEW YORK CENTRAL LOCOMOTIVES

Last October the first half of the 50,000 mile endurance run of the first high-speed electric locomotive No. 6000, built jointly by the General Electric Company and American Locomotive Company, was completed on the test tracks of the New York Central lines in Schenectady. On June 12, this locomotive completed the second half of this exhaustive service test. The maintenance expense per mile for the complete 50,000-mile run amounted to $0.0126. This figure includes all maintenance expense on motors, brake-shoes, tires, inspection, and other miscellaneous items. Moreover, the operating conditions were much more severe than those to which the thirty-five electric locomotives, which have been ordered, will be subjected. The test locomotive hauled a train averaging from 200 to 400 tons over a 6-mile track, and high-speed running under these conditions involved higher braking and accelerating duty than in regular operating service. There are in all fourteen machines now complete. Of these, two have been shipped to New York. The remaining locomotives are well under way at the shops of the General Electric Company and American Locomotive Works, and it is expected that the complete number, thirty-five, will be ready for service early in October.

## CHICAGO TRACTION OFFER

On July 21 the traction companies gave the Chicago Council committee on local transportation the figures at which they would agree to sell to the city their present tangible properties. The figures are: Chicago City Railway Company, $20,103,935; Union Traction Company, $27,401,218; total, $47,505,153. Mayor Dunne at once declared the figures to be "grossly excessive," and the committee referred them to two experts for analysis and report. The figures are based on the cost of "reproduction, at current prices, less cost of bringing property at this date up to a condition operatively equal to new," to quote from the City Railway statement. That of the Union Traction Company puts it in this way: "This amount has been arrived at by determining the cost, at current prices, of reproducing the property in question, and deducting therefrom the amount of money that would be required to place the present property in a condition as good as new."

Both statements contain the declaration that the cost of changing the present cable lines to trolleys and lowering the tunnels would have to be added if the city wanted to purchase after the transformation.

## STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED JULY 17, 1906

825,927. Electrical Signal System; Carl P. Nachod, of Wilkinsburg, Pa. App. filed Aug. 2, 1905. A block signal system for use with single-track trolley roads which have turnouts at predetermined intervals. A shaft is stepped around by an electromagnet whenever a car enters a block, and is reversely rotated by another magnet whenever the car leaves the block. The signal circuits are closed by the movements of this shaft.

825,975. Railway Rails; J. Moyle, of Saxton, Pa. App. filed Feb. 7, 1906. A railway rail having a longitudinal channel in its web and a tread having a fin engaging the channel and the flange fitting against the side of the web, bolts being passed through the flange and web and fin.

825,988. Railway Signaling System; Lewis H. Thullen, of Edgewood Park, Pa. App. filed June 20, 1905. A signal system of that class in which the rails are divided into block sections and energized to a potential difference by a battery. The rails are also connected to a transformer primary circuit, the secondary of which includes a relay magnet.

826,003. System of Signaling; Paul Winsor, of Weston, Mass. App. filed Jan. 27, 1902. This patent covers the application of an alternating current to the track rails and the plan of locating the signal relays in a transformer circuit with the rails.

826,050. Trolley Pole; Augustus Neubert, of Elizabeth, N. J. App. filed Nov. 5, 1903. The trolley harp is extended upward on either side of the wheel and has a pair of outwardly flaring prongs on each side, the purpose of which is to prevent displacement of the wheel when passing crosstown arches.

826,084. Street Railway Switch; Horace Blanchard, of Boston, Mass. App. filed Aug. 4, 1905. A removable detent for locking the switch point fitted in the bed plate and extending between the side walls and under the tongue, the central portion of the detent being thicker than the side portion.

826,136. Bond; Francis B. Badt and George M. Willis. App. filed March 10, 1902. The bond has a pair of tubular plugs in its ends which may be extended into the rails so as to make good electric contact therewith, in the manner of an ordinary boiler tube.

826,138. Collector; Benjamin Harry Bedell, of London, England. App. filed Nov. 22, 1904. Relates to railways of that class having contact plates inset in the roadbed at spaced intervals. The car has a depending chain to make contact therewith, and means are provided by which the chain is depressed only at the region of the contact plate.

826,199. Switch Operating Mechanism; Arthur E. Stevenson, of Buffalo, N. Y. App. filed Oct. 12, 1905. A pair of special trolleys are laid between the usual track rails and collector shoes are pivoted to depend from the wheel axles, and are spring-pressed into engagement with the trolleys.

826,256. Railway Block Signal System; Charles M. Kirwan, of Baldwinsville, N. Y. App. filed April 18, 1905. A series of tappets may be set by magnets in a position to be depressed by passing trains. If trains are too close together, circuits are closed which move a train-stop arm into position to give an alarm circuit on the rearmost train.

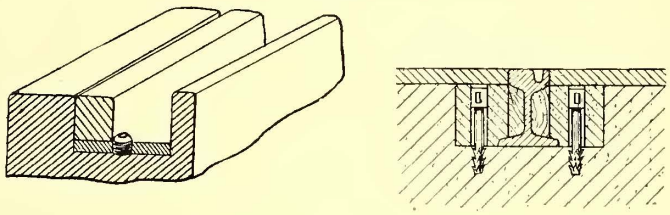
826,296. Trolley; Gurney E. Ward, of Abilene, Tex. App. filed Aug. 11, 1905. The upper end of the trolley pole is flared to produce a recess in which a pair of trolley wheels are contained. One of the trolleys is located in fixed bearings, and the other is spring-pressed upward.

826,307. Electromagnet; Walter W. Brown, of Schenectady, N. Y. App. filed Jan. 9, 1905. A semaphore operating means comprising a movable member, an electromagnet that moves said member, a switch arranged to be operated when said member is moved, and a relay controlled by said switch and adapted to decrease the current through said magnet.

826,315. Electric Railway Motor; Patrick J. Collins, of Scranton, Pa. App. filed Jan. 3, 1905. The field magnets of the motors are made a part of the frame of the truck, and the armatures are directly keyed on the wheel axles.

826,319. Trolley Pole; Pemberton Dudley, of Asbury Park, N. J. App. filed Aug. 11, 1905. The upper end of the trolley pole is flexibly connected with the main portion and capable of lateral motion. It is normally held centrally by springs.

826,344. Embedding for Street Car Rails; Franz Melaun, of Charlottenburg, Germany. App. filed Oct. 13, 1905. Concrete blocks to be used as filling material over which asphalt is laid after repairing the rails or laying new rails. Obviates the necessity of waiting for the concrete to harden when laid in a plastic state.



PATENT NO. 826,344

826,433. Spring Switch; Clarence C. Korns, of Johnstown, Pa. App. filed Aug. 24, 1905. Switch point may be readily set as a spring switch for either right or left-hand throw. The tongue may be semi-locked in either of its thrown positions.

826,439. Trolley; Bryan McManaman, of Wilkesbarre, Pa. App. filed Sept. 7, 1905. The trolley wheel has prongs fastened to the edges of its two flanges which are stated to close over the conductor in use and prevent the wheel from leaving the wire. The wheel has a feature by which it is removable from the harp.

826,440. Trolley Stand; Bryan McManaman, of Wilkesbarre, Pa. App. filed Oct. 3, 1905. The trolley pole is impelled upward by a counterweight and has springs for limiting the upward movement. In this way the pole is prevented from being thrown upward high enough to be damaged by guy wires.

826,462. Railway Switch Construction; Harry L. Young, f Pueblo, Col. App. filed March 21, 1906. A self-cleaning switch consisting of a supporting base provided with discharge openings and a chair having a set of openings registering with the base openings and another set registering with the tread flange openings.

826,474. Controller Regulator; C. N. Butler, of Philadelphia, Pa. App. filed Dec. 16, 1905. The controller shaft has a plate thereon with depending cam fingers which move into engagement with a detent finger in such a way as to prevent too abrupt movement of a controller shaft.

826,478. Electric Railway Motor; Patrick J. Collins, of Scranton, Pa. App. filed Aug. 11, 1905. The motor field magnets are organized into the frame of the car trucks and the armatures are directly keyed on the wheel shafts.

826,494. Controller Regulator; John P. Durkin, of Philadelphia, Pa. App. filed Nov. 20, 1905. The controller shaft has a ratchet-shaped cam thereon which moves centrically with a stationary cam of the casing. A pivoted finger is engaged with the two cam surfaces so as to prevent an abrupt movement of the controller arm.

826,495. Controller Regulator; John P. Durkin, of Philadelphia, Pa. App. filed Jan. 8, 1906. Relates to a modification of the above in which a ball is used instead of the pivoted finger.

826,508. Electrically Propelled Vehicle; Rudolph M. Hunter, of Philadelphia, Pa. App. filed Nov. 15, 1898. Motor is sleeved upon the wheel axle and has an arm engaged by a pair of opposed springs to keep the motor properly positioned.

## PERSONAL MENTION

MR. W. W. WHEATLEY, general manager of the Mexico Electric Tramways, Ltd., has been elected a director of the Mexico City Banking Company, of Mexico City.

MR. H. H. SMITH has been appointed superintendent of the Jackson & Battle Creek Traction Company, in place of Mr. E. S. Loomis, who has resigned. The change took effect July 16.

MR. J. C. YOUNG, general superintendent of the Saginaw Valley Traction Company, of Saginaw, Mich., has tendered his resignation, to take effect Aug. 1. He goes to Chicago to engage in other business.

MR. THOMAS M. KEELEY, assistant general superintendent of the Michigan United Railways Company, who has had charge of the construction work, has resigned and it is understood will take a position with a construction company.

MR. HUGH M. BUEGLER has resigned from the Elmira Water, Light & Railway Company as electrical engineer and is now associated with the Newman properties, in the operating department, as superintendent of railways. Mr. Buegler's permanent address after Sept. 1, will be Nashville, Tenn., where he expects to make his headquarters.

MR. EDWARD JOHN, who has been train despatcher, with headquarters in Lansing, for the Michigan United Railway Company for the past two years, has resigned his position and has left Lansing to accept a position as superintendent of the Norwich & Westerly Railroad, of Norwich, Conn. Mr. John's place will be taken by Mr. L. L. Steadman, who has been in the employ of the company for the past three years.

MR. W. T. DOUGAN, engineer of maintenance of way of the New York City Railway Company, has been appointed by Mr. H. H. Adams, president of the American Street & Interurban Railway Engineering Association, to serve on the executive committee of that association in place of Mr. W. Boardman Reed, who has resigned. Mr. Reed will, however, continue his membership in the association and will continue to serve on the committee of maintenance of way.

MR. W. M. EATON, second vice-president of the Rochester Railway & Light Company, will turn over his duties as general manager of the company to his successor, Mr. R. M. Searle, of Mount Vernon. Mr. Eaton will continue his duties as the secone vice-president of the Railway & Light Company as well as his duties as third vice-president of the Rochester Railway Company. Mr. Searle is at present the general manager of the Westchester Lighting Company, with offices at Mount Vernon, N. Y. He was formerly the general manager of the Atlanta (Ga.) Gas Light Company, which office he held for six years.

MR. A. L. NEEREAMER, heretofore traffic manager of the Columbus, Delaware & Marion Railway, has been promoted to the position of general superintendent, with headquarters in Delaware. Mr. E. J. Davis, heretofore assistant traffic manager, has been made general passenger and freight agent, with headquarters at Columbus; the positions of traffic manager and assistant traffic manager have been abolished. General Manager Geo. Whysall will move his office from Delaware to Marion, where he will give his personal attention to the construction work on the Bucyrus extension of the road.

MR. J. B. McNAMARA, of Cairo, chief electrical engineer of the State Railways of Egypt, has been making a tour of this country, during which he has inspected the Pennsylvania, New York Central, Long Island and other electrified steam roads, and has visited Schenectady, Pittsburg, Milwaukee and other cities. He expected to return by the "Patricia" July 28. Mr. McNamara stated that the management of the State Railways of Egypt has decided to install a 19-km single-phase line near Cairo and put a 10-minute service in operation. The road has previously been operated by steam. Bids will be asked for the construction of this line probably in January.

MR. W. H. HOLLENBECK, who has held the position of superintendent of buildings with the Milwaukee Electric Railway & Light Company for some time past, has resigned. He severed his connection with the company July 1. The name of his successor has not yet been announced. Mr. Hollenbeck came to Milwaukee from the General Electric Company, of Schenectady, N. Y., where he was employed in a similar capacity. As superintendent of buildings with the street railway company, Mr. Hollenbeck had the supervision of all the company's properties, including the new public service building, which was finished just prior to his leaving.

PROF. CHARLES E. LUCKE, of Columbia University, has been appointed by the United States Department of Agriculture an expert to secure data on the use of alcohol as a fuel in small engines. He has issued a general request for any who have any information on the subject to send it to him, especially copies of any patents on motors capable of using alcohol as fuel. Vaporizers, carbureters or complete engines for testing at the Columbia laboratories will be especially welcome. These tests will be conducted without expense except the transportation of the apparatus, and the reports will be published in a bulletin to be published later. Any data or shipments should be addressed to Prof. Chas. E. Lucke at Columbia University, and they will be returned when the test is completed. Acknowledgement also will be given for all assistance rendered in this investigation.

THE OPERATING PERSONNEL of the Public Service Corporation in the Newark district experienced the following changes, beginning July 12: Districts Nos. 2 and 4 were consolidated into one district known as district No. 2, Mr. W. B. Graham appointed district superintendent in charge; Mr. A. M. Stewart, formerly district superintendent in charge of district No. 2, was appointed division superintendent in charge of the Bloomfield, Valley Road, Orange & Passaic Valley and Eagle Rock lines; Mr. Chas. H. Coe appointed division superintendent in charge of the Kearny, Mt. Prospect and Mulberry lines; Mr. A. W. Pratt appointed division superintendent in charge of the Orange, Roseville, Central Avenue and South Orange and Maplewood lines; Mr. Jas. McCabe appointed division superintendent in charge of the Turnpike line, and Mr. J. F. Sparrow appointed division superintendent in charge of the Bergen and Clifton lines.

MR. E. W. T. GRAY, who has for years been manager of the New York sales office of the Westinghouse Electric & Manufacturing Company, resigned recently to take up commercial work in another field. Mr. Gray's decision to sever his connection with the Westinghouse Company was received with great regret by the management, as he was one of the pioneer employees of the company. Mr. Gray began his work with the Westinghouse Company about the year 1890, starting in the laboratory of its original works in the heart of the city of Pittsburg. Later he took up installation work for the company, installing the first railway motors the company made on cars in Lansing, Mich., about the year 1901. Following a short period spent in this work, Mr. Gray was called by the company to its sales organization, with headquarters at Pittsburg. In 1898 Mr. Gray received the appointment of manager of the New York office. Mr. W. C. Webster, who succeeds Mr. Gray as manager of the New York sales office, has a broad general knowledge of the company's commercial policy, and on account of his close association with the sales department in the past enjoys a personal acquaintance with the entire sales force, which should be of great advantage to him in his new work. Mr. Webster entered the employ of the company in 1898, and has always been identified with the sales department.

MR. PIERCE C. KEILHOLTZ has resigned as consulting engineer of the United Railways & Electric Company, of Baltimore. He has held the position since the formation of the corporation, and was previously employed in a similar capacity by the former City & Suburban Railway, which was merged into the present system. Altogether he has been engaged since 1895 in the electrical department of the street railway systems of the city, and for the greater part of that period had full charge of the electrical work in its operation since electricity was introduced in Baltimore as a motive power. It is understood that he has resigned to devote more time to the field of consulting engineer in his special line. Mr. Keilholtz is also the consulting engineer of the Consolidated Gas, Electric Light & Power Company. He will retain this position, which he has also held since its formation, about three years ago. Mr. Keilholtz has had many flattering offers from electric concerns throughout the country, but he has declined them, it is said, because he prefers Baltimore as a home.