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The Philadelphia Convention

As this issue goes to press the final arrangements are being made for the Philadelphia convention of the street railway interests. The preparations for this year's gathering are most complete, and there is every reason why all features should be most successful. The hotels in Philadelphia are excellent, the hall in which the exhibits will be shown is well adapted for the purpose for which it will be used, the papers and reports announced for the different meetings are on topics of great interest to the industry, and the city railway system of Philadelphia, with its many novel features and economical operation, will furnish a valuable opportunity, for all those who will, to study its methods. At no previous period in its history probably has any convention offered greater inducements for attendance than that which will be opened next Monday at the South Pavilion of the Philadelphia Museum.

No other convention, also, has been of such importance from an association standpoint as that which will be held next week. After an existence of twenty-three years under one name and constitution, the executive committee has recommended a change in both, which, in its opinion, is absolutely necessary to meet the requirements of the present day. In this opinion we concur, and we also believe that the proposed plan will appeal strongly to many companies which up to this time have remained outside of the association. It is inevitable that any new plan should be viewed with some trepidation, especially where there are various interests involved and so many traditions as cluster around the history of the past. But we are living in the present, not in bygone days. This day and this century are essentially those of the consolidation of energies and of organization along scientific lines, and where this principle of combination is recognized by the individual members, in the case of their own properties, it seems pre-eminently desirable where co-operative action is concerned. The American Street and Interurban Railway Association should be able to care for the interests of all the street railway companies of the country better than one or four associations have done in the past, and to carry out new lines of work which will be of the greatest practical benefit to all.

The convention will also be a notable one from the fact that it is the first in which the exhibit feature will be conducted by the American Street Railway Manufacturers' Association. This association, as is well known, was organized to take charge of a number of matters in connection with the annual conventions which could properly be delegated to it, but especially to manage the exhibit features, which heretofore had devolved, for the most part, upon representatives of the street railway company in the city where the convention was being held. The Manufacturers' Association comprises in its membership practically all of the principal manufacturers of street railway apparatus in this country, and has been officially recognized by the Street Railway Association as an allied organization, so that its co-operation in future conventions of the association is assured.

Philadelphia, the Convention City

Those who attend the Philadelphia conventions will find a number of methods and practices on the Philadelphia Rapid Transit system that may properly be termed distinguishing characteristics. From a transportation standpoint, perhaps the most interesting of these is the system of selling "exchange tickets." Before the final consolidation of the various independent companies in Philadelphia, which resulted in the formation of the Union Traction Company, a passenger who wished to go from one portion of the city to another frequently had to pay two or sometimes three 5-cent fares to reach his destination. Several years before the consolidation in 1895, a number of the independent operating companies by joint agreement issued what were known as exchange tickets for 3 cents, in addition to the 5-cent fare. These tickets gave a continuous ride upon connecting lines for 8 cents. When the new management took over the various independent properties many of the routes were changed, so that it is now possible to reach the downtown districts from virtually every part of Philadelphia for a single 5-cent fare. If, however, a passenger wishes to pass through the central portion of the city and continue his ride in another direction, the "exchange" system per-

mits him to do so by paying 3 cents additional. The exchange tickets differ from the transfers used in other cities, in that there is no time limit on them, and it is a common sight to see passengers, when asked for their fare, take out a number of old exchanges and sort out one good on the particular line they are using. Visiting street railway managers may differ as to the wisdom of providing a system whereby the patrons of the road can secure two separate and distinct rides for 8 cents. Nevertheless, the sale of these exchange tickets results in a number of desirable conditions. One of these is that many of the objections to the usual transfer system disappear when 3 cents is charged for the exchange. Again, it is evident that the reduction given by selling the two rides for 8 cents is available only to those persons who are regular and frequent patrons of the line, and this is the class that should be most favored by a street railway company if any distinction is made. The transient visitor to the city as well as those who ride only occasionally, and those to whom the reduction of only 1 cent is no object, pay the 5-cent fare. Moreover, the arrangement is conducive to short-distance riding. It would appear that in the selling of 8-cent exchange tickets the Philadelphia Company has evolved a solution of the vexatious transfer problem—satisfactorily to the public as well as to the company.

Two other practices, which are described in our Philadelphia Souvenir section, should meet with careful consideration by the visiting officials. These are the system of handling the fire insurance question and the practice of charging off at stated periods certain amounts for depreciation. The Philadelphia Rapid Transit Company carries three funds to take care of depreciation, namely, depreciation of roadway and track, depreciation of power plants, and accident account. At present the respective sums charged off to these items are 7 per cent, 6 per cent and 5 per cent of the gross receipts. The charges to depreciation account are not carried in the balance sheet, but the sums are expended each year and charged up to operating expenses.

Visiting superintendents of transportation and those having traction matters directly in charge will be particularly interested in the method of arranging and posting schedules. In Philadelphia, as far as this matter is concerned, the actual car numbers are disregarded, and the cars are operated and the crews are assigned in accordance with what are termed "block numbers." In this connection, the block number may be defined as the day's work for a car in distinction to the run number, which represents a day's work for a crew. The chief aim of the method of handling schedules is to give all the men, including the regulars and extras, a chance to perform a full day's work, and this is accomplished by dividing the block numbers, or "day's work for a car," into sections and then combining these sections into ten-hour periods. The scheme for arranging schedules does away practically with tripper runs, and the extra men know if they are assigned to a run at all they will earn as much as the regular men. In execution, the block numbers are designated by two small wooden signs about 2 ins. x 6 ins., which are painted black, with the block number in white figures. Two of these small block signs are hung on each car, one over each platform, just under the hood, where they can be easily seen. The principles upon which the schedules are formed are very fully explained in the Philadelphia section.

To those interested in the mechanical side of electric railway work, much will be found in the convention city to command attention and study. The system of generating and distributing power has been a sort of evolution, and has been largely influenced by the various mergers and consolidations of independent systems. The methods by which the different underlying properties have been welded into a homogeneous and self-contained whole, so that the generation and transmission of power could be handled upon a reliable and economical basis, contain many valuable lessons. Many of the results secured have been worked out under stress of necessity, and, as in other large cities, the engineers of the company have executed well-laid plans, only to find that almost before their arrangements had been perfected, conditions that no one could foresee would arise and new and greater problems would be presented. So far as the matter of power is concerned, the company is now working out an elaborate and comprehensive scheme, the details of which are set forth in our convention issue, and which will merit the closest investigation by those who are now facing—and their number is many—the problem of securing additional power facilities.

In regard to track construction and details of handling way and roadway matters, Philadelphia is a veritable store room of pointers and suggestions. The P. R. T. standard 137-lb. girder-rail section has received a great deal of attention in the columns of the technical press, and has been adopted directly or in a modified form in many other cities. The convention will afford good opportunities for seeing the rail in actual service under exacting traffic conditions. The new concrete track work that is being put in on Market and other of the heavy traveled downtown streets possesses many features of merit and is worthy of careful inspection. The departure from accepted types of concrete construction lies in the use of yokes or frames, which are imbedded in a concrete beam, and which serve the purpose not of supporting the rail, but of anchoring or holding the rail down to the surface of the concrete structure so that there can be no pounding of the rail upon the concrete. This does away with the disintegration and crumbling that have so frequently doomed concrete construction to failure. Many of the detail standard in methods, plans and processes followed by the track department, and described in our convention issue, afford solutions to problems that are still bothering the engineers in other cities.

From a distinctively engineering point of view, the new subway and elevated plans for relieving street congestion in Philadelphia and affording means of quick transit to the suburbs are of prime interest. The first section of the subway, from the City Hall west to the Schuylkill River, is practically completed as far as the subway structure itself is concerned, and the erection of the elevated structure west of the Schuylkill River has been commenced. As the subject of subway lines is being broached in several cities, and will soon receive the attention of a number of city as well as interurban companies, the opportunity will undoubtedly be grasped by those attending the convention of studying what Philadelphia has accomplished and is planning to do in this connection.

Convention Issues

In this connection, we hope that we shall be pardoned if we refer briefly to the subject of convention issues. The policy of issuing a special number of the Street Railway Journal just previous to the annual convention of the American Street Railway Association has been followed by this paper since its establishment, but it has been only since 1894 that the big souvenir number has been a feature of the convention. Although this issue has been the largest each year of any technical paper in this country, it is not upon its mere bigness that the publishers prefer to dwell. Each number has been com-

piled along some dominant idea which at that time seemed to be of greatest interest to the electric railway industry, and each consequently contains within its covers practically all of the material available at that time relating to that particular topic. Thus, in 1894, when the convention was held in Atlanta, the souvenir number was devoted to the electric railway development in the entire South, and in 1895, at the time of the Montreal convention, the electric railway interests in Canada were the topic considered. For four years the street railway system of the city in which the convention was being held was made the principal subject. This was in 1886, 1887, 1888 and 1901. In 1899 and 1900, which were the years following the great impetus to electric railway construction abroad, the souvenir issues presented reports of different aspects of this condition. In 1902 advantage was taken of the fact that the convention was being held in Detroit, to describe not only the important city and interurban roads there, but other recent railways of the same type, and this issue was entitled "The Interurban Number." In 1903 our souvenir number was devoted largely to city railway practice, and in 1904 we published our anniversary number, which described the developments of the last twenty years, and also the system of the Interurban Rapid Transit Company, which had just been put in operation.

In view of the important construction work and remarkable economical results of operation which are in existence in Philadelphia, we believe that no excuse need be offered for devoting the souvenir portion of this issue to the Philadelphia Rapid Transit system. A special effort has been made in this issue as to typographical appearance. An entirely new face of type is used, and all of the half-tone illustrations are upon especial inset paper in the form of plates.

Another feature introduced this year in our souvenir issue for the first time is a dictionary of electric railway apparatus. This dictionary occupies some seventy pages, and is by far the most complete compilation of the kind ever prepared. The items are classified alphabetically by subjects, and the information has been furnished directly by the manufacturer or has been prepared from his trade catalogues. Its aim is to give to the busy buyer a succinct and authoritative statement of the street railway apparatus available at this present time in the different departments of the industry.

If this number is of assistance to the visitors in Philadelphia in their study of the methods and practice of the Philadelphia Rapid Transit Company, and to those who remain at home, in their daily work, the publishers have accomplished their purpose.

Single-Phase Railways

Although the single-phase alternating-current railway motor is decidedly new as yet in this country, it can now be considered as well out of the experimental stage. The operation of the first two commercial interurban roads in this country to be equipped and operated with single-phase alternating-current motors exclusively (which have now been opened for periods of six and eight months, respectively) has been such that we are convinced, after investigation of the matter and visits to these properties, that if there are any inherent difficulties in the way of success of a single-phase alternating-current railway system, they are too small to show themselves in eight months of operation, and are hence too small to be worth serious consideration.

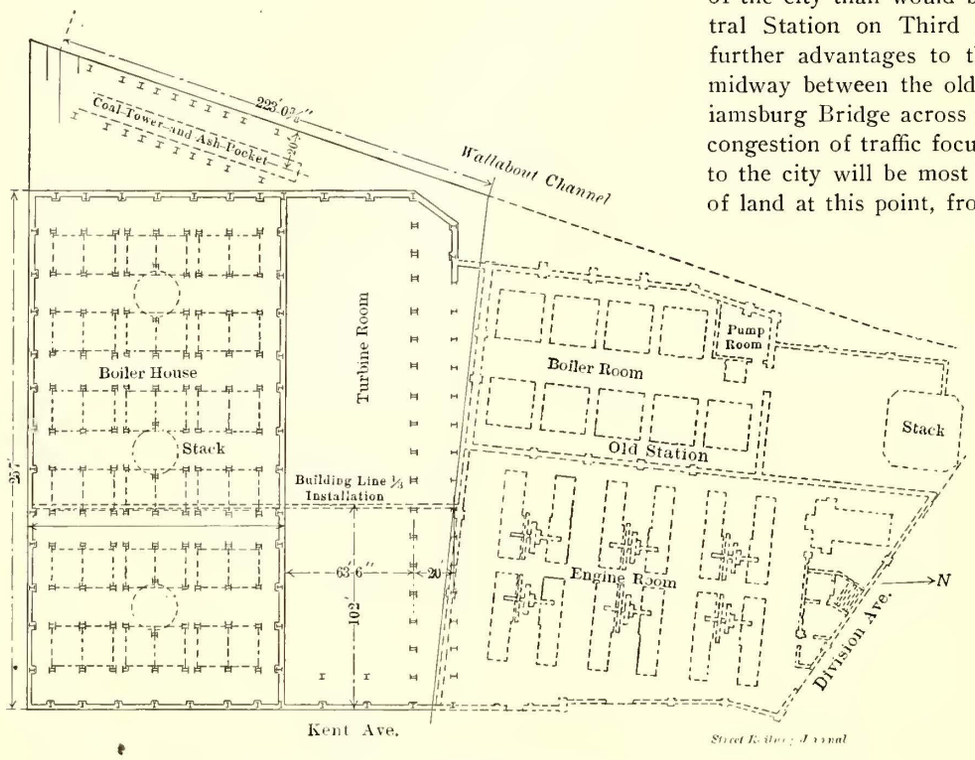
The two roads upon which fate decreed that the single-phase alternating-current motor should be first tried in every-day service in America are decidedly different in character. The Indianapolis & Cincinnati Traction Company's line between Indianapolis and Rushville represents the higher type of high-speed, heavy interurban railroading. As regards high speeds with heavy cars, the conditions are as severe as are to be found on any American interurban road. On the Pontiac-Odell line, on the other hand, the physical requirements, as far as weight and speed of car are concerned, were very moderate, the chief restrictions in this case being on the cost of construction. On both roads are to be found certain conditions favoring the selection of alternating-current equipment. On the Rushville line, where a large amount of energy must be delivered to each moving car and the speeds are high, the possibilities of the bow trolley and low distribution costs were very attractive as against the third-rail equipment and heavy sub-station investments which would have been necessary had direct-current motors been used. It was a question not only of cost, but of a practicable method of current supply, and both considerations were favorable to the alternating-current motor supplied from a substantial trolley line well out of danger. At Pontiac it was mainly a question of keeping down the cost of construction so as to build a road which could show profits in operating through a sparsely settled country.

The Rushville line has been in operation since the first of this year, and the Pontiac line since March 15 this year. On both roads the claims of the manufacturers that single-phase commutating motors can be built which will give almost as sparkless commutation as direct-current motors have been fully substantiated. It would seem that the question of sparkless commutation of such motors is now thoroughly settled; that there is little more to fear from commutator wear on a. c. motors than on d. c. motors. A road which can operate day in and day out for several months and maintain a regular schedule with one car and no reserve, as at Pontiac, cannot have very serious motor troubles. While there have been various rumors of burn-outs on the Rushville line, a closer investigation shows that what troubles have occurred are not in any sense to be taken as due to the fact that single-phase motors were used. Our friends at Rushville unfortunately had to start their road with motors intended for operation on a purely a. c. system at considerably lower voltage strains than those to which they are subjected in a combined a. c. and d. c. service. While the results have been annoying, and especially so since the eyes of the electric railway world are upon the performance of that road, there is nothing in the incident to give the advocates of the single-phase commutating motor any anxiety. The motors seem to be working well within the heating limit, and commutating well. The difficulties that may have been experienced because of insufficient insulation are easily remedied, and there is no reason to expect anything but satisfactory operation from now on.

Equally gratifying with the success of the a. c. motor is the satisfactory performance of the sliding contact bow trolley on the Rushville line. It was hardly to be expected that the bow trolley on such a high-speed line as this would give so little trouble from the start. In fact, nearly all anticipated that considerable experimentation would be necessary on this feature, and have been pleasantly disappointed. There is no doubt still some chance for improvement, but the performance of this trolley and the life obtained from the contact plates is satisfactory enough so that there is no great urgency about making improvements. A successful trolley that cannot leave the wire in service is as necessary to the success of the alternating-current railway in many cases, where it is desirable to employ it, as the alternating-current motor itself.

THE NEW WILLIAMSBURG POWER PLANT OF THE BROOKLYN RAPID TRANSIT COMPANY

In his last annual report just rendered, and published in this paper last week, President Winter, of the Brooklyn Rapid Transit Company, refers at length to the plans for increased power of the company. This requirement is a logical result of the greatly increased service during the last two or three years, on the surface lines in Brooklyn and the transition from steam to electricity as a motive power upon the elevated lines of the company. Although the company's power output has increased rapidly, the demands for power have grown in even a greater ratio, so that even the addition to the system of the new Central Power Station of the company, with a capacity of



PLAN OF NEW AND OLD POWER STATIONS AT WILLIAMSBURG

over 30,000 hp., has rendered the stations entirely inadequate to meet the requirements. The management realized nearly three years ago that greatly increased power facilities would soon be required, so that even before the Central Power Station was completed, plans were commenced for a large new steam turbine power plant to be installed in the Williamsburg district of Brooklyn. This station is now being completed, and will not only soon provide relief to the present heavily burdened power system, but will also provide liberal facilities for extension to cope with further developments. This new station will embody many interesting features, principal of which is the use of steam turbine generating units.

Previous reference has been made in the columns of the Street Railway Journal to the extensive power generating and distributing system of the Brooklyn Rapid Transit system, to which this new station will make a very important addition. The power system involves at present five independent generating stations, four of which, however, the old Third Avenue, the Fifty-Second Street, the Thirty-Ninth Street and the Kent Avenue stations, are exclusively direct-current stations of earlier design and of comparatively small size, while the large new Central Station at Third Avenue, now in operation for about three years, is of modern design, with 4000-hp vertical-engine generating units, and has formed the nucleus of a comprehensive and interesting high-voltage three-phase distribution system. The latter embraces seven important sub-stations, from which the network of surface and elevated lines of the company are supplied with direct-current, and several additional sub-stations are contemplated.

LOCATION

In spite of the fact that the load center of the company's lines has gradually been moving backward from the river front, it was decided that the new station should be located near the river or bay, both for a condensing water supply and for coal shipment direct by boat. Land fronting on the Wallabout Canal of the East River, and adjacent to the present Eastern District Station at Kent Avenue and Division Avenue, was found available, and was considered desirable in that it would afford, in addition to the above advantages of a river-front site, greater proximity to the rapidly growing eastern sections of the city than would be possible in the vicinity of the Central Station on Third Avenue. This location also offered further advantages to the distribution system in that it lies midway between the old Brooklyn Bridge and the new Williamsburg Bridge across the East River, so that the enormous congestion of traffic focusing at these two important entrances to the city will be most easily handled. Accordingly, a tract of land at this point, fronting 199 ft. on Kent Avenue, southward from the old Kent Avenue station, and 239 ft. upon the Wallabout Canal, near the Brooklyn Navy Yard dock, was secured for the new station site.

FOUNDATIONS

The building is divided by a partition wall at right angles to the Kent Avenue front, into an 83-ft. turbine room next to the Kent Avenue plant, and a 125-ft. boiler house to the south. For the foundations it was necessary to underpile the entire area occupied by the building. The upper 10 ft. to 25 ft. below the surface of the ground consisted of loose filling, below which was sand. All the column footings were heavily underpiled individually, as were also the wall foundations; 12-in. and 14-in. piles were used, cut off at about mean low water level. An interesting feature of the foundation work was the condenser circulating water tunnels, one of which was installed for inlet and another for the overflow. They are both 10-ft. horseshoe-shaped conduits, built one above the other in concrete, and are in turn carried upon a solid mass of piles throughout. These conduits enter beneath the turbine room basement and pass longitudinally the length of the room, so as to provide convenient and direct inlet and overflow connections for each condenser.

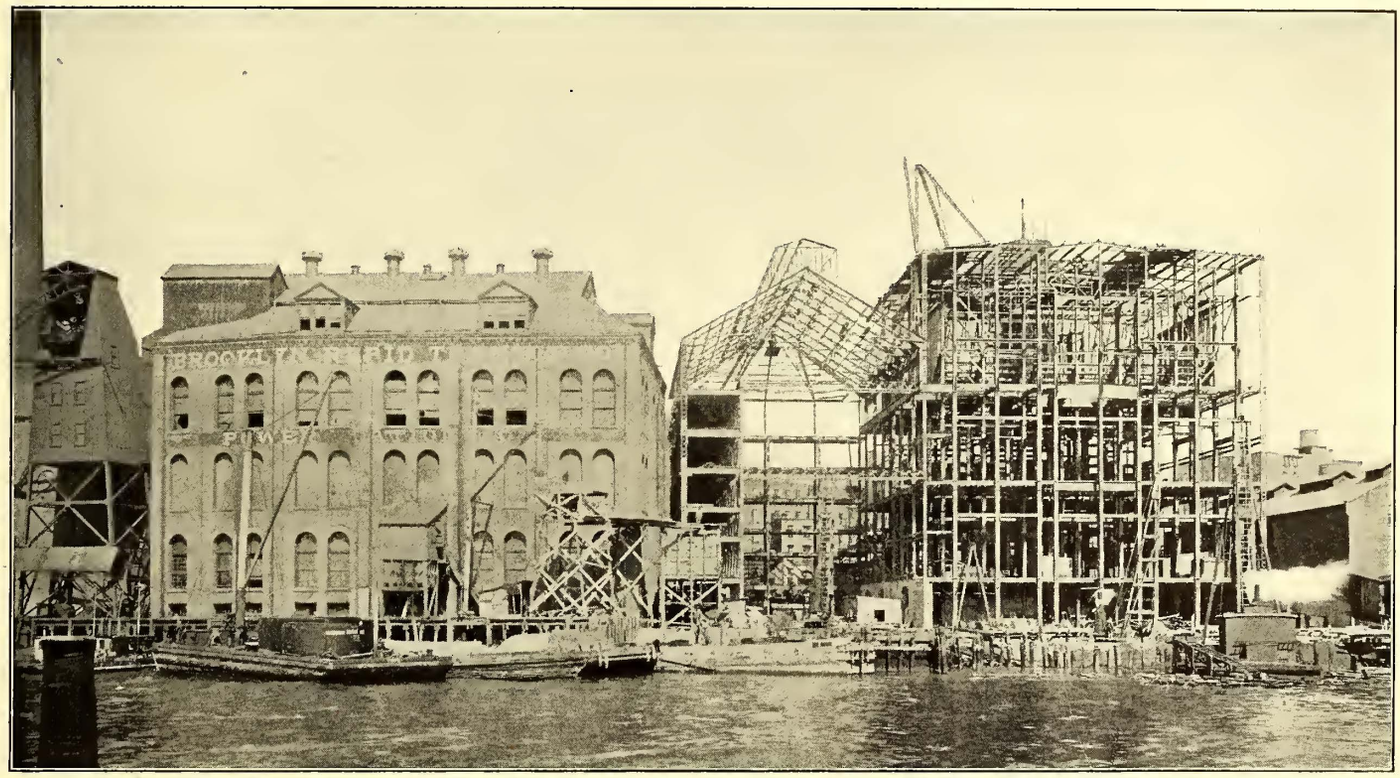
GENERAL ARRANGEMENT

The plan layout of the new station, shown herewith, is interesting on account of the small relative floor area required by the turbine generating equipment as compared with that required by the reciprocating engine equipment in the Central Station. In the latter, the engine room occupies nearly 60 per cent of the total ground plan, and boiler room section only 40 per cent, whereas in the new station this proportion is exactly reversed. A boiler room space 125 ft. x 257 ft. in size will be secured ultimately in the completed plant, while the turbine room space will be 83 ft. x 257 ft., of which 20 ft. in width on the north side is devoted to the galleries for accommodating the bus bar compartments, oil switches, and other electrical apparatus.

The boiler room section consists of a 17-ft. basement, two 33-ft. stories for the boilers, and above this a space of 47 ft.

up to the general roof level, which is devoted to the coal storage bunkers; the coal-handling system will be accommodated in the roof monitors. The turbine section involves an 18-ft. basement for condenser apparatus and a main turbine room with a clear height under roof trusses of 83 ft. The group of electrical galleries on the north side of this room consists of five mezzanine galleries above the main floor for the electrical switching equipment and storage-battery equipment. Across the Kent Avenue front of the turbine room there is also a row of mezzanine galleries to be devoted to offices, locker and toilet rooms, and mechanical and electrical laboratories.

The architectural treatment of the Kent Avenue front of the power house has tended toward ornamentation, and a very pleasing result has been obtained. The wall begins with a base of granite rising to the height of the first floor, above which are the walls of red pressed brick, with terra cotta trimmings and cornices. All the window trimmings are also of terra cotta, while the roof monitors are of copper finish.



VIEW FROM RIVER OF NEW POWER STATION UNDER CONSTRUCTION.—THE OLD KENT AVENUE POWER STATION OF THE BROOKLYN RAPID TRANSIT COMPANY SHOWN AT THE LEFT

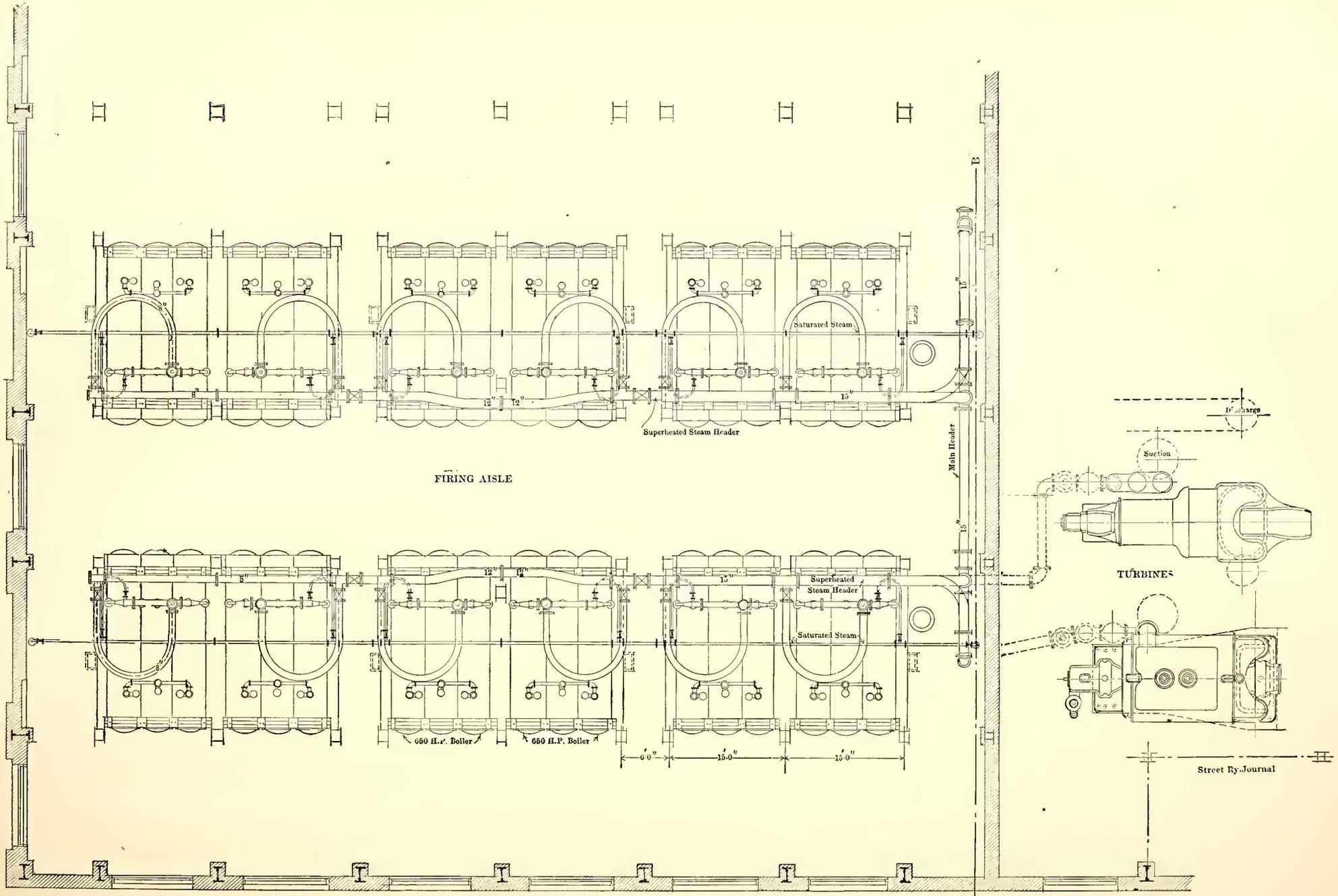
The roof of the boiler house is covered with Spanish roll tile on the mansard front, while the flat sections of both turbine and boiler room roofs are of slag concrete construction, surmounted by flat tiles. A feature of the exterior is to be noted in the window treatment, all windows being surmounted by a terra cotta architrave which rises from an entablature of terra cotta surrounding the structure.

The building, which is now nearly completed, is of steel frame and brick and concrete construction, and is absolutely fireproof. An accompanying cross section shows the principal details of the steel work and roof and coal bunker structure. The main boiler room and turbine room floors are of heavy construction, designed for uniform loadings up to 600 lbs. per square foot, while the less important floors are designed for 250 lbs.; the floors are all of concrete upon the Roebling system. In addition, the structure is designed ultimately to carry, above the boilers, four large coal bunkers designed to hold a total of 15,000 tons, when all filled. The coal bunkers are of reinforced concrete construction, with vertical stiffeners of I-beams embedded at intervals. The roof structure above the turbine room is carried by Fink roof trusses, of 83 ft. span, surmounted by a 20-ft. monitor for lighting and ventilation; the boiler room roof, monitors and coal handling apparatus are carried by a series of three-span trusses of special construction. The turbine room is traversed by a 50-ton Shaw traveling crane of 62 ft. span between runway rails.

BOILER AND ARRANGEMENT

It will be noticed that the arrangement of boilers adopted is upon the cross-fire-room plan, which has become typical of the more recent large turbine stations in this country. It has usually been found preferable to concentrate the firing rooms as much as possible, with the result of a less convenient arrangement of stacks, but in this plant a division of fire rooms was selected which, as may be noted in the accompanying plan, is more advantageous for the flue, stack and coal bunker arrangements. The ultimate plan provides upon each boiler floor two main firing rooms, each having upon each side a row of three batteries of two boilers each, and at either end of the building a half firing room with a single row of six boilers. This arrangement permits of the use of only three stacks, which will be symmetrical in design. Each stack will thus operate twelve boilers upon either floor, or twenty-four in all. The objection to the arrangement of half fire rooms will not here prove serious, as owing to the magnitude of the plant it will be an easy matter to divide the work at all times between the boilers to the best advantage of firemen.

The boilers will be of the well-known inclined water-tube type of the Babcock & Wilcox Company, and will be equipped with the new Babcock & Wilcox single superheaters. The station is designed for thirty-six boilers upon each boiler floor, or seventy-two in all, although for the initial installation only thirty-six will be installed, together with two stacks. Each boiler unit will be of 650-hp capacity, designed to deliver steam at 200 lbs. pressure and with a superheat of 100 degs. F. above saturation. Each boiler consists of three 42-in. steam drums and has 294 tubes, 4 in. O. D. by 18 ft. long, arranged 21 tubes wide and 14 tubes high, thus presenting a total heating surface of about 6500 sq. ft. The vertical rows of fourteen



PLAN OF FIRST FLOOR OF THE NEW WILLIAMSBURG STATION OF THE BROOKLYN RAPID TRANSIT COMPANY

tubes each deliver into a continuous wrought-steel header of a new design which materially simplifies the construction. The trimmings and fittings for each boiler are of extra heavy design, for the purpose of securing a maximum of reliability in service. The boilers will all be fitted with Gibson dumping grates to the entire exclusion of stokers.

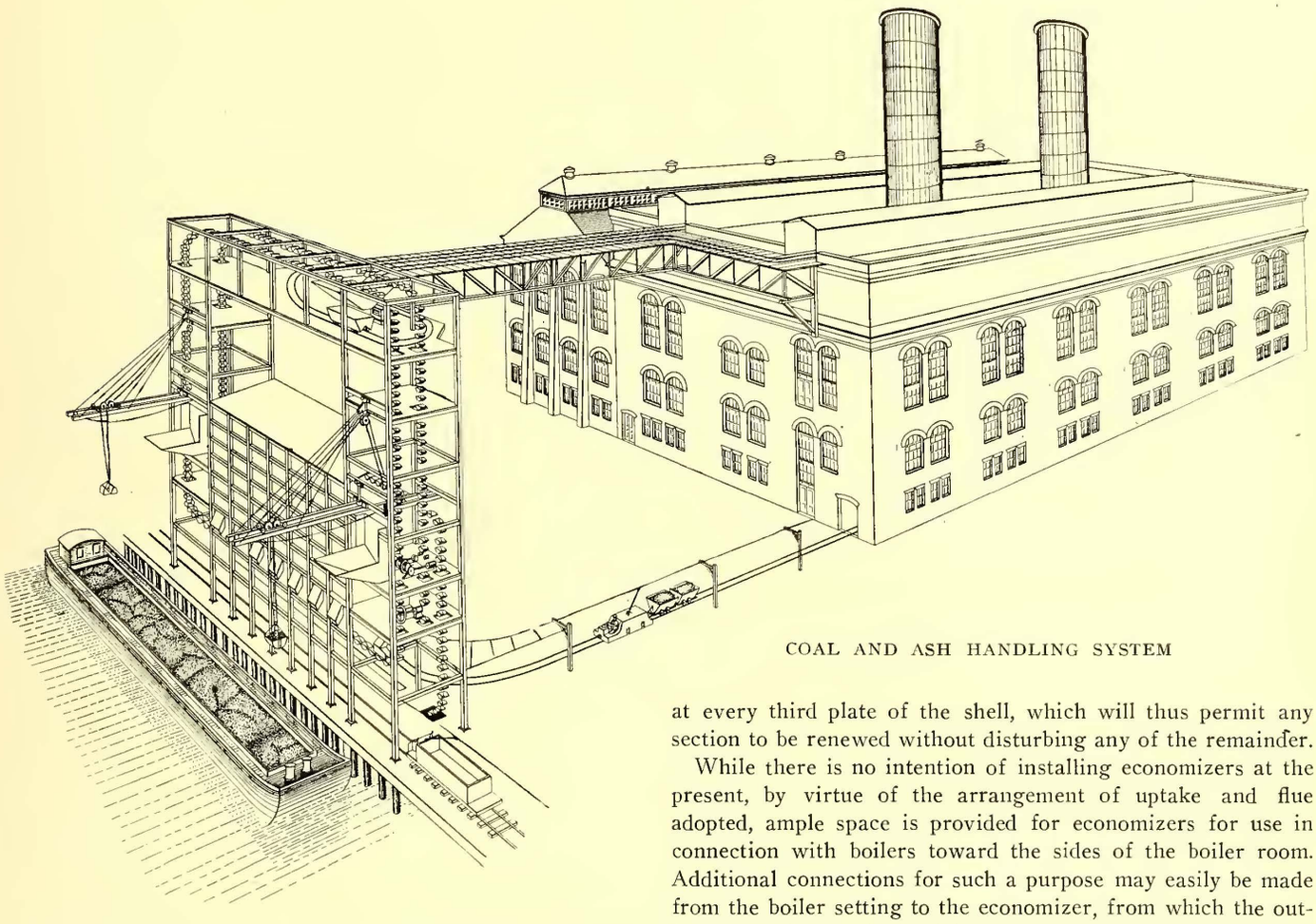
FORCED DRAFT

Both natural and forced draft will be provided, the latter permitting an advantageous flexibility in the burning of low grades of fuel. For the forced draft supply there will be installed two Sirrocco blowers of 90,000 cu. ft. capacity per min., for each row of six boilers. These fans, which will be fitted with cases and driving engines by the B. F. Sturtevant Company, Boston, are to be located upon elevated platforms at the sides of the boiler room or in the basement, from which position the delivery will be through ducts leading down to cross flues beneath the ash pockets. Damper openings are to be provided at each opening, so that the blast may be regulated at will. Sufficient capacity is provided in each blower to operate the entire six boilers to their maximum if at any time this is found necessary.

FLUES AND STACKS

The products of combustion are discharged from the boiler furnaces through a large self-supporting steel stack, rising to a height of 250 ft. above the first floor level of the boiler room. This stack will be duplicated for each additional twenty-four boilers. Connection is made to each stack through an interesting design of flue and uptake, which rises in the space between the rear ends of the double row of boilers up into the base of the stack. This flue structure is built up of ⅜-in. plate and 2½ in. x 2½ in. x 5-16-in. angles, having openings 3 ft. 9 in. x 9 ft. in area, at the rear of each of the boilers. In the main uptake from the first to the second floors, which is 8½ ft. x 24 ft. in section, there is a baffle plate to prevent interference with the draft when one side is idle. At the second boiler floor level the flue opens out to an area of 11 ft. x 36 ft., changing section above that to a 23½-ft. diameter circular opening beneath the stack. The entire flue and uptake structure will be enclosed in a non-conducting covering to prevent radiation of heat into the boiler room.

The stack, which thus commences at the third story level, is 181½ ft. high, and has an inside opening varying from 21 ft. 8 in. at the base, to 21 ft. 2 in. at the top. It consists of thirty-three sections of thicknesses of plate, varying from ½-in. at the base down to ¼-in. at the top. It is lined with 4-in. hard common red brick, backed up to the shell with 1 in. of concrete. This lining will be supported by an angle frame work throughout the interior of the stack, with horizontal members at every third plate of the shell, which will thus permit any section to be renewed without disturbing any of the remainder.



COAL AND ASH HANDLING SYSTEM

While there is no intention of installing economizers at the present, by virtue of the arrangement of uptake and flue adopted, ample space is provided for economizers for use in connection with boilers toward the sides of the boiler room. Additional connections for such a purpose may easily be made from the boiler setting to the economizer, from which the outlet connection could be joined to the uptake with ease, although the middle boilers of each group are inaccessible for such a connection owing to the presence of the main uptake at their rears.

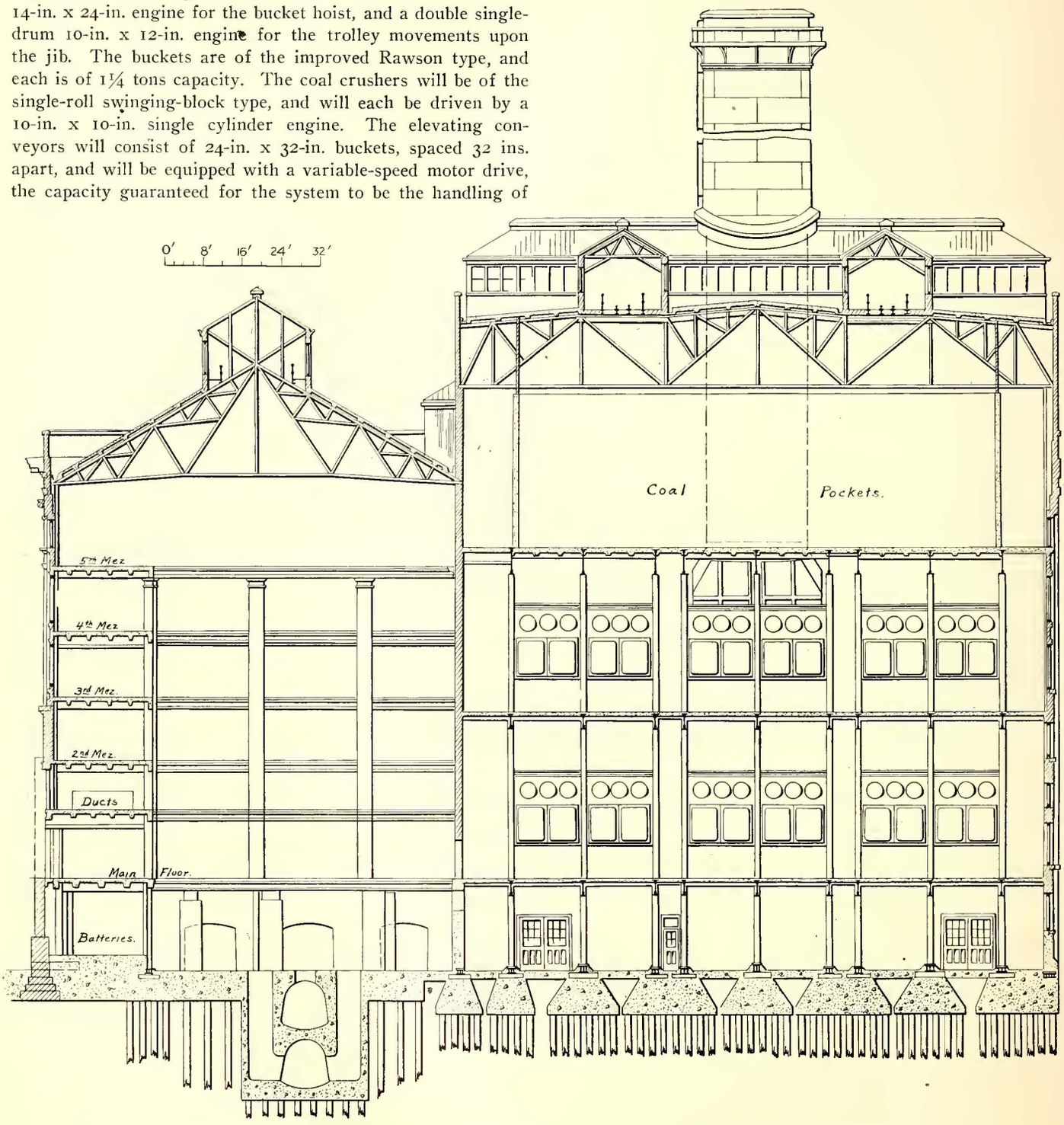
COAL AND ASH-HANDLING MACHINERY

Coal will be delivered to the new station by barges in the Wallabout Canal of the East River, which will be unloaded by a coal tower, and from the tower cars upon an elevated cable railway, which will distribute it in the pockets over the boiler room. The tower will consist of a steel structure 100 ft. long, 25 ft. wide and 133 ft. high, containing the barge unloading apparatus, coal-receiving bins, crushers, etc., together with an ash-handling and storage equipment. The coal unloader hoist jibs, of which there are two, one at either end of the tower, are to be located 73 ft. above the bulkhead level, from which the lift to the receiving bins will be 57 ft. The small receiving bins deliver to the coal crushers, whence the coal is elevated 115 ft. by two lines of bucket conveyors to the top of the structure for delivery to the automatic cable railway cars. Of the latter, there are to be five of 2½ tons capacity each, which

will be loaded at a rate of about two per minute, giving thus a total capacity of about 300 tons per hour. The cable railway crosses to the boiler house by a bridge, and makes a complete circuit of the coal pockets above the boilers.

The coal unloading tower equipments are of the two-man type, and each is operated by a combined hoisting and trolley engine set, consisting of a double direct-connected two-drum 14-in. x 24-in. engine for the bucket hoist, and a double single-drum 10-in. x 12-in. engine for the trolley movements upon the jib. The buckets are of the improved Rawson type, and each is of 1¼ tons capacity. The coal crushers will be of the single-roll swinging-block type, and will each be driven by a 10-in. x 10-in. single cylinder engine. The elevating conveyors will consist of 24-in. x 32-in. buckets, spaced 32 ins. apart, and will be equipped with a variable-speed motor drive, the capacity guaranteed for the system to be the handling of 300 tons to 350 tons per hour. The entire coal-handling equipment, together with the ash-handling apparatus, is being supplied by the Mead-Morrison Mfg. Co., of New York.

The ash-handling system will comprise a line of narrow-gage railway cars, passing underneath the ash-chutes in the boiler house basement, which will deliver the ashes to an elevating conveyor in the coal tower, raising them to a 1000-ton ash-storage pocket. Cast-iron chutes are carried from the furnace ash bins of the boilers upon both floors down to outlets over the track for dumping direct to the cars. The latter will be of the V-bottom dumping type, and will be hauled by a 6000-lb. electric locomotive, having a capacity of drawing a total load of 14,000 lbs. at a rate of about three miles per hour up a 5 per cent grade. The ash-elevating conveyor is of the bucket type, and is designed to deliver at a rate of from 50 tons to 60 tons per hour from the receiving bin to the storage pocket.



CROSS-SECTION OF STATION, SHOWING ARRANGEMENT OF GALLERIES AND FLOORS

The latter is provided with outlet spouts for delivery either to wagons or boats in the channel.

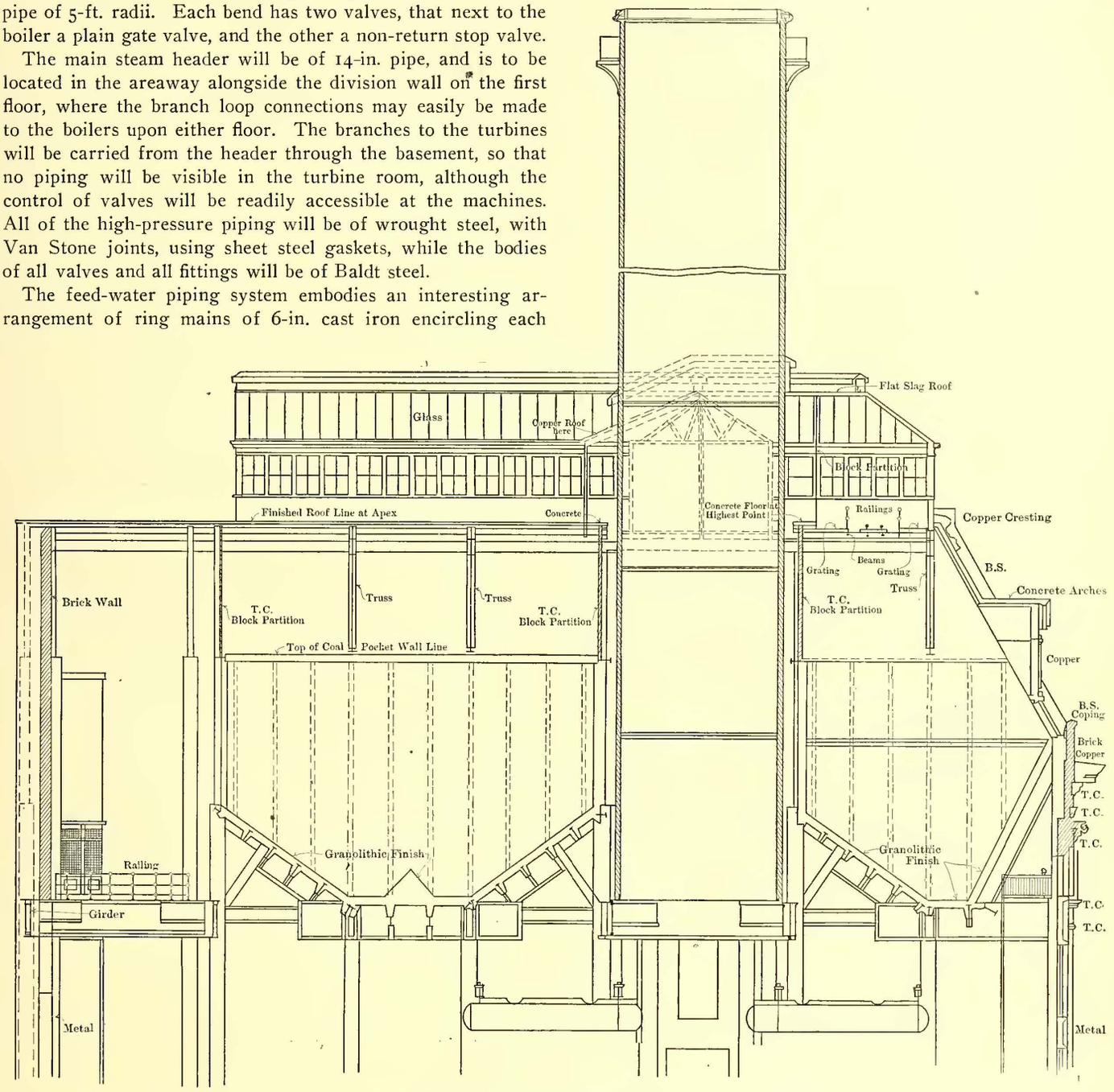
PIPING

Several of the accompanying diagrams illustrate the system of steam piping which will be used, and which is greatly simplified by reason of the use of turbines instead of reciprocating engines. Relatively small pipe sizes are to be employed, with correspondingly high velocities of steam flow, and the system of connections secured by this cross arrangement of boiler

room is simplified to the extreme. From the 14-in. main steam header next to the division wall a 14-in. branch steam pipe extends up and over the rears of each six boilers, reducing in size to 12-in. and 10-in. pipe toward the opposite side. There are intercepting gate valves between each battery for isolation in case of testing or repairs. The battery header or branch is located about 3 ft. above the boiler settings, and connections to it from the boilers are made by heavy return bends of 8-in. pipe of 5-ft. radii. Each bend has two valves, that next to the boiler a plain gate valve, and the other a non-return stop valve.

The main steam header will be of 14-in. pipe, and is to be located in the areaway alongside the division wall on the first floor, where the branch loop connections may easily be made to the boilers upon either floor. The branches to the turbines will be carried from the header through the basement, so that no piping will be visible in the turbine room, although the control of valves will be readily accessible at the machines. All of the high-pressure piping will be of wrought steel, with Van Stone joints, using sheet steel gaskets, while the bodies of all valves and all fittings will be of Baldt steel.

The feed-water piping system embodies an interesting arrangement of ring mains of 6-in. cast iron encircling each group of twelve boilers just below the floor level. These mains are connected to each boiler front by branches composed of a 5-in. branch between each battery, joined through a tee to 3-in. brass individual boiler connections. By virtue of this combination of a ring main, two independent feed connections thereto, and the sectionalizing valves, the system will be thoroughly reliable, as each boiler will have two independent sources of feed supply, and any section of the main is capable of removal from duty without affecting the remainder. The feed water supply will be taken normally from the condenser hot well, and the make-up water from the city mains. There will be three feed pumps and two closed-tube and one open feed-water heater utilizing the exhaust of auxiliary engines, pumps, etc., for the heating of the feed before entering the boilers. All connections from these to the two ring feed mains are carefully duplicated, so that there will be little chance of shut-down of the system.

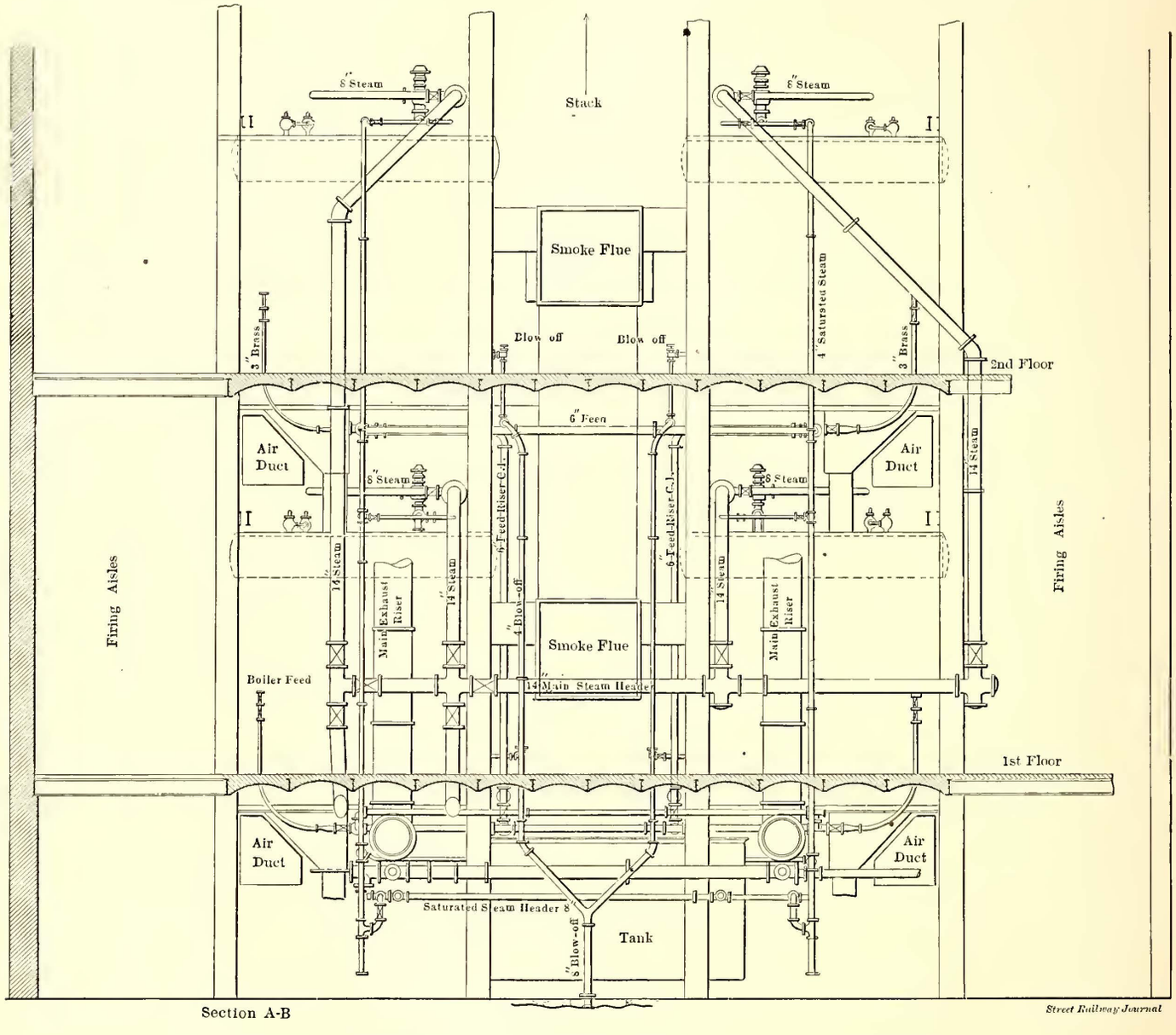


LONGITUDINAL SECTION ABOVE BOILER ROOM, SHOWING ARRANGEMENT OF ROOF AND COAL BUNKERS

PUMPS AND HEATERS

For the initial installation there will be three boiler feed pumps, which will be vertical direct-acting cross-compound Blake simplex pumps of the center outside-packed-plunger pattern, supplied by Henry R. Worthington. These pumps are designed for delivering against a pressure of 240 lbs. when operating with 175 lbs. steam pressure and no suction lift, and have a capacity of delivering 500 gals. per min., with a piston speed of 75 ft. per min. Each has 19-in. and 32-in. steam and 11½-in. water cylinders, with an 18-in. stroke. The open feed-water heater will be the Cochrane horizontal cylindrical feed-water heater and purifier, built by the Harrison Safety Boiler Works, Philadelphia, Pa., and will have a capacity for heating 400,000 lbs. of water per hour from 100 degs. to 207 degs. Fahr. This heater is 15 ft. long and 8 ft. in diameter inside, and has a water carrying capacity of 376 cu. ft. It is fitted

with twenty 15-in. x 144-in. trays for the deposition of impurities, and has the usual coke bed filter for purification of the feed, while a Cochrane oil separator incorporated in the heater prevents contamination of the feed by lubricating oil from auxiliary engine cylinders. The closed heaters are both Wainwright heaters, each 48-in. inside diameter, with 800 1-in. corrugated copper tubes 76 ft. long, giving thus a heating surface of 1333 sq. ft. The tubes are divided into four groups, through which the water passes in succession and baffles are used to cause the exhaust steam to pass in counter-current to the feed water.



ELEVATION OF PIPING IN BOILER ROOM, SECTION A-B OF PLAN ON PAGE 434

BLOW-OFF PIPING

The blow-off piping will consist of a single header of 4-in. pipe at the rear of each row of boilers, into which every boiler delivers through two 2½-in. brass blow-off connections. The two headers at the rear of boilers in every chimney flue space discharge downward through 6-in. connections to a tee leading to a common 8-in. discharge pipe to the condenser overflow tunnel beneath the turbine room, making thus short, simple and direct outlets for each group of boilers independently. The piping is all of wrought iron, with screw-flange joints, except the branches leading from the boiler mud-drums, which are of double extra-heavy wrought-iron pipe. Each blow-off connection will be provided with two valves for protection from leakage, one a Best angle and the other a Johnstone straight-way blow-off valve.

TURBINES

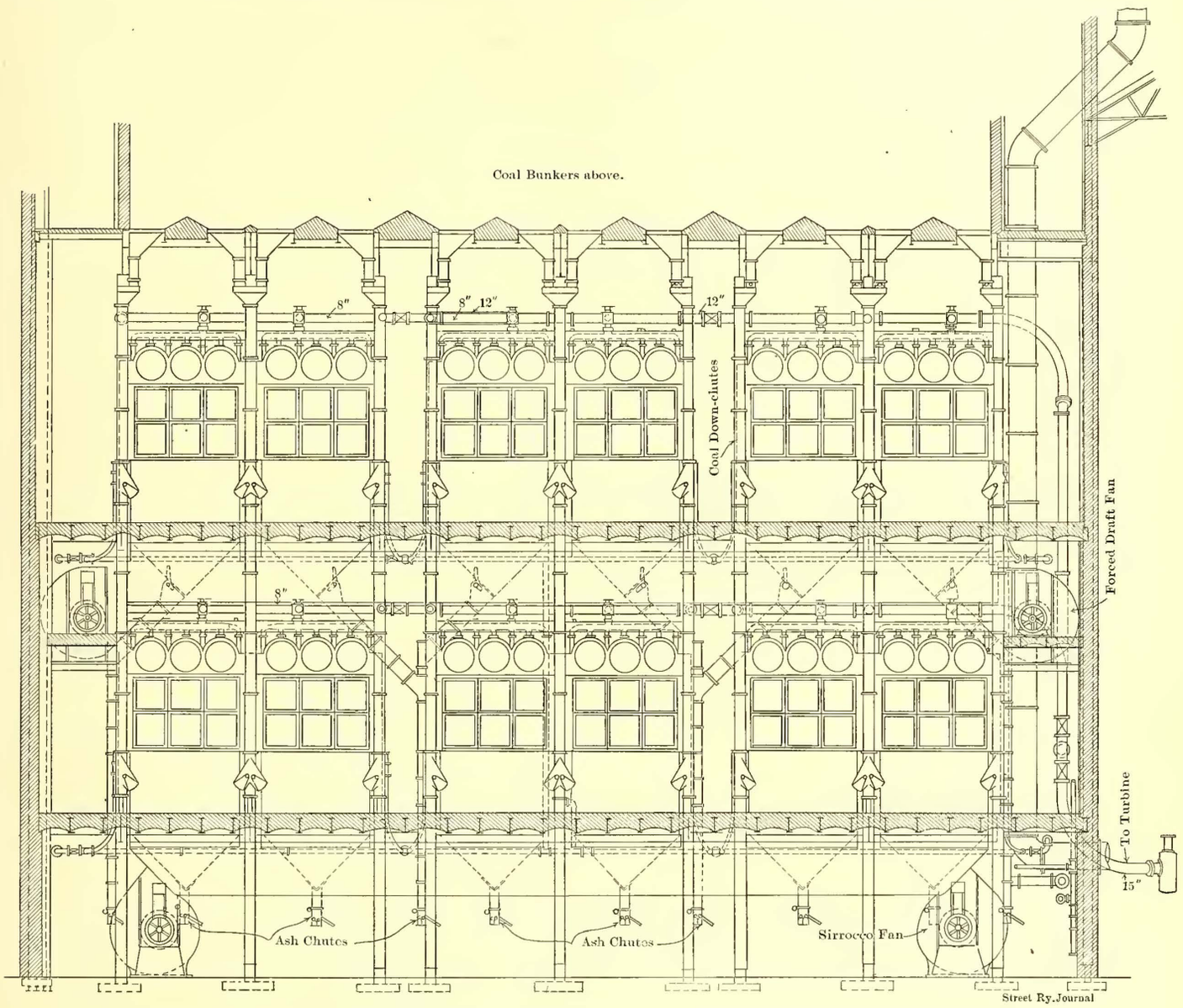
The station has been laid out to accommodate ultimately nine steam turbine generating units, one of 5500-kw capacity and the other eight of 7500-kw capacity each, giving thus a total station capacity of 65,500 kw, or, with the 50 per cent overload rating, of about 100,000 kw. At first, however, only three turbines will be installed, two of these to be of the Westinghouse-Parsons type, and the other the new turbine of the Allis-Chalmers Company. The use of turbines of the 7500-kw ratings and the 50 per cent overload capacity mark an important departure, as each turbine at 50 per cent overload will be capable of delivering 15,000-hp, which is by far the greatest amount of power ever developed in a single prime-mover in stationary practice.

The new 7500-kw Westinghouse turbine units will differ in some details from the company's well-known 5000-kw capacity machines, the same general type and form of unit being preserved in the new design. It is understood that the blades are to be made longer, and that other modifications of a minor nature are to be incorporated, which materially affect the increase of capacity. As to the size of the new Westinghouse unit, it will be 50 ft. long, 17 ft. wide and 15 ft. high, occupying

thus a total floor space of 850 sq. ft., or 0.113 sq. ft. per kilowatt capacity. It will thus be only about 4 ft. longer than the 5000-kw turbine unit, while the width will remain practically the same. These turbines will operate at 175 lbs. pressure and 100 degs. of superheat, and the speed will be normally 750 r. p. m. Under the above conditions and a vacuum of 28 in., the steam consumption at full load will be approximately 16 lbs. per kw-hour. An important feature of the new design is that its best economy will be secured around full load, although heavy overloads may be carried at any and all times without material sacrifice of efficiency. The design also permits of the turbines developing its full-rated load non-condensing.

The alternators connected to the above units will be similar to the former standard Westinghouse designs for use with turbines, with the exception that they will embody a new enclosed construction which will be effective in entirely eliminating the hum peculiar to high-speed turbine generators. They are of the 4-pole type, and are wound so as to deliver either 6600 volts or 11,000 volts. As connected, they will deliver three-phase current at a voltage of 6600, and frequency of 25 cycles per second. The stationary armatures will consist of a cast-iron frame with laminated core, and coils set in practically closed slots; the field cores will be built up of steel castings, with slots closed by brass wedges. Their efficiency will approximate 97.5 per cent at full rated load, and they will be able to sustain 50 per cent overloads for three hours without dangerous rise of temperature of windings.

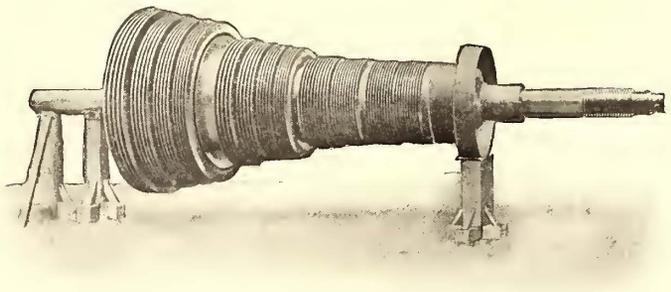
The turbine generating unit to be supplied by the Allis-Chalmers Company will be the first large unit installed by it for commercial operation. It is of the Parsons horizontal type, and will be of 5500-kw capacity, operating at 750 r. p. m., with a pressure of superheated steam of 175 lbs. The generator will be a four-pole revolving field Bullock machine, and will deliver three-phase alternating-current at a frequency of 25 cycles, and will be wound to deliver either 6600 volts or 11,000 volts. The rating of the unit provides for carrying 25 per cent overload continuously, and a 50 per cent overload for three hours with a temperature rise not exceeding 55 degs. C. The steam turbine is of the horizontal, parallel-flow, reaction type, being very similar in general construction and principle of operation to the well-known Parsons type.



LONGITUDINAL SECTION THROUGH ONE OF THE CROSS-FIRING AISLES, SHOWING COAL AND ASH CHUTES

One of the principal features of the Allis-Chalmers turbine is the blading. The blading is manufactured by special machine tools which have been constructed for this purpose. One of the widest departures from previous practice is in the method of securing the blades to the turbine spindle and cylinder. The blades are first inserted in a foundation ring, which is afterward secured in the turbine in such a manner as to withstand safely the high centrifugal force, instead of inserting the blades individually in the turbine. Another improvement is the ad-

dition of a channel-shaped shroud ring which is riveted to the ends of the blades, thereby stiffening them and preventing the effects of vibration in weakening the blades. The flanges of this channel strip are made very thin, so that if from any accidental cause the rotating and stationary part should come in

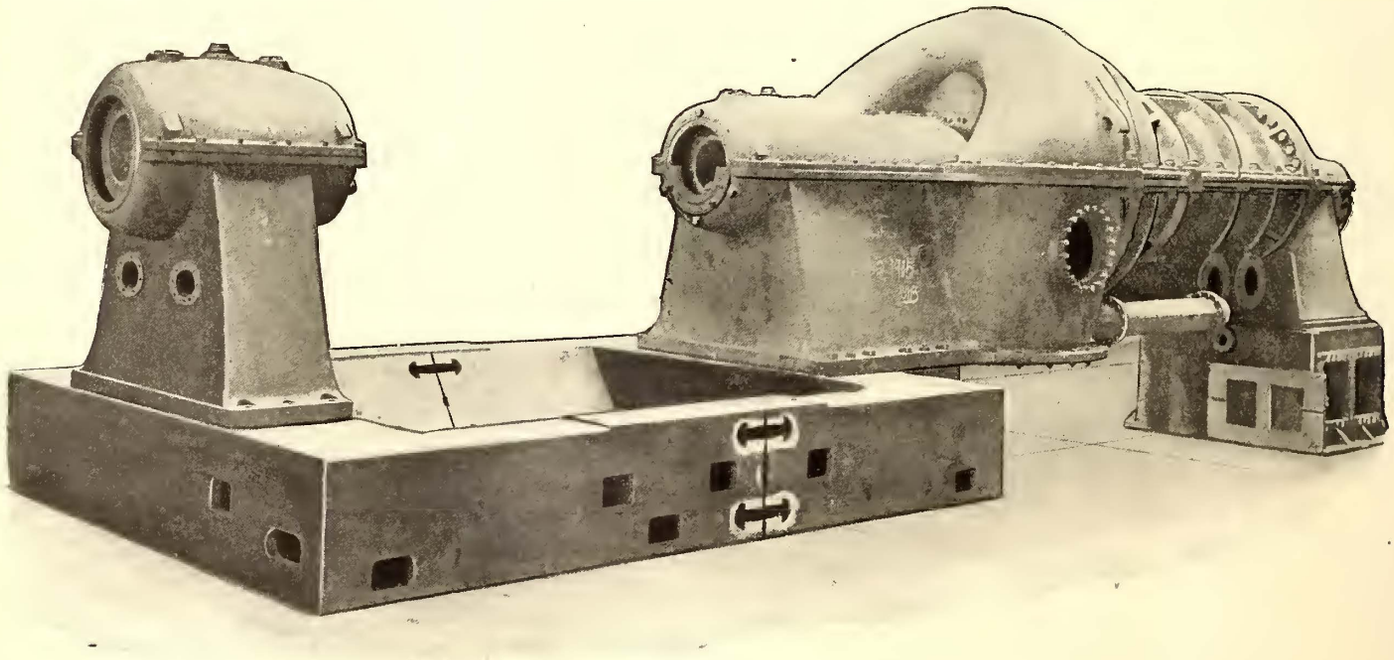


ALLIS-CHALMERS TURBINE SHAFT

contact, the flanges of the ring will not be injured. The use of this protecting shroud ring enables the Allis-Chalmers Company to build its turbines with a very low clearance between the rotating blades and the stationary cylinder. The speed of the turbine is regulated by a spring-loaded centrifugal governor acting through suitable mechanism on the steam inlet valve.

The turbine is lubricated by a thorough system of piping, whereby the oil is forced by a centrifugal pump, which is driven by the turbine, through the system of pipes to the bearings, thence through a large cooler, and used over and over again. There is a separate direct-acting steam pump in the oiling system for use in starting up the turbine, or to be used in case of emergency. The turbine and generator shafts are connected by an enclosed flexible coupling, and are carried in ball and socket bearings lined with a special hard babbit metal.

The generator is constructed with special reference to safety of operation at turbine speed and with thorough ventilation.



VIEW OF STATIONARY PART OF ALLIS-CHALMERS TURBINE

Particular care has been taken in the method of supporting the ends of the coils of the revolving field and at the same time thoroughly ventilating it, this being one of the specialties of the Allis-Chalmers construction.

The whole unit of turbine and generator measures 47 ft. 1 in. in length over all. The outside diameter of the stationary armature of the generator is 13 ft. 4 ins. The greatest outside diameter of the turbine casing over the flanges at the low pressure end is 8 ft. 10 ins. The highest part of the unit, namely, the top of the generator, stands 11 ft. 6 ins. above the floor level.

In the basement, underneath each turbine, there is to be installed a Worthington surface condenser, with a two-stage turbine hot-well pump, motor-driven, and a horizontal rotative dry vacuum pump. The circulating water will be handled by volute circulating pumps, direct-driven by vertical compound engines, short direct connections being had to the inlet and overflow tunnels beneath the basement floor. The condensers are rectangular in section. That for the 5500-kw turbine will have 22,000 sq. ft. of surface, made up of 1-in. tubes, 17 ft. long between heads, over which the steam makes three passes. It has a capacity, when supplied with circulation water at 70 deg. Fahr., of maintaining 1 lb. absolute in the exhaust passages when condensing 150,000 lbs. of steam per hour. The tube heads are of Muntz metal, and the tubes are of No. 18 B. W. G. seamless drawn brass, secured in the heads with stuffing boxes of the navy standard pattern. The condensers for the 7500-kw units will be of the same general design as the smaller one, but with 25,000 sq. ft. of surface; they are of the same length and height, and sufficiently wider to accommodate the increased tube surface.

ELECTRICAL DISTRIBUTION

The electrical control equipment for the new plant will be similar to that in general use in three-phase generating stations of this type, although features of departure have been introduced in minor details where practice has indicated the possibility of improvement. The high-tension system, including oil switches, control and switching apparatus, will be operated like that in the Central Power Station, although, instead of being arranged at one end of the building, this equipment will be located in the mezzanine galleries, of which there are five extending along the entire north side of the turbine room.

The arrangement of the electrical galleries adopted, as shown in an accompanying section, is novel. The space under the gallery on the first floor level adjacent to the turbine room will contain the exciter and lighting units, and associated control apparatus, also the lighting and power switchboard panels. The balance of this space and the first mezzanine will be devoted to the cable ducts, while the second mezzanine gallery is to contain the high-tension feeder switches, by which the feeders are connected to the group buses. The third mezzanine gallery will carry the control boards and operating

stands, which will be located near the middle of the proposed building in the form of an open balcony overlooking the entire turbine section. The potential transformer equipment and the equipment of generator and feeder buses will occupy the rear of this gallery. The latter equipment will be encased in cells of brick wall and alberene partition construction, with wired-glass doors in front and rear, where the connecting cables are attached through disconnecting switches. The control boards are to be arranged in two rows of semi-circular shape, the generator panels in front and the feeder panels at the rear. In general, the equipment of the panels will be similar to those in the Central Station, which has been referred to in considerable detail in these columns. The individual generator and group feeder oil switches are to be located upon the fourth mezzanine gallery, from which leads are carried down through the series transformers to the feeder switches.

The system of connections for the switching system provides for two 1200 amp. non-automatic switches in series between each generator and the generator bus, while the feeders are supplied in groups of four by a 600-amp. main group-feeder oil switch. The buses are in all cases sectionalized, the generator buses having been planned so that but three or four generators will be assigned to each section. Tie switches are provided to connect the various sections together if desired. There is to be only one section of the generator bus installed at present, while there will be three of the feeder buses, each supplying four feeders. The feeder switches, located on the second mezzanine gallery, are equipped with relays for automatic tripping under overload.

AUXILIARY ELECTRICAL APPARATUS

While the electrical equipment is not as yet installed and cannot be definitely referred to, there are several interesting features to be noted. Among the latter may be mentioned the exciter and lighting system, which will consist of three 150-kw units, two motor-generator sets and the other a steam-engine-driven unit, delivering direct current at from 125 volts to 150 volts; this is to be supplemented by a storage battery which will float upon the system constantly, not so much in the sense of reserve capacity as in security from interruptions, which it is arranged to prevent absolutely. The battery, which will be installed on the fifth mezzanine gallery, is to be of 2000-amp. discharge capacity, and will be operated without end-coil switch regulation. A novel form of direct-current reverse relay, or circuit breaker, will be used in this connection on all the motor-generator leads to prevent a destructive return flow from the battery to a motor generator in case it becomes inoperative. This relay is designed to open the circuit on any reverse flow from the bus to the machine equal to or above one-half its full-load capacity, although it is entirely inactive when current is flowing properly from the machine to the bus, even at heavy overloads.

The type C oil switch of the Westinghouse Electric & Manufacturing Company will be used as standard throughout the new station, as well as in all new high-tension work. These will be automatically controlled by the GE diaphragm-type inverse-element overload relays, which are designed to break the circuit more quickly in proportion as the overload or short circuit is heavier or more severe. The entire switch and control board equipment is being supplied and installed by the Westinghouse Electric & Manufacturing Company.

ENGINEERS

This station is being built by the Transit Development Company, an equipment and operating company subordinate to the Brooklyn Rapid Transit system. In the details of design and construction, the latter company has been represented by Edwin W. Winter, president; C. E. Roehl, electrical engineer, and R. C. Taylor, mechanical engineer. Thomas E. Murray has acted as consulting engineer.

DEPRECIATION AND RESERVE FUNDS IN MILWAUKEE

It is well known that the Milwaukee Electric Railway & Light Company makes a practice of charging off a certain amount of its gross receipts for different reserve accounts, and that the president of the company, John I. Beggs, has always been an advocate of this policy. The actual amounts so charged off are not, however, so well known.

The company has been following this plan for the last nine years. At that time the company had a depreciation reserve account, to which was carried from the gross receipts $15,000 monthly, which at that time was nearly 15 per cent of the gross receipts of the company. This fixed amount was carried to the depreciation reserve account until the company's gross receipts had increased to such an amount that the $15,000 monthly, or $180,000 per annum, equalled 10 per cent of its gross receipts. Since then the company has carried monthly 10 per cent of its gross receipts to the depreciation reserve fund, this amount being in addition to the ordinary current repair and renewal accounts which are charged month by month. From this depreciation reserve fund all large amounts for replacement and reconstruction are taken, that is, any single piece of work exceeding $500, as, for instance, expensive pieces of special work, replacement or reconstruction of tracks and overhead and rebuilding or replacing cars.

The company has also established a "fire insurance reserve," to which is carried a given percentage of its gross receipts monthly, and from this fund all fire insurance premiums and fire losses are paid. The amount carried to this fund in the past has been considerably in excess of the annual requirements, so that at the present time the company has in its fire insurance reserve fund (invested) over $350,000.

Another fund established by the company is an "injuries and damages" reserve, to which is carried a given percentage of its gross receipts monthly, and from which fund is paid every expense incident to taking care of and paying for injuries and damages to persons and property. The amount charged off to this fund in the past has been sufficient to create a reserve fund which at the present time amounts to nearly $230,000, and which is likewise invested in interest-bearing securities.

The company has also established a "legal expense reserve," to which is charged off 1 per cent of the gross receipts monthly. From this fund the city pays all legal expenses outside of the legal expenses in connection with the injuries and damages department.

Still another reserve fund is called the "storage battery maintenance reserve." To this the company credits each month, and charges against operation of power plants, a certain percentage of the original cost of the battery, and out of this reserve fund pays all the expenses of maintaining and replacing the battery.

At present the company's depreciation and reserve funds of all kinds amount to nearly $1,700,000.

The postoffice department is calling for bids for the carrying of the mail between Doylestown, Pa., and Newton, fourteen miles, by wagon after Oct. 2, 1905. The mail has been carried on the Newtown Electric Street Railway for several years, and the company has run a mail car twice daily through to Bristol, twenty-seven miles. The mail clerk was on the car leaving Bristol at 6.10 a. m., 2.03 p. m., and leaving Doylestown at 8.37 a. m., 4.13 p. m., making the run each way in 2 hours 10 minutes, or 1 hour 5 minutes to Newtown. The wagon service will be double daily each way, between Doylestown and Newtown, covering the fifteen miles in three hours, leaving Doylestown at 10.30 a. m. and 4 p. m., and leaving Newtown at 7 a. m. and 4.30 p. m. The change will inconvenience a great many people, and the only excuse given by the postoffice authorities is that the electric railway wants too much money.

THE PHYSICAL ANALYSIS OF AN ELECTRIC RAILWAY PROPERTY

BY ALBERT B. HERRICK

The period is rapidly approaching in the electric railway industry when greater attention must be paid to minor economies in electric railway operation. Net income is often such a small percentage of gross receipts that it is only by paying great attention to every detail of operation that ultimate success often depends. Moreover, the greatest defense against both competition and legislation is effective and satisfactory transportation facilities. Competition will not be fostered by a satisfied public, nor will its representatives be encouraged in adverse legislation.

The manager of an electric railway property is confronted with a peculiar problem—similar to a factory with a fixed output. This output, in the railway, is so many trips per day, accomplished with a given number of equipments, while the revenue received varies with season, weather and the temper of the traveling public. The manager often realizes that the difference between receipts and expenses is too small, and that there are leaks which ought to be stopped, yet he cannot put his finger on them. Some of these wastes may be inherent to the system, others have grown up through unsymmetrical development along the line of improvement and maintenance of the property, and ought to be corrected.

The maintenance in the different departments is so correlated that a defect in one will often react in the decreased efficiency of others, so that the true cause of the increased cost of maintenance is disguised. Good examples of this are the rapid depreciation of a good car body operated over a poor roadbed, the accelerated depreciation of motors when operated under low potentials, and the decreased efficiency of the power plant per car mile, due to defects in transmission.

It is rare to find, on an examination of an electric railway property, that the maintenance has been uniform throughout the system, for this would require that all technical personnel of the property should be equally efficient in their various lines.

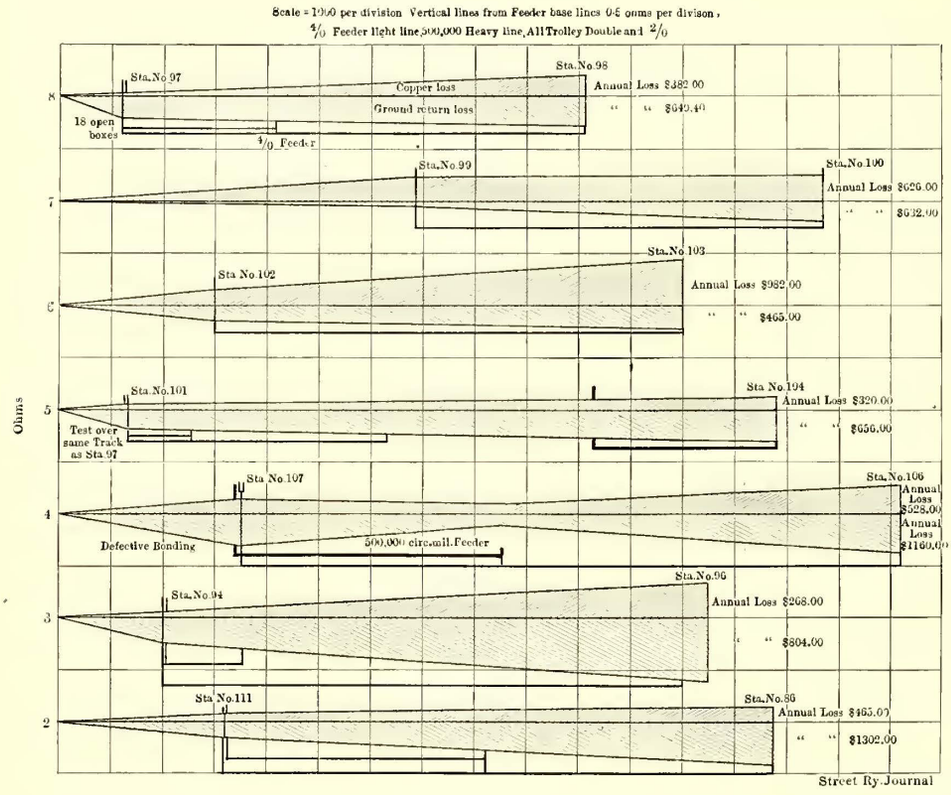


FIG. 1.—METHOD OF PLOTTING FEEDER LOSSES IN OUTGOING AND RETURN CIRCUIT

Very often the management will give special attention to development and maintenance along certain lines, while along other lines the efficiency will fall so that the aggregate is far from high. It is at this stage in the life of a railway property that a technical expert can become of value to a property. The expert should have had experience in the examination of other railroad systems, and be able to describe the condition in which he finds the property in a report which will contain an analysis of the improvements required for the betterment of the plant. The physical report cannot be prepared from a cursory examination, but only by a thorough and practical test while the system is operating under normal conditions. It should not deal with the problematic or academic side of the subject, but should be devoted to the concrete conditions existing in the particular plant under examination and their direct bearing on the operating costs. The function of such a report should be to explain how to increase the utility and economy of what now exists by expenditures within the allowable maintenance charges, and not the easy way of recommending reconstruction and the replacement of apparatus which is still useful with something new and of problematical economy, when the cost of the loss of the old apparatus would have to be added to the interest on the investment of the new.

A physical report should include within itself the direct deduction from the facts to the dollars. Where the dollars are to be expended either in operation or maintenance, graphic methods which appeal directly to the eye and do not require the analysis of a mass of figures, are found to convey the problem forcibly and make the deductions more evident. I have found it best in all cases of this kind to use graphic methods, and as each class of facts requires different treatment, some of the different methods used for graphically representing these conditions will be fully explained.

THE DISTRIBUTION SYSTEM

The physical report on the distribution system should include an analysis of the feeders, trolley and ground return, as well as of each feeder individually. The first thing that is to be determined is called the "economical factor" of each feeder; in other words, the cost of the losses in each feeder per annum under practical operating conditions. The load on an individual railway feeder is, of course, fluctuating constantly, but if an autographic recording amperemeter is inserted in the circuit of this feeder it will be found that there is a rhythmic fluctuation, the period of which depends on the schedule time required for an equipment to make a complete circuit of the trolley fed by this feeder. The average, maximum and times of maximum demands can be instantaneously recorded. The resistance of this feeder is then determined by measurement at the center of its load while the system is in operation. The problem then becomes simple if the cost of energy per unit as produced by the station is known. The autographic record can be readily planimetered to find the mean current, as the amperes are reproduced as a rectilinear function, with time as the horizontal component. The square of the mean average current when multiplied by the resistance of the feeder gives the units lost, and if this product is multiplied by the time this current flows in a year over this feeder we obtain the kilowatt-hours

lost per annum. This product multiplied by the production cost per kilowatt-hour, gives the cost of these losses. If this cost is too high there is a number of ways where this loss can be averaged throughout a system. Thus the length of the trolley wire fed by a particular feeder can be reduced, and if the feeder adjacent to it shows lower annual losses, it can be given more trolley to feed.

Undoubtedly, the most extravagant use of copper is caused by the employment of section insulators, by which each feeder is kept as an independent unit. This is usually done for safety in case of short circuits on the line. The same results can be obtained, however, by introducing an automatic circuit breaker between the end of one feeder and the feeder passing beyond, which practically jumps the section insulator. This automatic breaker can be set to open at any desired current value, which is generally 60 per cent of the maximum of the shorter feeder.

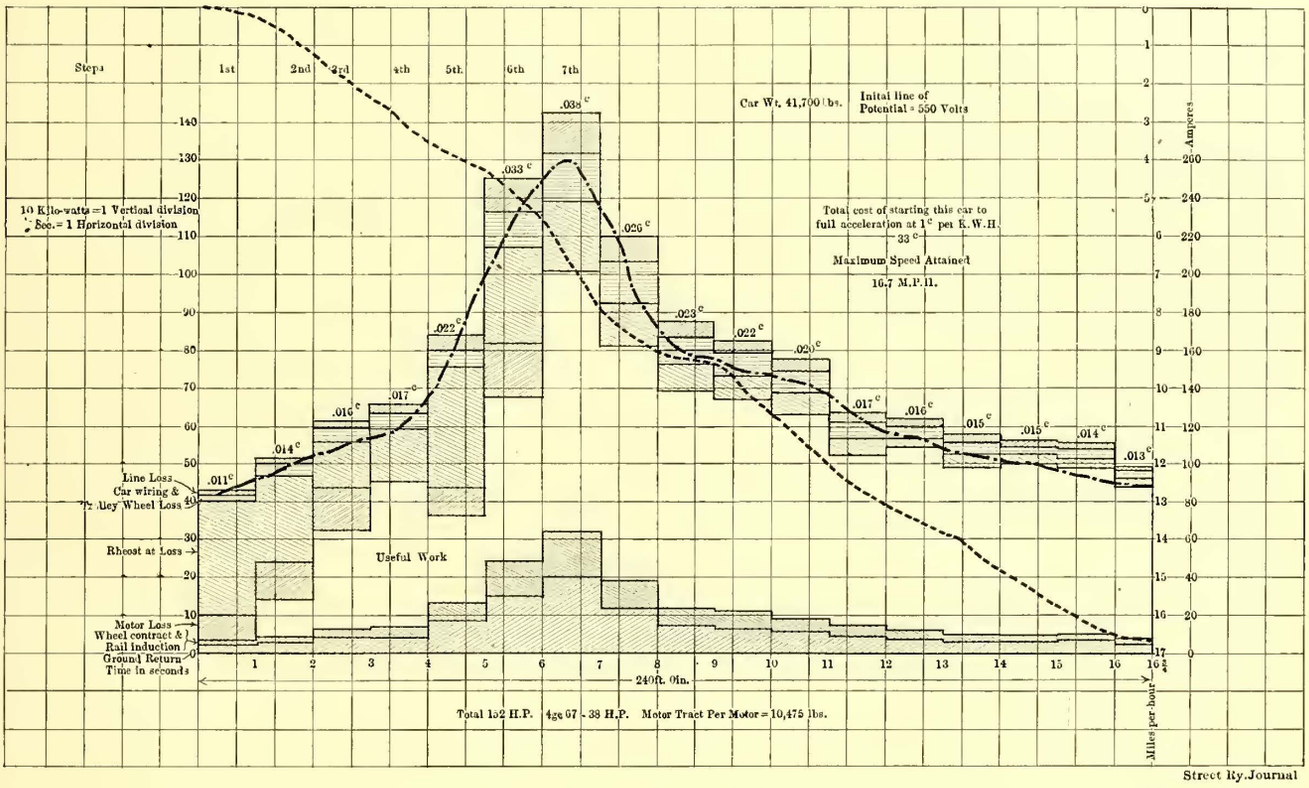


FIG. 2.—LOCATION OF LOSSES IN A FOUR-MOTOR GE 67 EQUIPMENT, WITH K_2 CONTROLLER AND CAR, WEIGHT 41,700 LBS.

If a short circuit now occurs the breaker between these feeders opens and leaves the different feeding sections independent of each other. This breaker can be provided with a semaphore so that it can be kept closed under normal working conditions, and as the maximum very rarely occurs on two adjacent feeders at the same time the economy of transmission is greatly increased. The expense is slight, as a breaker boxed with semaphore complete does not cost over $70.00. The returns on this class of investment, on the other hand, are very large. In a number of cases the cost of investment has been paid for monthly in energy saved, besides securing increased speed and lower heating limits on the equipment.

The methods of plotting these losses in the copper distribution is shown in Fig. 1, in which the annual cost of losses is given for both the overhead and return portion of the distribution system.

There are several physical conditions in the relation of the power plant to the railway system which largely affect the losses in the ground return circuit. Thus, if the station is located at the junction of several tracks the current density on each rail is less than in a station located on a single line. In either case, if the current density exceeds 600 amps. for a 60-lb. rail with two No. 0000 bonds, a supplementary feeder on the ground side of the system, extending toward the center of load of the system, is usually desirable. With a well welded joint, however, this density can be carried up to a mean average of 700 amps. per 60-lb. rail before the supplementary will be a profitable investment, provided the track joints are carefully maintained and cross bonding is used at frequent intervals. The above limit must be used as approximate only, as the resistance of rails varies over 30 per cent, according to the manufacturer and the time of rolling the rails.

The character of soil on which a city is built has a great influence on the percentage of current which the rails will carry back. That which does not return on the rails takes other paths, and again enters the rails or other ground connections near the power station. Cities near sea level, those built on earth carrying a substratum of moist earth, and those largely filled in with ashes and other refuse, show low resistance between rail and earth and a considerable diversion of current from the rail return circuit that has been provided. If a river with high banks passes through a city, a congestion of current will often be found on the banks of the river, accompanied by a return of the current to the rail in restricted areas. This physical condition has caused a great many of the cases where complaint has been made regarding underground piping systems. With well drained clay and sandy sub-soil, or in a city underlaid with a rock formation, the normal resistance of the earth paths is high. The physical report should show graphically the total loss existing on this return circuit. This can best be done when these losses are plotted out in the form of a diagram, as shown in Fig. 1, in which copper and ground return losses are separated. It is found that where two power stations feed over the same territory, but are placed in different points of the system, that the ground returns will swap current between each other. The ground resistance under this condition of distribution is much lower than with both systems operating independently.

When a car passes a given point there is a rise of potential on the rail, which may be caused by the induction of the rail, but when the car has passed, the potential again falls. The rise is proportional to both current discharged to the rail and the

speed of the equipment, and values varying from 2 volts to 21 volts have been found. This is a loss that is inherent with the operation of the equipment.

Insufficient cross bonding is another source of loss which is plainly indicated on autographic records of bonding where the current density is continuously recorded for both rails, as with the progress of the car the maximum current will follow one rail and then shuttle over to the other. It is often assumed that the car wheels and axles offer sufficient cross bonding between the rails as the cars roll along the track. This is not true, however, when they are discharging current into the rail and when they offer a high resistance, as they always do when the track is dirty. In roads where permanent cross bonding has been neglected except between the inside rails, the current density, while in operation, often averages 60 per cent greater on the inside rails than on the two outside rails, a feature which quently found. In this case the question often arises whether supplementary ground return feeders should be used or whether the rails which have neared the end of their life should be rebonded or welded. If the latter is proposed, care should be taken to learn whether the roadbed is of sufficient stability to hold the rail so as to insure reliability in the bonding or welding of the rail return circuit.

The current flow on the pipes can be shown on a pipe map by a broad color band paralleling the pipe, the width of the line being proportional to the mean current flow on the pipe. It makes considerable difference whether tests for current flow are made in summer or winter, as the current that leaves the rail is less when the ground is frozen, but the conductivity of the rails is better at low temperature, and any metallic connections between pipe systems and rail become accentuated, and are easily located by the direction of current flow on the rail.

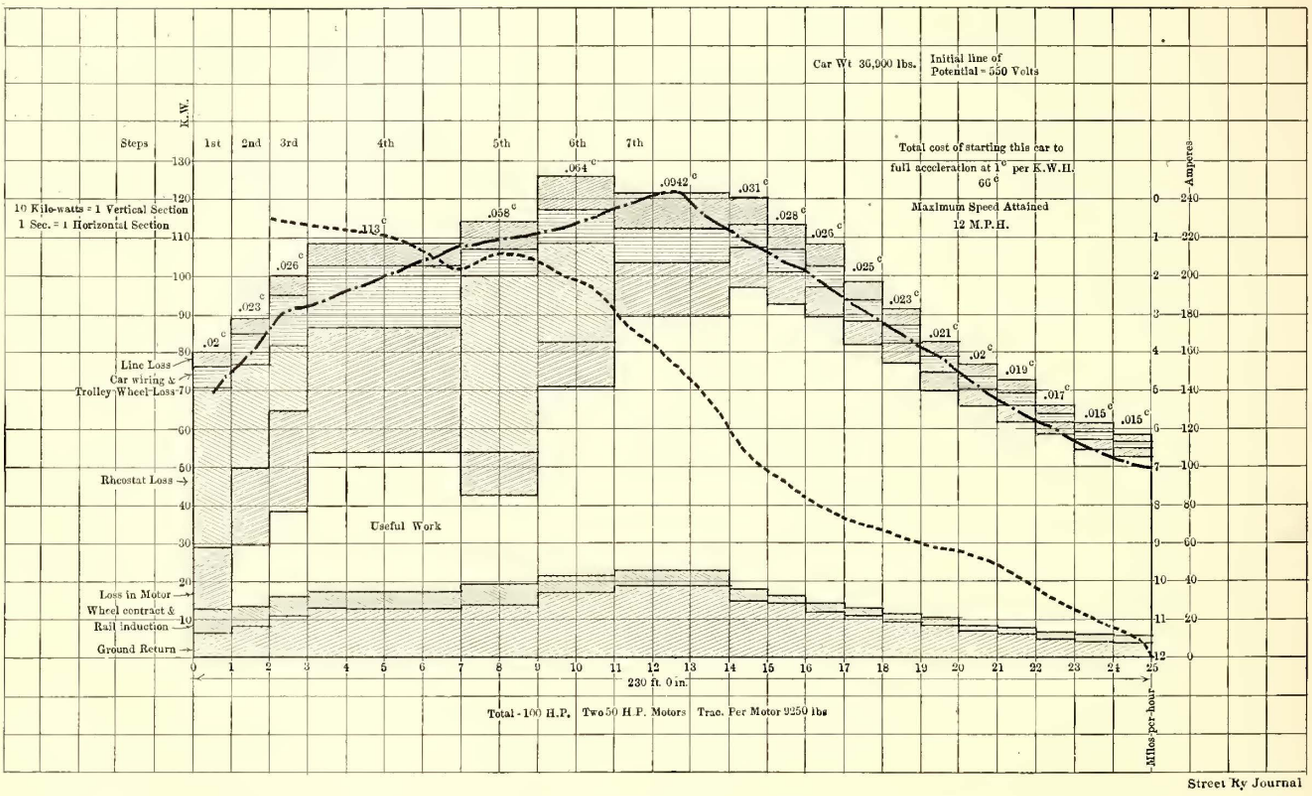


FIG. 3.—LOCATION OF LOSSES IN A TWO-MOTOR GE 57 EQUIPMENT, WITH K_2 CONTROLLER, 14 B3 TRUCK, CAR WEIGHT 36,000 LBS.

greatly increases the ground return losses and does not fully utilize the conductivity of the rail return. All these existing conditions have to be discovered, and their relative importance in the operating economy of the system determined in a complete physical report. By an autographic record the condition of each bond is recorded, the locations of those which are defective are marked, and the current density which should be carried by the rails, as determined by the feeder outputs supplying equipments operating on that line, is obtained. There occurs in every system critical points where the bonding plays a very important part, and the current may be diverted through roundabout paths with large losses in the return circuit. To designate these bonds and to state definitely where the return circuit is otherwise defective, form an essential portion of a physical report.

The amount of current carried by piping systems, whether through earth leak or inadvertent metalic connections, should be discovered, and whether there exists a hazard in the district where the tendency is for the current to leave the pipes for the rail; also what causes this diversion of current and what is the remedy. It is found that steam rail crossings, bridges and special work are the points where open joints are most frequently found. In the case of some interurban roads entering a city, where the interurban power station is located some distance outside the city, the direction of the current on the rails will reverse before reaching the city trolley, and the interurban return current will use the city rail system as an earth plate to return to its power station. In certain cases of this kind the rails of one company have been badly pitted by the current from another company where the two lines joined.

THE EQUIPMENT

The economical operation of an equipment depends, more than upon any other factor, on its proper maintenance, the motorman and the proper schedule, the proper selection of the motors for the weight of car body, and the road characteristics. It is often found on a road operating different kinds of equipments that some are unduly forced by grades, weight of car body and schedules, while other equipments are operating under underload conditions, and have been assigned to routes for which they are not fitted to give the best service. In such a case it is necessary to so adjust equipments over a system as to bring them all to maximum duty, and not require a four-motor equipment to run on a two-motor schedule, where most

of the time it is operated in series instead of the multiple position of the controller. The economy of the two methods can be seen graphically from Figs. 2 and 3, which show the results at the end of one acceleration period in a distance of 240 ft. with car bodies of practically the same weight in each case. The two-motor equipments reached a speed of 12 m. p. h., and the four-motor equipment of 16.7 m. p. h., while the cost of the four-motor acceleration is half that of the two motors. In this case, with a 10-mile run and a 15-minute schedule, a four-motor

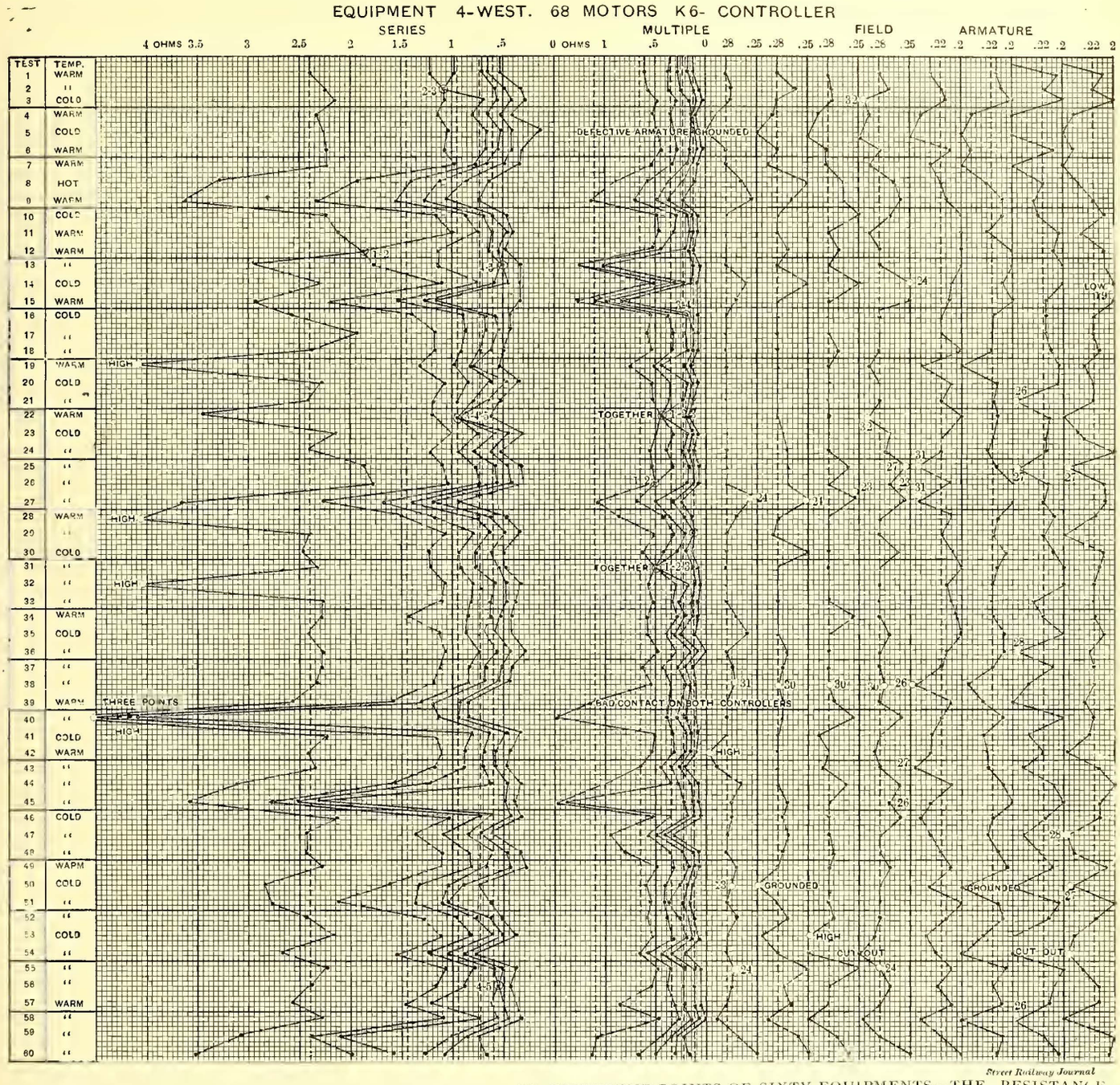


FIG. 4.—GRAPHIC ILLUSTRATION OF THE RESISTANCE ON DIFFERENT POINTS OF SIXTY EQUIPMENTS.—THE RESISTANCE POINTS SHOULD FALL ON THE DOTTED LINES FOR EACH STEP OF THE CONTROLLER

equipment would show a marked saving over a two-motor equipment in both maintenance and power. In the graphic illustration the different losses in the equipment are shown where they occur, and are determined by autographic methods, which are instantaneous. These diagrams are the result of the averages of a number of different equipments of the same type, and the weight and acceleration values are taken along the same track with the same motorman.

The route constant is determined by operating over the route a number of times a calibrated equipment which follows a car in regular service so that the stops are the same, as are also the maximum speeds that are obtained and the maximum and mean current demand. This car is operated over all routes and a constant is determined for each. The relation of these constants gives the relative duty required of the equipments over the different routes, and from these data the equipments can be placed to perform their best duty. Schedule speeds can then be altered to bring the same average duty on the equipments and reduce to a minimum the equipment depreciation.

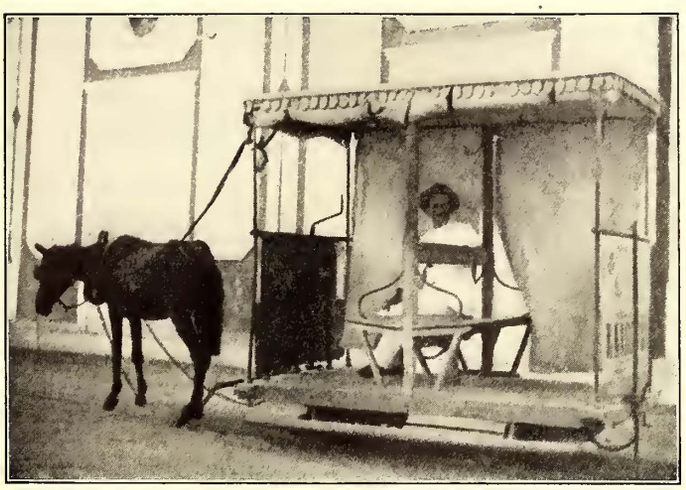
Car electrical maintenance is determined by an electrical inspection of the equipment. Measurements are taken with 500 volts, and the results are plotted as in Fig. 4, where the resistance of the rheostat, the motor fields and armature is given for each step on the controller. Each point that passes the standard is marked with a D, so that the equipment can readily be brought to a standard. A diagram of this kind reflects in an excellent way the care that the cars get in the car house and repair shop. There is no one thing that varies so greatly among electric railway companies as car maintenance.

In the repair shop the methods of making the repairs, handling material and motors, and the machinery and appliances used are subjects of consideration. In the majority of cases

the simplest and most successful of the apparatus has often been devised by the employees themselves, as they are products of a special study of the class of breakdowns which is peculiar to the system under inspection. All of these points should be brought out in a physical report on the property.

POWER STATION

The power station should be subjected to operating tests with calibrated instruments, to discover where the leaks are, as well as the character of supplies and help employed. The boiler room is generally the portion of the plant where the greatest losses occur. A complete graphic analysis of power station losses was given by the writer in the Street Railway Journal for Jan. 6, 1900. Especial attention should be given in the investigation to the method of firing the furnaces and to the quality of coal, because the higher steaming valves of more expensive coal will often show a net saving. Oil is another question to be considered, and, as a rule, economy in oil means extravagance.

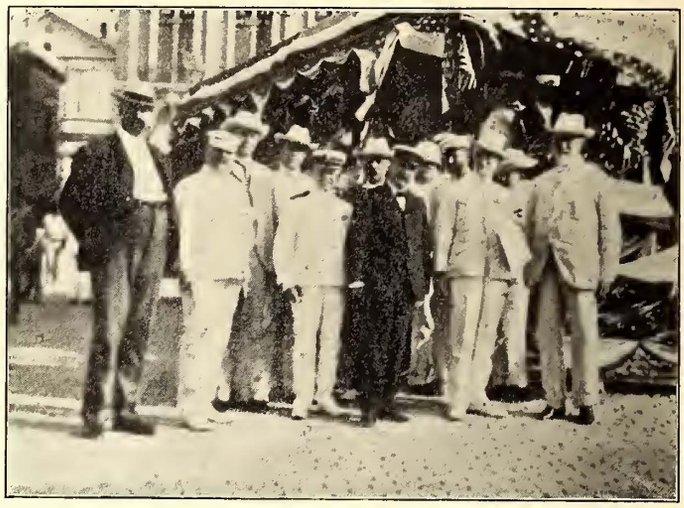


A CAR IN SAN JUAN REPLACED BY THE ELECTRIC SYSTEM

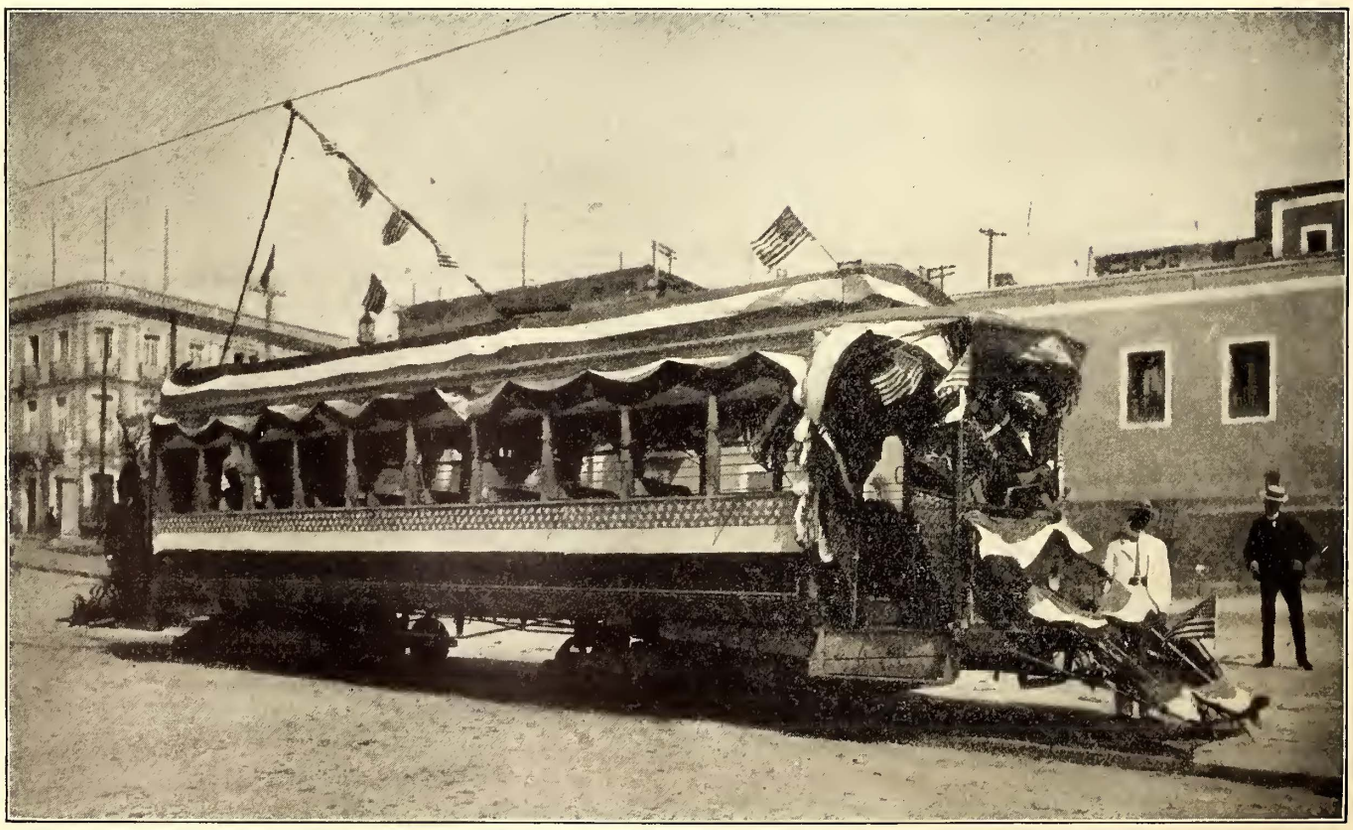
Broadly stated, no road is any better than the manager, and car maintenance is in no better shape than the repair shop. The cause of the troubles on any road can often be determined from the scrap heap.

THE ELECTRIC RAILWAY AT SAN JUAN, PORTO RICO

Among the important reconstruction work that has been carried out by J. G. White & Company, of New York, in the territory acquired by the United States from Spain, is the rebuilding and electrification of the mule and steam tramways of San Juan, Porto Rico. Several of the accompanying views show scenes on the opening day. In the group shown on this page, the gentlemen in the front row, counting from the left, are: (1) C. C. Benson, manager; (2) Secretary Moody; (3) Congressman Foss; (4) Commandant Dunlap, of the naval station at San Juan; (5) the late Postmaster-General Payne; (6) Joseph Cannon, of Chicago; (7) Senator Proctor.



THE LATE POSTMASTER-GENERAL PAYNE AND OTHER VISITORS AT OPENING OF SAN JUAN ELECTRIC RAILWAY



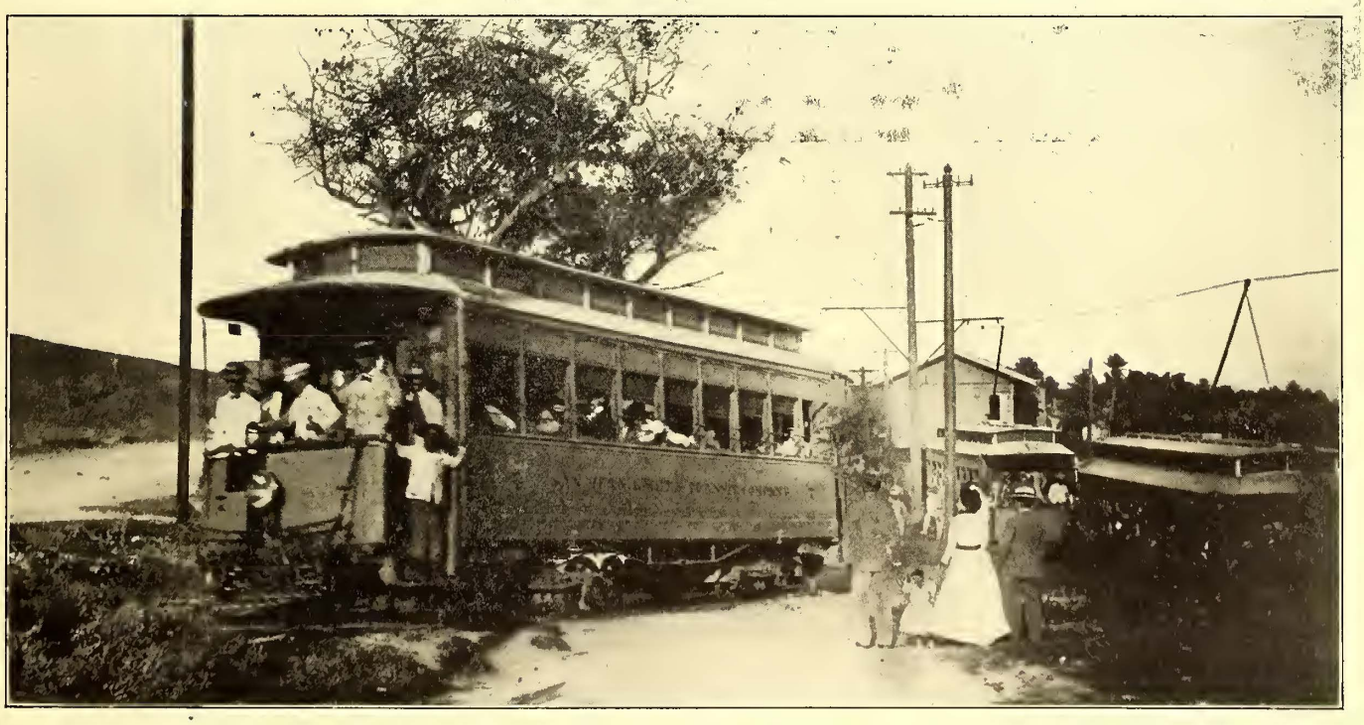
ONE OF THE NEW CARS ON OPENING DAY

San Juan, the metropolis and most beautiful city on the island, has a population of 40,000 inhabitants. The city proper is built on a peninsula of comparatively small area, and in the course of expansion of the resident districts, it became necessary to provide means of transportation to and from the outlying suburbs, particularly Santurce and Rio Piedras, two of the more important suburban towns on the island. Some years ago these communities were connected with San Juan by a narrow-gage steam railroad, whose rolling stock consisted of a dozen diminutive passenger cars and four small Baldwin locomotives. The track of this steam railroad was of .8 m gage, and in electrifying it the gage was changed to 4 ft. 8½ ins., American standard.

The San Juan Light & Transit Company, as the new organization is called, has at present 9 miles of road in operation, the main line extending from San Juan through Santurce, to the town of Rio Piedras, the terminus, a distance of 8 miles. There is also a branch leading to the beautiful Parque Borinquen, situated on the north beach of the island. The railway follows the Caratara, or Spanish miltary road, along which are many beautiful residences. At several points, private right of way is used. In San Juan, the railway enters the city near the sea level and gradually works its way through the narrow streets to the Plaza, or center square of the city, several hundred feet above the level of the sea. In leaving the city the road follows another route, and thus forms a loop. The suburban portion of the track is 70-lb. A. S. C. E.-rail laid on native wood, which resembles and has many of the properties of mahogany. Cinder is used as a ballast in many places, and has proved very successful. In San Juan, 90-lb girder rails were employed. The streets are paved with patent block. The overhead trolley is suspended from bracket construction, and is No. 00 in cross section. Four feeders of No. 0000 cable supply the system.

The rolling stock consists of fifteen passenger cars and one express car. All are mounted on maximum-traction trucks of the St. Louis or Peckham make. The passenger car bodies are from 35 ft. to 39 ft. over all and 8 ft. wide, and are of the semi-convertible type. This style of car is well adapted to the climate of Porto Rico, as sudden and intense rainfall is common in certain seasons. The car bodies were supplied by the Stephenson and American Car companies.

LAYING TRACKS IN SAN FRANCISCO STREET, A TYPICAL THOROUGHFARE IN SAN JUAN



LEAVING THE CITY FOR THE INTERURBAN SECTION

The majority of the cars are equipped with two GE 57 motors with K-8 and K-11 controllers. Two of the cars have GE 58 motors and K-10 controllers. All are fitted with hand brakes of the ratchet type.

The schedule in effect at present is as follows: Between 11 a. m. and 10 p. m. cars run between San Juan and Park Junction every 7½ minutes, and between San Juan and the Park every 15 minutes. Between 6 a. m. and 11 a. m. and between 10 p. m. and 12 p. m. the headway is twice as long. Cars run between San Juan and Rio Piedras every 30 minutes throughout the day.

This close schedule on a single track necessitates the utmost care to avert accidents. This is especially true in view of the fact that the motormen are all native Porto Ricans. In order to eliminate as far as possible all chances for collision, a novel block signaling system has been installed. This system was described in full by Charles G. Bennett in the Street Railway Journal for July 15, 1905.

In addition to its railway, the San Juan Light & Transit Company owns and operates a lighting system, which furnishes the residence and business houses of San Juan and Santurce with 60-cycle 104-volt alternating current through transformers. The lighting current is distributed at 2200 volts.

TRACK CONSTRUCTION ON THE CARATARA, SAN JUAN

One of the most interesting features of the overhead construction at San Juan is the arrangement whereby all feeders and high-tension lines are carried on specially built trusses or cross-arms on the roofs of the houses. This condition was necessitated by the fact that the streets are too narrow to permit the erection of pole lines. The majority of the buildings in the city are of brick, with flat roofs. The exterior walls, however, extend several feet above the roof level. To these walls are fastened the braces or trusses, so that the wires are carried at a safe distance above the tops of the buildings. The secondary distribution is three-wire. Electricity is used by the natives for both light and power to a surprising extent, largely on account of the high cost of oil. A gas plant was installed by an English company, but was not a success, and the mains have been removed from the streets.

The power station is located on the Caratara, midway between San Juan and Santurce, and is of steel construction, with corrugated iron roof and sides. Steam is generated in four 500-hp Cahill boilers. Current for the railway system is supplied by two 250-kw General Electric 600-volt generators, driven by Fisher engines. The alternating current for lighting is supplied by two 60-cycle two-phase Westinghouse generators of 225-kw capacity each, driven by Ames engines.

It was necessary to provide a machine shop for the repairs of the cars and motors, and this shop was located at Rio Piedras. Here several lathes, a wheel press, forges, drill presses, etc., are installed. The tools are motor driven.

The road is managed under the supervision of the operating department of J. G. White & Company. C. F. Beames, the local manager, is in active charge.

HINTS ON SHOP MANAGEMENT

BY A REPAIR MAN

Notwithstanding the fact that the average workman about a street railway repair shop encounters more dirt and grime than do other mechanics, these shops are often lacking in proper wash basins where the workmen may wash themselves at the close of the day. Pure negligence is about the only reason that can be given for the absence of such facilities. The cost of setting up one or more wooden troughs a foot wide, a foot deep and 10 ft. or 20 ft. long, and connecting them with the water supply system, is too small to be considered when the convenience afforded to the men is considered. But there are other considerations which show that money so invested is a paying investment. In some shops where washbasins are not provided, many of the men have their own buckets, which they keep either in their locker or in some out-of-the-way corner. These are usually filled with water before the whistle blows, and the time to do so is the company's loss.

In many cases a marked decrease in the consumption of gasoline would also be coincident with the installation of wash troughs. A piece of waste saturated with gasoline removes grease better than anything to be found about a car shop. If an inspection of lockers were made, in many belonging to workmen who have no legitimate use for it except for cleaning, a half gallon or a gallon can of gasoline will often be found. But the decrease in the consumption of gasoline is not the only item to be considered. The fire risk would be lessened materially, for there is hardly anything so dangerous as bunches of cotton waste saturated with gasoline lying around wherever thrown by the workmen, as they hurriedly leave the shop.

There is even a stronger argument in favor of the installation of proper washing-up facilities. The more self respecting the workmen and the more cordial their relation with the management, the better will be the class of work turned out. It necessarily follows that a self-respecting man is more likely to be attracted to a shop where some provision is made for his leaving it in a presentable manner.

RELATIONS WITH SHOP EMPLOYEES

The attitude to be assumed by a master mechanic or superintendent towards the men under him is one of the most vexing problems that comes before the head of a shop for solution. The fellow feeling common to all of us prompts a close and in-

timate relation. But the fact that in every collection there are always some who are ready to impose on such a relation makes it necessary for the superintendent to hold himself somewhat in reserve. The amount of reserve to be exercised depends as much on the characteristics of the governing man as upon the natures of the workmen governed. Some men are fortunate in having a demeanor that permits them to be free and easy with their employees, yet one which in itself always commands respect. Others who are called upon to govern men must assume a haughty, over-bearing attitude before they are able to make themselves obeyed.

The presence of the few men in every shop who cannot stand decent treatment causes many master mechanics to become imbued with the idea that all the men under them must be treated as cattle and be literally driven in order to get work out of them.

This is probably a more serious mistake than the opposite extreme of becoming too intimate with the men. The workmen, feeling that they are treated as unintelligent beings, act accordingly, and are ever afterwards at variance with the management. The consciencious workman observing that he is classed with those whom he regards beneath him, leaves the shop at the first opportunity. The plant, as a whole, soon acquires a bad reputation, and self-respecting men shun it. The result is a gradual lowering of the character of the men employed until the shop is filled with men who require the treatment of cattle.

Rather than shape his demeanor to that demanded by the lower class of workmen, it would in most cases be better for the master mechanic to fit his attitude to that required by the better class of men and to get rid of those who do not appreciate decent treatment. This would have a tendency to raise still higher the character of the men employed in the shop. Good men make returns for good treatment. It appeals to the manhood in them, and they try to show their appreciation by doing better and more earnest work. New comers into the shop, soon catching the prevailing atmosphere of good will and cordial relations between employer and employees, exert themselves to their utmost to maintain it.

When once the confidence and respect of his men are obtained, half the difficulties of the master mechanic are removed. Instead of being compelled to do and to see everything for himself, each man under the superintendent is on the alert to help him. The whole shop works with the idea of accomplishing something rather than simply to put in time. Work is done better, more quickly and more satisfactorily in every particular.

After cordial relations are once established, the utmost care should be exercised in order to retain them. It should be remembered that men are human and may make errors. An error should call for a caution against repetition rather than for an outburst of anger and a flow of vulgarity. If cautions and hints do no good, then it is in all probability best to get rid of the man before he exerts a bad influence on his fellow workmen.

RUSHING SHOP WORKMEN

Some master mechanics and superintendents believe that the best returns from money spent in labor are obtained when foremen or overseers are continually at hand to drive and urge the workmen to exert themselves to their utmost. Such treatment of employees is no doubt a success when the work is of such a nature that negligence and carelessness causes no great inconvenience. But it is a question whether forcing and driving employees should be practiced in car repair shops. It is true that this treatment will give the shop a busy appearance, but the men may be doing the work in a haphazard, imperfect manner, such that its nature will become evident at some future date.

There is a right and a wrong way of doing everything about a repair shop. In making a splice, for example, the wire may be "skinned" or the insulation peeled off most quickly by "ringing" the wire, or on the other hand it may be removed without injuring the wire by taking more time. The joint may be soldered by simply coating the outside with solder, or the solder may be allowed to sweat thoroughly through the splice. The chances are great that when men are rushed continually they will make splices in the quickest manner possible. The fact that an imperfect splice is soon taped and hidden, so that it has the same appearance as one which is carefully made, increases the liability to careless splicing. At some later date, however, an unusually severe strain may come upon the defective splice. Then the ringing of the wire, or the imperfect soldering, becomes evident. The actual cost to the company of the single joint may run up into dollars, and the master mechanic who reckoned its expense from the time spent in making it is therefore laboring under a delusion.

We often hear a superintendent say that his men tear down and rewind a certain armature in ten hours. The winders in another shop may require fifteen hours for the same machine. It does not follow that the work of winding the machine in the latter shop costs the most money. Possibly only one-third the number of defective armatures per car per year are brought into the shop where more time is allowed for rewinding them. If the superintendent who rushes his work was to make a close inspection of his rewound armatures he might find the coils beaten and hammered in such a manner as to cause him to reflect seriously on the difference between apparent and real economy.

The examples cited, the making of a splice and the winding of an armature, are but two of the innumerable pieces of work about a repair shop where quality of work rather than quantity should be the aim. In open work, such as in some parts of carpentry and machine work where the nature of the workmanship is made evident by an inspection, it may be well to drive workmen, but certainly one should do so with caution where the work is hidden, or where defective work may cause as much inconvenience and loss as the electrical work about a car.

WASTES ABOUT THE REPAIR SHOP

Laboring under the belief that the time required to save the little articles of waste material about the shops is worth more than the material saved, quite a few master mechanics allow themselves and their men to acquire careless and negligent habits concerning waste material. These increase the expenses of shop maintenance far more than is realized at first thought. To be sure there is a point of "diminishing returns," as many of us were taught in political economy, beyond which it does not pay to go, but we believe that this point is never reached in very many shops. Each little loss is in itself so trivial that at first reflection it seems more economical to let it continue than to go to any trouble whatever to stop it. In the course of a year, however, the losses multiply until they assume important proportions.

An incident that occurred in a winding room might be cited. Because of an improperly constructed armature coil former about four inches of wire was cut off the end of each coil after being wound. This loss continued for possibly six months or a year before it was corrected. In each coil there was 9 ft. of wire, so that 4 ins. cut from a coil meant a loss of about 4 per cent. The coil former was afterwards corrected and only one-half an inch of wire was wasted. While this was better, still, with the exercise of a little ingenuity, a method could have been devised for eliminating the loss completely. In this same shop these ½ in. and 4 in. lengths of copper wire were often swept out the door, to be scattered about the yard. Here is another source of loss in many shops. Proper attention is not given to saving copper and brass scraps. A great deal of money is swept out of many winding-room doors. Similar losses often occur at the lathe where commutators and brass

bearings are turned. The brass and copper filings and turnings and scrap ends of copper wire should be regarded as so much money and proper care should be exercised with regard to saving them.

If the shop foreman permits the waste of even copper and brass filings, the men seemingly become possessed with the idea that the material costs nothing. Tape, solder, cotton waste and in fact all material will be used carelessly. The quantity of friction tape consumed in the average repair shop is far greater than necessity demands. This tape is a very handy article for a myriad of purposes, other than for insulating. It takes the place of string in tying bundles. It may be used to form a knot or projection on a piece of wood or metal. The fact that it is always present in the tool box, brings it into use oftener than its cost warrants. A smaller loss occurs in the use of soldering paste. Only a thin coating of paste is necessary on a surface to be soldered, yet many electricians, either through indifference or because they believe it necessary, persist in covering the joint with a layer of paste so thick that when heated it melts and runs to the floor in a stream.

The whole list of electrical material used in a repair shop might be gone through in a similar manner. It may be seen, therefore, that these trivial losses, in the aggregate, become important factors in influencing the shop maintenance expenses. To eliminate the majority of them it is necessary to be on the watch continually and to drive into each workman, by repeated cautions, the importance of exercising a little judgment in the use of materials. When once the atmosphere of economy and saving prevails through the shop, a very little attention at proper times will maintain it.

CHANGING THE GAGE OF THE CARS IN EAST ST. LOUIS

The method of changing the track gage on the lines of the East St. Louis & Suburban Railway Company was described in the Sept. 9 issue of this paper by W. A. Bennett, engineer of maintenance of way of the company. The problem of changing the gage of the cars was also a very serious one, and through the courtesy of Lee Massengale, master mechanic of the company, the following facts are available:

In all, 125 cars had to be changed from 4-ft. 10-in. gage to 4-ft. 8½-in. gage. In order to avoid delays in service, it was necessary to plan the work well beforehand and to do as much preliminary work on the cars as possible while they were in service prior to the commencement of gage changing.

While the cars were in service on the 4-ft. 10-in. gage, the extra cars were taken into the shops in turn and a large amount of work done upon the trucks without changing the gage of the wheels. On the cars having St. Louis 23-B trucks, equipped with four GE 57, two-turn, high-speed motors, ¾ in. was faced off from the hub of each wheel. It was necessary, of course, to take the wheels off the axles to do this work, after which they were put back on the 4-ft. 10-in. axles. In order to take care of the space from which this ¾ in. was taken, the company had a collar of cast iron made in halves, which was temporarily fastened on the axle to take care of the end thrust of the motors. On cars having Brill 27-G trucks and Peckham trucks, equipped with GE 67, GE 1000, GE 800 and Westinghouse 49 motors, it was unnecessary to face the hub of wheels, as these cars had the wheel fits on the axles turned back ¾ in. on each end. This work was done as opportunity presented itself, and the wheels were put back on the axles at 4-ft. 10-in. gage. On all the cars, excepting the St. Louis 23-B, the brake beams were drilled for the 4-ft. 8½-in. gage. This work was also done before the gage itself on the cars was changed.

The effect of this preliminary work on the cars was such that when the track changing commenced, the mechanical department, under Mr. Massengale's direction, was able to put cars through the shops very rapidly by putting on extra gangs of men, and was able to supply the needs of the transportation department with cars of 4-ft. 8½-in. gage. This work, of course, was facilitated by the manner in which the track changing was done—that is, one division at a time was changed, which gave the shop time to keep up on its work of changing the gage of the cars. As it was practically impossible to get the narrow gaged cars on changed divisions back to the sheds each night, they were left out on their divisions all night and men were sent from the shops to give them whatever attention they might need.

When the time came for changing the gage of the St. Louis 23-B trucks, the cars were jacked up, the wheels were taken out, the temporary cast-iron collar was knocked off, the wheels were pressed in ¾ in. and the brake hangers were replaced with complete new ones made especially for the purpose. This was found to be a cheaper method than to try to move the brake-hanger brackets ¾ in.

To facilitate the work, both before and after the actual changing of tracks, a large number of extra axles of the different sizes, and also extra wheels, were purchased. The actual time required to change the gage on the cars (the preliminary work mentioned having been done) was about four hours to a car on the suburban cars with a gang of four men, and about three hours on a city car. It was necessary to change twelve cars outside the shops, as in the operation of their ordinary service that number could not be brought into the shops for that purpose. This work was done on the street at the termini of divisions without much greater expense for time than on those changed in the shops, the preliminary work above mentioned having all been done in the shops.

Before the tracks were changed so that all cars could be got back to the sheds, there were as many as twelve cars which were kept out on the divisions all night. Some of these were out for as long a period as five weeks without being brought to the sheds. During this whole period the company did not lose or burn out a field or an armature or a controller, and regular service on all divisions was practically uninterrupted.

Before commencing the work an estimate of cost was made at $25 per car for an average all around, suburban and city cars. The actual cost as finally determined proved to be about $30 per car. This increase over the estimate was due to a large extent to loss of wheels which could not be pressed on again during the preliminary work.

OUTING OF BROOKLYN EXECUTIVES

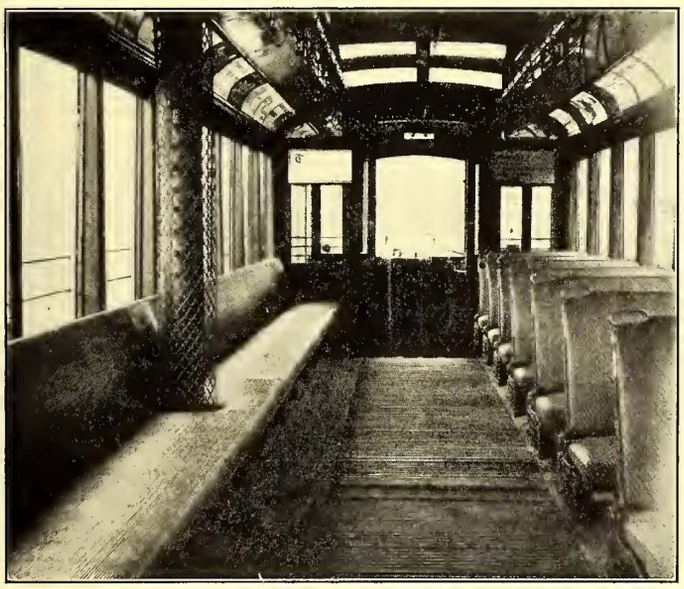
The annual outing of the executive force of the southern division of the Brooklyn Rapid Transit Company was held on Tuesday, Sept. 12. The party left the Fifty-Eighth Street depot at 9:30 a. m. in the parlor car "Montauk," and proceeded to Far Rockaway, Lond Island. On their arrival there they had luncheon at the Hotel Astoria. Athletic games and surf bathing were indulged in until 6 p. m., when the party left for Coney Island, where they spent an enjoyable evening as the guests of F. Henderson at his music hall. The following officials were in attendance: H. Bongard, assistant division superintendent; C. Hogberg and J. Cooney, depot masters; C. B. Hunter, stenographer; T. F. Young, timekeeper; W. J. Roome, W. P. Stott, P. H. Ryan, M. J. Loughlin, J. Forsythe, F. C. Duell, G. Schuck, W. J. Shaughnessey, C. Dreher, inspectors; E. B. Ricker, E. A. Keuney, J. Kelly, E. A. Cunningham, despatchers; E. A. Brown and J. Ham, shop foremen; G. Lockwood, L. Cunningham and F. McDermott, claim adjusters.

The Saginaw Traction Company, of Saginaw, Mich., has placed a 16-ft. gasoline launch in the water at Wenona Beach.

A NOVEL ARRANGEMENT OF CAR SEATS AT SCRANTON, PA.

In several recent articles a number of novel features introduced in street railway practice by the Scranton Railway Company, Scranton, Pa., have been described. Another interesting departure from accepted methods is to be found in the equipment of a number of new closed cars recently placed in service, and involves a combination of cross and side seating and the use of sashless windows. The interior of one of these new cars is illustrated herewith from which the seating arrangement may be observed.

Along one side is arranged a row of cross seats of the "walk-over" pattern, while upon the other is a longitudinal seat of the usual type, approximately 18 ins. wide and covered with rattan. The result of this arrangement has been that of securing an aisle of nearly the width and convenience of a car with the usual longitudinal arrangement of seating, but with the added conveniences and seating capacity on one side of the cross seats. This new arrangement has proven very satisfactory and popular to the patrons of the system and has re-received much favorable comment. It is to be noted also that



INTERIOR OF SCRANTON CAR

the scheme works out well in connection with the use of the "under-floor" type of stove which is used by the company. This stove is located upon the longitudinal-seat side of the car so that the top stove lid opening at the floor level for attendance is convenient of access.

The "sashless" feature of this car is something of a novelty in car construction, but has been applied for the purpose of making the car of the semi-convertible type. The window glass is removed entirely for the summer months and is inserted permanently for the fall and winter. The glass is inserted entirely without sash, that is, the panes are merely held in place in the window posts, with rubber-lined battens or strips and are cushioned at the side and bottom edges with rubber liners. The battens are arranged for a considerable movement in screwing them fast to the window posts so that the rubber cushions are tightly compressed and the cars run with no rattling of windows whatever, and no breakage has been experienced arising from this particular type of construction.

The disadvantage of the sashless window lies, of course, in the impossibility of lowering the glass or otherwise opening the window, in warm spells of early spring or late fall, but this is found to be easily counteracted to the satisfaction of passengers by use of the deck ventilators and opening of end doors. The great advantage of the elimination of the sash is, however, the greater interior width of car made available by obviating the necessity of the window pockets back of the seats; the seats are here located close up against the window posts, with a gain of 6 ins. to 8 ins. of available interior width of car. The elimination of repairs to sash, window pockets, etc., and their annual cleaning and varnishing, are also important desiderata, while in removing windows for the summer, the necessity for numbering the sash for proper return in the fall is entirely avoided, as all glass is interchangeable.

In case of rain, protection is secured at each window by lowering the usual roller shade with which each window is equipped.

THE MONTREAL STREET RAILWAY MUTUAL BENEFIT ASSOCIATION

In 1903 the employees of the Montreal Street Railway Company, in conjunction with the management, took in hand the organization of the Montreal Street Railway Mutual Benefit Association, and in August of that year delegates appointed by the men met the officials of the company and perfected the organization of the association along the lines of a general plan which had already been suggested. Rules and regulations were drawn up, and these were submitted at a general meeting and approved. Before the latter part of August a temporary board of directors was elected. A secretary-treasurer and a medical officer were also elected.

Every possible means was taken to place the idea clearly before the employees, and within three months of the time that the association was formed there were 600 members on the roll, while now there are upward of 1700 members in good standing, or practically all the employees eligible for membership. Briefly stated, the benefits of the association are as follows:

In case of disablement after the first six days, 60 cents per day for ninety days, and 30 cents per day for the next ninety days.

Free medical attendance.

Free medicine.

Twenty per cent discount on all medicines, etc., required by members of the family.

A life insurance policy of $500 and $50 toward cost of funeral expenses.

A pension when superannuated and too old to work.

All this costs the members the sum of $1 to join and 50 cents per month.

Of course, with the small revenue derived from the separate members, it would be impossible for any mutual benefit association to survive. But here the Montreal Street Railway itself steps into the breach, and by large contributions enables the association not only to pay all its liabilities, but to lay by a substantial surplus for future requirements as well.

Some idea of the calls made upon the association can be gathered from the following short summary of the relief work done for the year ended April 30, 1905:

Number of members disabled through sickness or injury.	611
Number of prescriptions issued	2,864
Number of visits made by physicians to disabled members	692
Number of consultations given by physicians to disabled members	4,026
Amount paid for sickness and injury	$6,239.10
Amount paid for medicine	783.73
Amount paid for death and burial insurance	5,767.67

The objects, as already pointed out, are to afford relief to the employees of the company, but the association does more than this, for it brings the men together socially. During the year special entertainments are given to members and their families, and each August the annual picnic is held. Here there are games in which the men and their families participate, special

prizes being given. In fact, the officers of the association leave nothing undone which will further the fraternal feeling and make the men happy and contented.

Aside from the benefits of life insurance and free medical attendance, an old-age pension is provided, and this insures old employees a sufficient income to maintain them in their declining years.

Within the past twelve months the medical staff of the association has been increased materially, which at all times provides the men proper and prompt medical treatment. In addition to the three doctors employed at the different stations, there is a chief medical officer and examiner.

The committee of management of the association is composed of fifteen members, drawn from the various departments, so that each may be fairly represented.

THE CONVENTION PROGRAM

As already announced, the annual convention of the American Street Railway Association and affiliated associations is to be held in Philadelphia next week. The following programme has been adopted:

MONDAY, SEPT. 25

Registration will commence at convention hall at 8:45 a. m.

10 A. M.—Convention of the American Railway Mechanical and Electrical Association. Address of welcome, Hon. John Weaver, Mayor of Philadelphia. Address by Hon. W. Caryl Ely, president, American Street Railway Association. President's annual address. Report of the executive committee. Report of the secretary and treasurer.

1:30 P. M.—Paper, "Power Distribution," by C. H. Hile, superintendent of wires, Boston Elevated Railway Company, Boston, Mass. Paper, "The Power Station Load Factor as a Factor in the Cost of Operation," by L. P. Crecelius, chief electrician, the United Railways Company, St. Louis, Mo. Report of the committee on "Controlling Apparatus," chairman, J. S. Doyle, master mechanic, Interborough Rapid Transit Company, New York, N. Y.

TUESDAY, SEPT. 26

9 A. M.—Convention of the American Railway Mechanical and Electrical Association. Report of the committee on way matters, "Welding of Rail-Joints," chairman, F. G. Simmons, superintendent of construction and maintenance of way, the Milwaukee Electric Railway & Light Company, Milwaukee, Wis. Report of the committee on "Maintenance and Inspection of Electrical Equipment," chairman, William Pestell, New York, N. Y. Paper, "The Power House," by Fred N. Bushnell, chief engineer, the Rhode Island Company, Providence, R. I.

1:30 P. M.—Paper, "The Track Brake," by F. F. Bodler, master mechanic, the United Railroads of San Francisco, San Francisco, Cal. Discussion of the question box. Reports of special committees. Election of officers.

10 A. M.—Convention of the American Association of Street Railway Claim Agents. Meeting at Room 1048 Land Title & Trust Company Building, Broad and Chestnut Streets. Reading of minutes of last meeting. Report of membership. Report of treasurer. Discussions of accident claims and methods of fakirs. Election of officers.

9 to 12 P. M.—Reception given by local reception committee, James Rawle, chairman, in ball room, Bellevue-Stratford Hotel; dancing.

WEDNESDAY, SEPT. 27

10 A. M.—Convention of the American Street Railway Association. Address of welcome. Address of the president, W. Caryl Ely. Approval of minutes of last annual meeting. Report of the executive committee. Report of the secretary-treasurer. Report of standing committees. Report of the reorganization committee. Consideration of, and action on, new constitution and by-laws. Appointment of nominating committee. Paper on "Notes on the Design of Large Gas Engines with Special Reference to Railway Work," Arthur West, Westinghouse Electric & Manufacturing Company. Paper on "The Application of Gas Power to Electric Railway Work," J. R. Bibbins, Westinghouse Electric & Manufacturing Company. Paper on "Single-Phase Railway System," Charles F. Scott, Westinghouse Electric & Manufacturing Company.

8 P. M.—Theater party at New Lyric Theater, "Babes of the Wood."

THURSDAY, SEPT. 28

10 A. M.—Convention of the American Street Railway Association. Unfinished business. New business. Report of nominating committee. Election of officers for the ensuing year.

2 P. M.—Convention of the Street Railway Accountants' Association of America. Annual address of President W. G. Ross, Montreal, Can. Annual report of the executive committee. Annual report of the secretary-treasurer. Appointment of convention committee on nominations. Appointment of convention committee on resolutions. Report on proposed reorganization of the American Street Railway Association.

8 P. M.—Banquet at the Bellevue-Stratford Hotel.

FRIDAY, SEPT. 29

10 A. M.—Convention of the Street Railway Accountants' Association of America. Annual report of standing committee on standard classification of accounts; C. N. Duffy, secretary and auditor, Chicago City Railway Company, chairman. Report of committee on international form of report; C. N. Duffy, secretary and auditor, Chicago City Railway Company, chairman. Report of committee to attend convention of National Association of Railway Commissioners, held at Birmingham, Ala., Nov. 15, 16 and 17, 1904; C. N. Duffy, secretary and auditor, Chicago City Railway Company, chairman. Annual report of standing committee on standard form of report; W. F. Ham, comptroller, Washington Railway & Electric Company, chairman. Report of committee to attend convention of National Association of Railway Commissioners, held at Deadwood, S. D., Aug. 15, 16 and 17, 1905; W. F. Ham, comptroller, Washington Railway & Electric Company, chairman. Reading and discussion of questions and answers in the question box. This includes those published and any others that may be presented.

2 P. M.—Paper on "The Cost of Carrying a Passenger." C. L. S. Tingley, second vice-president, American Railways Company, Philadelphia, Pa. Paper on "Interurban Fare Collections." Irwin Fullerton, auditor, Detroit United Railway, Detroit, Mich. Paper on "Interurban Ticket Accounting." J. H. Pardee, general manager, Rochester & Eastern Rapid Railway, Canandaigua, N. Y. Paper on "Accounting with Four Departments." H. M. Beardsley, secretary and treasurer, Elmira Water, Light & Railway Company, Elmira, N. Y.

2:30 P. M.—Grand ladies' trolley party by courtesy of President J. H. Porter, Fairmount Park Transportation.

8:30 to 12 P. M.—Vaudeville entertainment by amateur talent in the ball room of the Bellevue-Stratford Hotel; dancing.

SATURDAY, SEPT. 30

10 A. M.—Convention of the Street Railway Accountants' Association of America. Unfinished business. Report of convention committee on resolutions. Report of convention committee on nominations. Election and installation of officers.

CONVENTION NOTES

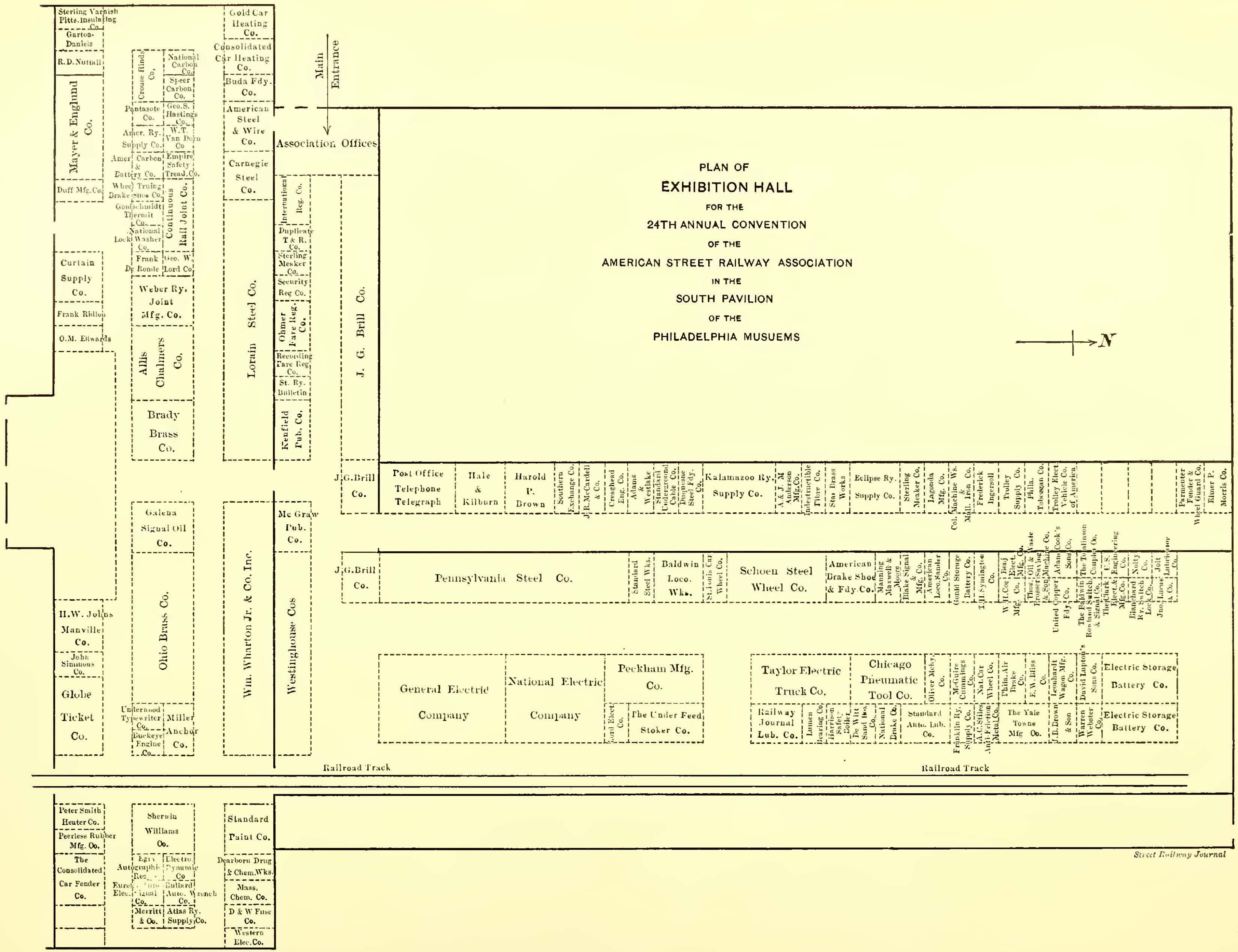
The patronesses of the reception Tuesday evening are to be:

Mrs. John B. Parsons, Mrs. James Rawle, Mrs. Geo. D. Widener, Mrs. G. Martin Brill, Mrs. A. Merritt Taylor, Mrs. Edward Brill, Mrs. Chas. O. Kruger, Mrs. Samuel M. Curwen, Mrs. David H. Watts, Jr., Mrs. Chas. A. Bragg, Mrs. Wm. M. Lycett, Mrs. Walter L. Eustis, Mrs. Henry L. Passavant, Mrs. Wm. H. Heulings, Jr., Mrs. H. S. Vane, Mrs. D. S. Coolidge.

Delegates to the American Street Railway Association and affiliated associations will obtain their badges and badges for ladies, also their banquet tickets, from Mr. Penington, who will be assisted by the secretaries of the different affiliated associations. Members of the Manufacturers' Association will obtain their badges and tickets from Mr. Baker, secretary of that association.

A diagram of the exhibit hall, showing the location of the different exhibits, as arranged at the time of going to press, is presented on the opposite page. These exhibits will be shown in the South Pavilion of the Philadelphia Museum, where all the meetings will be held, with the exception of that of the Association of Street Railway Claim Agents.

The Railway Commission of New York has granted the application of the New York Central Railroad to abandon the station at Crane's Village, 3 miles east of Amsterdam. Since the installation of electric railway service through the Mohawk Valley the station has not returned more than $4 a month.


PLAN OF
EXHIBITION HALL
FOR THE
24TH ANNUAL CONVENTION
OF THE
AMERICAN STREET RAILWAY ASSOCIATION
IN THE
SOUTH PAVILION
OF THE
PHILADELPHIA MUSEUMS
N
Main Entrance
Association Offices
Sterling Varnish
Pitts. Insulating Co.
Garton-Daniels
R. D. Nuttall
Mayer & Englund Co.
Duff Mfg. Co.
Crouse Hinds Co.
National Carbon Co.
Speer Carbon Co.
Pantasote Co.
Geo. S. Hastings Co.
Amer. Ry. Supply Co.
W. T. Van Dorn Co.
Amer. Carbon & Battery Co.
Empire Safety Tread Co.
Continuous Rail Joint Co.
Curtain Supply Co.
Frank Ridlon
O. M. Edwards
Frank De Ronde
Geo. W. Lord Co.
Weber Ry. Joint Mfg. Co.
Allis Chalmers Co.
Brady Brass Co.
Gold Car Heating Co.
Consolidated Car Heating Co.
Buda Fdy. Co.
American Steel & Wire Co.
Carnegie Steel Co.
Lorain Steel Co.
International Reg. Co.
Duplicate T. & R. Co.
Sterling Meeker Co.
Security Reg. Co.
Ohmer Fare Reg. Co.
Recording Fare Reg. Co.
St. Ry. Bulletin
Kenfield Pub. Co.
J. G. Brill Co.
Post Office Telephone Telegraph
Hale & Kilburn
Harold P. Brown
Kalamazoo Ry. Supply Co.
Eclipse Ry. Supply Co.
Mc Graw Pub. Co.
Galena Signal Oil Co.
Pennsylvania Steel Co.
Baldwin Loco. Wks.
Schoen Steel Wheel Co.
American Brake Shoe & Fdy. Co.
H. W. Johns Manville Co.
John Simmons Co.
Globe Ticket Co.
Ohio Brass Co.
Underwood Typewriter Co.
Buckeye Engine Co.
Miller Anchor Co.
Wm. Wharton Jr. & Co. Inc.
Westinghouse Cos.
General Electric Company
National Electric Company
Peckham Mfg. Co.
The Under Feed Stoker Co.
Taylor Electric Truck Co.
Chicago Pneumatic Tool Co.
Railway Journal Lub. Co.
Standard Auto. Lub. Co.
The Yale Towne Mfg. Co.
Electric Storage Battery Co.
Electric Storage Battery Co.
Railroad Track
Railroad Track
Peter Smith Heater Co.
Peerless Rubber Mfg. Co.
The Consolidated Car Fender Co.
Sherwin Williams Co.
Standard Paint Co.
Dearborn Drug & Chem. Wks.
Mass. Chem. Co.
D & W Fuse Co.
Western Elec. Co.
Merritt & Co.
Atlas Ry. Supply Co.
Street Railway Journal

IMPROVED SERVICE IN ARMATURE AND CAR-JOURNAL BEARINGS

BY H. P. WHITE

In the repair department of electric railways one of the largest items is the expense occasioned by maintaining the bearings. Superintendents and master mechanics having charge of this department are, as a rule, considered responsible for the comparative cost shown in the operation of different lines, and therefore are very much interested in any information which will tend to improve the service or in any manner reduce the running expense in that department.

One of the most common causes which lead to unnecessary expense in this department is the mistakes made by master mechanics in their choice of bearing or babbit metals for different special uses. Such mistakes are the outgrowth of natural trade conditions, for any manufacturer having a trade established on some particular product will not make any change in his business until the conditions of trade absolutely force him to do so. Such a change will affect every detail of his business. Supplies, labor, manufacturing equipment, advertising, the education of his selling force to meet the new conditions and many other business points would be involved, and such a step is never taken except as a last resort.

In no department of mechanics have there been greater improvements within the last few years than in the art of combining metallic alloys for use in bearings. The old process babbits were invented at a time when little or no attention was given to the proper proportions or chemical equivalents of the different elements involved, and, as a rule, they are mechanical mixtures of metallic elements and not chemical alloys. They are out of date, and their present position on the market is being maintained by that last insistent effort, which results from the natural trade conditions mentioned above. The plan of their construction makes it impossible for their cost to bear any relation to their real value as bearing metals. For example, take commercial copper genuine babbit, which is one of the most expensive of the old process babbits. The formula for this metal is: Tin, 88 lbs.; antimony, 8 lbs., and copper, 5 lbs. It is assumed that this product must have great value as a bearing metal, because it contains such a large per cent of tin, but there are no logical reasons which support such an assumption. It would be just as reasonable to expect silver or any other expensive element to add its relative value to the efficient service of a babbit, in the proportion in which it was used, as it would be to expect such a result from tin. The fact is that the commercial value of the elements in a babbit bears no relation to its real value as a bearing metal. An attempt to use any element in excess of the amount required to produce the desired molecular conditions of the alloy operates as a double loss, as it disturbs the molecular tension, thus injuring its quality, and adds unnecessary expense to the cost of production. The most desirable babbit is that which gives the most economical service, and as a rule such results are best secured by the use of special alloys which are designed to meet the conditions under which they are to be used.

The inventions and discoveries of recent years relating to metallurgical processes have made it possible for the expert metallurgist to design special alloys to meet the various requirements in every department of mechanical art with the same dependable accuracy that the expert mechanic designs special machinery. These modern new process babbit alloys are combined with due regard for both the physical and chemical properties of all the elements involved, and result in a chemical union which secures a close, fine, uniform grain and the highest possible molecular tension throughout the alloy. Mechanics will readily understand that babbits thus alloyed, from elements selected to meet the special conditions under which they will be required to work, will give more economical service than could possibly be secured from stock babbits selected without reference to their physical properties.

Some companies engaged in the manufacture of this class of bearing metals furnish a specification of the physical properties of each brand of their regular stock metals. Such specifications should at least list the following information regarding each brand or grade of babbit: (1) Melting point; (2) resistance to crushing strain per square inch; (3) elastic tension per square inch; (4) tensile strength per square inch; (5) elongation per lineal inch; (6) degree of anti-friction quality.

With this information before him, the master mechanic should be able to make an intelligent selection, and will often be able to find, among regular stock brands, metal well adapted to his service.

Every mechanic is not an expert metallurgist; therefore, the specifying of certain elements and their proportions to best meet the conditions of special service is out of their line. But they thoroughly understand every detail of the conditions connected with their service and the physical properties required in a metal to meet such conditions, and when they combine in their service their technical knowledge with that of an expert metallurgist they insure the most economical results than can be secured.

One of the companies interested in the manufacture of new process alloys is the New Era Manufacturing Company, of Kalamazoo, Mich. This company is not mentioned in an exclusive sense, as this field is not exclusive. Its business method, however, which includes, among other features, the furnishing of specifications of the physical properties of each of its regular stock brands of babbit and of special alloys, entitles it to consideration as one of the first to introduce this system, which is sure to lead to improved service and reduced cost in this department.

IMPROVEMENT IN HOT-WATER HEATERS

The Peter Smith Heater Company, of Detroit, has made a number of important changes in its system of hot-water heating for electric cars, so that a description of its present standard heater will be of interest. The heater is based upon the principle of rapid circulation, which, in the opinion of these manufacturers, is the secret of hot-water heating. To obtain this circulation, the company injects steam from the heater into the return end of the radiating pipe. This has a tendency to create a vacuum in the pipe and to assist the flow of water.

As will be remembered, the Smith heating system uses a coil heater fed with water from an expansion chamber, or reservoir of hot water, which is located above the heater. As the water passes from this expansion chamber into the heating coils in the heater, steam is generated very rapidly, because the pipes within the heater are of very small diameter, and also because the feed-water comes direct from the expansion chamber, where it is at the highest temperature of any part of the system, and so is much nearer the temperature of steam than if it first had to travel the entire length of the radiating pipes. After returning from the heater to the expansion chamber, the hot water circulates through the radiating pipes in the car.

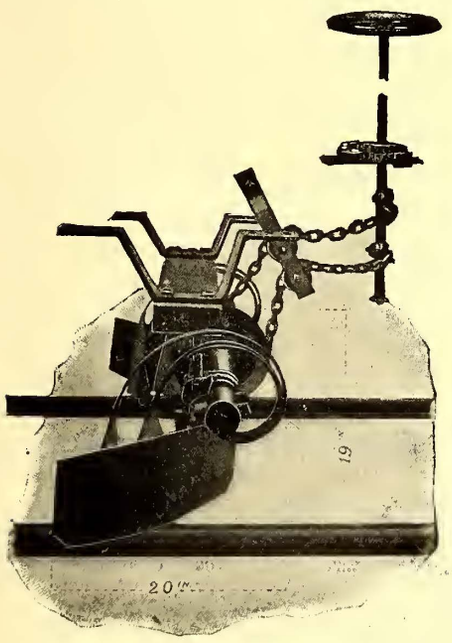
The return end of the radiating pipe does not terminate at the base of the expansion chamber, but is carried in it above the normal water level. The result is that every time steam is injected into the return end of this pipe it throws all the water above that point up into the expansion chamber and stimulates the circulation through the pipe. If the return end of the radiating pipe terminated at the bottom of the expansion chamber there would be a tendency for the water to run back down this pipe and retard the circulation. The rapid circulation is therefore due to gravity and not to a difference in temperature, as many suppose.

THE ROOT IMPROVED RAILWAY SPRING SCRAPERS

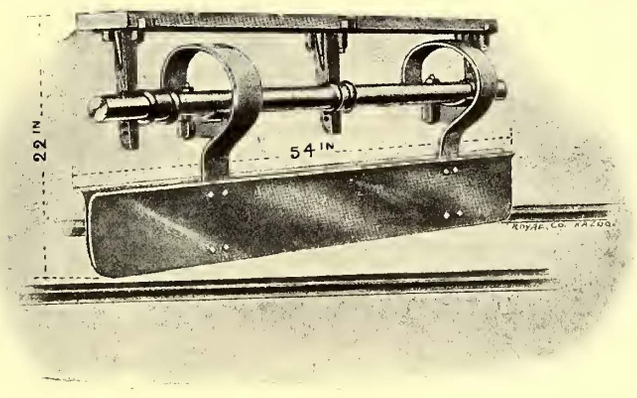
The track scraper is a valuable device at any time, but especially so during the winter season, when every effort must be put forth to keep the tracks free from snow, ice and mud. Learning from his extensive experience in this line, Fred N. Root, the inventor, has improved still further on his models of the widely-used Root scrapers, two types of which are presented in the accompanying illustrations. The Kalamazoo Railway Supply Company, of Kalamazoo, Mich., has recently arranged for the exclusive manufacture and sale of these scrapers, this arrangement being made after a very careful investigation as to their merits. These scrapers are giving good service at the present time on seventy-five or more different railway lines throughout the country.

The view of the No. 2 "special" scraper, designed for high-speed and heavy work, shows the maker's way of installing this scraper on high or short platform cars. On high cars, the hanger board is attached to brackets connecting with the platform or the sills of the car. By the use of a double pulley in connection with the guide chain and windlass rod, the scrapers can be installed and operated on any height of car. In this illustration, the hanger is shown fastened in the rear of the scraper shaft with the windlass rod in front, but both can be reversed if necessary.

The No. 3 fan scraper, shown in the second illustration, is designed for clearing snow from the middle of track, in connection with the company's regular track scraper. It is installed as a fixture and does not need to be operated. All parts are held rigid except the yielding springs, which will safely pass over any rigid object in the roadbed. The same results are obtained when the car is moving in either direction, always depositing the snow to the right, a valuable feature where there are double tracks.



NO. 2 SPECIAL SCRAPER



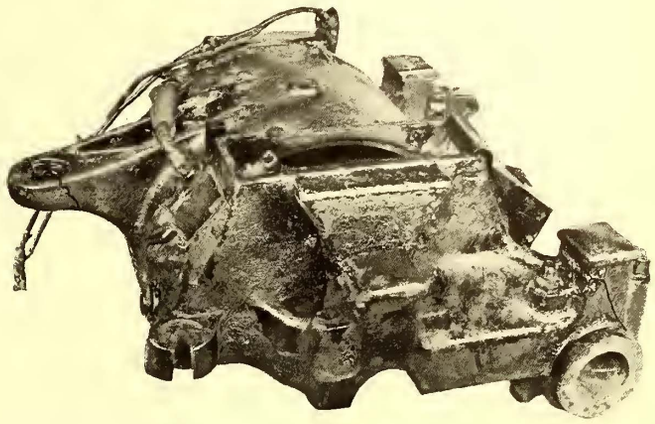
NO. 3 FAN SCRAPER

It can be installed in front of track scrapers on either end of a double-truck car, or on the rear end of a looped car. The shaft holding the springs is held rigid with keys, and can be set at any angle. The hanger board is installed about 22 in. above the rail, the shovels about 3 in. above the rail when the car is empty, or according to the track conditions.

Among the railway companies using these scrapers may be mentioned the Lansing & Suburban Traction Company; Michigan Traction Company; Grand Rapids, Holland & Lake Michigan Railway; Toledo, Fostoria & Findley Railway; Canton & Akron Railway Company; Rochester Railway Company; Binghamton Railway Company, Railways Company General; Chicago & Joliet Railway; Elgin, Aurora & Southern Railway; Scranton Railway Company; the Atlantic Shore Line Railway, etc.

IRON AND STEEL BRAZING PROCESS

A subject that is attracting great attention in the mechanical and engineering world is the brazing of cast, malleable and wrought iron and steel by the Ferrofix process under the Frederich Pich patents. Of course there are many skeptics who declare that cast iron has never been and cannot be brazed, but its usefulness, durability and practicability is being thoroughly demonstrated, and it promises to become a most potent factor in the reduction of operating and equipment expenses by the repairing of broken castings.



RAILWAY MOTOR REPAIRED BY THE FERROFIX PROCESS

The process of brazing cast iron is briefly as follows: Ferrofix, the brazing material in itself, consists of a powder together with a liquid which, when mixed, form a liquid paste which is applied to the fracture and subjected to a temperature of approximately 1600 degs. By the action of this heat on the Ferrofix, the pores of the iron are opened and receive the brass together with the flux, which latter is used to clean the surface of the fracture, as well as to assist the brass in flowing more readily. Invariably, the brass so used will penetrate far into the pores of the iron on both sides of the fracture and therefore should form a joint far stronger than the cast iron on either side of it. Many street railway companies have already taken advantage of this process to have broken motor frames, truck frames and gear cases repaired and restored, the advantages being the saving of the cost of new parts, the elimination of patch work in their plants, and the element of time saved.

The American Ferrofix Brazing Company, operating plants in Philadelphia, New York, Pittsburg and Scranton, is prepared to show wherein a street railway company will reduce very materially its operating expense in equipment, repair and purchasing departments by employing this method. Motor frames, depending upon the type, generally break through the bearings, or bearing and grease box combined. It is impossible at the present time to repair such breaks by other than

the Ferrofix process, successfully at least, as there is no room for patches to be employed. Gear cases have in the past been patched and riveted; the patches being of malleable iron will shortly work loose, the rivets wearing larger the holes where they are inserted. This means re-patching and the boring of more holes, which naturally weakens the entire casting.

By the method described, new patches are made and brazed solid over the fracture, and the part thereby gains additional strength in metal. The process not only applies to this particular line of street railway work, but to almost any and all classes of machinery used in every branch wherein cast iron parts are employed. The question of size of casting to be brazed is immaterial in the successful application of Ferrofix, providing the piece is so constructed that the heating will not distort.

A BOY-LESS BOWLING ALLEY

The Boy-Less Five-Pin Alley is a clever and most interesting game designed for use, particularly in connection with street railway parks. It is made in standard lengths of 40 ft., and in double sizes only, although single alleys can be furnished on special orders. It is made portable so that it can be moved from one place to another if necessary.

FIG. 1.—FULL-LENGTH VIEW OF DOUBLE BOY-LESS FIVE-PIN ALLEY

The feature that will appeal to the park manager particularly is the fact that no pin-boy is needed to set up the pins or return the balls. The balls are returned by gravity, and the pins reset by the simple pulling of a lever by the bowler. The earning capacity of the Boy-Less Five-Pin Alley is remarkable. At 10 cents a game one alley will earn $1.80 per hour. This will show a gross earning of $7.20 per hour for four alleys, which is the number one attendant can operate to the best advantage. Figuring on a basis of 30 hours' operation per week these alleys would earn a total gross income of $216.00 per week. This should prove very attractive to the up-to-date park manager.

Fig. 1 is a full-length view of the double alley, and Fig. 2 shows the pin platform sufficiently broken away to show the internal mechanism. In Fig. 1 is a platform upon which the bowler stands to deliver the ball onto the alley. Suspended above the alley at the opposite end is a curtain, having pointers arranged thereon to provide an objective point for the delivered ball. Passing under this curtain, the pointers serving as guides for the bowler; the ball, delivered with sufficient force, passes on to a curved runway, composed of a series of vertically disposed slats, spaced sufficiently far apart to receive the ball and guide it upwardly and forwardly.

Hinged bails (see B in Fig. 2), suspended from a rod and spaced apart by sleeve washers, have their lower cross pieces hanging across the path of the ball as it passes forwardly from the curved runway. These bails have upward extensions, designed to engage and knock down the hinged pins when a bail or bails is or are struck. A cushion receives the knocked-down pins. After striking one or more of these bails the ball is then received into an open-ended box, whose bottom is covered with sound-deadening material. The front wall of the box is provided with a cushion G1, and a cushion G2 is arranged along the upper rear edge of the box. The direction of rotation of the ball, in its travel along the alley and the curved guide ways, is such that when it strikes the cushion G1 the direction of rotation is counter to its momentum, and, unless the ball is delivered with considerable force, this counter rotation is sufficient to overcome the momentum, and consequently the ball will not strike the cushion G2, but will be arrested on cushion G1, and moved rearwardly down the incline provided by cushion G1, which terminates in a laterally inclined runway and delivers the ball on to an inclined runway. At the player's end of the alley this runway is provided with an unwardly inclined track, ending in a stall for the balls, placing them within convenient reach.

If a ball rolls off either side of the alley and is received in the curved guideways at the sides, a bail will be operated, but the side bails are not provided with upward extensions, and consequently a pin will not be knocked down. If a ball enters a curved guideway directly under the pointer 3, the bail struck will knock down either of the side pins directly above the pointer 3. If a ball enters either of the curved guideways between pointers 3 and 5, it will strike two bails and knock down two pins on either side. Should a ball enter directly under the pointer 5, the second pin on either side will be knocked down, and if it enters between pointers 5 and 7 the center and next adjacent pin on either side will be knocked down. If a ball enters the middle guideway directly under the wide pointer 7 it will strike an independently mounted bail and knock down all the pins standing. This makes a "strike" and a "spare" possible. The strike feature lends zest to the game, as it requires considerable skill for the bowler to deliver the ball accurately,

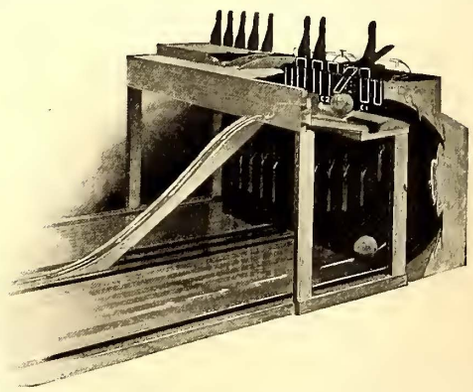


FIG. 2.—PIN PLATFORM AND OPERATING MECHANISM

so that it will reach the central curved guideway. It is designed so that the bowler shall bowl three balls. The game is counted the same as tenpins, except that the number of pins which the bails can knock down being five instead of ten, the value of a "strike" or "spare" is smaller by five pins. It is, therefore, possible, by observing the rules governing tenpins, to make 150 points.

The Matthews-Fahl Manufacturing Company, St. Louis, which owns the patents covering the boy-less five-pin alley, will have a double alley on exhibit at the convention.

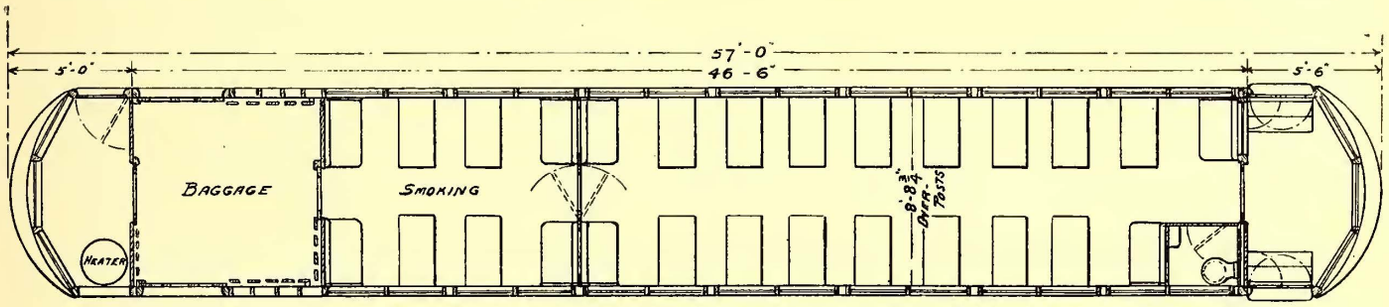
NEW CARS FOR THE COLUMBUS & CINCINNATI TRACTION COMPANY

The Columbus & Cincinnati Traction Company has just received four cars of an order of eight, built by the Jewett Car Company, of Newark, Ohio. These cars are of the latest type, and have all the new features of modern car construction, and are equipped with all modern conveniences. They are 57 ft. long, over buffers, and 46 ft. 6 in. over body; the width is 8 ft. 8¾ ins. over posts and 8 ft. 11¾ ins. over the widest point. As will be seen from the accompanying plan, these cars are divided into three compartments, the main compartment seating thirty-eight people, the smoking compartment seating sixteen people, and a baggage compartment. The baggage compartment has folding slat seats and will easily seat twelve people.

EXTERIOR OF COLUMBUS, NEWARK & ZANESVILLE CAR

The finish throughout the car is of selected mahogany of a rich color, inlaid with marqueterie, which with the artistic design gives it a very handsome interior. The ceiling is of semi-Empire type. The seats are of the high back walkover type, manufactured by the Hale & Kilburn Company, and are upholstered in green plush in the main compartment, and rattan in the smoking compartment. The cars are equipped with toilet room at the rear end and are heated by the hot water system, the heater being placed on the front platform and out of the way of passengers.

Parcel racks of a neat design are distributed all along the sides of the car and are made of solid bronze, same as the hardware. Curtains of Pantasote are provided at each window, manufactured by the Curtain Supply Company. The glass throughout the car is polished plate, except the gothics and deck glass, which are ornamented green glass. The outside finish is chrome green, which is used between the sash rest and on the letter board, and cream yellow, which is used between the letter board and the sash rest.



PLAN OF CAR, SHOWING ARRANGEMENT OF COMPARTMENTS

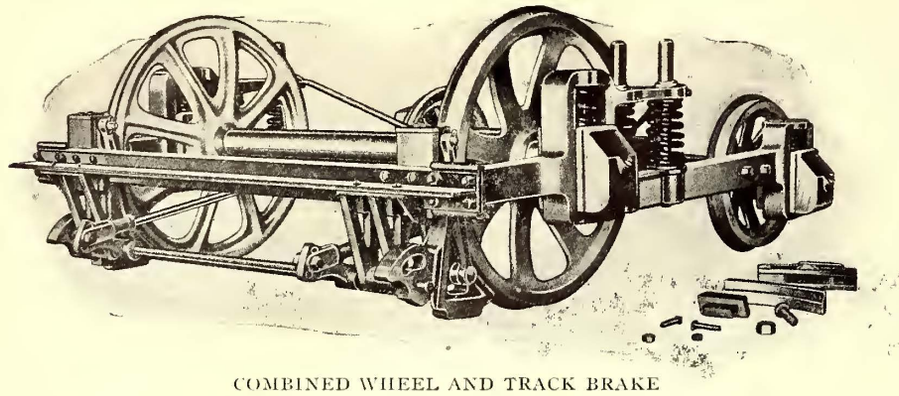
INTERIOR OF CAR

Each end of the car is equipped with M. C. B. couplers and the front end with locomotive type of pilot. The cars are further equipped with the De France air sanders, Westinghouse air brakes, Mosher arc headlights, signal lamps, cocoa matting in aisle, safety treads on steps, etc. They are mounted on Peckham M. C. B. No. 40-A double trucks with 6-ft. 10-in. wheel base, 34-in. diameter wheels and 5¼-in. axles. The electrical equipment consists of four G. E. No. 73 motors, operated by the Sprague-General Electric multiple-unit control system. The wires are run in waterproof conduits and all contactors are assembled in one fireproof box.

Competition of new and extended electric lines that parallel the Hocking Valley Railway is attributed as the cause for the decrease in the passenger earnings of that company. The passenger earnings for the year ended June 30, 1905, were $764,956.51, as against $831,627.84 for the previous year. The number of passengers carried during the year was 1,979,731, and the passenger earnings per mile, not including mail and express, was 97 cents.

COMBINED WHEEL AND TRACK BRAKE

A combined wheel and track brake has been in use for a number of years on the Montague Street cable cars of the Brooklyn Rapid Transit Company. This line extends from the City Hall in Brooklyn to the Wall Street Ferry, and the 9 per cent grade surmounted is so severe that a special type of

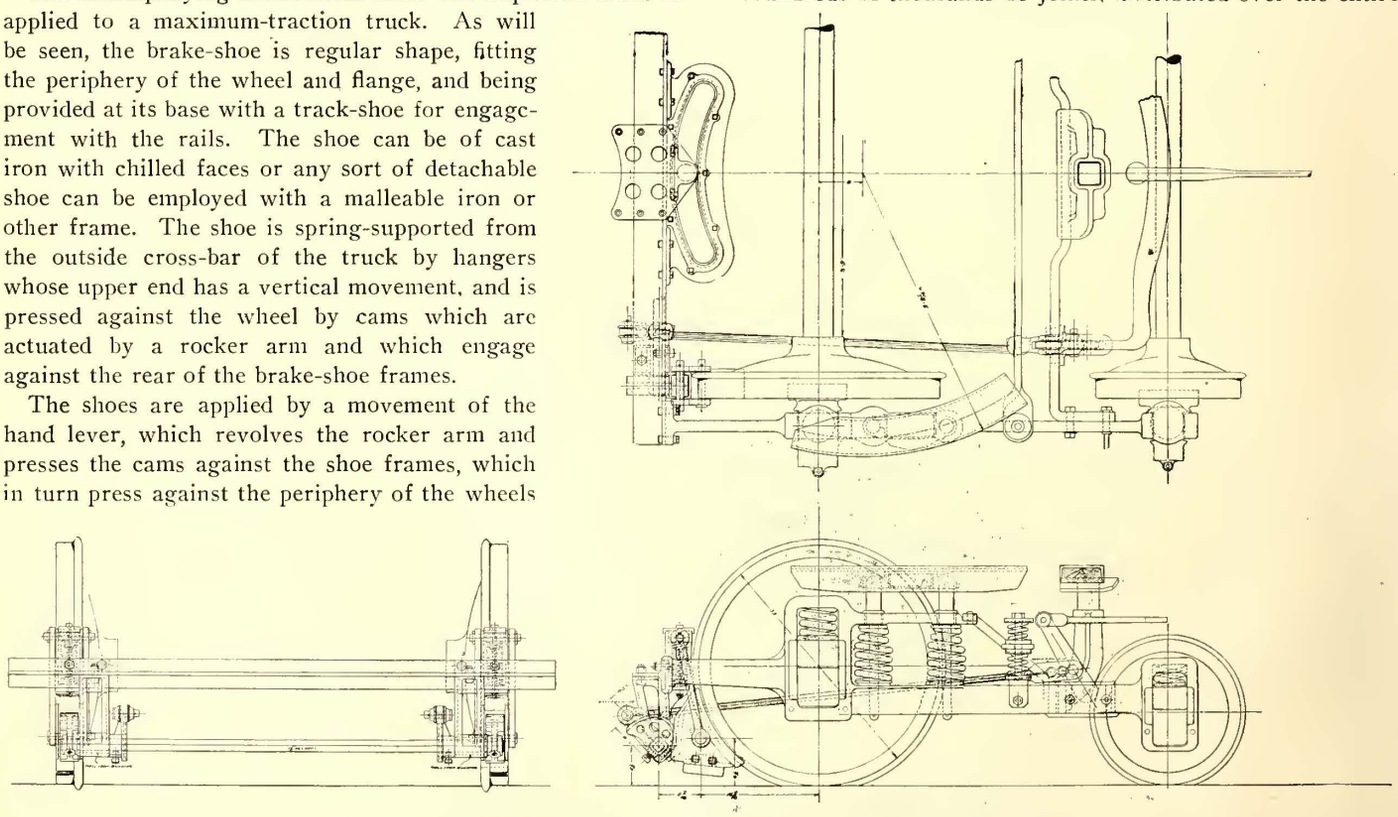


COMBINED WHEEL AND TRACK BRAKE

brake which would afford absolutely safety under all conditions was extremely necessary. The patents covering this brake have recently been secured by the United States Metal and Manufacturing Company of New York. The mechanism of the brake has been improved in certain directions suggested from its use in Brooklyn, and the brake has been adapted to electric cars and will soon be placed on the market by the company mentioned.

The accompanying illustrations show the improved brake as applied to a maximum-traction truck. As will be seen, the brake-shoe is regular shape, fitting the periphery of the wheel and flange, and being provided at its base with a track-shoe for engagement with the rails. The shoe can be of cast iron with chilled faces or any sort of detachable shoe can be employed with a malleable iron or other frame. The shoe is spring-supported from the outside cross-bar of the truck by hangers whose upper end has a vertical movement, and is pressed against the wheel by cams which are actuated by a rocker arm and which engage against the rear of the brake-shoe frames.

The shoes are applied by a movement of the hand lever, which revolves the rocker arm and presses the cams against the shoe frames, which in turn press against the periphery of the wheels



ELEVATIONS AND PLAN OF TRUCK WITH WHEEL AND TRACK BRAKE

by a rapidly increasing leverage on account of the shape of the cams. With an ordinary stop the shoes have a movement simply against the periphery of the wheel. If an emergency stop is required, the pressure on the brake lever is increased. This presses the shoes still tighter against the periphery of the wheels and carries the shoe down with the rotation of the wheel until the lower part of the shoe engages the rail. The brake then acts as a track brake, preventing the skidding of the wheels.

CAST-WELDING IN BALTIMORE

On June 8 last, the United Railways & Electric Company, of Baltimore, entered into a contract with the Falk Company, of Milwaukee, to cast-weld 10,000 or more joints on its tracks in that city. The work is now well under way on Linden Avenue, where 2.5 miles of track will be made continuous by the Falk process. Certain parts of Charles Street and McCullough Street have already been finished. Other streets to be cast-welded are as follows: Edmondson Street, 8.8 miles; John Street, 4.9 miles; Carey Street, 2.8 miles; Preston Street, 5.1 miles; Fremont Street, 3.7 miles; Orlean Street, 7.5 miles, etc.

Some time ago several Eastern street railway men visited a number of the largest cities in this country where cast-welding had been adopted, with a view to recommending similar work in their own town. In riding over old track which had been cast-welded by the Falk process for some time, and where the rail had formerly been pretty well worn and the ends gouged out, they found that the ends had been brought up to proper alignment and that it was impossible to feel a joint when riding over the track. In fact, a tape line was required to locate the joints. Electrically, it has been demonstrated that the conductivity of the rail is about 20 per cent greater throughout the joint than in the rail itself, and that the rail ends, when once cast-welded and finished, need no further attendance. The life of the rail end is made equal to that of the rail itself.

Hundreds of thousands of joints, distributed over the entire world, have been welded by this company. A few of the large cities in which work has been done by this company include the following: New York, Brooklyn, Boston, Baltimore, Newark, Jersey City, Providence, Cleveland, Cincinnati, St. Louis, Chicago, Milwaukee, Minneapolis, St. Paul, Los Angeles, San Francisco, Paris, Marseilles, Havre, Nancy, Bordeaux, Lyons, Nice, Berlin, Cologne and London.

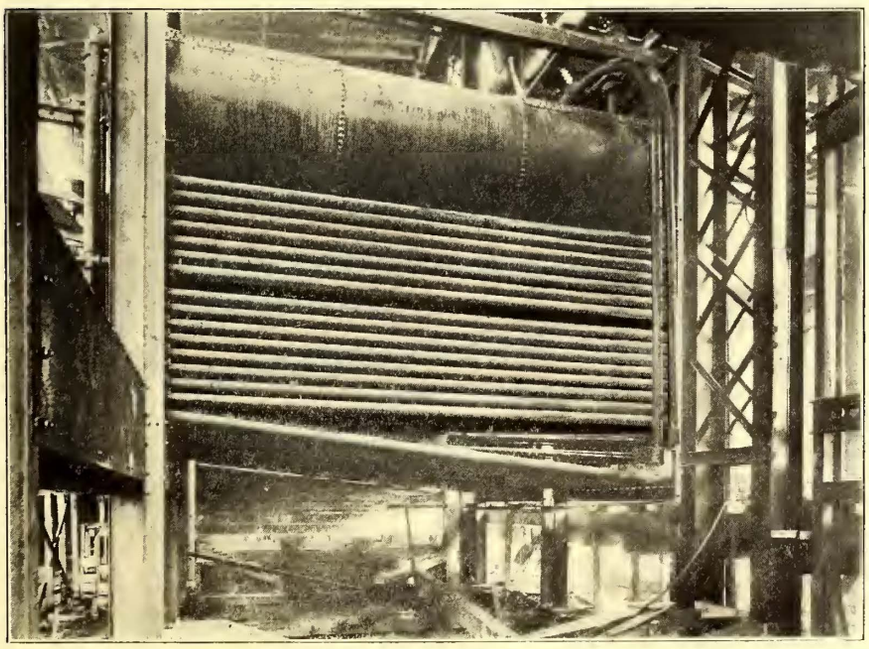
Outside the welding business, the Falk Company manufactures street railway special work, motor gears, pinions, etc.

THE PARKER DOUBLE-ENDED HORIZONTAL TUBE-BOILER

That important improvements are possible even in the well-worked field of boiler design seems to be demonstrated by the double-ended horizontal tube steam boiler invented by John C. Parker several years ago, and now manufactured by the Parker Boiler Company, of Philadelphia. The latter has installed several boilers of this type in power houses of the Philadelphia Rapid Transit Company, namely, the Thirteenth and Mt. Vernon Streets station and the Second Street and Wyoming Avenue station (10,000 hp). The Rapid Transit Company has also specified this boiler for its new Delaware Avenue station. The great advantage of this boiler is the material economy in the boiler room space, for, as the tubes are horizontal, grates can be set at both ends, and double the heating surface is secured on the same floor space.

Any number of boilers can be set in battery, as no access to the side walls is required. The horizontal tubes lend compactness, and in converting other types of boilers to this system it has been found possible to get 50 per cent more heating surface in the same space occupied by inclined tubes. One of the standard designs is made up of two drums of liberal size, a feed element next beneath them, and evaporating elements below the feed element.

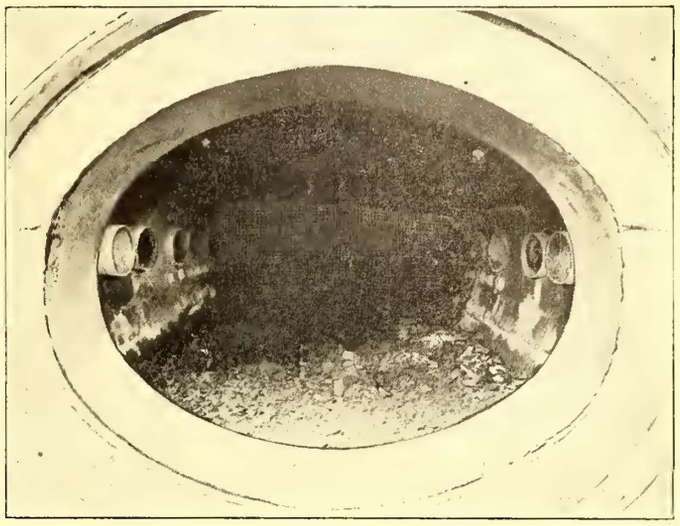
The drums are constructed in accordance with the very latest practice, using the best material and riveting of the highest efficiency. The diaphragm of ¼-in. steel plate is riveted to the shell and arranged to form a pocket at the front to collect the scale discharged from the tubes. The anti-priming valve is hinged to the diaphragm head and serves as a manhole for the lower chamber. The bottom of the drum below the level of the nipples leading to the elements forms the sediment pan or mud drum. An inverted angle with closed ends is placed along the bottom of the drum and over the blow-off opening, making the blow-off effective for its full length.



700-HP BOILER WITH SUPERHEATER AT THE SECOND STREET AND WYOMING AVENUE STATION OF THE PHILADELPHIA RAPID TRANSIT COMPANY

The tubes are expanded into the junction boxes, which are like return bends, holding two tubes. This arrangement permits the free and independent expansion of every tube without strain on any joint. The flexibility of the construction is such that the boxes can be separated several inches at any point for admittance to the baffles or for renewing a tube, giving sufficient opening to permit the removal of 18-ft. tubes in a 10-ft. fire room. Each tube is accessible for removal without disturbing the others. In high boilers, the lower row of tubes is usually inclined, giving access to the baffles and lower tubes without lifting the boxes.

The tubes above the top baffle form the feed element. The inlet end is connected to the drum with an expanded nipple, and the feed connection is made to the top rear junction box beyond the non-return valve. The flow in the element is forward and back alternately through each tube in the top row, then down to the next row, and so on, finally discharging through a vertical upcast into the rear drumhead above the diaphragm. A blow-off connection is made at the bottom end of the feed element, and solid water can be forced through the entire element under full boiler pressure.



VIEW THROUGH MANHOLE OF STEAM DRUM OF CONVERTED BOILER, SEPT. 17, 1904, SHOWING SCALE DISCHARGED FROM TUBE

The lower or evaporating elements are two tubes wide, passing the water twice across the furnace at each level. The connection to the drum at the upper or induction end is made by an expanded tube entering an "inlet" box which supplies two elements, each having a brass non-return valve in the top junction box, and the lower end of each element is connected to the steam chamber by an independent upcast. The baffles to direct the course of the gases are made up of small fire tiles resting on the tubes.

One of the illustrations shows a 700-hp boiler fired at both ends with inclined stokers and equipped with a superheater. The working pressure is 200 lbs. The lower tubes are inclined to give space for the superheater, and as much heat can be passed direct to the superheater as desired. The heating surface is as follows: Economizer surface, 3000 sq. ft.; evaporating surface, 4000 sq. ft.; superheating surface, 375 sq. ft. The grate surface is 140 sq. ft. The boiler proper, without the economizer and with a single grate, is rated at 400 hp, but by doubling the grate surface it has been run up to 940 hp. The addition of the economizer keeps the flue gases down to about 400 degs., and makes the economy very high for that rate of working.

Aside from economy in space, other advantages are:

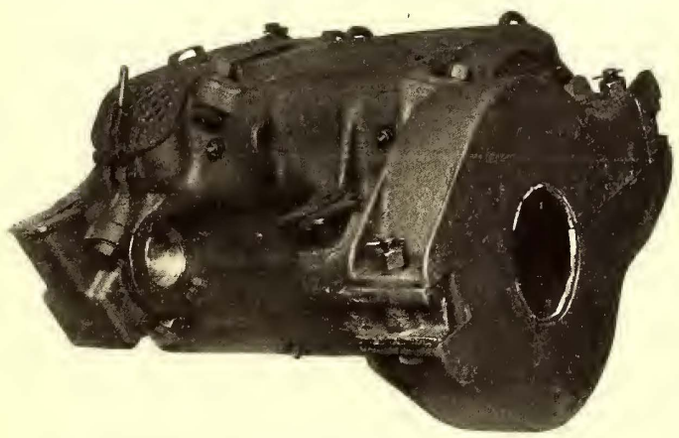
The scale can be removed from the tubes automatically while the boiler is in operation; the flexible construction permits the independent expansion of every tube; the combination of boiler and economizer in one setting, with the downward course of

the water and steam in the tubes, increases the efficiency of the heating surface by bringing the coolest water next to the coolest gases; the strong non-reversible flow makes burnt tubes impossible; the inside circular hand-hole covers, held to their seats by the pressure, with conical ground joints, require no cleaning nor packing, and do not become leaky; and the separate chambers for steam and for water, with anti-priming valve between, make wet steam impossible.

A NEW LINE OF RAILWAY MOTORS

Heavier rolling stock and faster schedules in electric traction have from time to time necessitated the production of larger motors for elevated, subway, interurban and suburban service. Each increase in size has been marked by mechanical changes, but at no time possibly have such wide departures been made in railway motor construction as the Westinghouse Electric & Manufacturing Company has embodied in a new line which is fully described in this article. The smallest motor of the new design has a capacity of 75 hp, and the largest 200 hp, with a number of sizes between the two.

Among the many excellent features which characterize these motors may be mentioned the diagonally divided field frame, which makes every part accessible; the gear case supported en-



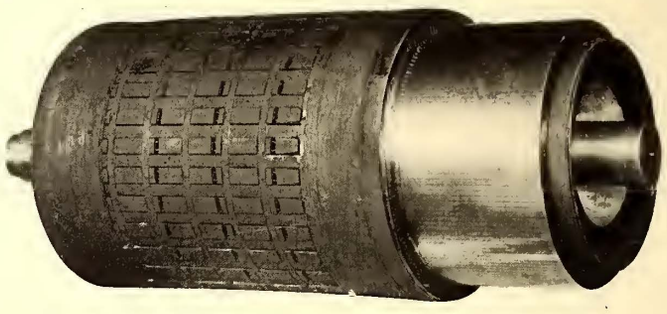
75-HP MOTOR

tirely at the ends, so as to avoid the side strains which have been the source of so much trouble; housings for armature bearings clamped between the two halves of the frame; generously proportioned bearings, with the most effective system of lubrication yet devised; armature and commutator assembled upon a single spider; bar-wound armature with split coils; commutators with many bars; low-current density in the brushes; bolted-in laminated poles; sealed field coils wound with strap; excellent commutation, high efficiency, low operating temperature and great mechanical strength.

Limitations are naturally placed on the size and construction of a motor by the amount of available space on the truck of the car; therefore the frame of square cross section has been adopted as utilizing this space most advantageously. All motors in this line have cast-steel frames split at an angle of 45 degs. with the horizontal. The axle bearings are carried by the lower half of the field frame and are divided at an angle of 35 degs. with the perpendicular, so that the weight of the motor is supported almost entirely by the part of the frame extending over the axle, rather than by the axle cap bolts. By lifting off the upper half of the field casting, the armature may be removed from the frame without taking the motor from the truck, or the motor may be removed from the truck by simply taking off the gear case and axle caps. Three bales conveniently located make handling of the motor easy. Bolts with nuts and lock washers hold the two halves of the frame together and the axle caps in proper position.

The housings for the armature bearings are circular in form and are turned slightly larger in diameter than their seats in the frames, so that when clamped in place all the advantages of a press fit are obtained. Finished shoulders on the housings prevent any lateral movement, and also take the entire end thrust of the armature instead of imposing this severe strain on the clamping bolts. Two bolts through the frame at each end prevent the housing from turning.

The armature bearings are made of solid phosphor-bronze bushings finished all over, with a 3-32-in. lining of babbit metal. If from neglect the bearings should become so hot as to melt the babbit, the armature would be supported on the



ARMATURE

brass shell and would not strike the poles. Both oil and waste lubrication are provided. The waste comes in contact with the bearings on the low-pressure side and is supplied with oil from separate pockets from below; in this way it is filtered before reaching the bearing. The amount of oil in the reservoirs may be gaged so that it may be kept at the proper level for economical service. With intelligent care these bearings will run 100,000 miles to 150,000 miles.

The axle bearings are similar in construction to those of the commutator, except that split bushings are used. Here also lubrication is by means of oil and waste, the oil being supplied from below. This is the same method which has given such

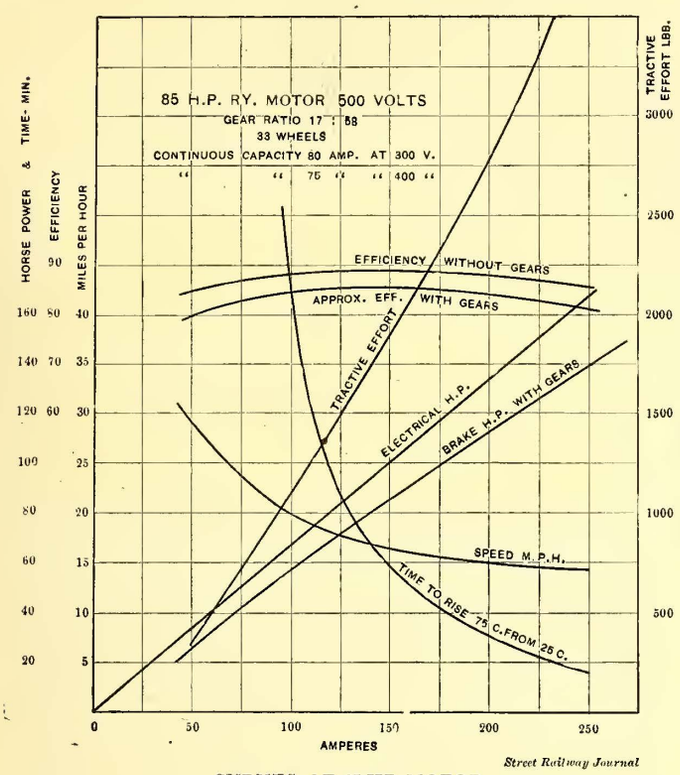
200-HP MOTOR

universal satisfaction in steam railway service. All bearings have generous dimensions, and the large surfaces readily dissipate the frictional heat and insure cool running.

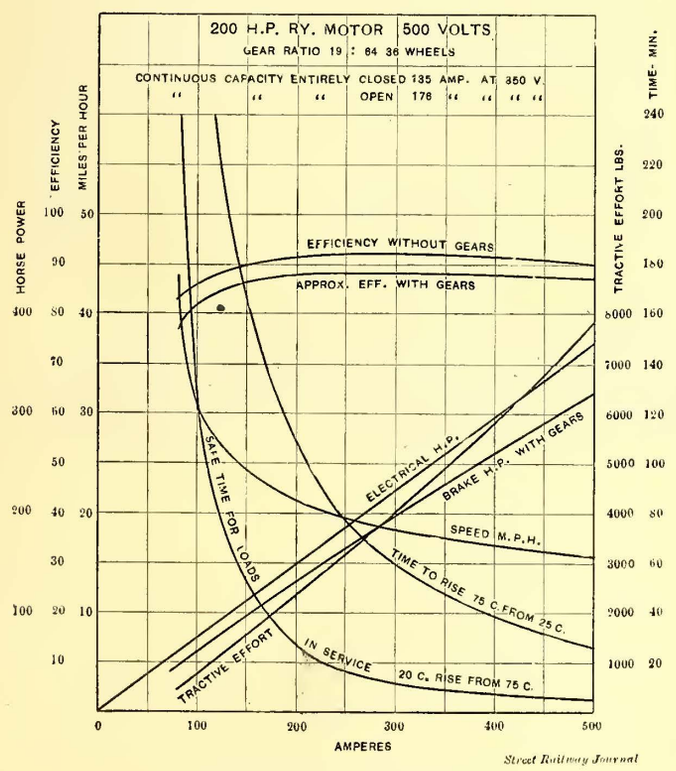
Pole pieces, built up of punchings of soft steel, are bolted to the top, bottom and sides of the motor frame, which, being almost square in cross section, permits the use of flat field coils. These coils are wound of copper strap, insulated between turns with treated asbestos ribbon, and then carefully taped and given repeated dippings in specially prepared insulating compounds and varnishes, which make them moisture repelling and able to stand internal heat. Brass hangers hold the coils in place independently of the poles.

The armature core is built up of steel punchings keyed on a cast-steel spider, which also carries the commutator. The shaft is forced into the finished armature and keyed thereto, and may be removed, should necessity arise, without disturbing the windings or commutator. The armature coils are strap wound and made in two parts. As the top coils are more liable

to injury, this design makes it possible to remove the damaged part without disturbing any other part of the winding. The coils are liberally insulated with mica and sealed, and further insulated by dipping in varnishes which are oilproof and moisture repelling. On each end the armature slots are made deeper and wider, thereby providing space for mica cells, which greatly reinforce the insulation at these points. As a further protection, fibre strips are taped to the upper sides of the top coils. A bell-shaped flange at the pinion end and a cylindrical flange on the commutator end form rigid supports for the windings. Countersunk bands of steel wire on the core and wide bands outside the core hold the coils firmly and securely.



CURVES OF 85-HP MOTOR

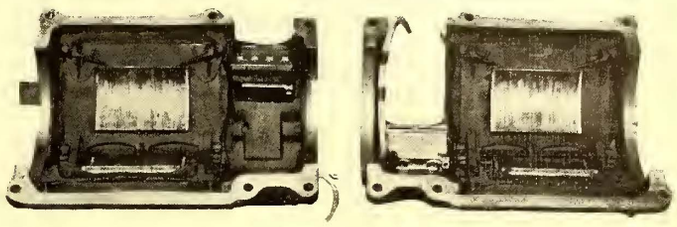


CURVES OF 200-HP MOTOR

Openings through the spider and core allow a free passage of air, which is thrown forcibly against the field coils, thus maintaining a low temperature throughout the motor.

The commutators are made from a great number of hard-drawn copper bars with short necks, carefully insulated from each other and held securely between insulated V-rings. A liberal wearing depth insures long life. The excellent design of the motor windings, the great number of bars in the commutators and the even wearing qualities of the insulation produce commutating characteristics of the highest merit.

The brush holders are of the sliding type, with springs of phosphor bronze held in a harness, which definitely fixes the radius of action of the spring tip, and is so constructed as practically to eliminate friction between turns, making it possible to provide a large number of turns, which gives a very uniform pressure upon the brush over a considerable range without requiring adjustment. The tension of the spring may be adjusted without removing the holder from the motor. The brush holder proper is bolted to an insulated guide, and may be removed without disturbing the insulation or connections. Leads of flameproof flexible rubber-covered cable are brought out at the front of the motor over the commutator through insulating bushings. Access to the brushes and brush holders is provided through a large opening in the frame over the commutator which extends well down the side, making inspection easy from the pit. A hole in the rear end bell and an opening under the commutator provide means for inspecting the clearance between the armature and field poles.



INTERIOR CONSTRUCTION OF 200-HP MOTOR

Pinions used on these motors are machined from solid steel forgings and held on to tapered seats by keys, nuts and lock washers. Gear cases are made of malleable iron and divided along the center line of armature and axle. They are supported only at the ends, which does away with all side strains, which are responsible for so many broken gear cases. Nose suspension with safety lugs is ued for all motors of this design.

RECENT ORDERS FOR THERMIT JOINTS

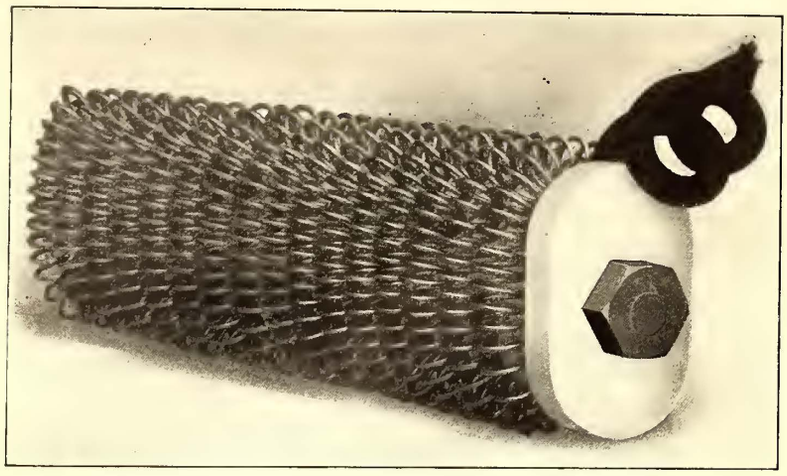
The Goldschmidt Thermit Company, of New York, reports that last year, the first year in which the Thermit joint was put upon the market in this country, it sold about 3000 joints. The record this year is over 10,000 up to date. Some of the larger orders this year are as follows: Altoona, Pa., 125; Birmingham, Ala., 25; Butte, Mont., 150; Joliet, Ill., 185; Cincinnati, Ohio, 100; Cleveland, Ohio, 2984; New Haven, Conn., 503; Fitchburg, Mass., 50; Holyoke, Mass., 1015; Buffalo, N. Y., 50; Los Angeles, Cal., 100; New York City, 650; Bayonne, N. J., 200; Camden, N. J., 100; Rochester, N. Y., 200; Springfield, Mass., 580; Utica, N. Y., 610; San Francisco, Cal., 1000; Salt Lake City, Utah, 600; Sao Paulo, Brazil, 250; Manila, P. I., 500; Worcester, Mass., 25.

WESTINGHOUSE AUTOMATIC BRAKE FOR SURFACE CARS

It is understood that the Westinghouse Traction Brake Company will exhibit at the Philadelphia convention an automatic air brake suitable for electric cars. An extended description of this brake will appear in an early issue of this paper.

HEATER COIL FOR NEW TRUSS-PLANK HEATER

The accompanying cut illustrates a heater coil wound on an elliptical spindle for the Consolidated Car Heating Company's new truss-plank heater. The cut is two-third actual size, and



TRUSS PLANK HEATER

shows how it is possible to use 1 mile of wire on the coils of twelve of these heaters. On account of this large radiating surface, the wire is only heated to a moderate degree. From the cut it will be seen that the coils are perfectly insulated and supported continuously, which absolutely prevents vibration.

DUPLEX DOUBLE-DOOR FIXTURE

This fixture is intended for simultaneously operating two doors, and more particularly for use on street cars that are equipped with twin doors, although it may be used in connection with elevator gates or for other purposes where it is desirable to have two doors operate reciprocally. The accompanying illustration gives a fair idea of the principal features of the mechanism and method of operation.

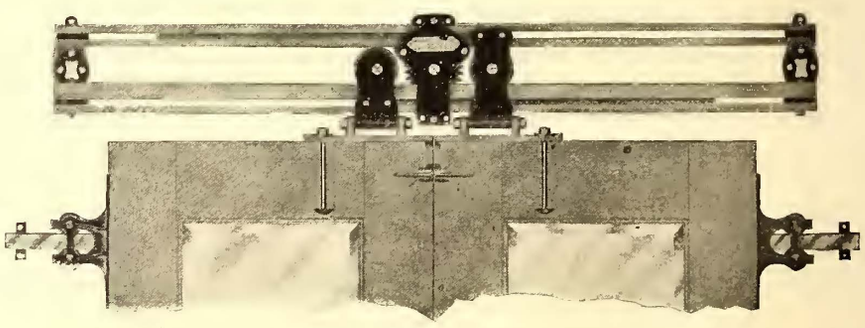
Channels are ingeniously arranged in such a manner as to form guideways for cold-rolled machine-cut racks. One of these racks is attached to the left-hand hanger at the bottom and the other to the right-hand hanger at the top. A gear wheel is interposed at the center of the mechanism between the two channel-iron guideways, and operates through a slot that is cut in the bottoms of the channel irons for a short distance, thus permitting the gear wheel to engage the racks, both top and bottom. Any force applied to either door is communicated to the opposite door by means of the interposed gear wheel, which operates both racks simultaneously and reciprocally.

While the accompanying illustration does not show this very clearly, attention is called to the fact that the hangers consist each of two plates, which straddle the channel irons, and between these two plates the rollers are journaled, the rollers operating in a supplementary channel, which is placed with the legs of channel upward, thus forming a sort of grooved trackway for the rollers. The racks are secured to the hangers by means of steel pins, and the holes for engaging these pins to the hangers are oblong in shape, thus preventing the possibility of any weight coming on the racks by reason of rollers wearing down or by reason of any inequality in the castings or in the manner of assembling them.

The supporting brackets, which are to be attached to the door, are hinged on to the hanger plates by means of a bolt. Thus the doors can be easily loosened and taken away without necessitating the removal of the fixture. Furthermore, this method of attaching relieves the fixture from any strain that may be brought against it in case the doors are forced out of line slightly by the weight of a person being thrown against them, or otherwise. This hinged feature also prevents any binding strains from warping of the wood or other suspending the doors does away with the unsightly causes. Aside from these advantages, the method of plates usually employed, as the bracket for suspending the doors is entirely out of view. A ¼-in. hole is bored through the rail of the door, into which a bolt is inserted before the glass is put into the door. The suspending bracket, which is made of malleable iron, is countersunk into the door stile, as shown in the illustration, and is firmly secured at that point by a long wood screw. The opposite end of the suspending bracket is slotted to receive the threaded end of the bolt, over which a key plate is placed, and the nut then turned down tightly. The key plate has its bearing against a slight projection or lug on the end of the bracket. This method not only securely carries the door and does away with the plates, but also reinforces the corner of the door, where it is most required. There is no chance for the door tilting. For example, if the front edge of the door is raised, the roller of the hanger by which it is suspended will travel on the under side of the channel immediately above it. If the back edge of the door is raised it will bring the lower roller of the double-back sheaves into contact with the under side of the track extension.

The width from the top of the door to the top of the fixture is only 7 ins., and even this can be reduced where conditions make it necessary to do so. The clearance required between bulkheads is only 1⅝ ins., and this also can be reduced slightly if necessary. The total length over all of a fixture having a travel for each door of 16½ ins., or a total opening of 33 ins., would be only 45 ins.

Double sliding doors have many advantages over the single type of door, one of which is the increased space available for a large door opening. By the use of an operating mechanism, the weight of one door is counterbalanced by the other, and



DOUBLE-DOOR FIXTURE

there is no danger of the doors shifting back and forth from the oscillation of the car or when rounding curves. Many accidents have occurred on cars equipped with doors of the single type by passengers having their hands crushed when doors would slide shut unexpectedly. One large road has had no less than thirty-eight accidents of this kind in one year.

The Duplex double-door fixture is the invention of Carl Metterhausen, who was for quite a number of years connected with the Pullman Company when it was still engaged in the street car building business, and later with the Jackson & Sharp Company, of Wilmington, Del. Mr. Metterhausen is at the present time secretary and treasurer of the Wallace Supply Company, of Chicago and New York City, which is marketing the Duplex double-door fixture just described, and other railway materials.

COMMERCIAL TESTING OF HIGH-VOLTAGE INSULATORS

Less than a year ago the testing of insulators—even the output of a large factory—was a very inconsiderable item, requiring but two or three men and a suitable testing equipment. So long as the insulators were small and easily handled, there was no occasion to improve the testing facilities. But with the advent of large pieces of ware for multi-part insulators, new conditions have arisen and have practically compelled the utilization of some more economical method of handling and testing.

The method in common use among insulator manufacturers two years ago called for a 25-kw or 30-kw testing transformer and a simple pin rack capable of accommodating about thirty insulators. After the insulators had been placed on pins or upside down in cups fitted on pins, a chain from an overhead high-tension wire was dropped into the pin hole or wrapped around the insulator head. Voltage was then applied for some stipulated length of time, after which the insulators were removed and others substituted. During this time the testing transformers were allowed to stand idle. With the change in organization of the Locke Insulator Manufacturing Company

TESTING RACK FOR INSULATORS

and its accompanying increase in business, it was found such primitive methods were entirely inadequate. To relieve somewhat the situation, a second exactly similar rack was put up parallel to the original one, so that by the use of large air-brake switches one rack could be tested while the other was being loaded or unloaded, practically doubling the capacity of the test without increasing labor costs. For a few months this method cared for the whole output, but the sudden increase for the past few months has at this time made some other provision imperative. First, all the parts of the multi-part insulators must be tested, then cemented together, and again tested, calling for much handling, with its consequent loss. With an eye to the elimination of much of the handling, the scheme now in use in Victor, N. Y., was developed, whereby 550 insulators may be tested, cemented and retested with minimum handling. To accomplish this, four double racks, each about 90 ft. in length, have been constructed and fitted with galvanized sheet-iron cups in which to set the insulator to be tested. The shells are then assembled with cement, and by means of a movable high-tension wire supported by large strain insulators and equipped with chains properly spaced, the test voltage is applied. Large air-brake switches are provided, that one or all racks may be disconnected or connected at will. The test having been completed, the high-tension wire and its chains are drawn up out of the way to facilitate loading and unloading of the rack, though unloading does not occur until the cement has become sufficiently hard to permit handling. On very large insulators the saving of time is very great; in fact, the time required to handle the 550 insulators on to the racks is entirely saved, since it is necessary under any condition to set up and assemble for the cementing. The saving of the inspector's time is also of importance, for he has but to witness the assembled test for fifteen or twenty minutes and the 550 insulators are ready for shipment.

The testing equipment in use at Victor is of 200-kw capacity, in place of the commonly accepted 25-kw or 30-kw of two years ago. The whole reason for this may be summed up in one word, "regulation," and a short study of testing transformers brings forcibly to mind the fact that a testing transformer of small kilowatt output is little better than an inductive coil, draft of any considerable current in the secondary of which may reduce the voltage to a very low value. High secondary impedence would, of course, be disastrous to a good insulator testing transformer, for one of its prime requisites is that it shall be capable of delivering sufficient current to a soft or partially punctured insulator to insure its being detected before leaving the factory. Not only must the transformer be capable of delivering considerable current, but the arrangement of primary and secondary winding must be such as to insure that the generator supplying power shall work well up on its curve of magnetization, else any sudden draft of secondary current will at once reduce the generator voltage to a low value. The difference in the results obtained when using 200 kw and when using 50 kw are truly astonishing, more especially when the insulators are somewhat wet. If the regulation of the transformer be not good, final breaking down or flashing over of the insulator is usually preceded by a brilliant static display, while in the case of the large and powerful transformer employed at Victor the first display of static is accompanied by a powerful arc, which upsets everything and necessitates shut-down.

In connection with the test of large insulators in numbers of 100 or more, it is interesting to note the effect of the large capacity current upon the spark gap, which discharges with the force and vehemence of a small cannon. When such discharge occurs, all neighboring circuits, electric light, telephone, etc., take up their portion and discharge to the nearest available point. Only the most careful guarding will prevent the destruction of lamps, even in distant parts of the factory. Under normal conditions about ¾ amp. is required as charging current when a full rack of 14-in. insulators is being tested at 120,000 volts.

SECRETARY TAFT'S PARTY IN BERKELEY, CAL.

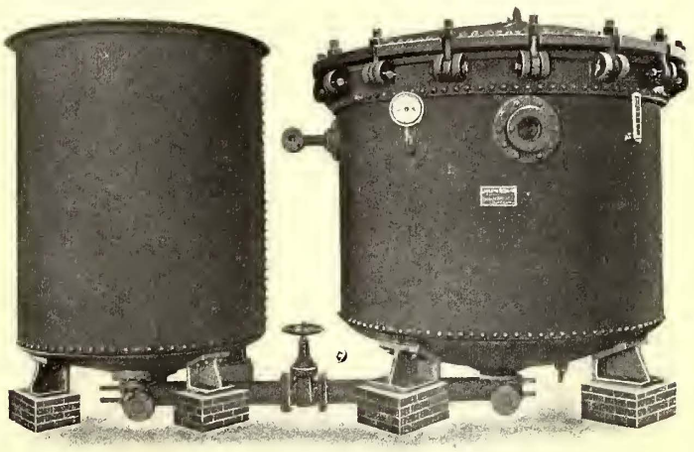
An interesting incident during the visit of Secretary Taft and his party to San Francisco last July was a trip across the bay to Berkeley, where they were entertained at the University of California, a special mass meeting of students being held to hear Mr. Taft speak. The party was taken from San Francisco to the Key Route Pier on the Oakland side of the bay, and as they landed, the Key Route messenger boy, on behalf of his employers, handed Miss Roosevelt a beautiful boquet of orchids. A special train was boarded and the trip over the 3-mile trestle and 3-mile land track to Berkeley station was made in 12 minutes and 36 seconds. Considering that the schedule time for this trip is over 18 minutes, and that after leaving the pier the road is all upgrade, with several curves, this record was a good one. The train consisted of three regular Key Route cars, two motor cars and one trailer, thus giving the train a total power of 1000 hp. Eight and nine-car trains are regularly operated over the Berkeley line of the Key Route.

THE PASSBURG SYSTEM OF DRYING ARMATURES

The Passburg system of drying and impregnating field and armature coils in vacuum has been giving such good results on a number of roads that some particulars on this subject may prove of interest.

The apparatus consists of a vacuum chamber and impregnating liquor tank, a combined condenser and receiver and a dry vacuum pump, with the necessary auxiliaries. The chamber is constructed to maintain an extremely high vacuum and an air pressure of at least 60 lbs. to the square inch. The coils to be treated are first placed in the vacuum chamber, a high vacuum is then obtained and the moisture is abstracted rapidly at the lowest possible temperature. The vacuum chamber and condenser are provided with observation glasses and by-pass valves, which permit an ocular demonstration of the moisture leaving the coils being dried. When the moisture ceases, the coils are absolutely dry and ready for impregnating.

The impregnating compound is heated, and if a solid compound is melted in the impregnating liquor tank, which is connected with the vacuum chamber. The latter is so arranged that



VACUUM DRYER FOR FIELD AND ARMATURE COILS

the compound is allowed to enter the vacuum chamber without breaking the vacuum. This eliminates any possibility of the dried coils absorbing moisture, as is the case in the old-fashioned method of drying and impregnating in bake ovens and dip tanks. Arrangements are also provided for overcoming the freezing or solidifying of the compound in the connecting pipes between the vacuum chamber and the impregnating liquor tank. The vacuum chamber is provided with facilities for accurately determining the temperature of the materials being dried, as well as of the insulating compounds. The apparatus is so constructed that any insulating compound can be used. When solid compounds, with a high melting point, are used, special arrangements are made to obtain the highest possible temperature and to prevent the material from coking or caking, which has heretofore been one of the greatest difficulties with solid compounds.

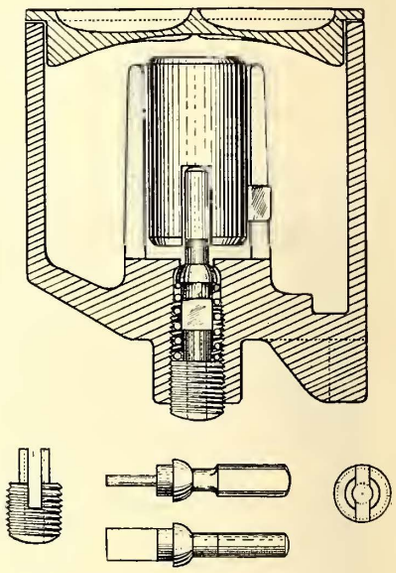
After the insulating compound has entered the vacuum chamber, the vacuum is broken and an air pressure of at least 60 lbs. is applied, which forces the compound through the entire coil, as all air and moisture have been removed. The impregnation is therefore absolutely perfect. The drying takes place at the lowest possible temperature and in a fraction of the time heretofore required, and is entirely independent of climatic conditions. Moreover, there is no waste of compound. Fire hazards are also done away with, as the apparatus, when working, becomes an hermetically sealed plant and all vapors or obnoxious odors pass off through the condenser into the sewer. If a solvent is used for cutting the compound it can be reclaimed in the receiver of the condenser.

The apparatus is in use in all of the principal electrical and cable manufactories in this country and in Europe, and is being placed on the market in this country by Joseph P. Devine, of Buffalo.

NEW LUBRICATING DEVICE

The Jolt Lubricator Company, of Providence, R. I., offers a novel design of oil cup for lubricating motor bearings and axles of street railway cars. The device has been put to prolonged practical tests, and is believed will meet every requirement, the mechanical construction embodying the essential elements of positiveness and simplicity.

The jolting of the car operates the feed mechanism, oil being supplied only while the car is in motion. The feed valve is controlled by a spiral spring, a weight resting on the valve stem in such a manner that it strikes a hammer-like blow at each jolt of the car, opening the valve and allowing a small quantity of oil to escape, the valve being promptly returned to its seat by the spring. The amount of oil fed can be closely regulated with the aid of the spring, the tension of which can be increased or lessened by a regulating screw with the aid of a simple wrench supplied for the purpose. The feed is positive, and adapted to the requirements of the bearing, either thick or thin oil being fed, at any season, with equal precision. No wick, felt or packing is used, and there is no possibility of clogging.



JOLT LUBRICATOR

The Jolt lubricator is made to be placed inside the regular grease cups of either armature bearings or axle bearings of any street railway motor, and any car can be completely equipped with the device in a few minutes.

Properly adjusted, the lubricator carries sufficient oil for one week's supply, without risk of waste or slopping over, or the possibility of leaking through the valve, and without requiring attention.

Thorough test, by a number of railroad companies, has proved the efficiency and dependability of the Jolt lubricator, and it is accepted, by those who have given it careful trial, as a solution of the troublesome problem of oil lubrication for street car motor and axle bearings.

MOTOR 'BUSES FOR NEW YORK

The Fifth Avenue Coach Company, of New York, is placing on trial for Fifth Avenue service a gasoline-electric motor omnibus, which will begin running on regular schedule between Washington Square and Eighty-Eighth Street within the next few days, a fare of 10 cents being charged. It is now being run for experimental purposes during the evenings. In designing this 'bus, the object sought has been to produce a vehicle that could be profitably operated with safety and despatch through the heavy traffic of the avenue. The omnibus is the design of the General Electric Company, and consists of a 40-hp four-cylinder engine, direct connected to a 6-kw generator transmitting current to two motors.

KOERTING & HORNSBY AKROYD INTERNAL-COMBUSTION ENGINES

The prominent place that the gas engine is taking in the production of power, both on a large and small scale, is well shown in the following illustrations and brief descriptions of some of the internal-combustion engines built by the De La Vergne Machine Company, of New York:

Fig. 1 illustrates a 1000-hp single-cylinder Koerting 2-cycle double-acting direct-connected unit. This engine is said to be the only large size two-cylinder double-acting gas engine built. A number of this size is used in the main power plant of the Lackawanna Steel Company at Buffalo, N. Y. They are direct connected to 500-kw 250-volt direct-current Sprague-Lundell generators and 440-volt 25-cycle three-phase alternating-current General Electric generators. The machines operate in parallel at 100 r. p. m.

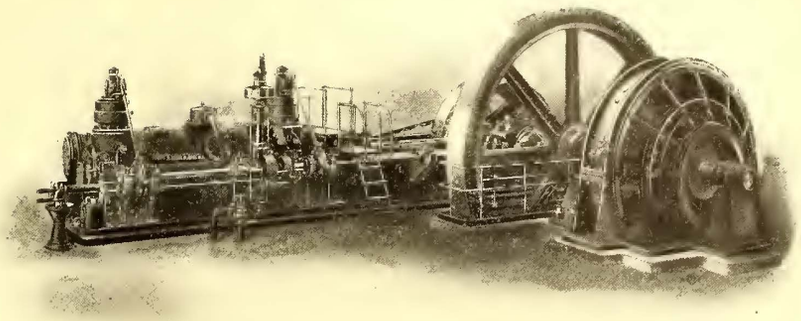


FIG. 1.—1000-HP KOERTING TWO-CYCLE DOUBLE-ACTING GAS ENGINE

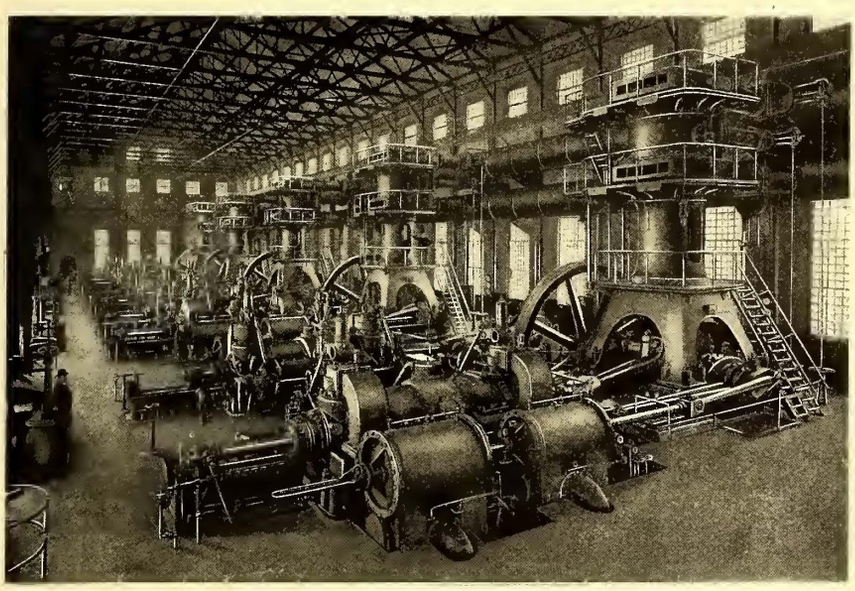


FIG. 2.—2000-HP KOERTING GAS ENGINES DRIVING BLAST FURNACE BLOWING CYLINDERS

Fig. 2 is an interior view, showing five of the sixteen twin-cylinder 2000-hp Koerting units, operating in the two main blowing engine rooms of the Lackawanna Steel Company's Buffalo plant. These engines run at from 70 r. p. m. to 80 r. p. m. on blast furnace gas of from 80 B. T. U. to 100 B. T. U. calorific value per cubic foot. The total horse-power of the Koerting gas engines of this installation, some of which have been in constant operation for over three years, will be, when the plant is completed, 40,000 hp.

According to the size and requirements of the power plant, the producer may be of the suction or pressure type. For plants of small and medium capacity, the suction producer is employed on account of its greater simplicity. In this type of producer, air and steam, both under atmospheric pressure, are drawn through the bed of coal in the generator by the action of a small engine, hot gases leaving the generator effecting the evaporation of the required steam. The partially cooled gases are then cleansed of the major part of their impurities by passing them through layers of coke, over which water is showered in a vessel called a scrubber. Entrained moisture and final traces of other impurities are removed in a sawdust purifier, after which the gas passes to the engine.

The pressure producer shown in Fig. 3 is similar in general construction to the suction producer, with the exception of the addition of a gasometer from which the gas is supplied to the engine. A slight pressure is maintained in the gasometer and other parts of the apparatus by the action of a Koerting blower operated with steam at about 100 lbs. pressure, which forces the air and steam through the gasometer. The action of the blower is automatically controlled by the amount of gas in the gasometer.

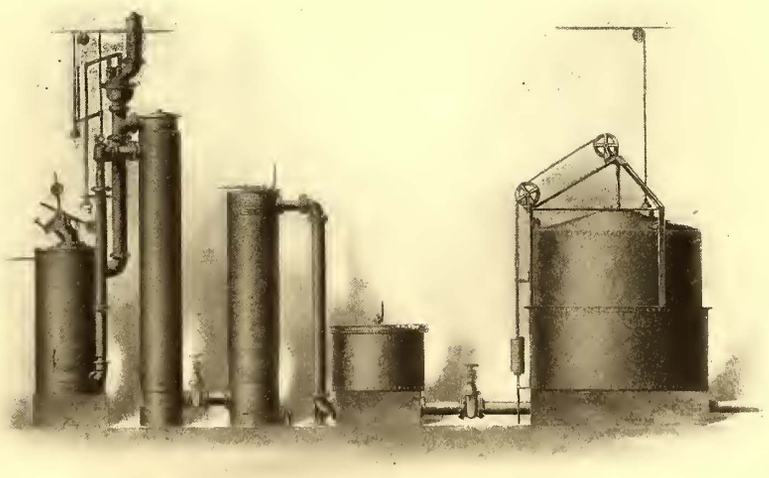


FIG. 3.—KOERTING PRESSURE PRODUCER PLANT

The company also makes single and twin-cylinder Hornsby Akroyd oil engines in various sizes. These engines are used largely for operating generators and compressors in connection with electrical and pnuematic tools. The cost of crude oil for operating these engines is about 0.3 cent per B.HP.-hour, or about $9 per hp-year of 300 ten-hour days.

The Springfield, Troy & Piqua Traction Company has put on a limited car leaving Springfield at 5 a. m. and connecting with the Lima Limited on the Dayton & Troy, which reaches Lima at 7:57, or 2 hours and 57 minutes for 85 miles. It has also instituted a through freight service from Springfield to Dayton in connection with the Dayton & Troy.

FINANCIAL INTELLIGENCE

Wall Street, Sept. 20, 1905.

The Money Market

There has been no appreciable change in the money market this week. The demand for funds, and especially for time accommodations, has fallen off considerably, but at the same time the local institutions have not offered with any degree of freedom, even at the current asking quotations, and there is nothing in the situation at the present time to warrant the belief of an easier market in the near future. Money continues to be sent in large amounts to the West and South for crop-moving purposes. Interior rates of exchange on New York have displayed an easier tendency, which would indicate a less urgent demand for funds at those points, but it is expected that the outflow of funds will continue in fairly large volume for several weeks longer. About the middle of October the final instalment on subscriptions to the Japanese loan becomes due, amounting to about $39,000,000, but it is understood that part of this payment has been anticipated. Since Sept. 15, the local banks have gained about $500,000 from the Sub-Treasury, which compares with a loss of $3,511,000 in the same time a week ago. Gold amounting to $2,750,000 has been engaged in the London market for shipment to New York, which, together with the $1,250,000 announced last week, brings the total amount to date up to $4,000,000. Of this amount about $600,000 has been received and the balance is expected to arrive within the next ten days. Future engagements of the yellow metal in the London market depend largely upon the action of the directors of the Bank of England this week. Private discount rates have displayed a hardening tendency, and it is expected that the bank rate will be advanced to 3½ or 4 per cent in order to check the withdrawals of gold, not only for New York, but for Argentina and the Continent as well. The sterling exchange market has ruled firmer at about 4.8530 for prime demand bills. The bank statement published on last Saturday showed a further loss in cash of $7,463,400, which was somewhat smaller than indicated by the preliminary figures. Otherwise the statement was considered favorable. Loans showed a further shrinkage of $20,861,600, owing to the employment of foreign money in the local market. Deposits were smaller by $29,069,400. The required reserve was $7,267,350 less than in the previous week, resulting in a small decrease in the surplus of only $196,050. The surplus now is $4,635,300, as against $29,353,150 in the corresponding period a year ago, $13,173,625 in 1903, a deficit of $1,642,050 in 1902, a surplus of $13,654,225 in 1901 and $20,836,175 in 1900.

Money on call ranged from 2½ to 4 per cent, with most of the new business transacted at 3 per cent. Sixty-day money was quoted at 4 per cent, ninety days' at 4¼ per cent, and four to six months at 4¼ per cent, with business reported at those rates. Commercial paper was in good supply at 4¼ and 4½ per cent for the best names.

The Stock Market

Monetary conditions continued to dominate the stock market and prices moved rather irregularly during the week, and, at times, were reactionary on the probability of higher rates for money here and the uncertainty of any heavy gold import movement during the ensuing week. Thus far the imports amount to only a little more than $4,000,000, but in addition to this the banks have gained moderately from the Sub-Treasury, and the currency movement to the interior has not been so heavy as in the previous week. The tendency of prices was downward until the close, when a sharp upward movement followed aggressive buying of Northern Pacific, Great Northern preferred and Northern securities, the moving influence having been rather positive reports that the Great Northern management is about to make an extra distribution to its stockholders out of the profits of the Northern Securities adjustment. The sharp advance in these stocks stimulated buying of the other active issues, which was also encouraged by unconfirmed rumors of further gold engagements of some importance. This left the market at the end of the week decidedly strong. While there is every reason to look for a heavy movement of gold in this direction, it is likely that the supply will come from Paris and Berlin rather than from London. Discounts in the English market have hardened in anticipation of an advance in the minimum rate of the Bank of England, and this institution is placing every obstacle in the way of gold engagements for America. The increasing exports of breadstuffs and cotton and the large volume of exchange resulting therefrom will enable us to draw rather liberally upon foreign supplies of the metal, but at the moment sterling exchange rates are above the point at which gold can be imported at a profit, although a decline in sterling appears inevitable. Until we have assurance of assistance to the money market, speculative opinion is likely to continue rather mixed, but fundamental conditions are so thoroughly sound that activity in and higher prices for stocks are rather positively indicated to follow the beginning of the return movement of money from the interior. There is some talk of an early dividend on Steel common, which would appear to be justified by the strong position of the industry and the enormous business and large earnings of the corporation.

The local traction stocks showed considerable weakness at times, the selling having been on the report that the local Democratic platform will contain a plank in favor of municipal ownership of public utilities.

Philadelphia

Increased strength characterized the dealings in the local traction issues this week, but apart from Philadelphia common very little activity developed. Trading in this stock was upon an extremely large scale; upwards of 18,000 shares changed hands. Early in the week the buying was said to be for Pittsburg account, and toward the close the advance was accompanied by rumors of a deal, but no news relating to the affairs of the company was forthcoming. From 46½ at the opening the price ran off to 46⅛, but subsequently it advanced to 47⅝ and closed within ⅛ of the highest. The preferred stock was quiet and practically unchanged as to price, about 150 shares changing hands at from 48 to 48½. Scranton Railway was openly dealt in for the first time in weeks, and was strong, 50 shares selling at 27, an advance of 2 points. Philadelphia Traction moved up ½ to 99½ on the purchase of upwards of 300 shares. Rochester Railway sold at 93 for 100 shares, and 500 shares United Railroads of San Francisco preferred sold at from 88½ to 90¼. Philadelphia Traction ruled quiet, about 500 shares changing hands at from 28½ to 28⅛. Union Traction sold at 61⅞ and 62 for about 250 shares, and 500 shares American Railways brought 52½ and 53.

Baltimore

Extreme dullness prevailed in the Baltimore market this week. Trading included a fairly large number of issues, but the individual totals were considerably below those recently recorded. About the only issue to show activity was United Railways pooled stock, of which about 4000 shares were dealt in at prices ranging from 17 to 16¾. The free stock sold to the extent of about 400 shares at from 17 to 16⅝. The 4 per cent bonds were very quiet, about $20,000 changing hands at 92¾ and 93. The incomes brought prices ranging from 67 to 66¼ for about $35,000, while the certificates representing income bonds deposited sold at 66¼ and 66 for about $10,000. Other transactions included Norfolk Railway & Light 5s at 94, Augusta Railway & Light 5s at 105½, Central Railway 5s at 117¾, Charleston Consolidated Electric 5s at 95¼, and Washington City & Suburban 5s at 105½.

Other Traction Securities

There was no improvement in the Chicago market. Trading continued upon an extremely small scale, and, with the exception of Metropolitan Elevated preferred, the price movements were insignificant. Metropolitan preferred, after declining from 69 to 67⅞ advanced to 70 on the exchange of about 300 shares. The common sold at 23½ for a small lot. Other sales were: 7 shares of North Chicago Street Railway at 65, 25 shares of Chicago Union Traction preferred at 62½, 13 shares of West Chicago at 49 and 70 shares of Northwestern Elevated at 22½. The feature of the Boston market has been the pronounced strength displayed by West End common, which rose from 99 to 102 and closed at the highest on the purchase of about 800 shares. The preferred remained unchanged, odd lots bringing 113½. Boston & Worcester was active and strong also, upwards of 1000 shares changing hands at from 29 to 30, while the preferred sold at 74 to 75½ for upwards of 400 shares. Boston Elevated was traded in to the extent of several hundred shares at 154½ to

153½. Massachusetts Electric sold at 16¼ and 17, and the preferred at 60 and 59½. Boston & Suburban brought 67 for small lots. In the New York Curb market Interborough Rapid Transit has been fairly active and strong. Early in the week transactions were made at from 216½ to 215½, but later on the stock advanced sharply to 219⅞ and closed at 216 ex the dividend of 2 per cent. Upwards of 3000 shares were dealt in. New Orleans Railway common has ruled quiet but firm, 300 shares selling at 37¼ and 37, while 650 shares of the preferred sold at prices ranging from 80¼ to 79¾. The 4½ per cent bonds sold at 90⅝ and 90¼ for $50,000. Washington Railway common brought 43 and 42½ for 400 shares, and 100 preferred sold at 93. Of the 4 per cent bonds, $8,000 brought 91. Other sales were: $10,000 Jersey City, Hoboken & Paterson 4s at 76⅝ and interest, and $20,000 Public Service Corporation 5 per cent notes at 97⅛ and interest.

Cincinnati Street Railway advanced to 148 at Cincinnati. Cincinnati, Newport & Covington continues active around 38⅛. Cincinnati, Dayton & Toledo stock sold at 24, a slight advance. The bonds sold for 97¾ for $65,000 worth. Detroit United sold at 93, a slight decline.

Tractions continued active at Cleveland. Aurora, Elgin & Chicago is still the active feature, about 1900 shares of common selling with an advance from 27½ to 29¼ and still going up. The preferred sold at 85½ and the bonds at 95¾. There was a strong movement in Cleveland & Southwestern which looks like an effort of insiders to support the stock against the slump which it suffered on the report that the preferred dividend was to be passed. The common opened the week at 10¾, and on Tuesday of this week it had advanced to 14½; sales, about 2000 shares. The preferred was boosted from 53¼ to 62 early this week; there is talk of a pool at 70 on this stock. Talk of a pool on Cleveland Electric Railway advanced this stock from 79¼ to 83 on Tuesday; this in the face of the almost certain re-election of Mayor Tom L. Johnson, with prospects of continued adverse legislation. Lake Shore Electric common made a gain from 12½ to 13⅞. Northern Ohio Traction made a slight advance from 23 to 24. Western Ohio receipts are stronger at 15⅛ and in good demand. The bonds of this company have been active and advanced to 83½. Northern Texas sold up from 72 to 75 on news of the consummation of the sale of the property to Stone & Webster, this being the price paid for the controlling interest.

Security Quotations

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

	Sept. 13	Sept. 20
American Railways	52½	52
Boston Elevated	153½	153
Brooklyn Rapid Transit	67½	68⅝
Chicago City	a195	190
Chicago Union Traction (common)	8	8½
Chicago Union Traction (preferred)	—	—
Cleveland Electric	79	79
Consolidated Traction of New Jersey	82	82
Consolidated Traction of New Jersey 5s	109	109
Detroit United	93¼	93¼
Interborough Rapid Transit	215¾	*215
International Traction (common)	32½	34
International Traction (preferred) 4s	73	73
Manhattan Railway	165	165⅛
Massachusetts Electric Cos. (common)	15½	15½
Massachusetts Electric Cos. (preferred)	59½	58½
Metropolitan Elevated, Chicago (common)	22⅝	25
Metropolitan Elevated, Chicago (preferred)	68	70
Metropolitan Street	127	126⅞
Metropolitan Securities	81	80⅛
New Orleans Railways (common), W. I.	37	36¾
New Orleans Railways (preferred), W. I.	80	79
New Orleans Railways, 4½s	90½	90¼
North American	98¼	98
North Jersey Street Railway	28	28
Philadelphia Company (common)	46¼	47⅜
Philadelphia Rapid Transit	28	28
Philadelphia Traction	—	99
Public Service Corporation 5 per cent notes	96½	96½
Public Service Corporation certificates	69¼	69¼
South Side Elevated (Chicago)	a99	97
Third Avenue	127½	126½
Twin City, Minneapolis (common)	117½	117
Union Traction (Philadelphia)	61¾	61¾
West End (common)	99	100
West End (preferred)	113	113

a Asked. W. I., when issued. * Ex-dividend.

Iron and Steel

The "Iron Age" says one of the characteristic buying rushes seems to be on in the pig iron market, reports from all the leading distributing centers showing a heavy movement. In Pittsburg the purchase on the part of the Steel Corporation of a lot of 10,000 tons of Bessemer pig for prompt delivery, has been followed by some large sales, aggregating 65,000 to 75,000 tons of Bessemer and basic pig, the bulk being taken by a large western Pennsylvania steel plant. Chicago reports large transactions in foundry iron, aggregating 25,000 tons, which included one lot of 10,000 tons of charcoal iron to large car wheel makers. Cincinnati notes some round sales. It is understood that the Steel Corporation will need 40,000 tons of outside iron for October. While the largest orders for steel rails which were in the market last week, including the 160,000-ton order for the New York Central, have not been placed, some goodly contracts have been booked by the mills. They total up to over 100,000 tons. Railroad buying is greatly in evidence, too, in bridge material. The scarcity of steel is becoming more pronounced.

CHICAGO COMPANY TO REPLY TO QUESTIONS PROPOUNDED BY THE CITY COUNCIL

The meeting of the committee on local transportation of the Chicago City Council on Friday, Sept. 15, ended in the traction companies agreeing to answer on Sept. 26 several questions submitted by aldermen. The tangible results of the meeting were two offers, made by the Chicago City Company, as a part of what it would agree to do in order to secure an extension of franchise. While the Union Traction representatives did not concur in these offers, they sat silent when the one involving them was made. They are understood to be bound by it. The two offers are:

"An exchange of transfers between the two companies outside of a fixed zone and a through routing of cars inside of that zone, so as to make a case of 'one city, one fare.'

"An immediate rehabilitation of the service of the company on the lines of the recommendations in the Arnold report."

The important questions which the company has agreed to answer at the next meeting of the committee are:

"In any settlement agreement which may be made will it be provided that at a determined period, or periods, during the life of the agreement the city may take over your lines and the price and method of fixing the same be therein set forth?

"Will you agree to the city taking over the lines at any time during the life of the franchise, if one is granted?"

The other questions are all based on the report of the committee on Dec. 11, 1901, when it outlined the terms of what it then considered a proper franchise ordinance. This report deals with requirements calling for good service on the part of the companies, and then provides for universal transfers; that the city can take over the properties at any time after the first ten years; that all grants terminate at the same time; that the underground trolley be used in the territory bounded by Ashland and North Avenues and Twenty-Second Street, and that the companies operate in subways if the city ever builds them.

CHANGES IN THE CAR WHEEL BUSINESS

One of the largest transactions in the iron world of the present year was consummated during the past week, when the control and management of the National Car Wheel Company passed into the hands of James D. Rhodes, of Pittsburg, Pa., and William F. Bonnell, of Cleveland.

This company owns and operates four plants, one at Pittsburg, one at Cleveland, one at Sayre, Pa., and one at Rochester, N. Y. Its product is cast-iron chilled car wheels, steel-tired wheels, grey iron castings, aluminum and brass castings. The works have an annual capacity of 300,000 wheels. The officers are as follows: James D. Rhodes, president; C. A. Otis, Jr., and William F. Bonnell, vice-presidents; George P. Rhodes, treasurer, and C. A. Maher, secretary.

The directors number nine, and are as follows: James D. Rhodes, of Pittsburg; George P. Rhodes, of Pittsburg; C. V. Slocum, of Pittsburg; J. C. Holt, of Grand Rapids, Mich.; C. A. Otis, Jr., of Cleveland; C. A. Maher, of Cleveland; William F. Bonnell, of Cleveland; W. T. Goodnow, of Sayre, Pa., and C. T. Chapin, of Rochester, N. Y. C. T. Chapin, former president of the National Car Wheel Company, remains with the company in a special capacity, with headquarters at Rochester, N. Y.

NEW YORK SUBWAY CONTRACTS

Contracts for the next rapid transit subways in New York may be let soon after Jan. 1, 1906, if the hopes of the Rapid Transit Commission as expressed at last week's meeting are realized. Albert B. Boardman, counsel to the commission, reported that he was ready to go to the Appellate Division of the Supreme Court to have consents to routes approved, and for permission to act in cases where consents had not been obtained, and said he would make the application as soon as the courts open in October. The routes which will come before the courts include the Lexington, Third, Seventh and Eighth Avenue lines in Manhattan with their Bronx connections and also include the Brooklyn route which will effect connections between the bridges.

Mr. Boardman said that his canvassers had been all along the routes of the proposed subways obtaining consents of property owners, but that it would be necessary to get the authority of the Appellate Division because not enough property owners had signed the consents.

By resolution the board extended to Sept. 11, 1906, the time for the construction of the Brooklyn addition to the subway. This action was taken at the instance of the Rapid Transit Subway Construction Company, which said it was unable to complete the entire work within the three-year limit.

The commissioners said that the extension of the proposed Jerome Avenue subway line as far north as 233d Street would be granted at the proper time.

ANNUAL REPORT OF THE PHILADELPHIA RAPID TRANSIT COMPANY

The annual meeting of the Philadelphia Rapid Transit Company was held Wednesday, Sept. 20. At that time was presented the annual report of the company for the year ended June 30, 1905, giving in detail the earnings of the company, and showing its status in the general balance sheet. That the report should have been presented at this time is especially gratifying, in view of the meeting in Philadelphia next week of the American Street Railway Association and affiliated bodies. Below follows the statement of earnings, as shown in the official report:

OPERATIONS FOR THE YEAR ENDED JUNE 30, 1905

	1905	1904
Number of passengers carried	402,893,245	390,532,689
Receipts from passengers	$16,188,645	$15,923,518
Operating expenses	8,183,437	8,093,315
	$8,005,208	$7,930,193
Miscellaneous receipts, interest, etc.	185,979	172,855
	$8,191,188	$8,103,048
Licenses and taxes, paid and accrued	966,535	1,060,896
	$7,224,652	$7,042,151
Fixed charges, paid and accrued	7,116,442	6,821,301
	$108,209	220,848

Operating expenses, including licenses and taxes, 56 52-100 per cent.

The increase shown in fixed charges is due to the advance in rental on Union Traction stock commencing July 1, 1904, as per lease, less sundry adjustments in certain fixed charge items.

The general balance sheet as of June 30, 1905, shows:

ASSETS

Cash	$1,976,230	
Cash in agents' hands	9,500	
Fire insurance fund	850,000	
Advanced to leased lines	502,208	
Supplies	456,577	
Construction and equipment	12,867,219	
Real estate	776,495	
Accounts receivable	25,312	
Sundry stocks	1,635,559	
Franchise account	115,325	
		$19,214,428

LIABILITIES

Capital stock	$11,972,320	
Accounts audited but not due	285,003	
Fixed charges and taxes accrued	2,113,748	
Open accounts	112,471	
Proceeds sale of bonds underlying companies	4,000,000	
Profit and loss	730,884	
		$19,214,428

REPORT OF THE TREASURER OF THE COMPANY FOR THE YEAR ENDED JUNE 30, 1905

RECEIPTS

Balance as per report, June 30, 1904		$589,650
Passenger receipts	$16,178,502	
Chartered cars	10,112	
Advertising	89,583	
United States mail	42,059	
Rents, real estate	26,648	
Interest	11,850	
Miscellaneous	143,644	
Capital, instalment on stock	2,987,640	
Market Street Elevated Passenger Railway Company bonds	3,000,000	
Philadelphia & Willow Grove Street Railway Company bonds	1,000,000	23,490,041
		$24,079,692

DISBURSEMENTS

Pay rolls	$6,161,456	
Operation, construction and equipment accounts	7,572,900	
Stocks underlying companies	47,000	
Advance to agents	1,000	
Advances to leased lines	73,594	
Sundry advances	3,450	
Taxes and licenses	1,014,604	
Fixed charges	6,945,287	
Real estate purchased	284,167	$22,103,462
Balance		$1,976,230

In presenting the report to the stockholders President Parsons said:

The gross receipts have not greatly increased during the year owing to the stagnation in business in the first five months and the severe weather of the past winter.

There was built during the year 28.72 miles of new road, which is now in operation; with the exception of 17 miles of this, which is the new line to Willow Grove Park, the balance is extensions of existing lines.

During the year 42.98 miles of track were laid with the new standard girder rail (137 lbs. to the yard), 18.55 miles of this were new lines and the balance were renewals through territory where the traffic is very heavy.

The total trackage of your system is 554 miles.

The construction of the subway on Market Street is progressing favorably, and at the present time the tunnel is practically completed to Sixteenth Street. The bridge over the Schuylkill River is completed with the exception of the tracks, and the foundations for the columns which will carry the elevated structure from the west bank of the Schuylkill River to Delaware County, at Sixty-Third and Market Streets, are almost all completed. The work on the terminal and elevated structure in Delaware County is being pushed as rapidly as possible.

The new line to Willow Grove was put in operation May 15, 1905, and has proved to be a decided success.

There was laid during the year approximately ten (10) miles of new conduits. The power-generating machinery has been increased by 6000 kw during the year, all of which has been installed at Second Street and Wyoming Avenue power house.

There have been added during the year seventy-two double-truck cars, with the necessary electrical equipment for same, making a total of 3554 cars of all kinds used in the operation of your property.

The following amount of paving has been maintained by the company during the year:

	Sq. Yards.
Belgian block	4,316,180
Asphalt	1,500,359
Macadam	499,072
Brick	341,701
Cobble	27,699

This paving has been maintained in addition to the payments of $966,535.28, being licenses and taxes paid and accrued to the city and State.

On Dec. 1, 1904, there fell due $67,500 of 5 per cent bonds of the Fairmount Park & Delaware River Passenger Railway Company (merged into Germantown Passenger Railway Company); these bonds were paid off and canceled.

There fell due Jan. 15, 1905, $219,000 of People's Passenger Railway first mortgage 7 per cent bonds; these bonds have been extended for thirty years at 4 per cent.

As per authority given at the special meeting of the stockholders

of this company, held April 25, 1905, this company has become guarantors for an issue of $10,000,000 of the Market Street Elevated Passenger Railway Company's bonds, bearing 4 per cent interest and running for fifty years from May 1, 1905; all of this issue of bonds has been disposed of.

Your company also became guarantors for an issue of $1,000,000 of 4½ per cent bonds of the Philadelphia & Willow Grove Street Railway Company, due thirty years from July 1, 1904, also guarantors for an issue of $200,000 of 4½ per cent bonds of the Darby & Yeadon Street Railway Company, due thirty years from Dec. 1, 1904; all of the capital stock of the above-named companies being owned by your company. The Darby & Yeadon line is now in course of construction.

The fire insurance fund consists of the following: Three thousand six hundred and fifty shares Philadelphia Traction Company stock, 5300 shares Union Traction Company stock, $100,000 Electric & People's 4 per cent stock trust certificates, $12,000 Union Traction Company 4 per cent collateral trust mortgage gold bonds, $100,000 Philadelphia & Willow Grove Railway Company 4½ per cent bonds, $58,000 Market Street Elevated Passenger Railway Company 4 per cent bonds, $455,000 in first mortgages on real estate, $1,437.60 in ground rents, $9,731.71 in cash.

ANNUAL REPORT OF THE NORTHWESTERN ELEVATED RAILROAD COMPANY

The Northwestern Elevated Railway, of Chicago, reports earnings as follows for the year ending June 30, 1905:

INCOME ACCOUNT OF THE YEAR ENDING JUNE 30, 1905

Passenger earnings	$1,340,446
Other earnings (including loop net earnings)	445,968
Total earnings	$1,786,414

OPERATING EXPENSES

Maintenance of way and structure*	$63,720	
Maintenance of equipment	85,851	
Conducting transportation	400,537	
General expenses	66,518	616,628
Net earnings		$1,169,786

CHARGES

Taxes†	$163,520	
Bond interest	779,379	
Other interest	9,727	952,627
Surplus for year		$217,159

* Includes $39,500, which has been set aside in monthly instalments, for betterments and maintenance of structure.

† Includes compensation to city on account of loop.

*GENERAL BALANCE SHEET—JUNE 30, 1905

ASSETS

Cost of road and equipment	$29,411,098	
Land and buildings	450,908	
Stocks and bonds owned	32,265	
Cash and bills receivable	719,705	
Accounts receivable	108,134	
Materials and supplies on hand	21,578	
Unadjusted accounts	272,357	
		$31,016,045

LIABILITIES

Capital Stock—		
Preferred	$5,000,000	
Common	5,000,000	
		$10,000,000
Bonds	$19,500,000	
Less bonds in treasury	1,076,000	
		18,424,000
Mortgages		151,973
Reserved for taxes		98,252
Reserved for interest		241,804
Reserved for maintenance		188,294
Other reserves		2,122
Accounts and notes payable		873,901
Unadjusted accounts		14,763
Profit and loss		1,020,937
		$31,016,045

* Includes Loop Division.

COMPARATIVE STATEMENT OF DAILY AVERAGE PASSENGER TRAFFIC PER MONTH DURING THE YEARS ENDING JUNE 30, 1901, 1902, 1903, 1904 AND 1905

Month	1901	1902	1903	1904	1905
July	40,816	48,559	56,110	59,393	60,816
August	43,961	49,770	57,911	60,093	62,453
September	47,092	54,065	63,950	68,107	66,407
October	50,808	59,044	69,562	71,617	73,385
November	53,345	59,857	67,236	71,422	74,307
December	53,798	63,375	71,607	76,259	78,263
January	52,022	62,010	68,266	70,204	73,728
February	55,256	64,760	69,885	73,193	78,773
March	57,193	65,362	70,070	74,344	80,500
April	58,623	65,430	71,340	74,217	79,779
May	56,999	63,199	66,990	69,232	77,863
June	53,586	60,813	66,571	68,222	75,837
Daily average	51,918	59,641	66,591	69,664	73,460

Passengers carried year ended June 30, 1901	18,950,167
Passengers carried year ended June 30, 1902	21,769,079
Passengers carried year ended June 30, 1903	24,305,704
Passengers carried year ended June 30, 1904	25,497,079
Passengers carried year ended June 30, 1905	26,812,825
Daily average passengers carried year ended June 30, 1905	73,460
Daily average passengers carried year ended June 30, 1904	69,664
Average daily increase	3,796

Equal to 5.45.

	Per Cent
Ratio of operating expenses, including maintenance reserve to earnings	44.55
Ratio of operating expenses, maintenance reserve, loop account and taxes to earnings	62.04

ANNUAL REPORT OF RAILWAYS COMPANY GENERAL

At the annual meeting of the stockholders of the Railways Company General, in Jersey City, P. C. Rhoades was elected a director to succeed J. O. Hoffman. At a subsequent meeting it was voted to reduce the capital stock from $1,200,000 to $900,000. The report of the company for the year ended June 30 is as follows:

	1905	1904
Income for year	$38,215	$45,901
Expenses, rentals, taxes, etc.	14,473	7,482
Net profits	$23,742	$38,419
Previous surplus	124,377	85,957
Total surplus	$148,119	$124,376

The general balance sheet as of June 30, 1905, compares as follows:

Assets—	1905	1904
Cash	$17,006	$84,639
Cash from sub. companies	64,187	60,990
Bonds sub. companies	830,500	787,300
Capital stock sub. companies	264,695	242,723
Other securities owned	66,470	284,459
Sundry underwritings	.....	24,500
Furniture, fixtures, etc.	3,443	1,910
Capital stock in hands of trustee	34,000	34,000
Unpaid stock sub.	26,000	28,000
Loans on collateral	39,816	.....
Total	$1,346,119	$1,548,522
Liabilities—		
Capital stock	$1,198,000	$1,200,000
Notes due	.....	224,145
Surplus	148,119	124,377
Total	$1,346,119	$1,548,522

President E. R. Dick says in his report:

"A feature of the past year has been the decided improvement in the net earnings of the Michigan Traction Company, the result of the large expenditures for equipment and improvements which have been made upon that company in the last two years. After the payment of interest, taxes and sinking fund, that company has shown a surplus equal to almost 6 per cent upon its capital stock of $500,000. The development of suburban trolley lines in the section of the State traversed by the Michigan Traction Company is giving that property a greater strategic value each year in addition to its earning powers. The other subsidiary companies, with the exception of the Elmira & Seneca Lake Railway, have been able to pay their expenses and contribute small amounts towards the pay-

ment of back interest, but as outlined in a previous report, the operation of these small isolated trolley properties is, as a usual thing, unsatisfactory. The Elmira & Seneca Lake Railway, which has been showing a decided improvement, met with a serious setback. A flood washed away a number of miles of track, destroying bridges, culverts, etc. This has caused the operation of the line as a whole to be abandoned for the present; and the management is now considering what shall be done in regard to putting the property in working condition. In the meanwhile, to preserve this company's interest in the property, Mr. D. A. Hegarty, general manager of the Railways Company General, has been appointed receiver.

"During the past year, in conformity with the laws of New Jersey, the management has taken advantage of the low price of Railways Company General stock to purchase same for the purpose of cancellation. It is expected this will be ratified at the forthcoming meeting of stockholders, at which time the capital stock will be reduced to $900,000. This will enable the management to mark down the book value of assets and in addition thereto the surplus fund of $148,117 will be applied, reducing the book value of assets to a fair market value, or in other words, the assets taken at a valuation would equal par for the company's stock."

THE CAMBRIDGE RAPID TRANSIT QUESTION

The Cambridge rapid transit question came up again last Wednesday at the meeting of the Cambridge City Council, when Mayor Daly sent in a letter containing reference to the correspondence that has passed between him and the officials of the Boston Elevated Railway Company since the latter refused to accept the act of the last Legislature providing for a four-track subway and his recommendations in the matter. The Mayor recommends that Howard A. Carson, the rapid transit commission's engineer, be employed to give an estimate of the cost of a four-track subway, and that the question of what the citizens want be submitted to the voters at the December city election.

Mayor Daily, in his letter, says:

The bill was presented to the Legislature in the name of the city under an order of the City Council, after consultations with the executive committee of the board of directors of the Boston Elevated Railway Company and its attorney, the Hon. Albert E. Pillsbury.

The bill was drawn and its provisions agreed to by the executive committee of the board of directors of the company and its attorney and the city, represented by the city solicitor and Mayor Daly. Mr. Pillsbury appeared before the committee of the Legislature in behalf of the passage of the bill.

The clause in the act allowing the company two months in which to accept it was inserted on the advice of Mr. Pillsbury. It was not stated that it was for the purpose of considering the cost, and the city's representatives were not informed during the negotiations that if the cost was more than $5,000,000 that the act would not be accepted.

The company says that it would have accepted the act if it provided for the building of a two-track subway.

Two points have been settled: First—The company recognizes that the city wishes a subway instead of an elevated railway. Second—It is willing to build a two-track subway under the same terms and conditions as are provided under the act of 1905 for a four-track which it has rejected.

The engineer of the company estimates the cost of a four-track subway will be $7,900,000. The city engineer estimates it $6,333,800—a difference of $1,566,200.

The Mayor recommends that the question of whether there should be built a four or two-track subway, and whether it should be built by the city under the Boston plan and leased to the company, be submitted to the voters at the next city election. Before the city election there can be placed before the public the report of Mr. Carson's estimates of cost, and the whole question can be discussed and determined so far as the voters of the city can determine it, in view of the franchise held by the company for an elevated railway. By this means public opinion will be manifested, and the next city government will know what it is upon this subject. There will be ample time for this procedure, because nothing can be done toward construction until the Legislature of 1906 passes a bill authorizing it.

NEW YORK & PORT CHESTER RAILROAD COMPANY GETS NEW YORK CITY FRANCHISE.

At a meeting of the Board of Estimate and Apportionment of the City of New York, held last week, the application of the New York & Port Chester Railroad Company for a franchise to construct that portion of its line within the limits of the city of New York, about 10 miles, which is necessary for the completion of its system, was unanimously granted, and the Controller was directed to prepare the ordinance as required by law. This action of the Board of Estimate and Apportionment completes the last legal step of the Port Chester Railroad, and gives it a complete set of franchises and charters through all the towns and cities lying between the Harlem River and the Connecticut State line. The Port Chester Railroad Company had already taken the following steps:

Secured the certificate of public convenience and necessity, commonly known as the charter, from the Railroad Commission as required by law.

Had that certificate twice unanimously sustained by the New York Court of Appeals.

Secured from the Common Council of Mount Vernon a franchise, in perpetuity, and without any conditions whatever, to pass over all the streets of the city of Mount Vernon.

Secured from the Common Council of New Rochelle a franchise, in perpetuity, and without any conditions whatever, to pass through all the streets of New Rochelle.

Secured the right, in perpetuity, to pass through the towns of Pelham, Larchmont, Harrison, Rye and Port Chester.

Secured an order, in perpetuity, from the Supreme Court of White Plains to cross all of the other public highways and streets in Westchester County.

Purchased the real estate for the joint terminal station between the Interborough Rapid Transit Company and the Port Chester Railroad Company under the traffic alliance contract between those companies.

Purchased about 75 per cent of its Bronx right-of-way real estate and stations property; also purchased large tracts of real estate for right of way and stations in the city of New Rochelle and other parts of Westchester County.

The Port Chester Railroad will be constructed by the New York Railroad & Development Company, which is now letting the sub-contracts for that purpose. Among the underwriters of that company are Edwin Gould, William C. Sheldon & Company, Harvey Fisk & Sons, the Trust Company of America, Charles D. Barney & Company, C. D. Simpson, of the Chicago subways, O. C. Barber, president of the Diamond Match Company.

The individual members of the syndicate now own in the borough of the Bronx alone approximately 600 acres of land, through which the line of the Port Chester Railroad will pass. They also own in Westchester County about 300 acres.

EQUIPMENT WANTED FOR CALIFORNIA ROAD

The Ocean Shore Railway Company, which recently let contracts to C. E. Loss, of New York, for the construction of the 81-mile double-track electric railway, connecting Santa Cruz with San Francisco, is in the market for the electric equipment of its initial installation. The call for proposals issued by Sidney Sprout, the company's electrical engineer, includes forty multiple-unit car equipments, each of four 125-hp, direct-current motors. The sub-stations call for ten 500-kw, 25-cycle rotary transformers, 550 volts to 650 volts on direct-current side, and thirty 250-kw static transformers. Eight of the sub-stations will be located at points on the line according to the load, while two will be mounted on cars, so as to be portable. One rotary and three static transformers will be installed in each sub-station. The main power station will be erected at Balboa, a new town, 1 mile north of Halfmoon Bay, near the water, so that a salt-water pumping system can furnish condensing water for the engines. Two 2000-kw, three-phase, 2300-volt, 25-cycle generators are called for, each to be direct connected to a vertical condensing engine. Seven step-up transformers, to 30,000 volts, will be required, three to each generator and one extra. There is an alternative of three 1500-kw generators with three engines, and ten 750-kw transformers. Switchboards for generating and sub-stations are to be included in the proposals, as well as exciters and auxiliaries. Water-tube boilers are specified, equipped for burning oil fuel. The company's capital stock is $5,000,000, and the road when completed and fully equipped will represent an expenditure of nearly $6,000,000, it is said. W. E. Dean is president and A. D. Bowen general manager of the company, which is located at 561 California Street, San Francisco.

C. E. Loss, the contractor, has taken the grading of 67 miles of the roadbed, the remaining 14 miles having been constructed by the company from Santa Cruz northward. He has twelve months in which to complete the contract, but the bridge work and track laying will be rushed, and the road placed in operation sooner if possible. The contractor will commence operations at Ocean View, which is the base point, about 6 miles south of Francisco, and work toward the freight terminals. One of these is at Army and Illinois Streets, and the other at Army Street and San Bruno, in the packing house district. As soon as the franchise is granted by the supervisors ground will be broken within the city, and the roadbed graded from freight terminals through the Pedro Valley toward Halfmoon Bay.

One branch of the road will be built across the west end of Golden Gate Park, paralleling the ocean beach, and thus securing

an entrance to the Richmond district. A car line through the park will be an innovation, but the Ocean Shore officials expect to secure the privilege without serious opposition. Several hotels and pleasure resorts will be constructed at points along the new scenic route, which keeps close to the ocean the greater part of the distance. It is the intention to despatch single cars from the terminals hourly. When travel is heavy, however, trains will be made up to suit the traffic.

KENTUCKY PROPERTIES SOLD

Official announcement is made that negotiations have been closed by which the ownership of the Lexington Street Railway Company's system, including the gas, the electric light plant, two ice factories and the street car system, is acquired by a syndicate of Philadelphians, at the head of which are J. Levering Jones and Chandler Brothers. In addition to the public utility companies of Lexington, the syndicate has purchased the Blue Grass Traction Company, owning the interurban lines from Lexington to Paris and to Georgetown, the Central Kentucky Traction Company, owning the interurban lines from Lexington to Versailles, and the Frankfort Power & Light Company. The amount involved in the purchase of the properties is $8,000,000.

MEETING OF CANADIAN STREET RAILWAY ASSOCIATION

At the last meeting of the Canadian Street Railway Association, held at St. John, N. B., Aug. 30 and 31, it was decided that the convention shall be held semi-annually in the future. The next meeting will be held in London, Ont. The papers which were considered at the meeting in St. John were as follows: "Street Railway Accounts," John M. Smith, comptroller, Toronto Street Railway Company; "Uniforms and Decorations Thereon and Their Effect Upon Street Railway Employees," D. McDonald, manager, Montreal Street Railway Company; "Mutual Benefit Association for Employees and the Best Methods to Aid and Assist Them," P. Dubee, secretary, Montreal Street Railway Company.

PITTSBURG RELIEF ASSOCIATIONS AT BANQUET

The feeling of good fellowship which exists between the Pittsburg Railway Company and its employees was demonstrated on the evening of Sept. 14, when an enjoyable social meeting of the various relief associations of the company was held at Duquesne Garden. S. L. Tone, vice-president; W. B. Carson, secretary; John Murphy, general superintendent; Clarence Burleigh, general trial attorney, and other officials of the company, together with the inspectors, despatchers, division superintendents and the officers of the relief associations, were present. In all more than 250 persons sat down to the elaborate dinner which opened the entertainment. During the dinner the guests were entertained with orchestral selections. Then came a vaudeville show by professional talent, during which a stereopticon was used to show photographs of men prominent in public life and of the officers of the company. The first picture was that of President Roosevelt, which served to introduce the following printed announcement: "But there are other presidents. This one has the 'delighted' smile for every employee, and the smile does not wear off." Then came the picture of President James D. Callery. Next came the announcement, "Fairbanks is all right, but we go Uncle Sam one better, having two vice-presidents. Reed this one." The picture of Vice-President James H. Reed was shown, followed by this announcement: "This one adds Tone to the business and the tone is a high one." Then there was presented a picture of Second Vice-President S. L. Tone. Next came the announcement, "The man at the controller," which preceded the likeness of General Superintendent John Murphy. Then came the picture of Superintendent of Transportation P. J. Callaghan, followed by the pictures of eleven division superintendents, as follows: M. J. Maxwell, John Day, J. S. Shedd, Chas. E. Long, F. R. Wilhelm, J. E. Caller, M. J. Loftis, C. C. King, William Mischler, J. M. Fleming, Thos. Harrington.

Following the photographic reproductions were a number of comedy moving pictures, beginning with "A good old 5-cent trolley ride." Street cars figured very prominently, also, in the other pictures which were presented to the accompanyment of ringing the gong, bell cord, register, etc. The meeting closed with short addresses on live topics by officials of the company and members of the relief associations. A. S. McSwigan, manager of amusements of the company, acted as stage manager, musical director and toastmaster.

CONSOLIDATION OF THE BOILER COMPANIES

A consolidation of great interest to the engineering world has just been consummated through the amalgamation of the water tube boiler business of the Aultman & Taylor Machine Company, of Mansfield, Ohio, and the Stirling Company, of Barberton, Ohio, as a result of which The Stirling-Cahall Boiler Company will be organized with a capital of $4,500,000.

The position of the new company will be unique in that it will be in a position to supply to the trade practically every type of water-tube boiler on the market, for in addition to manufacturing boilers of the Stirling and Cahall horizontal and vertical types, it is said it will shortly take up and place upon the market an improved water-tube boiler of the water-leg type. Its policy will be aggressive, and the same methods that have forged the Stirling and Aultman & Taylor companies to the front will be pursued by the new company.

Details in respect to the organization of the company have not, it is said, been worked out, but it may be safely assumed that the consolidation will be one of the organizations as well as of the plants.

An aggressive policy will be maintained in the export department through the foreign connections of the Stirling Company in its offices in Johannesburg, S. A. R.; Havana, Buenos Ayres, Yokohama, the Hawaiian Islands, etc., as well as through its stockholdings in the Stirling Boiler Company, Ltd., of Edinburgh, which is interested in the water-tube boiler business of Great Britain and the Continent.

The Stirling Company was organized in 1890, and in 1898 established its marine department, securing control of the United States patents on the Niclausse, Yarrow and Mosher boilers, and its growth has been little short of marvellous, since its sales in eight years have shown an increase of nearly 800 per cent. The history of The Cahall Sales Department of the Aultman & Taylor Machinery Company has been an equally honorable and creditable one, and the new company will start with enviable prestige and with every facility for both manufacturing and selling. The general offices will be at 111 Broadway, New York.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED SEPT. 12, 1905

799,085. Car Truck; Harry M. Pflager and Clarence H. Howard, St. Louis, Mo. App. filed June 21, 1905. The center plate through which the king-bolt extends is held by and adapted to be adjustable within a pocket in the top of the truck bolster. The center plate is removably fixed to the bolster.

799,110. Cover for Third Rails; William G. Taylor, Forest City, Pa. App. filed Dec. 3, 1904. An ordinary T-rail is supported by L-shaped standards in such a manner that contact is made with the under side of the rail, and a cover of non-conducting ceramic material encases the upper portion of the rail in such a way as to leave air passages between the tread and base thereof.

799,117. Car Brake; William S. Washburn, Brocton, Mass. App. filed Jan. 3, 1905. The brake is supported by a horizontally-arranged pivotally-mounted lever, the end of the lever from which the brake is supported being substantially in the plane of the movement of the brake as it is applied.

799,118. Car Brake; William S. Washburn, Brocton, Mass. App. filed Jan. 16, 1905. A brake-supporting lever having intermediate of its ends a bearing to rest on a car-axle box, the portions of the lever which come opposite the rim of the wheel when the lever is in place being offset laterally.

799,213. Trolley Catcher and Retriever; Charles F. Wilson, New York, N. Y. App. filed Jan. 24, 1905. A spring drum and ratchet arrangement for controlling the trolley cord.

799,264. Motor Suspension for Electric Motors; Edward D. Priest, Schenectady, N. Y. App. filed Feb. 11, 1905. Two motors hinged together and mounted upon opposite sides of the driving axle and provided with a common support upon the axle, one end of each motor being supported in the usual manner from the truck frame.

799,295. Bolster; Edwin H. Benners, Elizabeth, N. J. App. filed Nov. 28, 1903. Comprises a top plate, a narrower bottom plate and inclined side webs connecting them, the side webs being approximately straight from the top to the bottom plates.

799,315. Truck; Richard J. Edwards, Galena, Ill. App. filed Dec. 13, 1904. The truck bolster contains raceways for balls upon which the body bolster bears.

799,316. Car Truck; Richard J. Edwards, Galena, Ill. App. filed May 27, 1905. Consists in combination of a truck bolster and a body bolster, of blocks secured to the truck bolster, cap-blocks movable thereon, and springs between the cap-blocks and blocks, the said parts forming the side bearing for the body bolster.

799,330. Car Bolster; John Green, St. Louis, Mo. App. filed Jan. 29, 1904. Comprises top and bottom members and side members connecting the top and bottom members to form a substantially triangular cross-section.

799,419. Trolley; William S. Tichenor, Owensville, Ind. App. filed Feb. 4, 1905. The axle of the trolley wheel is mounted in roller bearings in the harp.

799,606. Car Truck; Gustav Lindenthal, New York, N. Y. App. filed Oct. 23, 1903. Spherical-ended rockers support the car body on opposite sides of the central pivot.

PERSONAL MENTION

MR. CALVIN ALLEN has become real estate and tax agent of the Indiana Union Traction Company in place of Mr. Horace Stilwell.

MR. E. B. DUTCHESS, formerly with the Fort Wayne & Wabash Valley Traction Company, has been appointed Peru superintendent of the company, to succeed Mr. Millard Bechtol, who has resigned.

MR. GEORGE C. MOREHOUSE, who on Aug. 10 resigned as secretary and assistant treasurer of the Rochester Railway Company, of Rochester, N. Y., has accepted the agency of New York State for the Rochester Waste Machine, which is manufactured by the Oil & Waste-Saving Machine Company, of Philadelphia. Mr. Morehouse will have his headquarters in Rochester.

MR. CHARLES E. A. CARR has resigned as general manager of the London Street Railway Company, of London, Ont. Mr. Carr has been with the company about ten years. Under his supervision the conversion of the lines to electricity was carried out. No one has yet been selected to succeed Mr. Carr. It is understood that Mr. Carr has accepted an important position in the United States, an announcement regarding which will soon be made.

MR. A. J. BLACK, chief engineer of the power station of the Indiana Union Traction Company, at Anderson, Ind., has resigned to take a position with the Chicago & Milwaukee Electric Railroad. Mr. Black will spend some time inspecting large plants recently erected, and will then take charge of the construction of a large, new power house which the Chicago & Milwaukee Electric Railway Company expects to build at some point on the lake shore north of Chicago.

MR. W. C. SPARKS, on Oct. 1, will become superintendent of roadway of the Indiana Union Traction Company, assuming part of the duties formerly performed by Mr. A. S. Richey, who recently resigned as chief engineer. Mr. Sparks has been in the track department of the Indiana Union Traction Company for a number of years, and has done much toward bringing the company's track up to the high state of perfection which now exists. He has recently been superintendent of construction.

MR. DANIEL ROYSE has resigned his position as editor of the "Street Railway Review," to take effect Oct. 14. Mr. Royse joined the "Review" staff in December, 1896, and since February, 1901, when he succeeded Mr. H. H. Windsor, has served as managing editor of the journals owned by the Kenfield Publishing Company, including for a time "Steam Engineering," as well as the "Street Railway Review" and "Brick." The publishers announce that Mr. Lawrence E. Gould, who for some time has been associate editor, will succeed Mr. Royse as editor of the "Review."

MR. F. A. HARRINGTON, of Albany, superintendent of the Mohawk division of the New York Central Railroad, and one of the best known railroad men in Central New York, has been elected by the combined New York Central interests in control of the Schenectady Railroad as the president of the Schenectady Railway to succeed Mr. Hinsdill Parsons, of the General Electric Company, who resigned a couple of months ago when the road passed from General Electric control. Mr. Harrington will continue to reside in Albany, it is stated, and will also continue his duties with the Central Company. New directors of the Schenectady Company were chosen recently, and the board is now constituted as follows: Mr. F. A. Harrington, Mr. Edward F. Peck, of Schenectady, general manager; Mr. A. J. Culver, vice-president of the Delaware & Hudson Company; Mr. John Carstensen, vice-president of the New York Central; Mr. Horace E. Andrews, of Cleveland, Ohio; Mr. T. B. Dixey, Mr. Axel Akstrom, Mr. George E. Emmons and Mr. W. T. B. Emmet. The last two directors are holdovers from the old directorate, representing the General Electric interests.

MR. G. H. KELSEY, formerly master mechanic and electrical engineer of the Western Ohio Railway Company, has resigned, to become superintendent of power for the Indiana Union Traction Company, with headquarters at Anderson, Ind. In this position he will have charge of the power houses and everything pertaining to electrical distribution. Electrical distribution on this system was formerly in charge of Mr. A. S. Richey, chief engineer, whose resignation to accept a professorship at Worcester Polytechnic School was recently announced. The steam end of the power plant was formerly in charge of Mr. A. J. Black, whose resignation is announced elsewhere.

MR. JOHN W. CHIPMAN, formerly secretary and general manager of the Indianapolis & Eastern Electric Railway, is dead. Mr. Chipman had not been well for more than a year, and at the time of his death was in New England, with a view to rest and a respite from the cares that had undermined his health. Mr. Chipman organized the company that constructed the Greenfield line, one of the first roads to enter Indianapolis. The line was subsequently extended to Dublin and New Castle under his supervision. Mr. Chipman retained connection with the road until its control passed to a syndicate a few months ago. He was vice-president of the Indiana Electric Railway Association, in the management of which he took an active interest, and was well known to electric railway interests throughout the entire West.

MR. W. G. CARLTON, of the Chicago Edison Company, has just been appointed superintendent of power of the electrical zone of the New York Central & Hudson River Railroad Company. In this capacity Mr. Carlton will have charge of the two main electric power stations which the company is building near New York, the eight sub-stations and the transmission system. He will report to the electrical department. Mr. Carlton has been associated with the Chicago Edison Company for the last twelve years, and is at present assistant to the chief operating engineer. He was born in Warren, Ill., Feb. 20, 1869, and is a graduate of Cornell University, of the class of 1892. After leaving Cornell he spent a year in taking the students' course with the General Electric Company, at Lynn, after which he entered the construction department of the Chicago Edison Company.

MR. WALTER H. WHITESIDE was elected president of the Allis-Chalmers Company, as announced in the last issue of this paper. This is an indication that there will be no change in the policy of the company, for Mr. Whiteside has been in full charge of the operations of the organization, with the title of vice-president and general manager, during the absence in Europe since April last of his predecessor in office. Mr. Whiteside joined the Allis-Chalmers interests in July, 1904, when he accepted the position of general manager of sales. He came at a time when the company, which had just taken over the Bullock Electric Manufacturing Company, needed the injection of a vigorous and energetic personality into its sales force. The task with which Mr. Whiteside was confronted was one which would have baffled a man with less determination, less energy and less force of character. Not only did he have to become familiar with all the intricacies of the company's varied products, but the new interests and the old had to be consolidated, and the sales organization had to be enlarged and its efficiency increased. With what success Mr. Whiteside has met in his efforts, the increase in the volume of the company's business and the crowded shops, and the reopening of the old south foundry at Milwaukee, testify. In taking up this higher and more responsible position, Mr. Whiteside has behind him not only the confidence of his organization, but a long and varied business experience, in which he has filled many executive positions. His achievements have won him recognition as a man of marked administrative ability. Mr. Whiteside is a member of the American Institute of Electrical Engineers, of the Engineers' and Lawyers' Clubs, of New York, of the Midday Club, Chicago, and of the Milwaukee Club.

W. H. WHITESIDE

E. C. FOSTER

JOHN I. BEGGS

RICHARD McCULLOCH

W. CARYL ELY

F. G. JONES

C. G. GOODRICH

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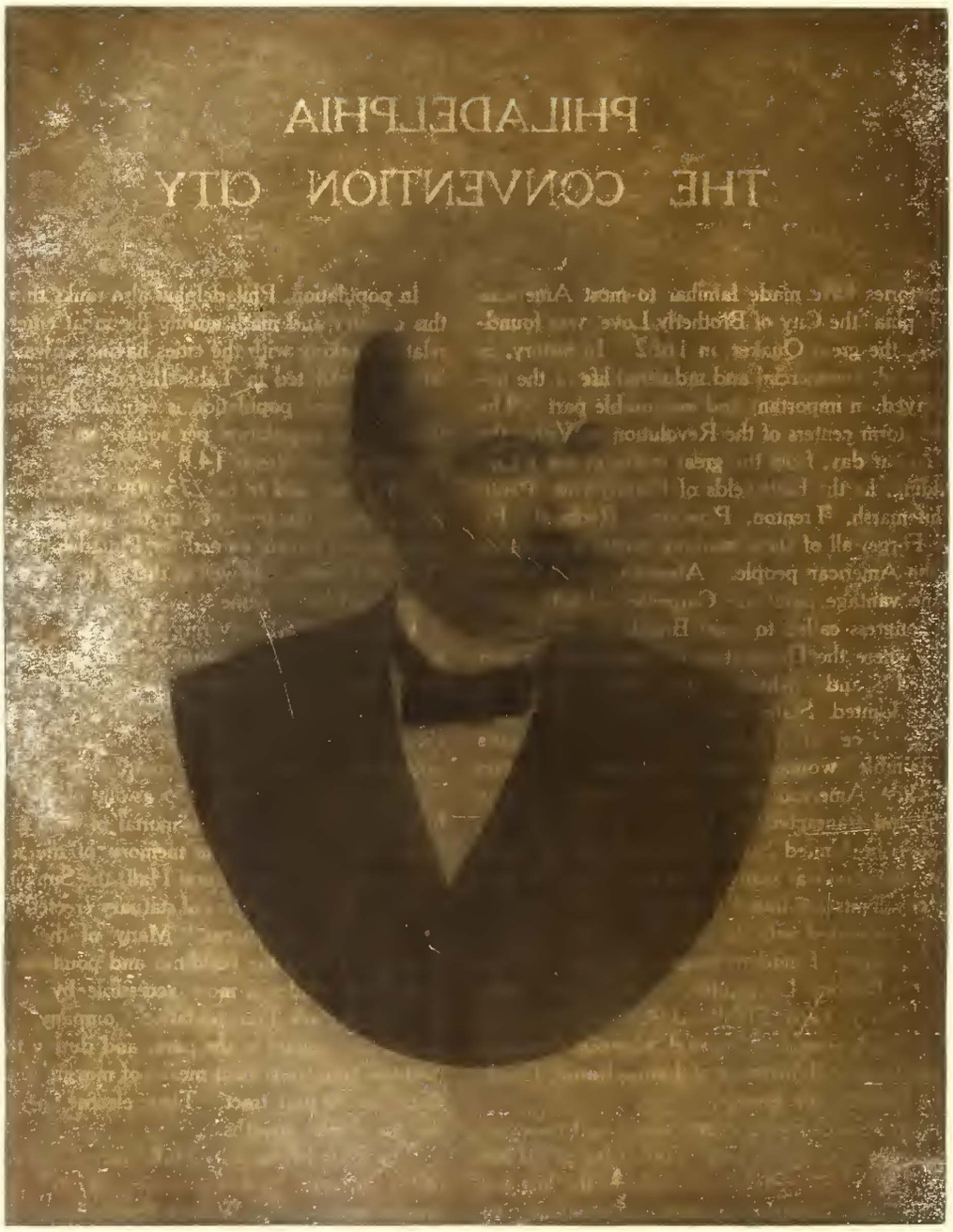

MR. JOHN B. PARSONS, President of the Philadelphia Rapid Transit Company, is a prominent figure in the electric railway interests of the country, and has established a high reputation, both as an organizer and as an operating manager. The present efficiency and high standing of the Philadelphia street railway system are due more to him than to any one individual. Mr. Parsons began his street railway career in Philadelphia in 1870, when he entered the service of the People's Passenger Railway Company as clerk. He was promoted rapidly and was elected president of the company in 1886. In 1887 he was called to Chicago to take charge of the West Chicago Street Railway Company. In January, 1897, he returned to Philadelphia to accept the position of vice-president and general manager of the Union Traction Company, and in October, 1898, was elected president of the company. Upon the organization of the Philadelphia Rapid Transit Company he was elected its president.