THE STREET RAILWAY JOURNAL

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The Newark & South Orange Railway.

For the last eighteen months the lines of the Newark & South Orange Railway have been operated entirely by electricity with marked success. The company owns fifteen miles of double track through the business and residence districts of Newark and the Oranges.

The power station and offices are located at South Orange Avenue and South 19th Street. The building is of brick, one story in height, and 490 × 125 ft.

The engine room is located on the 19th Street side of the building and is 110 × 50 ft. The power plant consists of four simple, non-condensing engines with cylinder dimensions 26½ × 48 ft., built by Cyrus Currier & Sons, of Newark N. J., and belted direct to four Westinghouse multipolar generators of 250 H. P. each. The engines are provided with the Woodberg automatic cut-off governor as shown in Fig. 1. This device is a combination of trip cut-off gear and a governor for regulating the same, and is attached to the steam inlet nozzle of slide valve and similar engines to regulate the speed. It consists of a double beat poppet valve, operated by a double trip mechanism. A sensitive regulator sets the point of cut-off according to the demand of steam. The cut-off gear is operated by an independent eccentric, and the regulator is driven by a belt. It is claimed that the range of cut-off obtainable is from 0 to ⅞ of stroke.

The belts are two ply, thirty-six inches wide, and were furnished by the Hoyt Belting Company.

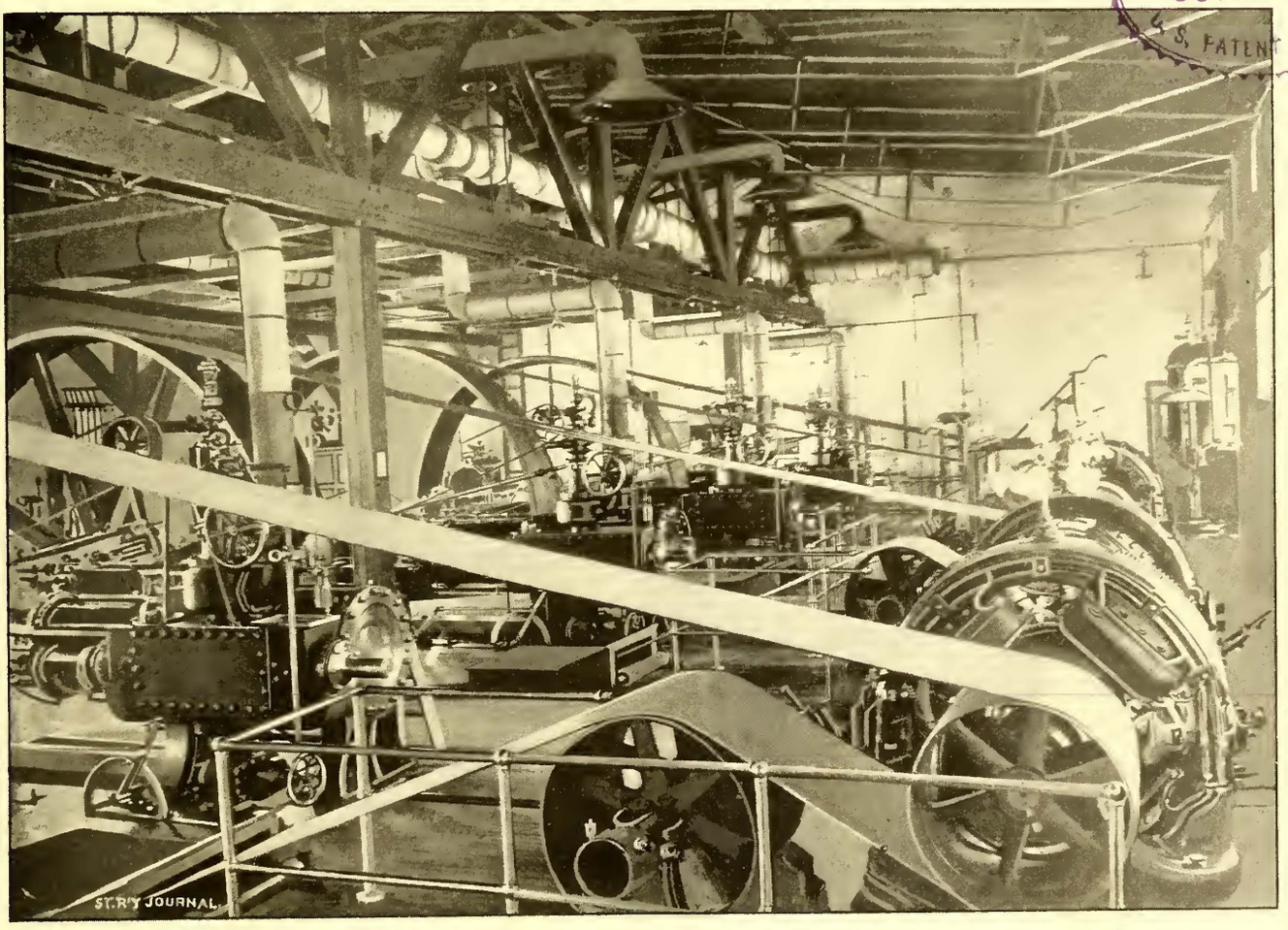


FIG. 1.—INTERIOR OF POWER STATION—NEWARK & SOUTH ORANGE RAILWAY CO., NEWARK, N. J.

The steam generating plant consists of eight horizontal tubular boilers of 125 H. P. each, built by Cyrus Currier & Sons, of Newark, N. J. The boiler room is directly in the rear of the engine room, and the dimensions are 50 × 110 ft. A duplicate system of steam piping is provided so that any section may be cut out and the other used. The H. W. Johns pipe covering is employed throughout. The stack is 166 ft. in height with a tapering flue seven feet in diameter at the base and five feet in diameter at the top.

The plant is equipped with the Taylor improved draught and ventilating device. It is claimed that with this system a cheaper grade of fuel can be used, and the

insuring of absolute combustion of all particles of carbon in the fuel.

The ventilating system consists of a number of funnels located near the roof of the engine room, and connected to the stack by pipes which carry off the heated air from

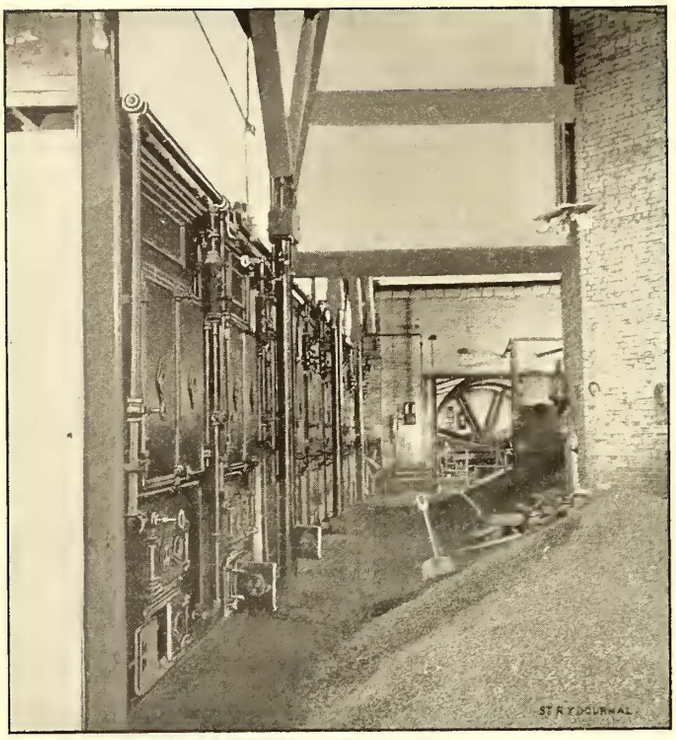


FIG. 2.—BOILER ROOM—NEWARK & SOUTH ORANGE RAILWAY CO.

the upper part of the room and, it is claimed, reduce the temperature from 10 to 11 degs. National feedwater heaters and Deane feed pumps are provided.

The switchboard is conveniently located in the center of the engine room and is of marbleized slate mounted with Westinghouse instruments. It is of a double desk form with station controlling instruments and feeder switches and ammeters located on opposite sides. A complete fire apparatus is provided. Reels of hose are attached to the walls throughout the building, and connected to a 12 × 7 × 12 Smith-Vaile duplex fire pump.

The interior of the station presents a particularly neat appearance. The engines and generators are tastefully ornamented and surrounded by polished brass railings.

FIG. 3.—PRIVATE CAR—NEWARK & SOUTH ORANGE RAILWAY CO.

Adjoining the engine room is the car barn which extends the entire length of the building, a distance of 490 ft. There are eleven tracks extending the full length of the building, and all repairs, except armature winding, are made on the premises.

The track construction consists of Wharton girder rails, weighing ninety pounds to the yard, spiked directly to the ties and connected by eight-bolt fishplates. The rails are bonded with copper wire and channel pins and cross bonded at every third rail. Side poles furnished by the Syracuse Tube Company are used on the greater portion of the line.

The trolley wire is of No. 0000 hard drawn copper, and was supplied by John A. Roebling's Sons Company. The overhead appliances were furnished by the H. W. Johns Company. The hangers for the brass shell, round tips and the pull-offs are of the regular Giant pattern. The Brooklyn strain insulators are used at the poles, and the No. 1 solid moulded mica pole insulators are used for carrying the lighter feed wires. The heavy feed wires are carried by iron clad insulators.

The company is operating thirty-six closed and twenty-five open cars. The cars are of the Stephenson make mounted on Brill trucks, and are equipped with two Westinghouse motors. Lewis & Fowler fare registers and Pittsburgh Steel Hollow Ware and patent rachet gongs are employed. The cars are equipped with sand boxes and ratchet brakes.

Included in the equipment are seven snow plows, sweepers and levelers and Davis tower wagons.

A very handsome private car, built by the John Stephenson Company, is shown in Fig. 3. The car has an eighteen foot body with vestibules, and is painted maroon color with gold letters and ornaments. The interior is handsomely furnished in birdseye maple with delicate scroll work ornaments. The chairs are of rattan, with olive green cushions.

The offices of the company are located in a comfortable suite of rooms in the north east corner of the building. A very simple and complete system of booking has been adopted by which the receipts and expenses for any day, month or year can be easily ascertained. A safe is located in the receiving department and is connected with the conductors' room by chutes in which the envelopes containing the receipts are deposited. On the face of the envelopes blank forms are printed on which the conductor's number, trip and car number are entered together with the number of full and half fares and tickets. The safe is divided in the center and has compartments for two days' receipts.

Since the starting of the road by electricity in February, 1893, there has never been a shutdown through any fault of the power equipment.

The officers of the company are: E. S. Ward, president; G. Kreuger, vice president; W. Scheerer, secretary and treasurer; A. Radel, general manager and superintendent; J. McDonough, assistant superintendent.

Large Order in Chicago.

Last month the Chicago City Railway Company placed an order with the Westinghouse Electric & Manufacturing Company for six multipolar generators of 700 H. P. each, which will be used for rope transmission. Another order was also placed for 240 No. 12, single reduction, twenty-five horse power Westinghouse motors. An addition or extension to the switchboard in the company's power station will also be built by the Westinghouse Company, and will consist of sixteen feeder and six dynamo panels, constructed of black enameled slate, with the necessary parts, etc.

Work has been begun at Ashland, Mass., on the Ashland & Hopkinton Electric Railroad.

Electric Railway Construction in Philadelphia.

The city of Philadelphia has probably shown more activing during the last year in electric railway construction than any other in the country. The extensive rights accorded the railway companies in that city a year ago or more were immediately acted upon, and track and station construction was promptly commenced upon the different lines. The work to be done, however, was so extensive as to require a great deal of time for its completion, and although a large proportion of the total track has been laid, many of the streets are still torn up, and on a great deal of the mileage the old horse cars are still in operation.

THE PHILADELPHIA TRACTION COMPANY.

The Philadelphia Traction Company, the largest of all the railway companies in Philadelphia, has proceeded farther with the work of electrical equipment than any of the other railway companies. The company is now supplying power from its three stations on Sutherland Avenue, 13th and Mt. Vernon Streets and Market Street near 33d, and is erecting a fourth station, which will have a capacity of 2,250 H. P., at 32d and Dauphin Streets. During the last two months the company has put in operation its 17th and 19th Streets north line, its 19th and 20th Streets south line and its Lancaster Avenue line. The next lines to be put in operation are 22d Street and Allegheny Avenue line, York and Dauphin line, Jefferson and Manchester line, Spring Garden and Walden line, West Spruce Street line and the Paddington line in West Philadelphia.

The Sutherland Avenue station, which was originally equipped with three 250 H. P. Corliss engines belted to generators, has been increased in capacity by the addition of two 750 H. P., cross compound, condensing Wetherill-Corliss engines, direct connected to Westinghouse generators. The same kind of engine is being installed in the other two stations of the company now in operation.

FIG. 1.—EXTERIOR OF DAUPHIN STREET POWER STATION—PHILADELPHIA TRACTION CO.

We present in Fig. 1 a view of the new power station of the company located on Dauphin Street. This station is of cream colored brick with stone trimmings, and presents an extremely tasteful appearance. The interior walls are also of cream colored brick, with handsome wainscoting for a distance of about five feet above the floor. The ceiling is of Georgia pine, giving the interior of the station a very bright and handsome appearance.

An interesting feature of the station is the fact that natural draft is used. The stacks are of brick and are 100 ft. in height. It will be remembered that in the stations erected by the Philadelphia Traction Company at 13th and Mt. Vernon Streets and 33d and Market Streets, the mechanical draft system was employed, and in the present station it is the intention of the company to thoroughly test the natural draft system, so as to compare the two methods of practice in actual service.

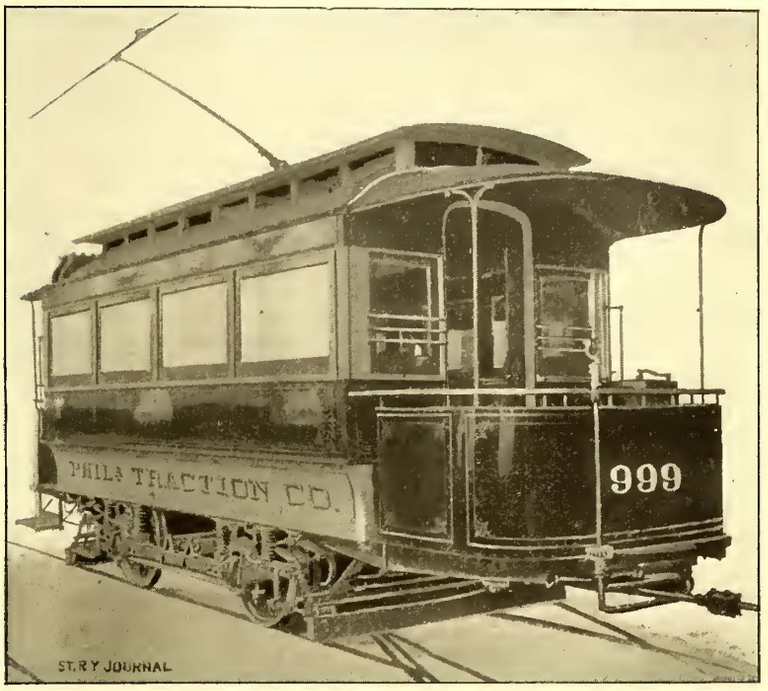


FIG. 2.—TESTING CAR NO. 999—PHILADELPHIA TRACTION CO.

The station is so arranged that the floor of the engine room is about ten feet above the street and that of the boiler room is on the street level. Upright boilers of the Berry type, manufactured by Robert Wetherill & Company, of Chester, Pa., are employed, there being eight boilers in the station, four on each side of the stack. These boilers consist of two shells, an outer and an inner joined by radial tubes. The fire is built in the inner shell, the heat passing through tubes, making the boiler essentially of the vertical tubular type.

The engine room will contain three 750 H. P., cross compound, non-condensing Wetherill-Corliss engines, direct connected to Westinghouse generators. Stratton separators and Wetherill feedwater heaters will be used. The switchboard is of the single deck panel type.

Close to the station and adjoining its old car house, the Philadelphia Traction Company has erected a new car house with a capacity of from 400 to 500 cars. The walls of the car house are of brick, one story in height and surmounted by a monitor roof, with a span of 100 ft. The floors are of concrete.

To assist in making tests on the line, Chief Engineer Uhlenhaut, of the Philadelphia Traction Company, has designed a testing car, No. 999, shown in Fig. 2. This car has somewhat the appearance of an ordinary eighteen foot closed car, but has closed platforms with folding steps, so that persons will not mistake it for an ordinary car and attempt to board it. The main panel and dashes of the car are painted in Tuscan red, a color not

used on any other car of the company, to further distinguish it. An interior view of the car is shown in Fig. 3. It is fitted with a testing table, carrying a complete equipment of voltmeters, ammeters, watt recorders, speed indicators, instruments for determining grades, the height of the trolley wire, etc. There are no benches, but chairs are provided for the engineers. The car is equipped with trolley and motors, so that it can be used as a motor car, or it can be attached as a trailer to another car. It is lighted with ten incandescent lamps.

FIG. 3.—INTERIOR OF TESTING CAR—PHILADELPHIA TRACTION CO.

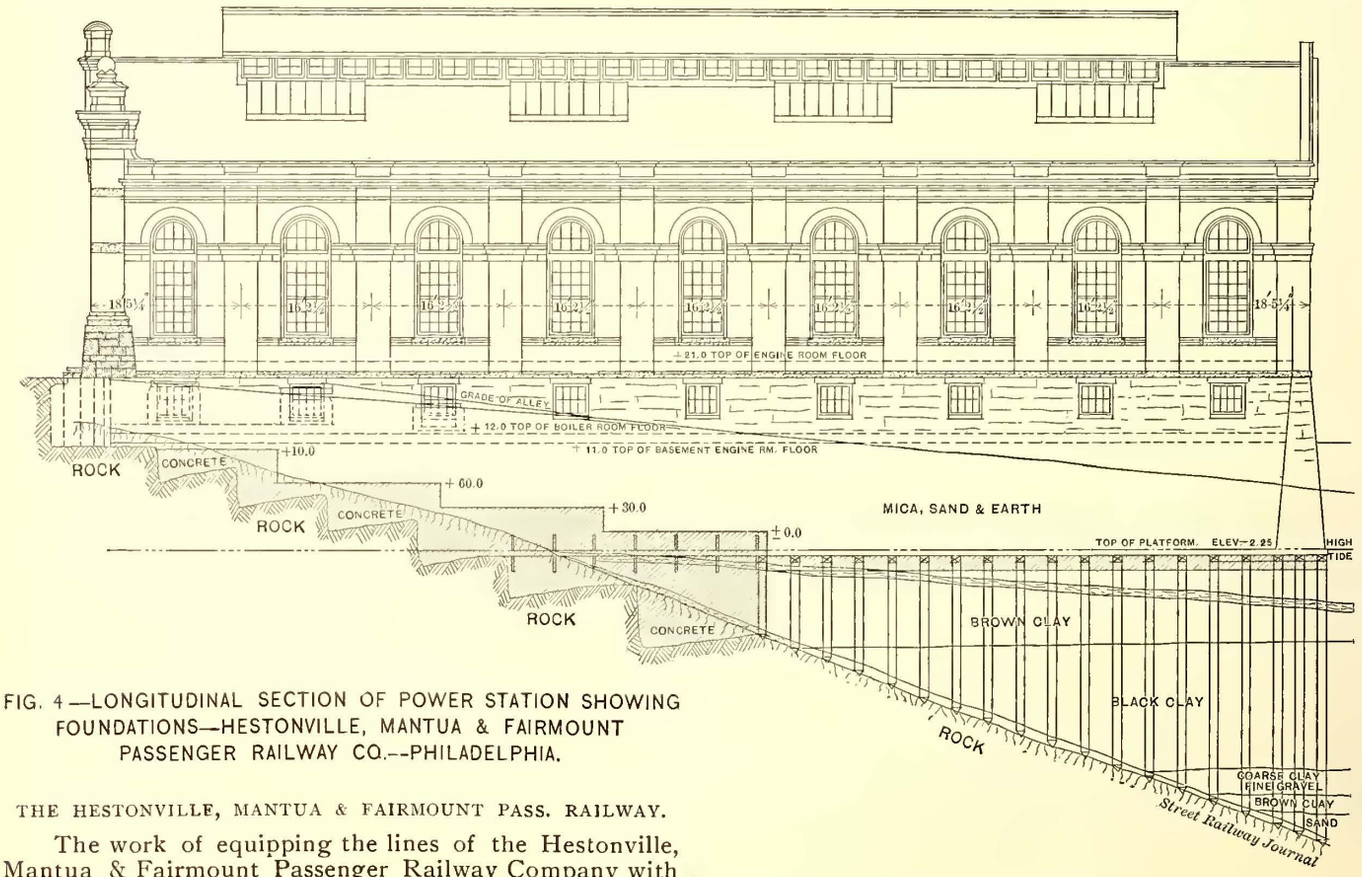


FIG. 4.—LONGITUDINAL SECTION OF POWER STATION SHOWING FOUNDATIONS—HESTONVILLE, MANTUA & FAIRMOUNT PASSENGER RAILWAY CO.—PHILADELPHIA.

THE HESTONVILLE, MANTUA & FAIRMOUNT PASS. RAILWAY.

The work of equipping the lines of the Hestonville, Mantua & Fairmount Passenger Railway Company with electricity is progressing rapidly under the direction of A. Langstaff Johnston, the chief engineer of the company.

The new power station is located on the Schuylkill River at 25th and Callowhill Streets. The building is of a very handsome design measuring 152 × 112 ft., and when completed will be one of the most attractive power houses in the city. The material used in the construction from the level of the street to the engine room floor is Hummelstown brownstone, and above this it is of brick with terra cotta trimmings. The window sills are of cream color sandstone. The roof will be slate supported by iron trusses, and will be provided with a large lantern, affording good light and ventilation.

The foundation of the north end of the building rests on solid rock which comes within six feet of the surface, while at the south end it was necessary to drive piling to a depth of fifty feet. The piling is cut off at mean low water and covered with a layer of concrete two feet thick on which the foundations for the machines are built up of Conshohocken bluestone. The general arrangement of the piling and foundations can be seen from the section Fig. 4. The building is so constructed that it can be extended in the future and the capacity doubled without disturbing the present arrangement.

The engines and generators will be located in a well lighted and ventilated room measuring 64 × 150 ft., and located in the west side of the building. The engine equipment will consist of four Greene tandem compound, condensing engines of 500 H. P. each, built by the Providence Steam Engine Company. The electrical equipment will consist of four General Electric multipolar generators of 400 K. W. capacity each, direct connected to the engine shaft, and running at 100 revolutions per minute.

The switchboard was designed by the chief engineer of the company, and will be a very handsome affair. It will be thirty feet in length with ornamental marble panels. The right hand side will contain the feeder panels, each panel being provided with a circuit breaker, ammeter and cut-out switch. The central panel will contain a recording wattmeter and a general station ammeter. The station controlling instrument for the generators will be located on the left side of the switchboard. On the extreme left is a swinging bracket containing two Weston voltmeters, which can be thrown in connection with any generator. All connections from the generators pass under to the switchboard, and from the switchboard to the line are carried under the floor to a testing room under the northwest corner of the building. A complete set of instruments will be provided here for testing the insulation,

resistance and capacity. The instruments will be mounted on a solid brick base resting on a natural rock foundation.

The boiler room is located in the east side of the building, in a room measuring 42 × 150 ft., and will contain eight Babcock & Wilcox water tube boilers, of 250 H. P. each, arranged in batteries of two each. The fronts will be of enameled brick, and brass pipe fittings will be used throughout.

The smoke flue will extend the entire length of the division wall between the engine and boiler rooms, entering a large and ornamental stack at the north end of the building. This stack will be 150 ft. in height. The base will be twelve feet square to a height of thirty-five feet; above this it will be octagonal in form, surmounted by a cap of very ornamental design.

The coal handling apparatus will be very complete. Coal is brought by boats to a substantial wharf and unloaded by means of an elevator and conveyor supplied by the Link Belt Engineering Company, and erected by Armstrong & Pringtzhoff, of Philadelphia.

The coal will be conveyed to a bin holding 300 tons, constructed alongside of the east wall of the boiler room. Chutes from this bin will pass through the wall and deposit coal in front of each boiler. The conveyors will also be arranged to store coal in the space between the boiler room and the adjoining property. This space is 36 × 200 ft., and will hold over 2,000 tons. The boiler will be provided with a narrow gauge track and coal cars for conveying the ashes to the wharf, and to deliver coal from the storage piles if necessary.

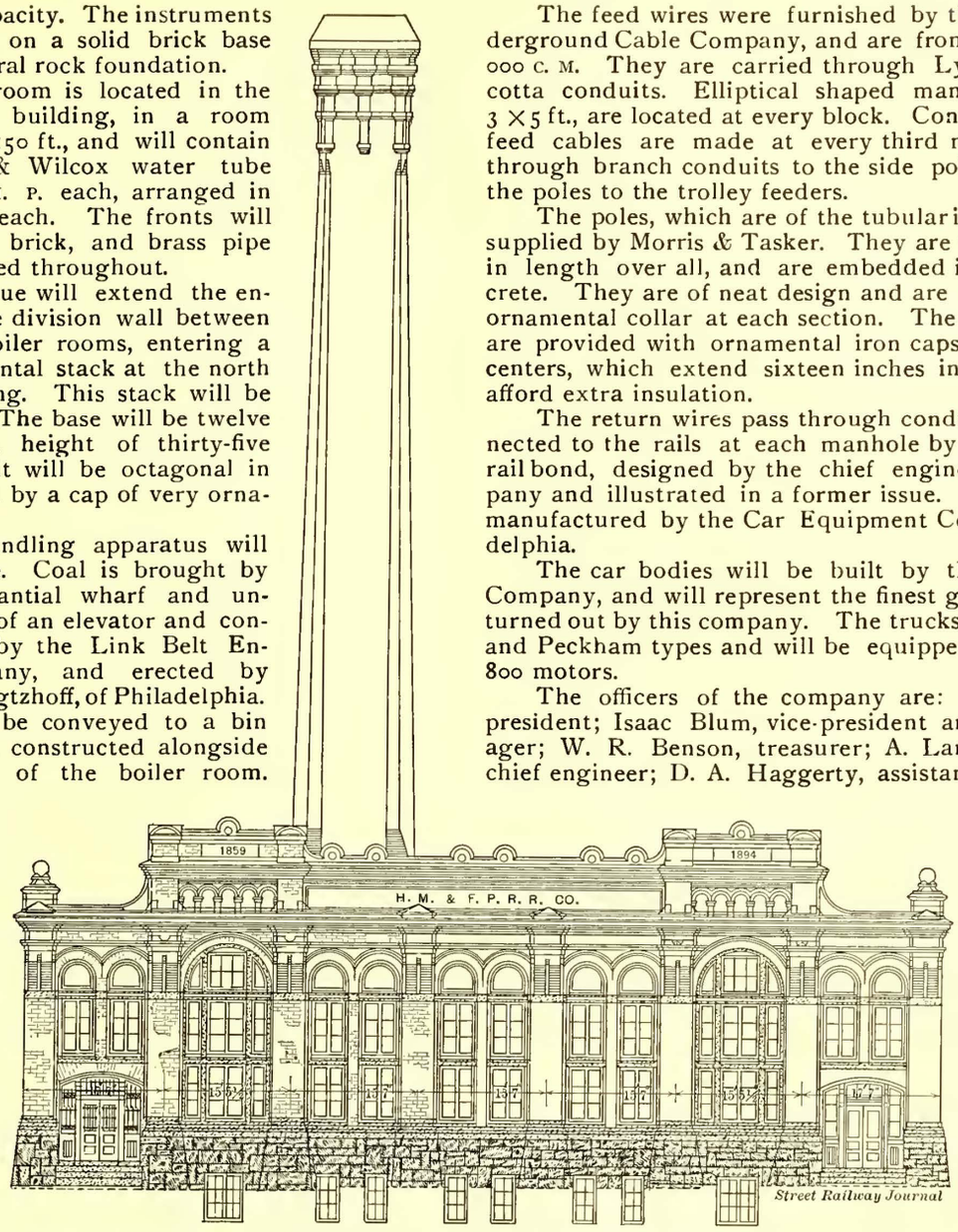


FIG. 5.—FRONT ELEVATION OF POWER STATION—HESTONVILLE, MANTUA & FAIRMOUNT PASSENGER RAILWAY CO., PHILADELPHIA.

The condensers are located under the floor of the engine room, and take water from a well, 8 × 8 ft., located in the center of the building. This well will be supplied by two Worthington duplex pumps located in a separate building. These pumps have a capacity of 20,000 gals. each. It is intended to use one at a time, the other being held in reserve. Water is taken from the Schuylkill River. A well is located inside of the wharf line and is furnished with a grating provided to protect the ends of the pipes from drift and ice. To provide for any accident to the supplementary pump, the receiving well has connections with the city mains, from which it can take its water supply.

The boiler feed pumps will be located in the center of the boiler room between the boilers, and the piping is so arranged that the water can be pumped direct from the hot well to the boilers or through the heaters. The feed pumps were furnished by Barr, of Philadelphia. Two Berryman heaters of 1,000 H. P. each are provided.

The work on the roadbed is about completed. The rails and all special work, as mentioned in a previous issue, were supplied by the Johnson Company. The rails are of the girder type and weigh ninety pounds to the yard. A very elaborate piece of special work was put in at Spring Garden and 25th Streets.

The feed wires were furnished by the Standard Underground Cable Company, and are from 300,000 to 700,000 C. M. They are carried through Lynch Lake terra cotta conduits. Elliptical shaped manholes, measuring 3 × 5 ft., are located at every block. Connections with the feed cables are made at every third manhole, and run through branch conduits to the side poles and through the poles to the trolley feeders.

The poles, which are of the tubular iron pattern, were supplied by Morris & Tasker. They are twenty-seven feet in length over all, and are embedded in six feet of concrete. They are of neat design and are provided with an ornamental collar at each section. The tops of the poles are provided with ornamental iron caps fitted with wood centers, which extend sixteen inches into the poles, and afford extra insulation.

The return wires pass through conduits and are connected to the rails at each manhole by special types of rail bond, designed by the chief engineer of the company and illustrated in a former issue. These bonds are manufactured by the Car Equipment Company of Philadelphia.

The car bodies will be built by the St. Louis Car Company, and will represent the finest grade of the work turned out by this company. The trucks are of the Bemis and Peckham types and will be equipped with two G. E. 800 motors.

The officers of the company are: Johns Hopkins, president; Isaac Blum, vice-president and general manager; W. R. Benson, treasurer; A. Langstaff Johnston, chief engineer; D. A. Haggerty, assistant chief engineer.

THE ELECTRIC TRACTION COMPANY.

The Electric Traction Company, of Philadelphia, Pa., was the second company in that city to commence operations electrically, having put the first electric cars in operation last April. It operates the lines of the Frankford & Southwark Philadelphia City Passenger Railway Company, the Citizens' Passenger Railway Company, the Second & Third Streets Passenger Railway Company, the Lehigh Avenue Railway Company and the Lombard & South Streets Passenger Railway Company. The company has at present two power stations, one located on Delaware Avenue between Beech and Laurel Streets, which has a capacity of 6,000 H. P. The other station, which has been in operation for some time, and which was described in the June issue of the STREET RAILWAY JOURNAL, is located on Hutchinson Street, near the corner of Oxford Street, and has a capacity of a little over 1,000 H. P.

We present in Fig. 7 a view of the interior of the Delaware Avenue power station of the company. It is of brick, with fronts of pressed brick. The lower part of the walls is faced with brownstone for a distance of ten feet. Brownstone sills are also used for the windows, and brownstone headstones for the doors. On the latter is cut the name of the railway company. The power house rests on piles and stone foundations, and is provided with heavy walls which are twenty-two inches in thickness for a height of ten feet. The thickness in the walls is then eighteen inches at the top. Ample windows are provided on all sides, giving plenty of light and air. The engine room roof is provided with a skylight twelve feet wide, running the entire length of the building. This is not fitted with ventilators, but both gable ends of the power station are arranged with exhaust fans run by electric

power, each of which has a capacity to effect a complete change of air in the room in fifteen minutes, thus supplying complete ventilation. The roof of the boiler house is of corrugated iron.

The engine room, which measures 200 × 80 ft., contains six Porter-Allen engines of the tandem compound, condensing type, and of 1,050 H. P. each, which are direct connected to General Electric 800 K. W. generators. One small couple of 250 H. P. is provided for the night load. The engine room is provided with a twenty ton Sellers traveling crane.

An especially interesting feature of the station is the switchboard, which is located midway between the front and back of the station and near the south wall. It is of enameled slate, and so arranged that its entire length can be that of the engine room. It is located at a distance of six feet from the wall, giving easy access to all connections.

Owing to the great distance to which power is transmitted and the distance of some of the outlying lines of the company from the power house, special provision had to be made to keep up the voltage at these outlying points. This is accomplished by means of providing the switchboard with two positive bus bars in addition to the negative bus bar, one positive bus bar being at a potential of fifty volts or more higher than the other. The connections are so arranged that any feeder can be connected with the higher or lower positive bus bar, or so that any generator can be put in connection with it. In this way the potentials of the outlying lines can be kept up by raising the potential at the station end of the feeders if there should be a drop in the voltage. By this method a large saving in copper can be effected. The switchboard panels are of the General Electric one-pole switch system. The equalizer switch is set close to the generator and the equalizer bus bar is run straight between the generators, the two connecting to the switchboard. The board is fitted with the Thomson magnetic circuit breaker, type F, manufactured by the General Electric Company, and voltmeters and ammeters which are of the Weston type. All of the switches are of the so-called quick break type, and one is a 7,000 ampere Ajax switch.

The boiler room measures 200 × 80 ft. and employs the mechanical draft system, which as our readers know, is being used extensively in Philadelphia. It will be fitted with twenty-four Babcock & Wilcox boilers, each of 250 H. P. capacity each and four economizers of the American Economizer Company's manufacture. The capacity of the economizers will be equal to the boiler horse power and so arranged that any one of the four economizers can be used with any one section of boilers. The stack, which has an inside diameter of ten feet and rises to a height of sixty feet from the ground, is provided with two direct

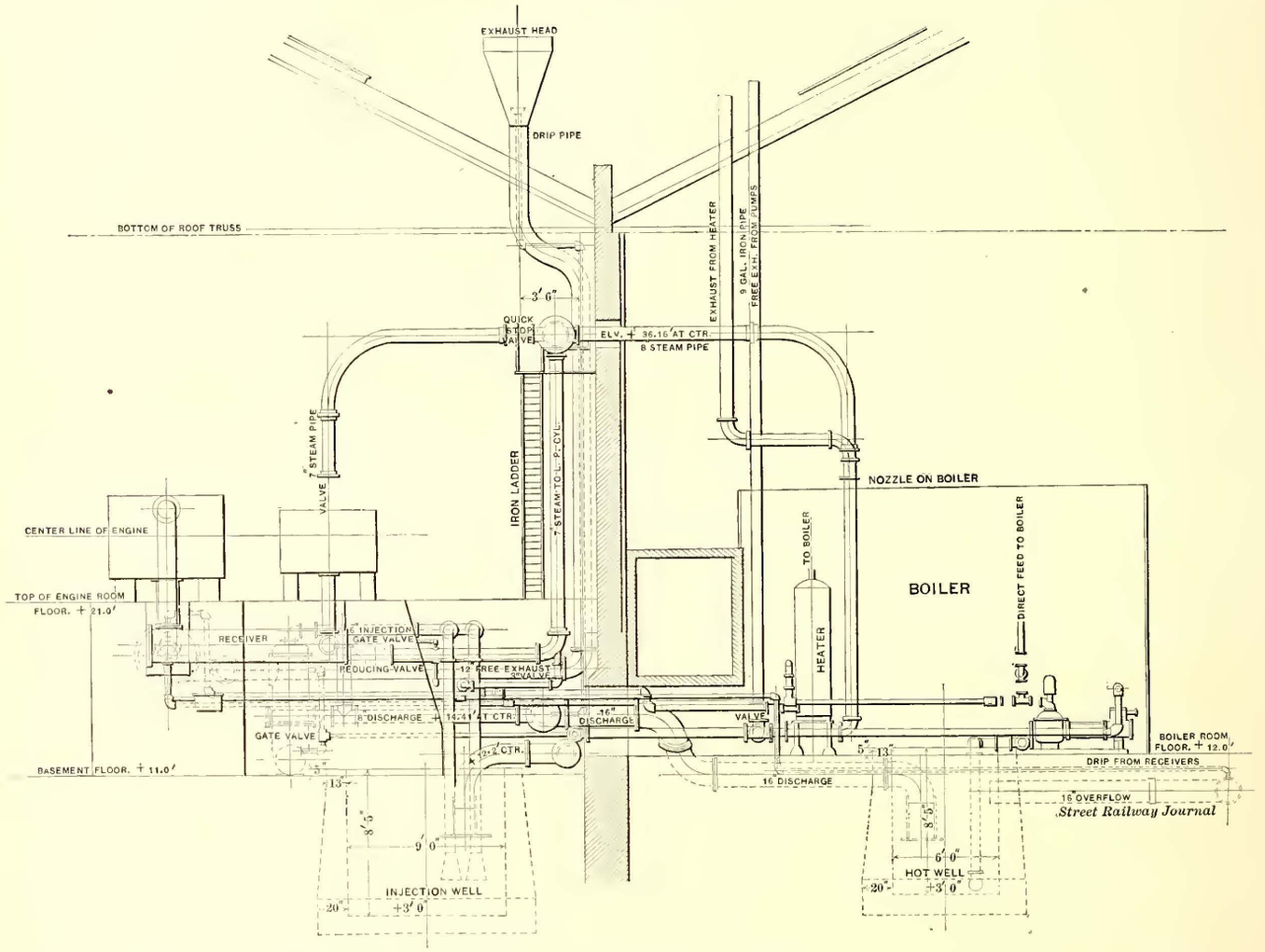


FIG. 6.—SECTION OF ENGINE AND BOILER ROOM, SHOWING PIPING—HESTONVILLE, MANTUA & FAIRMOUNT PASSENGER RAILWAY CO.

driven Sturtevant fans for the mechanical draft. Each fan has a capacity equal to taking care of all the boilers when running at their full capacity. The condensing pump is of the Blake vertical type.

The boiler house has a storage capacity for coal of 500 tons. The coal can be transferred at any time to the boilers by coal handling machinery manufactured by the Link Belt Engineering Company. Ashes will be taken from the boilers by conveying screws and elevators, thence carried to a hopper on the coal wharf so that when a car unloads coal for the station it can be reloaded with ashes which are then taken away.

For condensing water the company has laid two eighteen inch pipes to the Delaware River, one a suction and one a discharge pipe.

All the feed pumps are supplied by the Blake Manufacturing Company, and the station is fitted with two, each with a capacity equal to that of the entire station. The station is also provided with an injector manufactured by L. Schutte & Company, of Philadelphia, of a capacity equal to that of the entire station. This injector was one

shown at the World's Fair, and the object of its installation was to provide for the operation of the station in case of accident to the pumps, the latter being usually relied upon to supply feedwater to the boilers. To all bends in the steam piping or at any other place where steam might condense, piping is laid so that the condensed water is carried to the Blake pump and receiver, by which it is pumped into the boilers.

As mentioned in previous articles on the electric railway system in Philadelphia, all of the feeder and return cables are carried in underground conduits. The type of conduit of the Electric Traction Company is creosoted wooden ducts manufactured in Williamsport, Pa. The cable vaults at the power station to which all the vaults lead are lighted by windows and also by electric lights. Provision is made so that ninety cables can enter here and be hung on the walls. One end of the cable vault is utilized as a testing room. Permanent connections are made with each cable and the terminals are run to the testing room where they terminate in a switchboard. By this means connections for testing can be easily made from testing instruments to any feeder terminal.

The Electric Traction Company is rapidly completing its outside work of construction. The 10th and 11th Streets line, which is owned by the company, has been in operation for some time and is receiving power from the Hutchinson Street station. The 5th and 6th Streets line, and the 2d and 3d Streets line are almost completed and will be put in operation, it is hoped, by October 1. The Lombard & South Streets line and the Lehigh Avenue line will be the next to be put in operation. Bracket construction is employed on the 10th and 11th Streets line, and span wire construction is used elsewhere. About two-thirds of the company's track is now equipped.

FIG. 8.—VIEW OF BOILER ROOM, DELAWARE AVENUE POWER STATION—ELECTRIC TRACTION CO., PHILADELPHIA.

FIG. 7.—INTERIOR OF DELAWARE AVENUE POWER STATION—ELECTRIC TRACTION CO., PHILADELPHIA.

The track construction used consists of ninety pound, nine inch girder rails, illustrated in the January, 1894, issue of the STREET RAILWAY JOURNAL. These rails are double bonded by riveted bonds through the web. The rails are also cross bonded and connected to the return cable, which has a cross section equal to 20 per cent, of that of the outgoing feeders. The feeders are of a standard size of 650,000 circular mills and were supplied by the John A Roebling's Sons Company. They are lead covered. The return cable is of 1,000,000 circular mills, and is slightly insulated. The trolley wire is No. 00. Medbery insulation and that of McAllen type are used. From some tests made on the 10th and 11th Streets line the drop of voltage on the return circuit was found to have a maximum of 2 per cent.

As will be seen, the equipment of the Delaware Avenue station is similar in many respects to that of the Hutchinson Street power station of the company, the chief characteristics of which are Porter-Allen engines direct connected to General Electric generators, and in the steam equipment Babcock & Wilcox boilers operated with economizers and mechanical draft. The engineers of the company are well satisfied with the results secured in economy at the Hutchinson Street station of this plant. Tests made at this station show a fuel consumption of only 2.2 lbs. of coal per horse power hour on tests extending over a length of two weeks duration, when the feedwater was introduced to the heaters at 70 degs., leaving at 200 degs. to go to the economizers, and leaving the economizers at from 260 to 265 degs. For an average output of 15,000 H. P. hours per day fifteen tons of coal were used, at a cost, including wear and tear, wages, coal, oil and interest, at about $.009 per horse power hour. The depreciation is estimated at 6 per cent. and interest on capital at 6 per cent. It should also be remem-

bered that the plant is a non-condensing one. It was, however, built when material and wages were low, and at figures which probably could not be obtained in ordinary times.

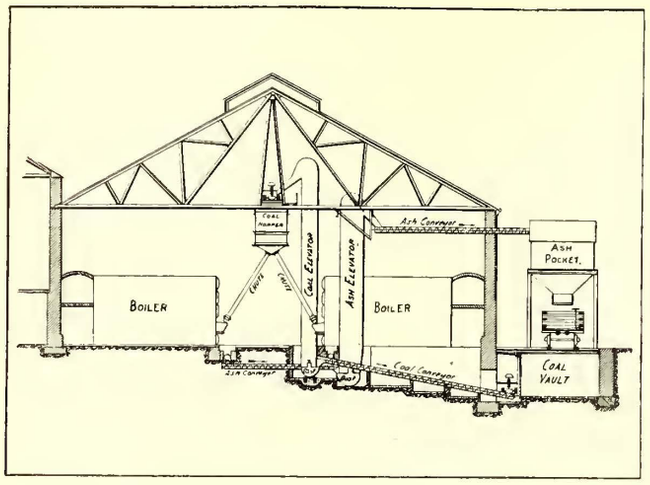


FIG. 9.—SECTION OF BOILER ROOM, SHOWING COAL AND ASH CONVEYOR.

Important Purchase in San Francisco.

An important change in ownership of San Francisco street railway property occurred last month in the purchase by the Market Street Railway Company, of almost the entire capital stock of the Metropolitan Railway Company. The capital stock of the company is $1,000,000, amount of first mortgage bonds, authorized, $250,000, of which only $200,000 have been issued. The road had but a slight floating indebtedness.

The Metropolitan has been put under the management of the Market Street Railway Company, by the appointment of M. D. Stein, as manager, and the election of N. T. Smith, treasurer, and J. L. Willcutt, secretary. The road is five miles long and was the second electric railroad constructed in this city, having been running since October 20, 1892. The first electric railway in operation was the San Francisco & San Mateo Railway which opened April 26, 1892. It is a first class road in every respect, well equipped, with ample power for much more than its present requirements. The route of the Metropolitan Railway is from the junction of Market, Powell and Eddy Streets, along Eddy Street for five blocks to Hyde Street, along Hyde for two blocks to O'Farrell Street, out O'Farrell Street to Scott, Scott to Fell, Fell to Baker, Baker to Page and along Page Street to the Stanyan Street entrance to Golden Gate Park, with a branch from the junction of Page and Clayton Streets, along Clayton, Waller, Cole, Carl via J Street and Ninth Avenue to a southerly entrance of the Park. From this it will be seen that the system works into that of the Market Street Railway Company very well.

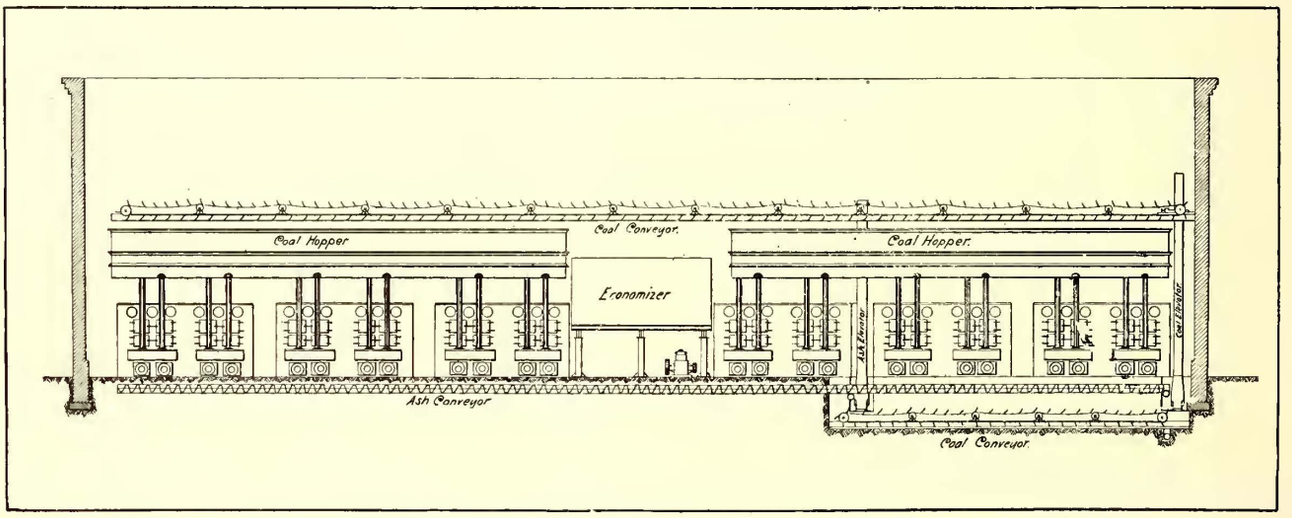


FIG. 10—LONGITUDINAL SECTION OF BOILER ROOM—ELECTRIC TRACTION CO, PHILADELPHIA.

The chief engineer of the Electric Traction Company is Capt. Edw. B. Ives. Axel H. Engstrom has general charge of the power house construction.

Boiler Accident at Indianapolis.

A gas explosion occurred in the boiler house of the Citizens' Street Railway Company, of Indianapolis, on August 31, at 3:50 P. M. As a result the eighteen inch brick walls surrounding the boilers on three sides were blown down, as well as the steam fittings upon the outside of the brick wall. The accident is attributed to the accumulation of gas under the boilers, though the gauge showed only four ounces pressure of gas and 125 lbs. steam. The boilers were guaranteed to stand a pressure of 165 lbs., and the company was allowed to carry a pressure of eight ounces of gas.

Under direction of General Manager McLean, masons and steam fitters were immediately set at work to undertake repairs. The work was prosecuted speedily, commencing Friday evening and continuing through Friday night, Saturday and Saturday night, Sunday and Sunday night, until 2 A. M. Monday, when all was finished, and at 11 o'clock the load was again put on the station.

The amount of the loss is not yet determined, but fortunately no lives were lost. One fireman received a scalp wound, and the chief engineer, who was standing with him in front of the boiler at the time, was considerably shaken up, but is on duty again.

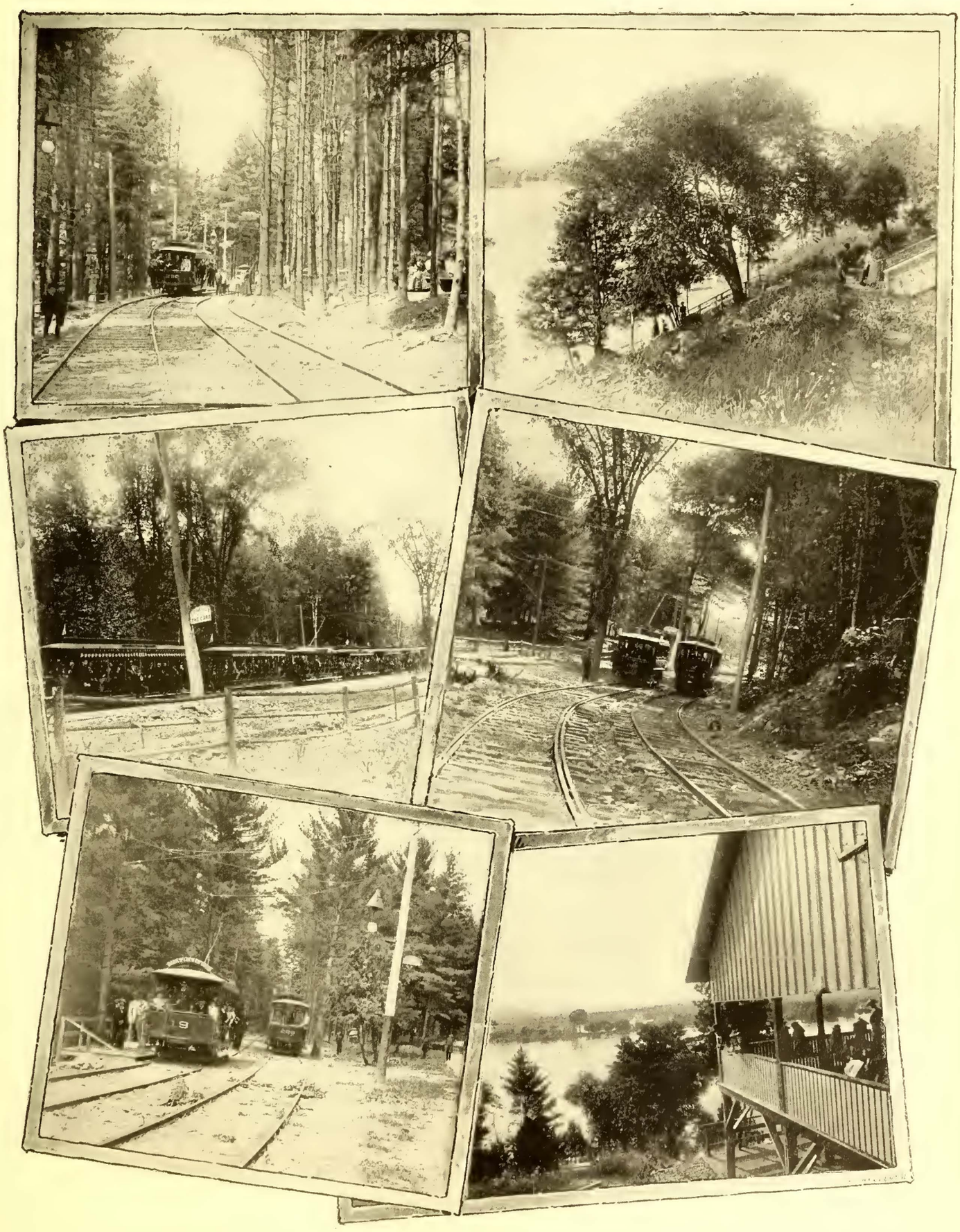
The power house of the Gettysburg (Pa.) Street Railway Company was destroyed by fire on September 10.

Rockliffe Park, the Summer Resort of the Ottawa Electric Railway Company.

The value of parks at the termini of street railway lines as traffic promoters is clearly recognized, and many street railway companies have found that an investment made in this direction is often repaid in a few years by the traffic induced. We have published in former issues views of different street railway parks, and present this month views of the Rockliffe Park, on the line of the Ottawa Electric Railway Company.

The park is situated about three miles east of Ottawa on the high bluffs overlooking the Ottawa and Gatineau Rivers, which have their confluence directly opposite the central portion of the park and thence flow through a charming country to the St. Lawrence and the ocean. The view from the park pavilion is claimed to be as fine as any on the Rhine. Looking west, the Laurentian Mountains rise to an altitude of several thousand feet, and slope gently down to the luxuriant farm lands of the Templeton district. On the mountain side is Kingsmere, the few months' home each year of Canada's Governor General, Lord Aberdeen.

The park properties, consisting of about a hundred acres of beautiful woodland, were purchased by the Ottawa board of park management this year, and will be improved from year to year without interfering with their natural beauty. The cars of the Ottawa Electric Railway run directly through Rockliffe Park, and give a three minute service during the summer. On an average, Ottawa's population of 50,000 visit the park every week. Every pleasant evening a band concert is given at the park, the announcement to the public that the band will play being made by means of pennants carried midway on the trolley poles of the cars during the day.



VIEWS AT ROCKLIFFE PARK, ON THE LINE OF THE OTTAWA ELECTRIC RAILWAY.

The Paterson, Passaic & Rutherford Electric Railway Company.

By Lemuel William Serrell, M. E.

This railway company, extending as it does from Rutherford, N. J., through Passaic and Paterson to Singac and the intermediate towns along the line, forms part of a trunk line system which will run in Hoboken from the Barclay and Christopher Street Ferries through Jersey City to Rutherford and Paterson. This line is now complete and in operation from Rutherford to Singac, which is about six miles west of Paterson, and the construction of that portion of the trunk line from Rutherford to the ferry, known as the Jersey City, Hoboken & Rutherford Electric Railway, is now nearing completion. These two roads when in operation will give a double track electric railroad all the way from Passaic to the ferries, a distance of fourteen miles; and a considerable portion of the line from Passaic to Singac is also double tracked. The entire line when completed will have its terminus at the Delaware, Lackawanna & Western Ferry, in Hoboken, to New York, and will run out into the country a distance of about twenty-six miles; and will go through fourteen cities and villages, having a population of about 400,000 people.

The president of this company is Charles A. Johnson, a banker of New York, and the treasurer is Gen. Louis Fitzgerald, president of the Mercantile Trust Company.

This line was designed and built by the writer, and the accompanying illustrations were taken at various points along the route. The Westinghouse system is used, and power is taken from the Edison Electric Light Company, in Paterson, on terms favorable to both companies, the average cost for power being only a trifle more than the company could produce the same by having its own plant. The entire line from Paterson to Rutherford, a distance of nine miles, is operated from the Paterson station; thirty-six miles of No. 0000 feed wire has been put up for the operation of this portion of the road, the feed wire being arranged in lengths as shown on the accompanying diagram. The total mileage of the line from Rutherford to Singac is about twenty miles.

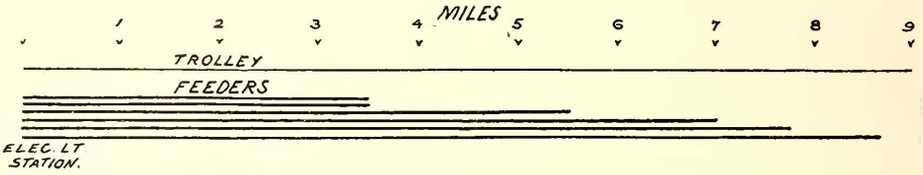


FIG. 2.—DIAGRAM OF FEEDERS—PATERSON, PASSAIC & RUTHERFORD ELECTRIC RAILWAY CO.

One of the illustrations in the group on page 613 shows the car house at Rutherford, of which there is also shown a plan view in Fig. 1. This car house was built on low ground, and about two feet of peat and bog was removed from the entire surface where the building now stands. A Howard clock in front of the building enables the conductors to set their watches without leaving the car. Each of the tracks in the building has a separate entering curve so that cars can be readily run out of the

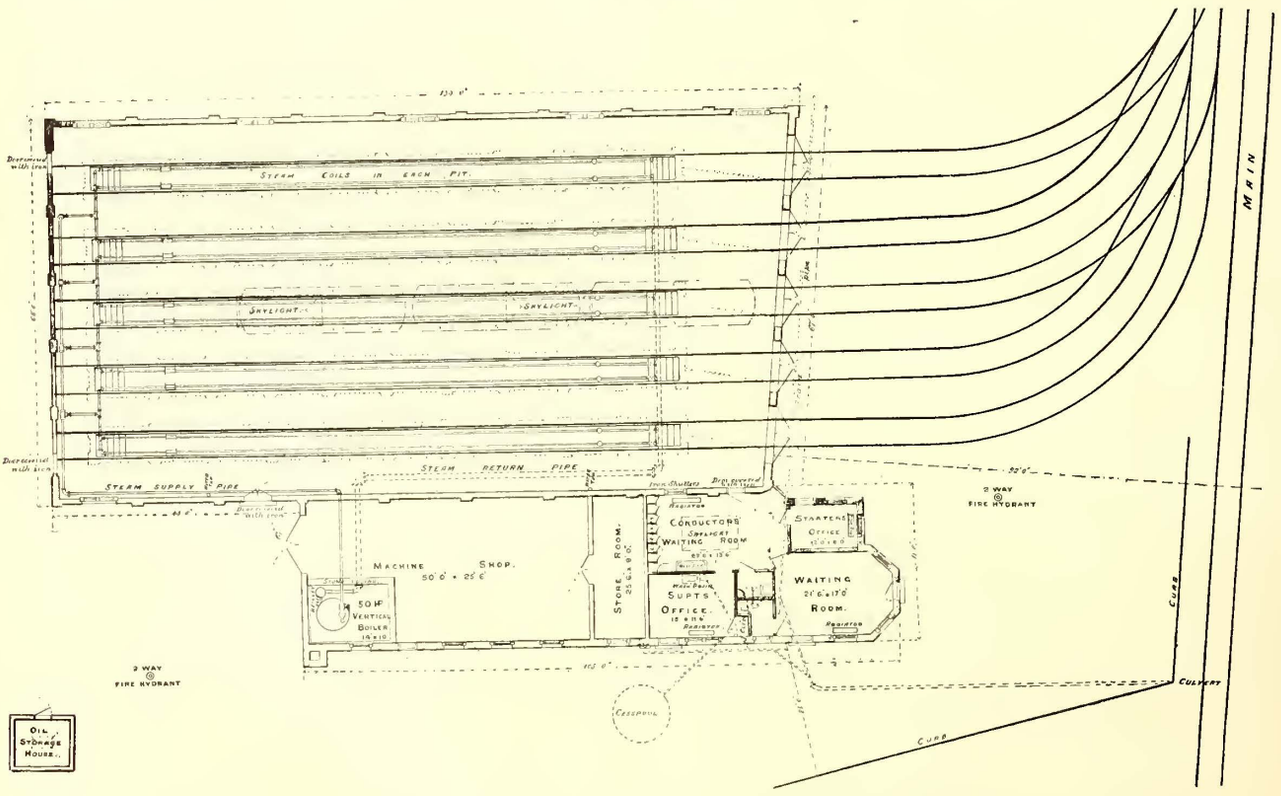


FIG. 1.—PLAN OF CAR HOUSE—PATERSON, PASSAIC & RUTHERFORD ELECTRIC RAILWAY CO.

Some of their associates in this enterprise are Charles Curie, of Curie, Smith & Mackay, New York; Ex-Senator Charles H. Russell, Thomas D. Jordan, comptroller of the Equitable Life Assurance Company, F. C. Van Dyk and James A. Morrisse, of Paterson, N. J. The company is a consolidation of five different companies, by which it secures a continuous line from Rutherford through Passaic and the heart of the city of Paterson to Little Falls and Singac.

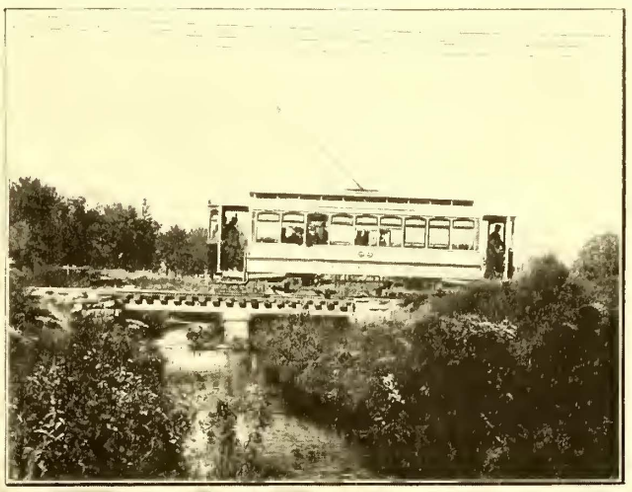
building in case of fire. The floor of the building slopes fifteen inches in 100 ft. from the rear to the front. This enables cars to run out by gravity in cases of necessity, such as fire; and the trolley wires are so arranged that the current can be cut off of the wires inside of the building by means of a switch on a pole outside at the street line. Pits are provided under the tracks the entire length of the building, and the bottoms of the pits, as well as the floor itself, are ofconcrete. The roof is of the iron trussed

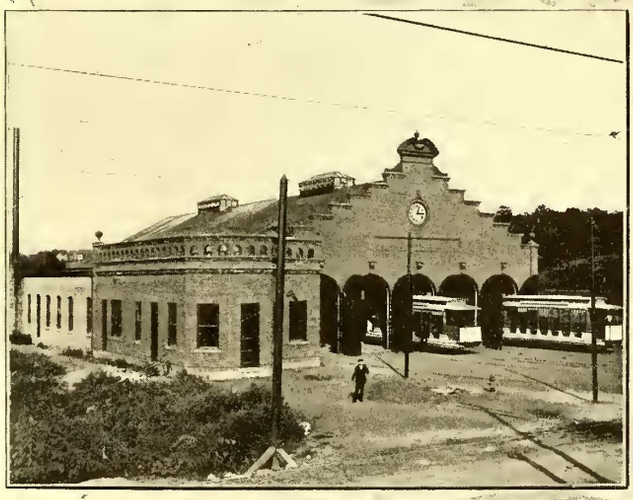
type, covered with corrugated iron, and the wing contains machine shop, store room and other rooms, as shown on the plan. A high pressure steam heating system has been put in having a gravity return. A fifty horse power, vertical boiler is used, the water being returned to the boiler by a Keiley trap. Two fire hydrants, one in the rear and one in the front of the building, are provided in case of fire, and connected with the water main in the street, which carries fifty pounds pressure. A separate building is provided for the storage of oil and other inflammable materials.

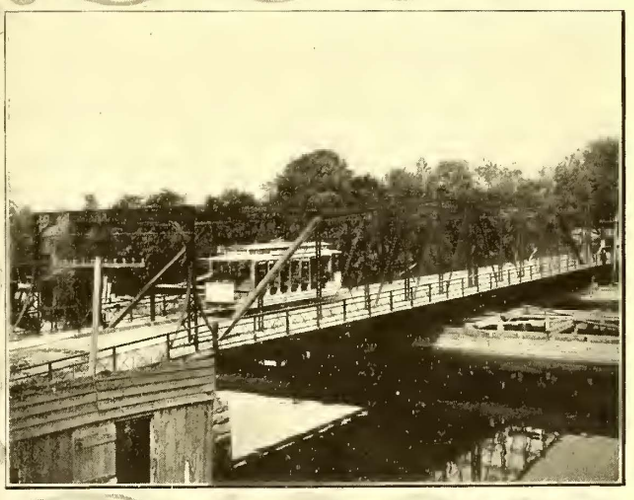
A second illustration shows a part of a retaining wall about 1,200 ft. long and ten feet high, which was built along the plank road between Rutherford and Passaic.

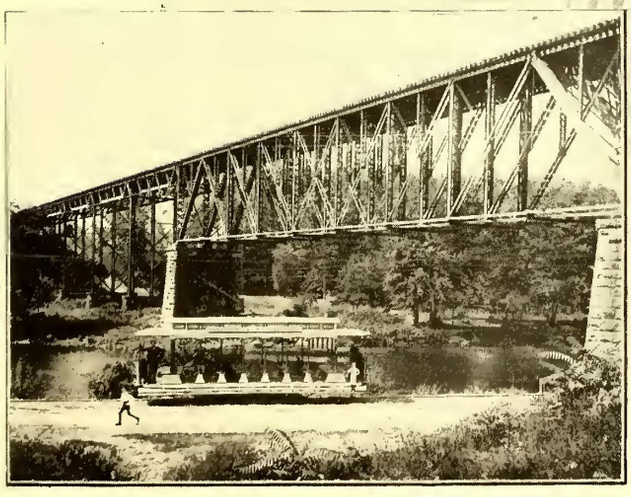
Another view shows the arrangement of the bents on the drawbridge over the Passaic River. A 500,000 circular mill, armored cable runs under the river and is connected with the feeders on each side, while a galvanized iron cable about one inch in diameter is run across the river for the ground return. Another view is taken on Main Street, in Passaic, and shows the Passaic & Newark Electric Railway lines and on the opposite side the Erie tracks.

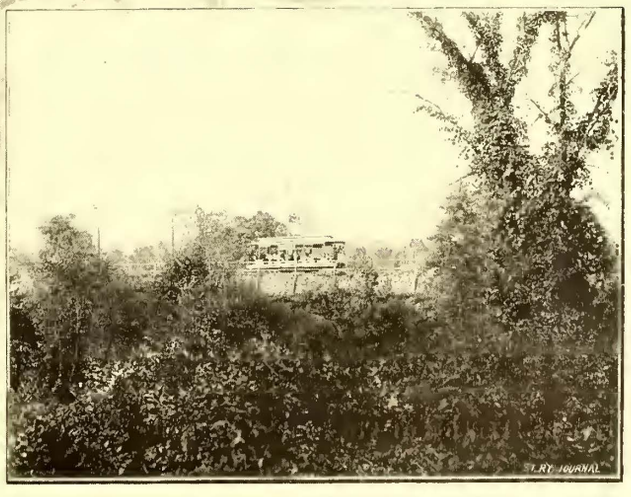
Between Passaic and Paterson for a short distance the railway company has its own right of way, and the











VIEWS ON THE LINE OF THE PATERSON, PASSAIC & RUTHERFORD ELECTRIC RAILWAY CO.

illustration in the upper right hand corner shows a small bridge built over the Weasel Creek. The line from Paterson to Little Falls and Singac runs along the bank of Passaic River and the route is very beautiful. The view in the lower left hand corner is taken on this portion of the line at the high bridge of the Delaware, Lackawanna & Western Railroad over the Passaic River.

The track in Paterson and Passaic is laid with seven and nine inch high girder rail, and the balance of the track is laid with a seventy pound T rail. 6 × 8 in. ties, seven feet long, are used. Octagonal wooden poles are used throughout for the overhead construction, except in the heart of the city of Paterson where iron poles are used.

Thirty-five cars are in use upon the line; and besides the car house at Rutherford, a car house is being built at Lake View, and is now nearly completed, which will hold twenty cars, and another car house located at Singac, now finished, which will hold twelve cars. The cars in use upon the line are of the Brill and St. Louis Car Company manufacture.

The road is capitalized for $800,000, and its earnings show a splendid income upon the investment. Some portions of the road have been running more than a year, and the entire system has now been in operation about three months. Credit for the successful carrying through of this undertaking should be given to its president, Mr. Johnson. The general manager of the road is A. H. Hayward, formerly manager of the Allentown & Bethlehem road, and under his judicious management the ultimate success of the road is well assured.

FIG. 1.—FEEDER SWITCHBOARD—NORTH HUDSON COUNTY RAILWAY, HOBOKEN.

THE Toronto (Ont.) Street Railway Company reports earnings of $87,666 for the month of August. Last year in August, the earnings were $89,436, the excess of last year over this being attributed to the military tournament during August.

THE Bristol Tramways & Carriage Company of Bristol, England, carried 13,000,000 passengers last year.

A New Feeder Switchboard.

A feeder switchboard, possessing several new and novel features, is shown in the accompanying illustrations. It has recently been installed in the Palisade Avenue power station of the North Hudson County Railway of Hoboken, N. J. It was designed by A. K. Bonta, the electrician and engineer of the company.

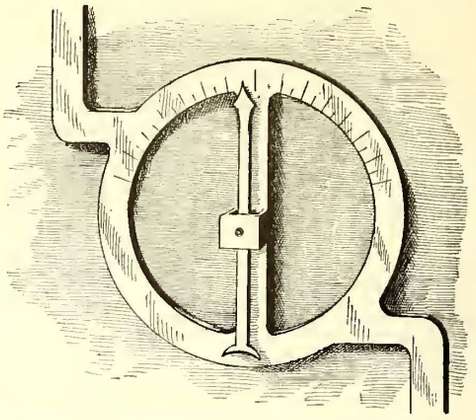


FIG. 2.—CURRENT INDICATOR—HOBOKEN.

The board is constructed of highly polished, quartered oak and is thirty-two feet long and four feet six inches high, with a horizontal shelf about two feet wide, extending the entire length. On this shelf are mounted the feeder switches. These switches were designed especially for this plant. They are of the quick releasing type and have double contact jaws with the lever hinged to the base between the jaws. One of the jaws is connected to the high speed plant and the other to the slow speed plant, both being employed in this station. There are sixteen sections, each section being provided with a circuit breaker.

Current indicators of a special design, shown in Fig. 2, are mounted on the board between the switches and circuit breakers. These indicators are circular in form, having an indicating needle mounted in agate bearings. They are calibrated to a standard instrument, and show the amount and direction of the current.

In the center of the switchboard is a desk on which is an electric call to the patrol station, and a telegraph instrument with which the man in charge can send an alarm to the patrol station in whose district trouble may occur.

All of the instruments are nickel plated, and the board presents a very attractive appearance.

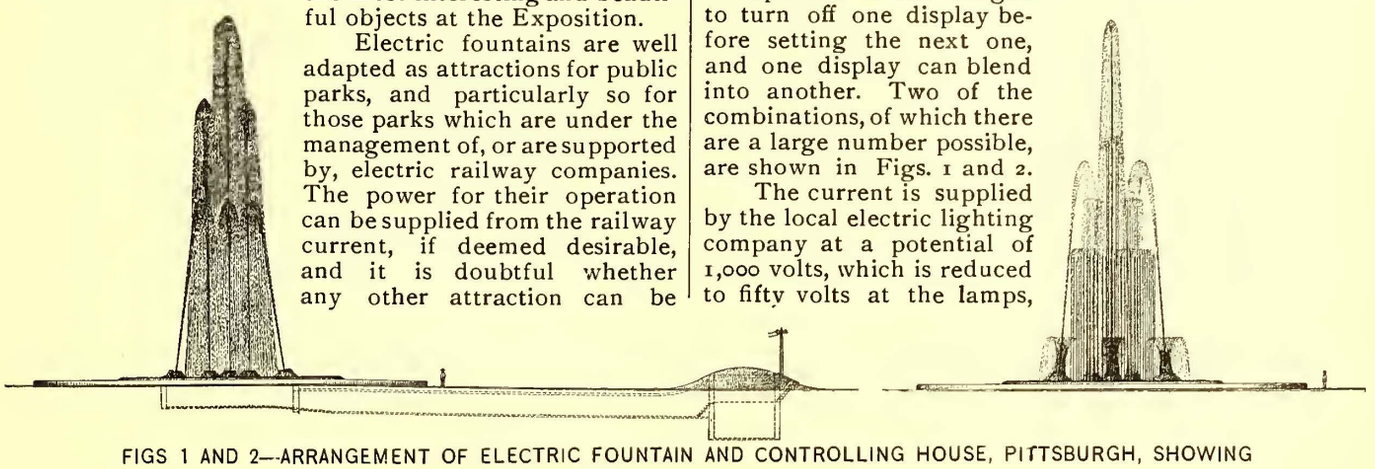
The First Electric Railway in Russia.

The first electric railway in Russia has been opened at Kiew, and has a length of about two miles, with grades as high as 9 per cent. The two generators used are of German make, each having an output of thirty kilowatts. They are driven by Otto gas engines of sixty horse power. The track is laid with stringer rails. American line appliances are used to a considerable extent.

New Electric Fountain.

All who saw the electric fountains at the World's Fair, Chicago, must have been much impressed with the beautiful effects secured by the electric arc light in connection with jets of water. While not the first electric fountains, those of the World's Fair were by far the largest and most elaborate which had at that time been constructed, and they deservedly were regarded as among the most interesting and beautiful objects at the Exposition.

Electric fountains are well adapted as attractions for public parks, and particularly so for those parks which are under the management of, or are supported by, electric railway companies. The power for their operation can be supplied from the railway current, if deemed desirable, and it is doubtful whether any other attraction can be installed for the same sum of money which would prove equally attractive. We illustrate on this page a new electric fountain, which was put in operation last month in Pittsburgh, Pa. Its cost was defrayed jointly by the Duquesne and Pittsburgh Traction Companies and the city of Pittsburgh.



FIGS 1 AND 2—ARRANGEMENT OF ELECTRIC FOUNTAIN AND CONTROLLING HOUSE, PITTSBURGH, SHOWING TWO POSSIBLE COMBINATIONS.

The fountain differs materially from those exhibited at the World's Fair. While larger than either of those at Jackson Park, Chicago, the method of operation has been much simplified so as to largely reduce the number of employes required to operate the fountains.

The fountain (Fig. 1) is located at Stanley Park, on the line of the Duquesne and Pittsburgh Traction Companies. Its approximate cost was $25,000, an amount somewhat in excess of that which would have been required had not considerable blasting been necessary. The height of the central jet is 200 ft., about fifty feet higher than that at the World's Fair.

The basin of the fountain measures 120 ft. in diameter, and the fountain jets will be lighted by fifteen 8,000 C. P. arc lamps, supplied by the Washington Electric Company, of Chicago. These lamps will operate on an alternating circuit of fifty volts. The pit under the foundation is forty feet square, and all the work required in the pit during the operation of the fountain can be done by one man instead of eight or more which were needed in the Chicago fountain.

The operating house is located at a distance of 100 ft. from the center of the fountain, as shown in Fig. 1, and one man can handle everything from that point From this house the different displays and colored lights are regulated by means of hydraulic power operating cylinders, instead of by hand power with directions telephoned from the operating house as in Chicago. The hydraulic cylinders for operating the color displays are each independent of the other and are operated by independent valves from the operating house so that a very wide variation in displays is given. Chapman valves of a special type are used.

Another important feature of the installation is that the operator is not obliged to turn off one display before setting the next one, and one display can blend into another. Two of the combinations, of which there are a large number possible, are shown in Figs. 1 and 2.

The current is supplied by the local electric lighting company at a potential of 1,000 volts, which is reduced to fifty volts at the lamps, which are put in multiple so that one does not interfere with another. The supply of water is taken from the city mains and is under pressure of 135 lbs. 13,000 gals. are used per minute.

All plans and specifications of the fountain were drawn by F. W. Darlington, of Philadelphia, who was also supervising engineer of the installation. The construction was carried on under the charge of Director Bigelow, of the Department of Public Works, of Pittsburgh. The pipe work was supplied by the Wilson, Snyder Company, of Pittsburgh.

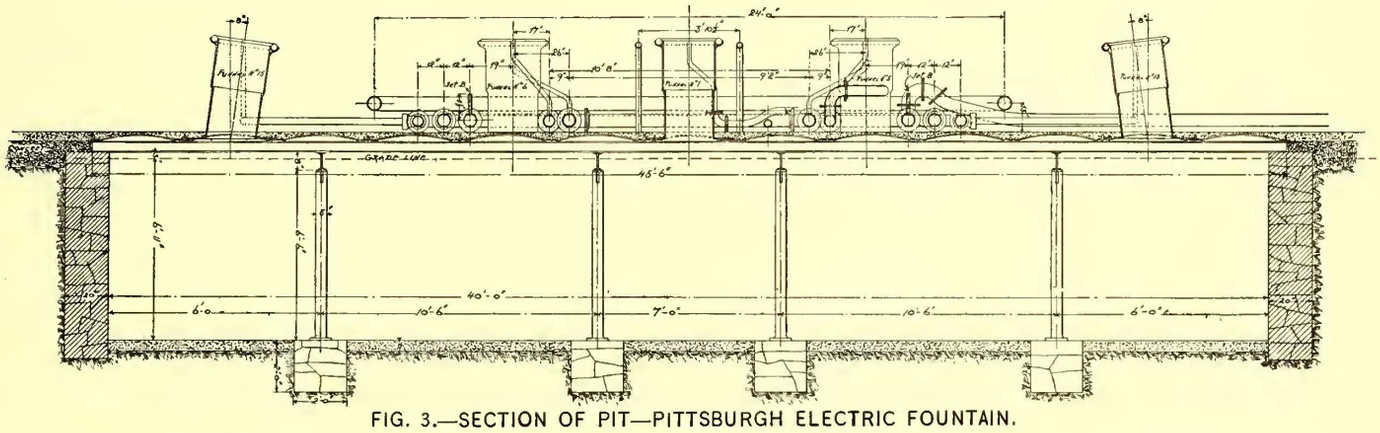


FIG. 3.—SECTION OF PIT—PITTSBURGH ELECTRIC FOUNTAIN.

A COMPARISON of passenger charges per mile on steam railways, from investigations of the Interstate Commerce Commission, shows an average in Great Britain of 4.42 cents for first class, 3.20 cents for second class, and 1.94 for third class. In France, the average is 3.85 cents for first class, 2.86 for second class, and 2.08 cents for third class. In Germany, the rate is 3.10 cents for first class, 2.32 cents second class, and 1.54 cents third class. In the United States the average charge is 2.12 cents. The average charges per ton per mile are as follows: Great Britain 2.80 cents, France 2.20 cents, Germany 1.64 cents, and in the United States one cent. The interest on capital invested in the several countries is said to be as follows: United Kingdom 4.1 per cent., France 3.8 per cent., Germany 5.1 per cent., Peru 5.3 per cent., Austria 3.1 per cent., Belgium 4.6 per cent., United States 3.1 per cent. Throughout the world it is 3.1 per cent.

First Annual Meeting of the Michigan Street Railway Association.

The Michigan Street Railway Association, which was formed in Grand Rapids last June, held its first annual meeting September 19 at Grand Rapids. Among those present were William Canham, W. L. Jenks, of Port Huron; David D. Erwin, F. W. Thompson, of Muskegon; George A. Hart, of Manistee; J. P. Lee, of Lansing; Hudson T. Morton, of Ann Arbor; David H. Jerome, of Saginaw; B. S. Hanchett, Jr., of Grand Rapids; G. S. Johnson, of Grand Rapids; A. G. Bowne, of Grand Rapids; Mr. Harry, of Bay City; W. Worth Bean, of St. Joseph; Garson Myers, of the Standard Railway Supply Company; L. E. Myers, of the Electrical Installation Company; F. C. Randall, of the J. G. Brill Company; P. F. Leach, of the Bass Foundry & Machine Company; W. S. Louttit, of Pullman's Palace Car Company; Ed. Kohler, of the Walker Manufacturing Company; Mr. Smith, of the Consolidated Car Heating Company.

The old officers were re-elected as follows: President, W. L. Jenks, of Port Huron; vice-president, W. Worth Bean, of St. Joseph; secretary and treasurer, Ben S. Hanchett, Jr., of Grand Rapids. Executive committee: The above officers and Strathearn Hendrie, of Detroit, and David H. Jerome, of Saginaw.

In the morning the guests were given a ride around the city in a special electric car, and an inspection was made of the power house and other points of interest. The meeting was called to order at 2.30 P. M. in one of the parlors of the Mansion House, and lasted until six o'clock. The subjects of the papers read were as follows: "Suburban Electric Railways and their Possibilities," by C. M. Swift, of Detroit; "Construction, Maintenance and Operation of Small Street Railways," by W. Worth Bean, of St. Joseph; "Street Railway Accident and Fire Insurance," by David D. Erwin, of Muskegon.

Each paper was discussed at length, and many new ideas in the management and maintenance of railways were developed. It was decided to hold the next annual meeting in Grand Rapids in September, 1895, and the meeting was adjourned.

In the evening the members of the Association held an informal banquet at the pavilion of the Grand Rapids Company at Reed's Lake, Mr. Bean was chosen as toastmaster, and a pleasant evening was passed by all. Speeches were made by ex-Governor Jerome, of Michigan, and Messrs. Jenks, Howard, Bowne, Kohler and Ward. Upon the return to the Mansion House after the banquet, further entertainment was offered the delegates by the supply men present.

A Change in Ownership of the Detroit Street Railway System.

The Detroit (Mich.) Street Railway system changed hands again last month, the interest of Thomas Nevins, of Orange, being purchased by a syndicate represented by R. T. Wilson & Company, of New York. The amount paid is not stated. The new directors of the company are: R. T. Wilson, M. W. O'Brien, Cameron Currie, Maj. J. M. Edwards, of New York; F. R. Pemberton, of New York; D. M. Ferry and John C. Donnelly.

The officers are as follows: President, J. M. Edwards; vice-president, M. W. O'Brien; treasurer, R. T. Wilson; assistant treasurer, George H. Russell, secretary, J. R. Sterling; general manager, J. D. Hawks.

Graphical Records of Street Railway Statistics.

By Russell Robb.

The profits of an electric road depend so largely upon the proper maintenance and operation of the power equipment that the need of keeping full records was soon appreciated. The modern plant is well systemized in all branches. It is an easy matter to collect data bearing upon the different elements of its operation, and one will usually find records of different degrees of completeness. It is very rare, however, that the full benefit of these records is taken advantage of. There is often the most complete data on coal consumption, watt hours output, car miles run and passengers carried, and yet the meaning of the figures lies buried in the records. It is there to be sure, if it is wanted, but the time never comes when there is leisure to work it up into significant shape. The superintendent may perhaps note that various items bear this or that relation to the same items in other cases, and there is, of course, better information about the running of the plant than if there were no records at all, but their full import, the evidence they give of a change of conditions or of the effect of one item upon another, is usually quite lost.

There is no doubt such a thing as getting wound up in statistics, and they do not always have the respect of practical men. The interminable calculations of "pounds of coal per kilowatt hour," "kilowatt hours per car mile," "car miles per passengers carried," etc., seem to absorb an unwarrantable amount of time, and introduce a useless amount of red tape. But if this information were easily secured, and in such shape that it could be quickly appreciated, no one would question the value of its instruction.

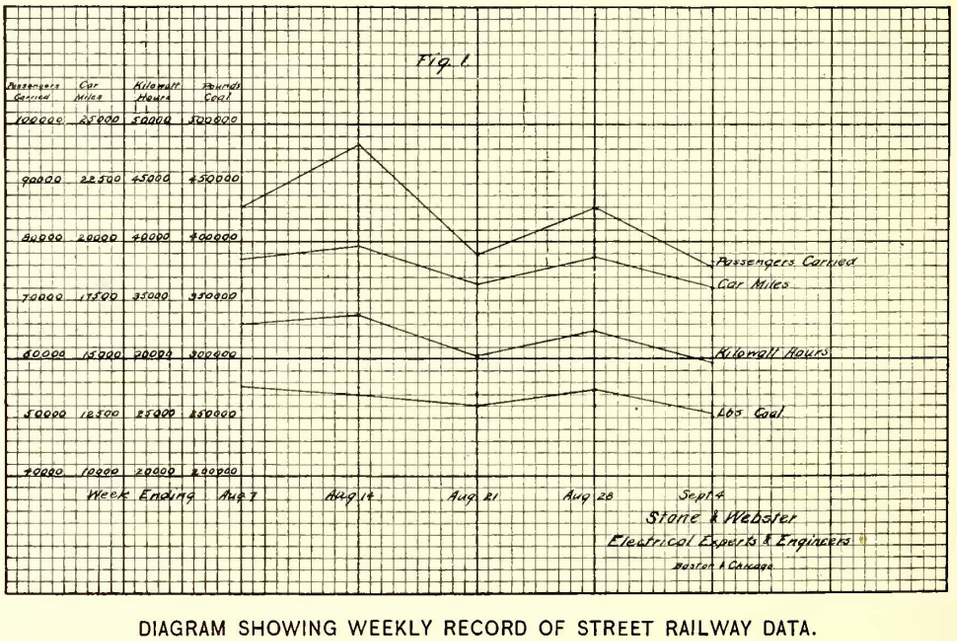


DIAGRAM SHOWING WEEKLY RECORD OF STREET RAILWAY DATA.

Graphical methods, which have so often added to the clearer understanding of other statistics, seem to give the better and simpler representation of street railway data that is needed. The plotting of the data in "curves" brings out very plainly conditions and relations that would hardly be noticed in the bare figures, and they are shown without the labor of making calculations. Those given herewith are from stations in operation, and so represent actual tests.

In Fig. 1 are plotted in four curves, passengers carried, car miles run, kilowatt hours output and coal consumption in pounds. The different curves are plotted on such a scale as will bring them conveniently near for comparison. Thus, while a unit length of an ordinate represents 50,000 lbs. of coal, it represents 5,000 kilowatt hours, 2,500 miles and 10,000 passengers carried. Each curve by itself will, of course, show the constancy or

change in the feature it represents. The growth or decrease in travel or the rise or fall in the consumption of coal, for instance, will be plainly illustrated as in any graphical representation. But by plotting the four curves together in this way additional information of an interesting and useful nature is shown quite as plainly.

Take, for example, the two lower curves, those representing the coal consumption and the kilowatt hours output. Under normal conditions these will run along together, nearly horizontal and nearly parallel. But suppose that it is found that the coal line is constantly coming nearer the kilowatt hour line (Fig. 2), and perhaps even crossing it. It is evident at once that the "pounds of coal per kilowatt hour" is increasing, that somewhere on the station side of the wattmeters there is decreasing efficiency. There may even be indications of the nature of the defect, for if the coal is changed and there is much difference in the quality, or if there is sudden depreciation of the plant in any part, there would be abrupt changes in the relative positions of the curves, while if the decreased efficiency were due to leaks in the cylinder gradually growing worse, or if accumulating scale in the boilers was gradually reducing the efficiency of the steam generation, the change in the relative positions of the curves would also be gradual.

In the same way the approach of the kilowatt hour curve to the car mile curve (Fig. 3) would indicate changes in the conditions outside the station, for it would show an increase in the kilowatt hours per car mile. This might be due to heavier traffic, and if so, evidence would be found in the relative positions of the car mile and passenger curves. It might be due to abnormal conditions of weather which could also easily be checked. But if there were a gradual decrease in the efficiency of the car equipments, or if the bonds were becoming disconnected and the losses in this way increased, the curves would give evidence of the trouble by their gradual approach.

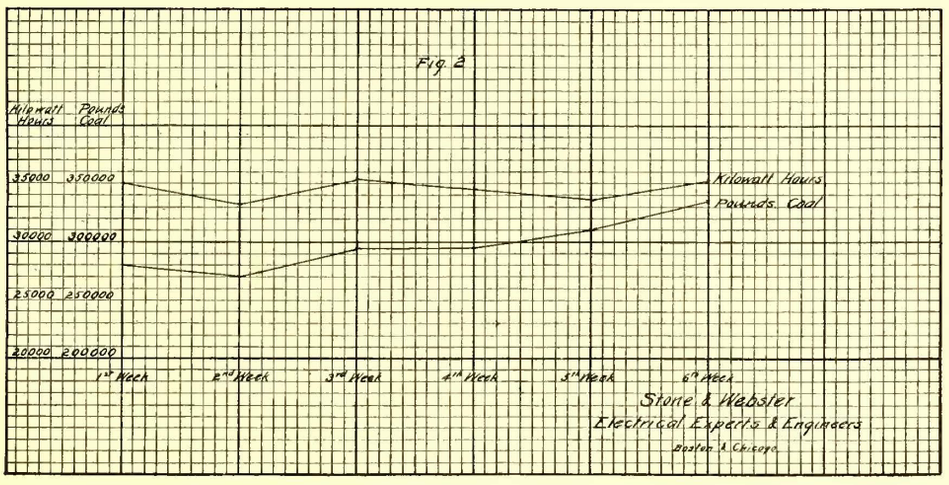


DIAGRAM SHOWING VARIATIONS IN KILOWATT HOURS AND LBS. OF COAL.

There would be shown too, with curves of this kind, the effect on the travel when more cars were added, the effect of the passengers carried on the power required, or the effect of increased speed, and all without any tedious calculating of results which, even when found, would perhaps be made more intelligible by plotting. The labor of keeping such curves up to date would not only be far less than that of calculating "pounds of coal per kilowatt hour," "kilowatt hours per car mile," etc., but would be little more than simply copying the reports. Each day, or for the sake of average values, each week, one more point could be added to each curve and connected to the rest with a pencil. But using crayons of different colors for the different curves, the relations are more plainly seen.

Such a plot does not, of course, give exact values, and the distance between any two curves would vary somewhat with the variation in the height of the ordinates, but this

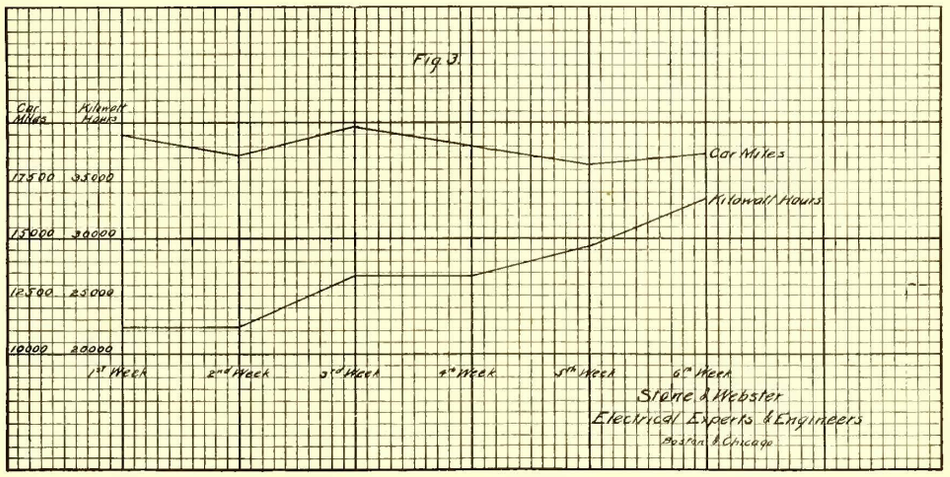


DIAGRAM SHOWING VARIATIONS IN KILOWATT HOURS AND CAR MILES.

could be made practically negligible, and there seems to be a genuine value in the *indications* that it can give. Such a chart would keep before a superintendent at all times, the general conditions under which his road was operating, and it would hardly be possible for serious depreciations to go on without his having immediate and striking evidence of it. There is at least one road where a chart of this kind would have shown many months before detection, serious losses in the power plant, and great increase in the output per car mile.

The Proposed Line of the Pennsylvania Traction Company.

The right of way between Harrisburg and Philadelphia for the high speed electric railway of the Pennsylvania Traction Company has now, it is said, been secured, with the exception of about five or six miles. The proposed line of the company extends from Harrisburg through Lancaster, Strasburg and West Chester to Philadelphia, with branches from Lancaster to Columbia, Marietta, Safe Harbor, Manheim, Terre Hill and Reading, from Strasburg to Quarryville, and from Parksburg to Oxford. The total length of the proposed line is over 400 miles, of which fifty miles are running and forty-three miles are under construction. The latter includes the lines from Lancaster to Lititz and Manheim and to Terre Hill and Ephrata. The portion now in operation includes the lines in Lancaster, and from Lancaster to Millersville, the system in Columbia, and the line from Columbia to Marietta.

The officers of the company are: President, ex-Senator John J. Patterson, of Lancaster, Pa.; secretary and treasurer, John P. Hertzler, of Lancaster, Pa.; consulting engineer, F. W. Darlington, of Philadelphia. Directors: John J. Patterson, John D. Skiles, J. Hay Brown and S. M. Patterson, of Lancaster, and Robert McMeen, of Mifflintown, Pa.

The Rochester (N. Y.) Railway Company has leased the line of the Rochester Electric Railway Company for a term of fifty years.

The Youngstown Street Railway Strike.

Youngstown is a city of about 40,000 inhabitants, and has always given evidence of being a very good railroad town, but, unfortunately for the town and its industries, it is largely governed by trade unions. The long contest between the Youngstown Street Railway Company and Division No. 6 of the Amalgamated Association of Street Railway Employes of America, which has just terminated successfully for the railway company, has attracted more than usual attention throughout the country, so that a brief history of the affair may not be without interest.

The first strike of this year on the line of the company occurred in March, following a reduction of twenty-five cents per day in the wages of one engineer. The men were out ten days, and finally came back after accepting a reduction of 10 per cent. right straight through, from the motormen up, the engineer in question accepting his twenty-five cents a day reduction, glad to get back.

The next strike occurred on July 9. After giving the company less than eighteen hours' notice, the Association handed Mr. Anderson, the general manager, a scale of wages to sign, including the following items: Conductors, motormen and swingmen to get sixteen cents per hour on week days and eighteen cents per hour on Sundays, 12 hours to constitute a day's work; engineers to receive $2.50 per day, firemen and machinists $2.25 per day, etc. The company was told that unless the scale of wages was signed before five o'clock A. M. on July 10, the road would be tied up. It was perfectly evident to the managers of the road that the company could never concede the advance of about 15 per cent. on its employes' wages, as it had been doing a losing business for a long time, and had long felt the necessity of curtailing the expenses wherever possible. The managers politely and firmly told the men that it would be impossible to concede their demands. Two or three minor rules, that the men complained of, which the company could change just as well as not, were at once changed. At five o'clock on July 10 but one man out of 120 employes reported for work. This one man, B. R. Shover, a lineman, deserves great credit, as he stood by the company through its long and bitter fight.

The striking employes timed the strike so as to do the company the most injury possible. Two of the very best days of the year would have been July 10 and 11, as upon these days occurred the State Convention of the Christian Endeavor Society, and on July 10 Barnum's circus was in town. After due consideration General Manager Anderson and Superintendent Hazelrigg concluded to fight it out, and while it was a very costly luxury the result now justifies the means. The company now has the control of its property, which it never had before. For fourteen days not a man offered to return to his work and not a wheel turned. The company then began hiring men to take their places. It had over 200 applicants for situations. Many were men of long experience in electric motor traffic in other cities. A number came from Indianapolis, most of whom were old members of the now defunct Street Railway Employes' Union of that city. The result was that after lying idle for two weeks the company found itself with an entire new force of men, all of whom have developed into first class operators.

After being shut down for fourteen days, the company began operating its entire system. But little resistance was offered by the strikers, only one conductor was seriously injured, and, although cars were repeatedly stoned, no great damage was done. Then set in one of the most extensive boycotts ever inaugurated. While the daily papers and the business men of the town would admit the justice of the street railway company's position, they became helpless through the organized efforts made by the unions. The merchants were served notice that if they patronized the street cars the unions would withdraw their trade. In the case of the daily papers, to their credit it must be said, they did all in their power to convince the strikers that their position could not be maintained, and we wish to say that it is decidedly refreshing to find the local press for once on the side of the street railway company in its fight against a strike.

The different trade unions imposed a fine of $1 upon the members each time they were caught riding on the company's cars. To show better how much in the hands of the labor unions the city of Youngstown is, it is only necessary to call attention to the fact that the Mayor, City Clerk, all the policemen, and almost all of the other public officials have complimentary passes, but they became frightened and refused to ride.

While the company was running its full equipment, and employing over 100 men, the receipts were nominally nothing. From $60 to $75 was the average day's receipts for six weeks. The new men gave excellent satisfaction, but though the company was doing business at a fearful loss, it was not the only sufferer. The merchants in the city felt the strike very much, and sought for means to bring it to a close. All the business men of the city finally held a meeting, and passed a series of resolutions, which were submitted to the company. These requested the company to submit the entire question to the arbitration of three judges of the United States District Court, and the merchants pledged themselves morally, and otherwise, to the side which would agree to the provisions.

The managers of the railway company did not think it was exactly right to give up their position in the strike, as they knew they were in the right, as their old employes had left them without cause, and a new force of men, which was giving entire satisfaction, had been hired. This new force was operating the road as well as any set of men possibly could, but the people of the city would not ride, and it was thought that if the company could get the influence of the business men of the city, it would perhaps assist in breaking the backbone of the long continued struggle. All of these points were very carefully taken into consideration by A. A. Anderson in his answer to the merchants, in which he accepted the proposition. It was rejected by the men, however, and the pledges of the merchants counted for nothing. Thus the fight was prolonged. But dissensions began to take place among the striking employes. They saw that their positions were being well filled by strangers, some of their families began to suffer, and with some it was work or starve. A few of the men finally made written applications for their old positions. The company finally hired a few of their old men; then a regular stampede began, and the backbone of one of the most remarkable boycotts ever witnessed was broken. The union, as a union, made all kinds of overtures to have the men taken back and given their old positions, but in each case the company refused to even listen to them. Their reply was, "We have all the men we want, and until vacancies occur, will have no use for more men."

Out of 120 men now in the service of the Youngstown Street Railway Company, but twenty-seven are men that were formerly employed by it. Out of 200 applications the question of wages was only raised by two. Thus it will be seen that the men were glad to get back on any terms.

After the strike was hopelessly lost to the union, the unions of Youngstown officially declared the boycott off, and to show how successful the boycott had been, it is only necessary to make the following statement: On the last day of the strike, the company's gross receipts were $65. The first day after the boycott was declared off the receipts were $95, the second day, $160, and the third day the receipts reached their normal condition.

Thus ended one of the most useless contentions between the employer and the employed ever witnessed. The railroad company lost thousands of dollars in loss of business, the employes lost good positions and thousands of dollars in wages, while the city of Youngstown is also seriously injured both in prosperity and reputation.

Mr. Anderson, the general manager, says the new men are doing extremely well, in many cases much better than their old men did. He says their repair shop shows a decrease of nearly 50 per cent. in equipment needing repairs.

Correspondence.

Communications on all subjects of interest to street railway managers are solicited. Names of correspondents may be withheld from publication if desired, but must be known to the editors. The correspondent alone is responsible for his statements and opinions, not the editors.

Eighth Annual Meeting of the International Street Railway Association.

On Board S. S. "Persia,"
Atlantic Ocean, September 4, 1894.

Editor Street Railway Journal:

In this practical age of ours one must needs make an apology or give a reason for everything he does, and so at the outset my reason for writing to you is, to oblige the friend who asked me, that is, yourself. The reason I went to Europe is this: Ever since the organization of the Union Internationale Permanente de Tramways I have been annually invited by T. Nonnenberg, Esq., the general secretary, to attend the General Assembly. This union is to the continent of Europe what the American Street Railway Association is to the United States and Canada. It likewise holds one general meeting annually. A very pleasant friendship had sprung up between the secretaries of these societies, cemented by other, as well as professional, relations, and I was specially desirous of meeting my friend personally.

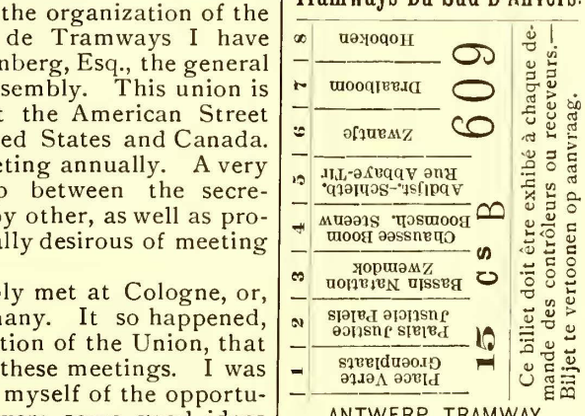
This year the General Assembly met at Cologne, or, as the Germans call it, Köln, Germany. It so happened, for the first time since the organization of the Union, that I could get away to attend one of these meetings. I was not slow, you may be sure, to avail myself of the opportunity, especially as I believed there were some good ideas to be obtained from attending the Cologne meeting, which would be helpful to our American Association.

Accordingly, I set sail for Hamburg on Friday, July 27, and after an uneventful voyage, the ship sailing, as it were, on the North River all the way, we reached Queenstown the second Sunday following. Leaving 140 steerage passengers there, we encountered the only rough sea on the whole trip, which lasted as far as the English Channel. Two days later, having sailed across the lower end of the North Sea, we arrived at Hamburg, much rested in mind and body. I say we, for I have been accompanied by my eldest son, a lad of nineteen, a six-footer, by-the-way, earnest, thoughtful and ambitious, with eyes and ears open for all that came his way.

Europe, every nook and corner of it, has been so often described by readier pens than mine, why should I stop to tell of our trip ere we reached our objective point, Cologne? And yet I cannot pass it by without so much as saying a word; perhaps more than a word. I was greatly impressed with the beauty of Hamburg. Bordering on the Outer and Inner Alsters (two connecting lakes in the heart of the city affording a circumference drive of three miles), are many very handsome residences set, as they are, in gardens of rare flowers, laid out with exquisite taste and tended with the greatest care. The Dutch cities, Amsterdam, the Hague and Rotterdam, all of which we saw hastily, are "queer, quaint and curious." Cities abounding in canals, taking the place of streets, are not plentiful in America, and they appeared very strange to us. The windmills of Holland are a characteristic feature of the Netherlands—you see them everywhere. Perhaps no country has its soil more faithfully and plentifully irrigated than Holland.

At Antwerp, that quaint old city, in its ancient Cathedral is one of the most renowned, if not indeed the most celebrated painting in the world, "The Descent From the Cross," Rubens' masterpiece. There is in progress there, as you know, an International Exposition of great merit. Not so great as our World's Fair at Chicago, to be sure, its buildings not to be mentioned in the same sentence, but notwithstanding, a great collection of the world's handiwork, such as a week would not suffice even to begin to see.

Brussels is a city beautiful in situation, in the lofty grandeur of its public buildings and charming parks. Here, as in Hamburg, electricity has a foothold in the matter of surface traction. One from America is impressed with the statement that on the whole continent there are but 260 kilometers of overhead electric construction, while in America there are 9,600 kilometers! This is the more remarkable when it is remembered that electric traction had its birth in Europe. For the most part the cars are drawn by horses; oftener one horse than two, but always with a conductor, and the cars are usually smaller than our two horse cars, though larger than the one horse car in America. When the fare is paid the conductor invariably gives a ticket to the passenger, on which is marked the point of boarding. This ticket must be kept, and is subject to inspection by a ticket examiner later on, who takes your ticket, looks at it, in some cases tearing off a small piece, and then returns it to you. I wonder how Americans would like to have this system imposed upon them. I am surprised to see how quickly the conductor is able to collect the fare, make the change, open his ticket book, mark the boarding point with his pencil, sometimes marking the point of destination also, put away his pencil, detach and hand the ticket to the passenger. A perfect system for the company, but rather too much of a good thing for an American to be obliged to carry a ticket as an evidence that he has paid his fare, under penalty of paying again, should his ticket be lost.



ANTWERP TRAMWAY TICKET.

Thus quickly have we reached Cologne and become domiciled in the Dom Hotel, one of the finest hostelries on the Continent and just under the shadow of the great Cathedral. This was the favorite hotel for the delegates from other cities, so we felt that we were "in the swim," especially when we saw our names published in the list of those present, which included representatives from no less than ten countries.

We were most cordially and hospitably received. The great sister association across the ocean was being honored in their royal treatment of one of its officers, and nothing was too good for us. To all the meetings, excursions, collations and banquets, the latchstring was always outside the door for us, and we had but to walk in and be at home, so brotherly was the greeting.

When the opportunity came at one of the banquets, I expressed my heartfelt appreciation of the kindness and courtesy so generously and considerately bestowed upon us, and recognized therein the honor paid the American Street Railway Association. I had in a measure anticipated the consideration shown me, and had learned a poem entitled "Dem Vaterland." I knew it, as we used to say when children, "by heart," and so I put my heart into its recitation. What was my delight at its conclusion to have gentlemen, and ladies too, come from all parts of the room to clink glasses with mine, in response to my toast to "The Fatherland."

One friend said: "Sie haben den Vogel geschossen," meaning as we would say, "bagged our game," while another said to me he could not find language to express his feelings, adding that he had not been so moved before in fifteen years. How was that for America and the American Street Railway Association?

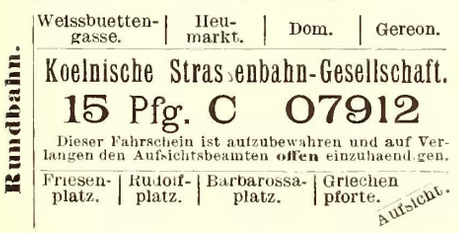
Everywhere in Europe an American is impressed with the fact that a European enjoys life as he goes along. He has learned the lesson that Young America has not yet learned, that "all work and no play makes Jack a dull boy." So in the annual Union meeting he works in the morning (neither does he play while working) and when the morning session closes, his pleasure begins. The rest of the day and evening are devoted to excursions and delightful social gatherings, in which wife and sweetheart join, to make the occasion a lasting memory through the year, and mayhap for all time.

Pardon the digression, but will the trip to Mt. Vernon and Marshall Hall ever be effaced from the memory of

those who had that rare pleasure on that perfect October day? Not while reason lasts. You will remember my conversation with you on this point in connection with the meetings of our Association, that the annual meeting should last nearly, if not quite, a week, so that the business in hand should not be made such hard work, but really all of it, business as well as the excursions, be a pleasure and delight. Instead of the hurried, rushing work we, because we are Americans, are in the habit of doing at our meetings, let us, like the Europeans, make them hereafter equally enjoyable as theirs. Why not?

Does not the man who journeys from San Francisco to Boston, to attend a two days' session, consider that he has paid rather dear for his whistle? How much more interesting too would the exposition of street railway supplies be made with a week's exhibit, than with one lasting but a third of that time!

The Continental Union started its meeting on Monday morning with an all-day excursion, visiting the electric tramway of Remscheid, the electric cog-railway of Barmen and the Barmen-Elberfeld Tramway installation. This was in every respect a delightful and memorable trip. From Tuesday through Friday there was a session every morning from 8 : 30 until 1 o'clock. An early hour to begin you will say, but that is the European way, and then there was to be but one session a day, and important subjects were to be reported upon and discussed. Under a similar plan of one session a day in America, I should be in favor of commencing at, say, 9 o'clock. Tuesday afternoon was devoted to visiting the street railways and their plants in Cologne. The newest open cars in the company's service were gaily decorated with greens and flowers. It would have done your heart good to see the horses, they looked so handsome in their new harness; and the drivers and conductors, all in new uniforms of a bluish gray, made altogether a sensation, as the party passed through the streets of the famous city. Cologne, let me say, once famed for its dirt, is now one of the handsomest cities in Europe, its new residence quarter, developed within the last fifteen years, comparing favorably with that of any other European city. The character of the pavement, its smoothness, whether of stone, wood or macadam and its scrupulous cleanliness, in nearly all foreign cities, impresses one most favorably. Surely in the matter of frequent slushing of gutters from the water mains, as well as in the building of perfect roadways, America has much to learn from Europe. If the state of civilization of a people be gauged by its roads, Europe is far in advance of America. Whatever question there may be as to the former part of the proposition, there is none at all as to the latter. Wednesday afternoon was occupied in visiting manufacturing establishments at Ehrenfeld and Dentz, which were replete with interest and instruction.



TRAMWAY TICKET—COLOGNE.

Thursday afternoon was the red letter day of the meeting. After an hour's ride to Bonn we were taken by the Bonn tramway and steam dummy road, skirting the romantic Rhine, to Mehlem, where we were ferried across the river to Königswinter in the heart of the Rhineland. From here we made the ascent by a cog railway to the summit of Drachenfels, one of the Siebengebirge (Seven Mountains), where a sumptuous lunch was provided. After making the descent, we ascended, also by a cog railway, Petersberg, another of the Seven Mountains, and from its summit obtained a never-to-be forgotten view of the Rhineland as it stretched out for miles and miles before our enraptured vision. After the banquet each carried a lighted Chinese lantern down the mountain to the river, where we all boarded the Rhine steamer "Elsa." Rockets, bombs, Greek fire and guns saluted us at different points along the river. We reached Cologne about midnight, after a day of unbounded enjoyment.

Friday afternoon was given over to individual visitation of the curiosities of Cologne, and in the evening the official banquet was given at the Casino. It is needless to say the dinner was fit for the Emperor. Ohligsberger of the vintage of 1886 and Ranenthaler of 1884! Brothers Kerper and Sage and Odell, why were you not with me on that "rich, rare and racy" occasion to help me out? "The feast of reason and flow of soul" continued long into the night, and it was a joyous occasion to me, no longer a stranger in a strange land, but one of a company of friends. Many expressed the desire that the American Street Railway Association would some time invite the Union to attend one of its annual meetings. One gentleman said to me "That would be an International Union, indeed." Were such an invitation extended, say, a year or more in advance, I have no doubt that several would make strong efforts to attend.

Saturday was devoted all day to either of two excursions, one to visit the steel works of Hoerde and the electric tramway at Dortmund, the other to visit the Phœnix Steel Works at Laar, and the electric tramway at Essen. You paid no money, and you took your choice just the same. Thus was the week spent. Briefly only have I sketched it, for even the Street Railway Journal, with its hundred or so pages, has a limit for such a communication as mine.

One feature of this Union I am led to remark upon, namely, the membership of individuals. There are active and associate members. The active members are the tramway companies only. The associate members are individuals or firms or companies, other than tramway companies. The fees for both classes are the same. The discussions are participated in by the representatives or delegates of active members only, unless associate members are requested to take part. Voting on all questions is confined to the representatives of active members only.

I made diligent inquiry in regard to this dual membership, and was assured that it was altogether satisfactory. "The proof of the pudding's in chewing the string," and hence, on the lines laid down by the European Association, associate membership may become helpful, strengthening the Association, bringing many into closer and more friendly relations by their becoming an integral, actual part of the society.

I believe that my visit to the Eighth General Assembly of the Union Internationale Permanente de Tramways has been of lasting benefit to me, and I trust will inure to the advancement of the best interests of the American Street Railway Association.

I am consciously proud of the fact that our Association deservedly stands the peer of any industrial society in the land. In the administration of its affairs, its officers have always kept it, "like Cæsar's wife, above reproach," and not only jealous of its integrity, but have steadily sought to raise the Association to the highest standard.

But as Aunt Samantha, Josiah Allen's Wife, would say: "I'm ruminatin," and as my letter is already too long, I must hasten.

From Cologne to Strassburg. What shall I say of the Rhine! Its ivy clad castle ruins of centuries long past; its "Bingen, fair Bingen," and a hundred other like pretty villages; its vine-terraced mountains; in a word, the embodiment of romance and the picturesque. Better to have said nothing, than to have said so little, you will say.

Antwerp has her Cathedral, Cologne her Dom and Strassburg her Münster. I climbed the towers of all three. The first two call for steady plodding; the last for the sailor's nerve, until finally you stand on the very pinnacle, and look out upon a picture that repays the weary effort and the test of grit. And the clock, that marvel of human genius! We stood with uncovered heads and watched the figures in their lifelike movements; the planets in their relative positions with respect to the sun, the wondrous mechanism that works out to a second more calculations in which time is concerned, than can be enumerated in the space covered by this letter, long as it is; and then remember that it is adjusted for 1,000 years, and you will not wonder that we journeyed 300 miles to see it.

Paris, the gay city of the continent. Two days there!

Why did we go there at all when we could stay so short a time? "Better have loved and lost than ne'er to have loved at all." The sands of inexorable time were fast running out when we must be again on the sea speeding homewards. August 28 our ship was to sail. We must see what we can of Paris; and we saw much. The Eiffel Tower with its summit in the clouds! What profound respect must one have for this triumph of engineering skill! Not that it is beautiful, but mighty and soul stirring as you mount higher and higher, by foot as high as you can, and then by elevator until you are as high as the pigeon seldom flies, 900 ft. above the ground, or three times as high as Trinity steeple, New York.

Memory carried me back to twenty-four years almost to a day. Sunday, September 2, 1870, the day the Republic was born, the day after the battle of Sedan, when a young fellow in an excited Parisian crowd. The gates of the Tuileries gardens opposite the Place de la Concorde, were broken in, and we rushed down the long avenue, the military on the Palace steps, instead of shooting, permitting us to pass through the Chamber of Deputies and out on the square beyond. An eventful day indeed.

Now again I stood in Paris on a Sunday morning at the same hour of the day, and saw within the once Imperial Gardens a candy woman selling cheap cakes and fruit for a sou up, and my mind reverted to the rocket-like splendor of Napoleon's empire; of the beauty of Eugénie, of the brave Prince Imperial, and then of their ignominious downfall and death, and those lines of Gray forced themselves upon me:

"The boast of heraldry, the pomp of power,
And all that beauty, all that wealth e'er gave,
Await alike the inevitable hour.
The paths of glory lead but to the grave."

"Ruminatin' agin!" It is harder to stop sometimes than to start. When your eyes meet these lines I will be again, God willing, "in the land of the free and the home of the brave." Sincerely yours,

WM. J. RICHARDSON.

Recent Improvements in Cable Traction.*

BY G. W. MCNULTY.

While the title of this paper is very general, it must be understood that the paper will be limited to a description of those improvements which have been embodied in the Broadway cable road of New York City. This limitation will perhaps appear reasonable when it is understood that the most recently completed road on the most important thoroughfare of the New World might naturally be expected to contain all the latest improvements. Indeed, in view of the writer's connection with the Broadway road from start to finish, he could hardly describe as an improvement something not used on that road without having to explain why it was not used—a task that might sometimes be awkward and occasionally invidious.

What, therefore, are considered to be the more important improvements adopted in the construction will be briefly described under the following heads:

1. Power Houses. 2. Power Plants. 3. Cables. 4. Vault Work. 5. Track Work. 6. Cars. 7. Car Barns.

It must be distinctly stated that originality is not claimed for these improvements. Many of them had already been used on other roads, but not so long that they could not properly be called "recent." Also of those used on the Broadway road, the writer, while he had to decide as to the adoption of all, does not claim to have originated all, or even most of them. He was fortunate in being able to surround himself with able assistants, and to their suggestions many of these improvements are due. It is, however, very difficult to give exactly due credit in all cases for improvement, often the outcome of prolonged discussion and experiment, and to avoid possible injustice to any, the above general acknowledgment will alone be made.

To those who may not think that some of the devices hereinafter described are improvements at all, it can only be said that perfect unanimity of opinion on such points is not to be expected, and if, in adopting and describing such devices the writer is only credited with having honestly exercised his best judgment, and incidentally adding something to the sum of our knowledge of that difficult subject, the cable road, he will be more than satisfied.

1. *Improvements in Power Houses.*—As the upper part of the Houston Street power house was to be rented for store and office business, it was important that no vibration from the machinery should be perceptible above the basement. Also, as the driving plant had to be installed and started before the building was completed above the first floor, and was everywhere pierced by columns supporting the upper floors, there was danger that with the imposition of the additional load of eight more stories, the compression of the soil might disturb the machinery foundation and throw the shaft bearings out of line. Fortunately, the remedy for both evils was the same, namely to isolate the column foundations, which were composed of "I" beam grillages resting on concrete. This was accomplished by surrounding each foundation by a steel cylinder driven to its full depth, six feet, into the sand. The machinery foundations rested entirely on the sand outside of the cylinder, and where necessary the column foundations were bridged over by "I" beams. The cylinder made a sort of slip joint between the sand inside and out, so that they could settle independently of each other. The result was very satisfactory. There has been no trouble from vibration, or disturbance of the alignment of the shaft bearing.

The ventilation of the power room of the Houston Street station was a somewhat difficult problem, which has not indeed been entirely solved, but it may be of interest to note the provision originally made for it. The power plant occupies the entire basement, which is about forty feet deep, and almost entirely below the street level. It is in plan about 125 × 200 ft., the side and both ends fronting on the street. The boiler room extends across the rear of the basement, and is separated from the machinery room by a brick partition, in which four openings were left for as many disk fans of an aggregate capacity of about 200,000 cu. ft. per minute, sufficient to change the air of the entire machinery room every three minutes. This would undoubtedly have kept the room comfortable in the hottest weather. The air was to be discharged into the boiler room, where it would have had the effect of assisting the draft, as well as reducing the temperature, since being drawn so rapidly through the machinery room, it could not become much heated in transit. To insure a uniform circulation of the cool air, it was to have been drawn in through openings just above the front sidewalk. Suitable screens, and if need be, the use of the front walk for a settling chamber, were relied on to obviate any trouble from dust. Air could also have been drawn down from the roof of the building through the shaft containing the cylinders of piping for the hydraulic elevators, but while a cool and a purer supply could thus have been obtained, it would, from the location of the shaft, have required ducts in the basement to insure proper distribution, and there would have been danger of piercing the cylinders, etc., in cold weather. The first plan of moving the air in mass from front to rear, by forcing it through an otherwise airtight partition, would, it is believed, have given good results, and, as far as known, is novel.

Provision for the health and comfort of the men was also made by ample bathrooms and convenient and well ventilated clothes lockers.

At the Houston Street station the coal was dumped into vaults under the rear sidewalk wall, which were high enough above the boiler room floor to permit the coal to run out into wheelbarrows from which it was shoveled into the furnaces, the only handling it received in ordinary circumstances. Hoppers under each furnace discharged the ashes into wheelbarrows whence they were dumped into the foot of a link belt elevator and raised to a bin from which they were discharged into carts in the rear driveway, all without handling. A reserve of several hundred tons of coal is kept in some lower vaults from which it can be wheeled to the elevator above mentioned, and raised above the driveway and discharged by a chute into barrels on the boiler room floor. An important part of the equipment of a power house is the system of hoists by which, not only the repairs and renewals of the plant, but also its installation is vastly facilitated. The time saved by such appliances is of special importance, where, as on the Broadway cable road, no stoppage of the machinery can be permitted.

At the 51st Street power house, where there were no columns, it was easy, by means of trolleys running on fixed and traveling beams to command every part of the room, and by the use separately or in combination of a five and a ten ton hoist to lift and transport any weight up to fifteen tons.

This arrangement has practically nearly the convenience of a large traveling crane at very much less cost and has the additional advantage that it can be used in two places at the same time, and cannot be disabled by a single breakdown.

At the Houston Street power house the multitude of columns, combined with the limited headroom, made any complete system of trolley hoists out of the question, but by placing a trolley girder over the line of the engine shaft, and one over each line of the cable driver shafts, and a pair of trolley girders over the jackshaft, it was possible to lift any portion of these shafts or their attachments, and carry it to the side of the room where it could be conveniently got at, or removed. By a combination of four ton hoists it is possible to lift sixteen tons at the jackshaft and eight tons at any of the other shafts. Separate trolley beams are provided for each engine to lift cylinder heads and pistons. In the 51st Street house a steam capstan and a pair of winch heads, running at different speeds, has been found very convenient in the rapid handling of heavy weights and in pulling and hauling around the floor. Unfortunately there was no good place for anything of the kind at Houston Street.

2.—*Improvements in Power Plants.* Following the course of the power from the coal through the cable to the car, we find on each boiler an automatic valve, so called, through which the steam passes on its way to the main. In its ordinary operation it is simply a check valve in case of a rupture of any part of a boiler, to prevent all the rest of the battery from blowing through the injured one. There is nothing new about this, but the valve is so managed that by moving a small lever it will also automatically close against the pressure of the steam, and by having the levers of all the valves on a battery of boilers connected together by a single chain which may be led to any convenient place, it is possible in case a steam main bursts or a general smashup occurs in the engine room to safely and certainly shut off all the boilers in a very few seconds by a single pull of the chain. Happily no accident has occurred to demonstrate the utility of this device, but such tests as we have been able to give it otherwise seem to leave no doubt of its effi-

* Read at the Twelfth Annual Meeting of the New York State Street Railway Association, held at Syracuse, N. Y., September 18, 1894.

ciency, and the knowledge that it is there ready for use will give increased confidence in the time of threatened danger.

Following the power through the engines, which present no novel features, we come to the transmitting gear connecting them to the cable drivers. Here rope drivers were adopted, not only to avoid noise and vibration incident to the use of gearing which, as before stated, would have been very objectionable in a building used for business purposes, but to give a degree of flexibility in the relative motions of the cable drivers that could not otherwise have been obtained.

This latter object was obtained by transmitting power to each shaft of the cable drivers by a separate set of cotton ropes whose elasticity permitted instantaneous slight changes in the relative speed of the drivers to accommodate sudden changes in the stress on the cable due to the variations in load, but also allowed a slight and continuous difference in that relative speed if required to compensate for the shrinkage or creep of the cable due to reduced tension as it leaves the drivers. A continuous variation, however slight, in the relative speed of drivers without slip of the cotton ropes does not at first sight seem possible without corresponding vibration in the ratio of the diameters, but a little study of the conditions which are obtained while transmitting power by an elastic medium will show that such variations of speed cannot be avoided if the resistance varies. In this case such variations accomplish measurably the purpose of loose differential rings in avoiding undue stress on the cables while passing over the drivers, and the unequal wear of the grooves resulting therefrom. An experience of over a year shows that the grooves wear very uniformly.

Another feature of the plant that has been carefully studied, has been the interchangeability, so to speak, of its different parts. By this is not meant the ability to move and replace, but to make a variety of different combinations, so that the plant can never be totally disabled by a single accident. For instance, in the Houston Street plant, there are four engines and four cable drivers, and any engine can be connected to any pair of drivers, making sixteen possible combinations. All important pipes are also duplicated, so that really our only sole dependence may be said to be the smokestack.

The signal system is believed to be a marked improvement over anything that has been done before, and while a large part of it is necessarily connected with the street work, it may on the whole be the best described here. Its operation is as follows:

When an employe wishes to communicate with the power house, he goes to one of the signal boxes, which are located a few hundred feet apart and just outside the train rail; he lifts a small, cast iron cover, opens the box inside and pulls a handle a certain number of times, corresponding to the signal he wishes to send in. In the engine room a large gong strikes the same number and a hand on a large dial points to the corresponding signal. When this has been done, the number of the box from which the signal has been sent in is struck on a small gong and at the same time both numbers are printed on a tape for future reference. Besides the usual signals for starting or stopping the cable, etc., and sending assistance, provision is made for "plugging in" a portable telephone at any signal box. A separate signal system is provided for each of the three cable divisions.

3. *Improvements in Cables.*—There is nothing novel about the cables, except their size—one and a half inches diameter—which is believed to be larger than any previously used on street railways. Those on the lower sections are about four miles long, and at a speed of six miles an hour and forty seconds headway, may sometimes be hauling as many as sixty cars at once. Doubtless, a one and a quarter inch rope would have been strong enough, as well as cheaper and lighter, but it would have stretched nearly 50 per cent. more under varying loads, giving a more irregular motion to the cars, and increasing the travel of the tension weights and the wear on the cable drivers. Its durability would for this reason have perhaps been decreased and in an even greater ratio, and as frequent change of cables is a serious inconvenience, as well as expense, the larger cable will probably prove cheaper as well as better.

The large cables weigh nearly forty tons each, a little over that indeed when mounted on the spools for shipment. They are delivered by a floating derrick to a special truck on which they are hauled to the power station by many pairs of horses. There a square cast iron shaft is put through the square hole in the spool and secured and centered by cast iron wedges drawn together by large bolts. The spool is then mounted in a wrought iron frame, the pillow block having sperical bearings so that no cramping of the shaft can occur. The old rope is then cut, and the new one having been led over permanant sheaves to the tension run is spliced on the other end of the old rope, brought up over the other permanent sheaves to a reel on which it is wound by a pair of engines geared to it, and having sufficient power to draw the old rope out and the new one in without assistance from the main engines. The shears, used to cut the old rope into convenient lengths for handling, can also be used for shearing and punching metal plates, often very convenient in repairing.

With these arrangements an old rope can be drawn out and a new one substituted and started up and the cars shifted over to it in a very short time and without the gripmen being aware that any change has been made. The old rope can be cut up at leisure, being wound off by reversing the engines that wound it on.

4. *Improvements in Vault Work.*—Under this head is included all work below the street surface, except that immediately connected with the track. Perhaps the most important improvement here was the side motion gypsy. In this device, the cable as it enters the conduit and just before it is engaged by the grip, goes over a vertical sheave which carries the cable at the proper height to enter the grip which, after it has passed the sheave, strikes a lever which forces the sheave horizontally into the conduit and lays the cable in the open jaws of the grip. When the grip leaves the lever the sheave is withdrawn by a spring. The arrangement is entirely automatic and has worked very well; it cannot, however, be used except where the cable enters the conduit.

Another gypsy, intended for use in all parts of the line, raised the cable from below the grip by a spiral wheel which, while revolving, had the requisite lateral motion given by cams on its shaft. The motive power was supplied by cable which entered a V groove in the spiral, and at the last of the revolution compressed a spring which, when released by the passage of the next grip, threw the spiral into part engagement with the cable. The device was ingenious, and for a time worked well, but as its operation depended entirely on the friction of the cable in the groove, it was soon found that when the rope became well lubricated and the groove a little worn its action was unreliable and its use was discontinued. This gypsy being actuated only by the live cable, could not under any circumstances throw it in the dead one, a point of much importance where two cables are run in the same conduit.

Another gypsy has since been devised which can also be placed on any part of the line, which will automatically select the right cable, and is much simpler in construction, as well as more reliable in operation. As it has not yet been protected by patent, its operation will not be further described.

The problem of "floating" a hundred feet or so up a 1 per cent. grade from the middle to the lower section of cables in front of the Houston Street power house received much attention. Although it was believed that it could be successfully done, it was feared that where so many vehicles are passing frequent delays must occur from obstructions of various kinds; so to avoid the trouble and expense of keeping men and horses on hand in case of any emergency, a so called "lazy chain" was installed. This consisted of a heavy endless chain of the link-belt type running in a trough under the slot and just below the grips, which were to be engaged by projecting hooks attached to the chain and held up by springs to permit them to recede when the grips moved faster than the chain, and when the cars slowed down they would catch and propel it. To enable the gripman to stop after the lazy chain had caught, the chain was driven through a friction clutch adjusted to slip if the gripman put on the brake, and, as an additional precaution, and to prevent the friction clutch from being destroyed by a long stoppage of the car, a reducing valve was put on the steam pipe by which the pressure was kept too low to permit the engine to slip the clutch for more than one or two revolutions. As the engine was double, it would start again as soon as the brake was taken off the car, so that as far as the gripman was concerned its manipulation was much the same as if he had hold of the cable or was on a down grade.

Fortunately, further experience showed that with proper care the track could be kept clean, so that the cars would always float over without trouble, especially as in reaching this point they were gripped to a high speed cable which gave the requisite velocity.

A modification of this device, with the lazy chain working in a horizontal position, was intended to be used to operate a curved cut-off or short circuit at Bowling Green or State Street in case of accident or congestion at South Ferry, but that also has so far proved unnecessary.

As it was very difficult to lubricate by hand the bearings of the deflecting wheels in the vaults while in motion, a grease reservoir was clamped to some convenient point on the V frame and connected to the bearings by lead pipes, through which the grease was forced at intervals by screwing down on a piston in the reservoir and directed by cocks to the upper or lower bearings as required.

5. *Improvements in Track Work.*—The first and greatest improvement was in the rails, which were especially designed for this road, To simplify the yokes they were made of the same depth, and for convenience of paving that depth was made seven inches. In the slot rail to secure a good support for the paving blocks, the web was made vertical, with very satisfactory results. The head of the tram rail was made with a groove just large enough to take the wheel flanges and enable them to crowd out the dirt, but too small to permit a wagon tire to catch in it. The flange was five inches wide, and contained enough metal to bring the vertical axis down to pretty near the center of depth, thus giving a very efficient girder section. The joint was made by a combination of a pair of four hole splice plates, with a McConway & Torley clamp, the former taking the transverse and the latter the shearing stress and together making a very effective joint. Owing to lugs on the yokes, and to the tie rods supporting the slot rail being half way between the yokes, the tram rail joints had to be one-quarter of a yoke space, or thirteen and a half inches, away from the yoke center, being thus not exactly suspended or supported. The result was satisfactory.

All slot rail joints were made on the yokes and no splice plates were used; only a larger and stronger washer being placed on the tie rod supporting the joint. This has answered fairly well. A drop forged, three hole splice plate joint, originally designed for the Broadway slot rail, is being used on the uptown extensions with promise of very good results.

The substructure presents some very novel features. Stout cast iron yokes were used wherever practicable, primarily of three standard types, namely, for straight track, surface crossings and curves, the latter weighing nearly twice as much as the others. Some modifications of these had to be made in complicated structures, but the number of special cast yokes was kept as small as possible, special wrought iron yokes being freely used in all difficult constructions. In fact, throughout the entire work all details were standardized wherever practicable. In the surface crossings, for instance, a typical structure was designed for a square crossing, and crossings of any other style or combination of sizes on double tracks were made by a slight change in the details, for which no special drawing was required. Crossing yokes were made flush on top and kept low enough to permit the use of heavy sole plates under the rails. A number of holes cored in the top flange of the yokes permitted the secure attachment of the sole plates in almost any

position. In this, as in other special constructions, the perpendicular web of the slot rail greatly facilitated all attachments thereto.

Cable crossings, which for sake of distinction were called intersections, were provided for at 23d Street and at Sixth Avenue, but fortunately their use has not been required. With the possible exception of fenders, perhaps no other subject received so much attention from the noble army of inventors as did the cable crossings. We planned, however, where a cable had to be dropped, to simply "float" over, which our experience at Houston Street shows to be always easily practicable at the points mentioned. With an automatic release, to be described later, and an automatic gypsy, as before noted, the whole problem, both of construction and operation, at cable intersections becomes very simple.

Crossovers from one track to another were always made with wrought iron yokes. They presented no other novel features.

Surface turnouts were made with tongue switches in place of run-offs, to secure better support for the wheels, and most of the latter tongues were secured by a locking pin that could be readily withdrawn from the surface, so that the tongue could be easily removed and replaced without disturbing the pavement.

In cable turnouts, of course, the slot switch was the most difficult problem, but it was very satisfactorily solved by making the point of the tongue stationary and throwing the grip shank into the proper slot by movable pieces working under the head of the slot rail, or in special boxes and arranged to support the slot tongue when at rest. Of course the slot and track switches were connected so as to work together, and no case has yet occurred where the grip has taken the wrong slot. They have also stood up very well under the heavy traffic of lower Broadway, which, it may be remarked, is often more destructive to track work than the cable cars themselves.

Before coming to the curves the carriers should be mentioned, since, though possessing no very novel features, they have worked very satisfactorily. To save journal friction and especially to reduce the slip, which occurs when the cable first touches the carrier after having been lifted off by the grip, and which by its multitudinous repetition becomes a serious source of wear, they were made as light as possible. They were cast with solid arms and heavy chills. As with the duplex system, each carrier had to be to one side of the center of the conduit; the size of the shaft bearings was made proportional to the weight they carried so as to secure uniformity of wear. Both bearings were contained in one bracket so as to insure proper position and alignment, and each bracket, secured from slipping by steady pins, rested on an angle iron frame at three points only so as to prevent chattering.

Curves are the *bête noir* of the cable road; their construction is its most serious problem. It is probable but for the curves there would be a dozen cable roads where there is now only one, but to have to go fast just where you ought to go slow, to be in constant danger of having your cable stranded if a careless or rattled gripman opens his grip ever so little, and to have to put a whole machine shop underground at every change of alignment are such serious and, so far, unsurmountable evils, that it argues much for the inherent merits of the cable road that they have not discredited it altogether. It must be confessed that there are no good curve constructions; some are less bad than others, that is all, and even the least objectionable are vastly complicated by the duplex system. That used on the Broadway road was as simple as any, and, as curve constructions go, has worked very well. Two sheaves, one for each cable, are carried in a frame secured between adjacent yokes so that it can be readily removed for repairs or renewals. Indeed some such arrangement was necessitated by the fact that we had to put the curve construction in the street before the curve mechanism was fairly designed, so that provision for its subsequent addition had to be made. This is a fair illustration of the conditions, probably too painfully familiar to most of you, under which such work is often if not usually, performed; the draughting room struggling hard to keep up with work already done, instead of having complete and harmonious plans prepared in advance, and the engineer expected to achieve just as satisfactory results as if sufficient time had been allowed him to see the end from the beginning and plan accordingly. In the present case circumstances more than individuals were responsible for the unfortunate conditions.

But this is a digression to what is neither recent nor an improvement in cable construction.

To return to our curve construction. In order to get the wheels on separate shafts instead of on the same pin, it was necessary to stagger them, as they could not be far apart vertically. In this way either sheave could be removed while the other was running. Lubrication was effected through pipes, the soft grease being forced from the reservoir by a weighted plunger. An angle iron guide, bolted to the yokes in short lengths, took the side pressure of the grip, while the edge of a flat bar, extending in sections between the sheaves for the whole length of the curve, guided each cable into its proper place. To get the cable started on the right side of this bar at the entrance of each curve, a so called "flipper" was employed. This was a novel feature, and deserves a moment's notice. It really was an extension of the flat bar or cable guide above mentioned, having a partial rotation on an axis parallel to the adjacent tangent. It was projected into the conduit between the cables, being kept out by a spring which permitted it to recede while the grip passed, but held it closely in contact therewith at a point between the cables so that the inner cable was kept above it and the outer one below, thus preventing the live cable from riding on the dead one, which would have done serious mischief. As a moving part kept in place by a spring and struck with some force by the passing grips many hundred times a day, it was adopted with some reluctance, but its action has proved very satisfactory.

6. *Improvements in Cars.*—While the grip is the fundamental feature of the car and, therefore, comes logically under this head, it is also the heart of the cable road as far as its design is concerned, the nucleus around which all the rest of the structure aggregates and the ultimate factor of the whole work. It may be said in planning any machine or structure—and a cable road is both—that part which is most closely controlled by the conditions of the problem to be solved should be first designed. The essential condition of the cable road problem is that there must be some means by which a street car can grasp or release at will a moving cable. The street car and the moving cable are simple problems taken separately. The difficulty lies in their combination; in a cable road it is the grip which effects that combination, and it follows that in planning a cable road the grip should be first selected or designed, and all other parts so arranged as to secure its highest efficiency. Unfortunately, in the Broadway road, through a peculiar combination of circumstances, which need not now be rehearsed, the grip was not fully designed until the road was nearly completed. This necessarily much complicated the design of the conduit and its attachments, as provision had to be made for some possible conditions of the grip which were afterwards found to be unnecessary, while the design of the grip was hampered by the development of unforeseen conditions for which the conduit as built did not adequately provide. Fortunately, by much patient study and some experimenting, it was found possible to devise a very satisfactory grip, whose more important features will be briefly described.

First. As it had to be able to take a rope on either side and go either end first, the grip was necessarily quadri-symmetrical in plan, with, of course, a pair of jaws on each side, both pairs moving together. Contrary to the more common practice, the lower jaws remain stationary. This was done partly to reduce the depth of the conduit, which on Broadway was a most important consideration, but more especially to reduce the slip of the cable on the carriers as it trails from the grip. This, as before noted, is in the aggregate a serious source of wear to both cable and carrier, and its amount in each case is obviously in direct proportion to the length of time that the two are out of contact, which in turn is approximately proportioned to the height that the cable is lifted by the grip. The jaws are lined by steel dies rolled from rail billets, which have given very good results. The shanks were of structural steel, and have also done well. At the end of each cable section, and also in case of prolonged stops, it is necessary that the gripman should be able to drop the cable altogether. Suitable provision was made for this, but it was early foreseen that it was not safe to place entire dependence on the gripman's care, whose attention was liable to be distracted at the critical moment, and whose neglect was certain to wreck the grip if it did not strand or break the cable. An automatic trip was therefore added, actuated by inclined projections in the conduit, which ensure the release of the cable at all desired points.

Some of the grips first supplied did not have this device, and its value was abundantly demonstrated by the accidents which occurred through lack of it. As several devices have been proposed whereby the grip can be made to pick up the cable at any point, a feature at first sight of much value, it may be worth while to say, first, that where cars are run on such short headway as on the Broadway road, should it be lost, it will be but a fraction of a minute before the following car will be ready to push the temporarily disabled one to the next gypsy where the cable can be regained. Next, to permit the jaw to get under the cable at all points, would require either a deeper conduit than was practicable in view of the underground obstructions on Broadway or, much more, cleaning of the same. Last, but not least, all carriers would have to be carefully protected from damage by the grip, a matter of considerable expense and one which would seriously interfere with keeping the conduit clean. Concentric wheels were used for operating both grip and brake as requiring less room for their operation and permitting greater range of motion and consequently power, and a more delicate manipulation of the grip when "stealing" or running slower than the cable, as is so very often necessary on lower Broadway. They are for these reasons easier for the gripmen, and hence preferred by them. While not quite so prompt as the lever, no trouble from that source has been experienced, and the starting and stopping of the car is less jerky.

The brakes offer no special features. Some air brakes have been tried with satisfactory results, but the advantage has not been sufficiently marked to warrant their general adoption.

The cars have been lighted with compressed gas on the Pintsch system, which has proved very satisfactory, and is believed to have been here used for the first time in street cars.

The heating question has received very careful attention, and several tests of different systems have been made. Some method of hot water storage has promised the best results, but the difficulty of charging on such short headway would be very great, and the experience of one winter would seem to prove that with a road carrying so few long trip passengers heated cars are not necessary.

7. *Improvements in Car Barns, etc.*—An extensive and elaborate structure for the storage of cars has been very carefully designed, but has not yet been erected. Its dimensions will be about 200 × 600 ft. by 100 ft. high. Its most noticeable feature will be a combined transfer turntable now partly installed and designed to be operated by electricity, but at present moved by hand gearing. To handle cars in and out of the barn, it is proposed to use two or three small motors driven by storage batteries, compressed air or superheated water. To bring out a car, the motor goes after it and brings it out to the transfer turntable near the front of the building. This not only shifts it to the proper track to run out, but, rotating 100 degs., puts the motor in position to push the car out onto the line and come back for the next one without switching. Of course, in running cars in, the operations are exactly reversed and the turntable then prevents the motor from being shut in by the car it has handled.

On the upper floors plain transfer tables traverse the center of the building, connecting with a car elevator at each side, while smaller motors or lazy ropes would handle the cars on the floor tracks.

Turntables would not be required here as, if lazy ropes were not

used, the motor belonging to the floor could always be placed near the transfer table opposite the track onto which the next car was to be run.

There is necessarily some complication of track work in front of the car barn, and all switches there are operated by one man in an elevated cab overlooking the whole street at that point, which has proved a very satisfactory arrangement. Suitable inspection pits and a well appointed machine shop equipped, not only for the repair, but also for the manufacture of grips when needed, complete the present installations at the car barn.

In conclusion, I may say that if the foregoing looks too much like a descriptive eulogy of the Broadway road, I was limited by the subject assigned to me to the record of improvements only, so that an impartial account of its shortcomings as well as its successes was not to be expected. It is very easy now to see where many things might have been made better, and even where some supposed improvements have not realized all the expectations that were formed for them. The next cable roads should be better than this, whoever builds them, and no one will be quicker than the writer to appreciate the magnitude of the difficulties which future improvements must surmount, or to give hearty credit to the man or men who may accomplish it.

One difficulty, however, ascertained in the construction of the Broadway road, can never exist to a like extent elsewhere. I allude to the underground obstructions, of subways, gas, water and steam pipes, pneumatic tubes, sewers and other matters too numerous to mention, which had accumulated in three centuries of the growth of a vast metropolis. Their removal alone would have been a formidable task, but as almost all of them had to be kept in use while the removal was going on, and the street traffic had to be continued as well, the writer is inclined to look back on this part of the work with a feeling akin to astonishment at its successful accomplishment in so short a time. To construct and put in running order through such a labyrinth, a complicated machine five miles in length to be jointly operated by an army of engineers and gripmen with reasonable precision and freedom from derangement, is an achievement of which any corporation may well be proud.

Taxation.*

By Allen Ripley Foote.

Taxes:—What Are They?

1. The many questions involved in the subject of taxation cannot be effectively discussed without a preparatory agreement as to the meaning of the word "tax." The courts frequently make law radically different in effect from what those who design the measure intended it to be, through construing the meaning of the words used. The law is not the act as engrossed, certified to, approved and filed with the Secretary of State; it is the Constitutional provision and the legislative enactment as construed by the courts. Words used in organic or legislative measures should be given an exact meaning, so that the spirit of the measure can neither be evaded by taxing authorities nor changed by judicial construction. This will make it certain that the law will have the effect designed by those who formulated it. The necessity for this precaution is thoroughly demonstrated by the experience of every community. The objects for which taxpayers' money can be expended under the elastic title, "*For the Support of the Government and Other Public Purposes*," are so many, and the opportunities for doing a good turn for party workers, personal friends and dear relations, through the distribution of public funds by vote winning measures are so great, it is not the part of wisdom to expect the kind of human nature that is subjected to such pressure and temptation, to be limited by any consideration less circumscribed than that of *legal honesty*. Whatever the law will permit them to do, in the matter of collecting and spending taxpayers' money, all taxing authorities will do.

2. Taxing authorities evade levying direct taxes in every possible way, because every dollar collected by direct taxation, as it is taken from the taxpayer carries with it his close scrutiny of, if not earnest protest against, the way in which the tax-spender uses his money. To avoid the inconvenience of showing that public funds are properly used, and to provide for liberal appropriations at the same time, taxing authorities have been forced to exhaust every discoverable means for squeezing income out of a subject after it has paid a direct property tax. The usual device is to resort to charges made for various reasons and called "fees," "licenses," "excise," "payments in gross amount or annual rentals, proportionate share of the receipts or a combination of such methods as compensations for franchise rights," "location permits," "inspection charges," or other designations. When appeals have been made to the courts for relief from burdens so laid, the relief has not always been granted, because the courts have illogically held that charges designated by other names than that of "tax" are not taxes and, therefore, must be paid, although a direct tax on the property employed in the industry has been paid. Guided by such decisions, all that it is necessary for any taxing authority to do, unless the word "tax" is designed by law, in order to avoid a constitutional provision or a legislative enactment designed to establish the principle of the equal taxation of all property, is to designate the charges made by some name other than "tax."

3. Justice determines the character of an act by its purpose and effect. The purpose of a charge by a taxing authority is to secure an income "for the support of the Government and other public purposes." The effect of the charge is to take by authority of law a portion of private property and devote it to "the support of the Government and other public purposes." This is taxation, and should be so defined by law in order to make all measures pertaining to taxation definite, so that they cannot be easily evaded by taxing authorities nor changed by judicial construction. This may be effected by a Constitutional provision which shall declare that:

All charges for the support of the Government of the State and of all political divisions thereof and for all public purposes are taxes."

Taxes:—How Should They be Assessed?

1. The object of government is to establish justice. This object cannot be realized unless all laws enacted for the government of society are just. The spirit of justice is equity, not equality. The Government requires for its support and other public purposes a financial service. Such a service must be laid on property. To be just, all measures for the assessment of taxes should claim payment at a uniform rate per cent. upon the value of all property within the jurisdiction of the taxing authority. A measure for the assessment of taxes, laying the charge on all men equally, on the ground that all men are or should be equals before the law, would be manifestly unjust. Such a measure would not be tolerated for a day in any civilized community. In the domain of personal duties all men are equal before the law. The next step of progress is to fix in the organic law with equal certainty the affirmation that in the domain of financial duties all property shall be equal before the law. Under this affirmation all property will be held for the support of the Government and all other public purposes, equally pledged dollar with dollar. This is equity.

2. A standard valuation must be established before a measure designed to tax all property equally can be carried into effect. The attainment of absolute justice is not possible. Value is, and must ever remain a comparative term. The only way to express value is in the terms of our monetary system, the dollar, its multiples and its divisions. An inequality in assessment necessarily produces an inequality in the charge, and would thus result in injustice being done.

3. With the standard for valuation fixed and the assessment made, the next act is to distribute the total amount required for the service of the Government, equally over the total amount of the assessed valuation of all property within its jurisdiction. In doing this an allowance must be made for the factor of error caused by delinquent taxpayers, so that the amount certain to be promptly received will be equal to the amount required. This adjustment is easily made, if honestly made, by making the tax levy at a uniform rate per cent. on the assessed value of all property.

4. It may now be affirmed:—(A) That all charges for the support of the Government, and for all other public purposes are taxes.

(B) That all property shall be assessed at its full value in current funds.

(C) That the tax levy shall be laid at a uniform rate per cent. on the assessed value of all property.

Taxes:—What is Property?

1. There is an important and far reaching necessity for a clear construction of the meaning of the word "property" whenever it appears in tax measures. So long as the standard of honesty in practical use is that of enacted, instead of natural law, crafty men will protect themselves from suffering the results of their dishonesty by seeking to make dishonest measures legal, and honest minded but not well informed men will govern their actions by such measures, never suspecting their dishonesty. The levying of indirect taxes through calling the charge by some name other than a tax, is one method whereby the payment of just taxation is evaded. Another method is to call property, for the purpose of taxation, that which is not property. If the fictitious property so assessed is 10 or 15 per cent. of the whole valuation, then those who pay the charges on fictitious property, pay more than their proportionate share. This is not just. In the light of this fact the necessity for strictly defining the meaning of the word "property" is clear.

2. The inherent quality of things of value, which constitutes them property, is the exclusive right of possession, of ownership. The natural right of ownership is the right of a laborer to possess unmolested the results of his labor. This protection is one factor in cost of government. If Government establishes justice, the protection offered by it to the possession and ownership of property will be certain, and its cost will be the lowest practicable.

3. The factors which combine to create property and give it value may be briefly recapitulated. A natural product upon which labor has been expended is a commodity possessing the first factor of value. When the commodity is desired by others and can be exchanged for another commodity having labor value, it acquires exchange value. The desire of others to possess the commodity, combined with their ability to give value in exchange for it, gives it a market value. When the government gives proof of ownership and protects the right of ownership so as to make it secure, the commodity obtains security value. The factors are therefore, natural product, labor, exchangeability, demand combined with ability to give value in exchange, and proof of ownership afforded and right of of ownership protected by the Government. These factors combined as a whole, create the entity known as property, and determine its value. The definition of property may be stated as an exchangeable product upon which labor has been expended and the ownership of which is protected by the Government.

4. It is clear that there may be as many classes of property as there are kinds of commodities or uses to which commodities may be devoted. If property is classified for the purposes of taxation, and the law includes all classes of property in its operation, and excludes from such classification everything not property, no injustice will be done. The usual method is to classify property as real and personal. Injustice is done through classing as personal property evidences of the

* Abstract of paper read at the Twelfth Annual Meeting of the New York State Street Railway Association, held at Syracuse, N. Y., September 18, 1894.

ownership, and the protection of the right of ownership granted by the Government. Such instruments are promissory notes payable to order or on demand, issued by individuals, firms, corporations, associations, or governments, title deeds, certificates of stock, mortgages or deeds of trust, bills of lading, checks, drafts, and all other written or printed forms authorized by Government or recognized by custom as being representative of property, its ownership and value. The correct designation for this class of instruments is *securities*. This designation will serve the valuable purpose of making a necessary distinction between property and its representatives in popular thought, and will lead to their exclusion from taxation under laws declaring that all taxes must be assessed upon property equally.

5. Large properties can be best managed by admitting many individuals to part ownership. Small properties are best managed by individual owners. The most helpful facilities of the age and the strongest government that has made the nearest approach to establishing justice, are based upon combined individual ownership and individual citizenship. The services rendered by the greatest corporations are the most powerful aids to industry, helpful ministers to comfort and active promoters of the value of all property ever known in the history of humanity. Without the facilities for divided ownership the aggregation of capital necessary for the construction and operation of their plants would be impossible. All unjust restraint upon the ownership of such securities is a direct check upon the progress of industrial development, and for this reason is a direct blow at the welfare of the masses who labor and are poor. In their interest the demand should be made that the securities in which they may invest their savings shall not be subjected to taxation after the property represented by the securities has been taxed.

6. I am aware that the demand for the taxation of securities comes from those for whom protection is asked from its injustice. This is not strange. Those who are in the full enjoyment of abundance should consider with tenderest compassion the vagaries of brain of those who feel poverty gnawing at their heart. Let the well-to-do reflect that, in the struggle for better conditions, character is not yet considered a greater good than property by the vast majority of men, and that the standard of legal honesty is not high nor infallable.

7. If any securities are classed and taxed with personal property, justice demands that all securities shall be so classed and taxed. To select some and omit others is as repugnant to the requirements of justice, as to create favored classes of individuals. In fact, this will be the result. All property has an individual ownership. All income derived from an unjust tax must of necessity relieve to that amount the payment of a just tax by others. This is the intention. If no such gain could be made, there would be no demand for taxing so-called personal property. Those who intelligently advocate such a tax know that a tax is a charge upon property, no matter how laid, and that to tax property, and then to tax its representative, which in itself has no value, is double taxation.

8. To obliterate the vice of double taxation effected through first taxing property and then taxing the representatives of its ownership and value, but one object lesson is needed. Let every person who is the owner of a representative of value by common consent, refuse to pay the tax unless ALL representatives of ownership and value are included in the tax assessment on equal terms. There is no economic difference between the character of a deed to a farm recorded in county records, and a certificate of stock recorded in the stock register of any corporation. There is no just reason, and should be no legal reason why the deeds owned by the Astors should not be taxed, if the stock and bonds are taxed, from the net income on which interest on the savings deposits of the poor are paid. Taxation cannot "be equal and uniform upon the same class of subjects" if a part of the representatives of ownership and value are included, and a part are excluded from the class of personal property. Such discrimination is based upon a legal and an economic fallacy. It must be abandoned by taxing all representatives of ownership and value, or none. It cannot be continued if the word property is used and construed in strict accord with its true economic meaning.

Property is an exchangeable product upon which labor has been expended and the ownership of which is protected by Government.

Securities are the representatives of the ownership and of the value of property.

Taxes:—Who are Interested in the Demand that They Shall be Just?

1. I once had the good fortune to hear a preacher say the reason people made the same mistake twice was because they did not learn their lesson sufficiently well the first time. In an address delivered before this Association September 21, 1886, the Hon. G. Hilton Scribner said: "During the late war the National Government, under great financial stress, instituted an inquisitorial burden, called the "Income Tax." This was such an unpopular proceeding that it was abandoned at the earliest possible moment, and the country breathed more freely and felt a sense of relief when the whole system was abolished."

An income tax is now imposed by the National Government under stress of political expediency. It cannot be said that this has been done because the people did not sufficiently learn the inquisitorial character of an income tax the first time it was imposed, for the reason that its reimposition has not been demanded by the people. It was demanded by politicians who have thought they could win votes from the many who are poor by adopting a measure popularly supposed to be an assessment upon the rich to relieve the poor from taxation. This is the conceded reason for all unjust taxation.

2. In his address Mr. Scribner further said: "If the street railroad corporations were taxed in the same manner that the citizen is, they would pay simply a tax upon their real estate, assessed at from 60 to 80 per cent. of its value. Instead of this method, these corporations pay:

First.—A tax upon their real estate.

Second.—A tax upon the roadway.

Third.—A tax upon personal property at the aggregate market value of the entire issue of stock.

Fourth.—A tax upon gross earnings.

Fifth.—A tax upon net earnings or dividends.

Sixth.—A specific tax upon each car.

Seventh.—A lump sum tax for maintaining three railroad commissioners."

3. If this statement is correct, your own books of account will show the price you have paid, are paying, and will continue to pay, for the failure to use the words "tax" and "property," with their strict economic meaning in tax legislation. You can trace the cost of unjust taxation to your shareholders, but you cannot trace its cost to the state or community as a whole. Your class of corporations is but one of many. Your interest, enormous as it is, does not equal that of the people who work for wages in this great state. You did not ask for this series of tax levies under the guise of many names. The people of your state have not asked for this glaring injustice. It is the work of tax eaters, who fatten on the spoils of political power. They have enacted this legislation without asking your permission or that of the people. They depend for its perpetuation upon your apathy, and upon being able to develop into vigorous life all the latent hatred that is assumed to rankle in the hearts of the poor against the rich, if an attempt is made to undo it. In this fact is enclosed the greatest danger that now threatens the stability of the state. The socialists and the anarchists, whom we need most to fear, have not come to us from abroad. They are the creation of our own political system, that intrusts ignorance and vice with political power.

4. I will again give voice to Mr. Scribner's words. He says: "For all this, the corporations are themselves, in good part, at fault, when they are unjustly attacked by legislative, executive or judical officers. The managers of such corporations instead of meeting in some very private manner and holding a whispered consultation, as to the easiest way of getting the hand out of the lion's mouth, should have the courage to assert the rights of the companies they represent, and to contend for them to the last. More than this, every holder of corporate property should not only propose to take part in the election of every officer whose action may affect his interests; but he should make no concealment about his intentions to do so. It is better, especially under a republican form of government, to demand inalienable rights than it is to beg for them. No class of citizens should acquiesce in, or tamely submit to any such injustice as that now being practised and imposed upon the holders of corporate interests, by the present system of unequal taxation. There is nothing in state socialism, not in communism, carried to its extreme results, more contrary to, and subversive of, all the fundamental principles upon which personal and proprietary rights are founded, than the present legislation of the state of New York in its cruel, unjust and extortionate discrimination against corporations in the matter of the distribution of public burdens. Of course, it cannot last, for legal extortion is necessarily short lived. It cannot last, for those classes that contrive iniquity for other classes are, sooner or later, the victims of their own devices. It cannot last, for as corporations have no means of making money, except as they collect from those who have dealings with them, these burdens which are placed upon corporations, if they are persistenly continued, must, in the end, be paid by an ever increasing proportion of the very classes themselves who were intended, not only to be exempt from them, but to be benefited thereby. It cannot last, for it is such a plain, obvious and gross injustice to such a large number of citizens, and to such important interests within the state, that if the Government shall fail to destroy the wrong, the wrong will not fail, in the end, to destroy it."

In concluding Mr. Scribner said: "Is there likely to be any better time than the present in which to expose the right and wrong of this whole matter, and in which to commence in earnest this corrective movement? Absolute equality in taxation should be *demanded*, and representation in every department of the Government, the only method for its *enforcement*."

This appeal was made to you by one of your own members in 1886. What has been your response? Apathy! The very condition upon which, so far as you are concerned, politicians relied to give them protection from righteous indignation and just punishment when they enacted these measures, the very condition upon which they now rely to maintain their perpetuation.

5. With a subject like this it is impossible within the limits of a single paper to do more than to sketch the outlines of a few of its salient points, but before closing this paper it must be given a practical turn by indicating a feasible line of procedure to secure a just system of taxation. In this behalf the first thing to be done is to formulate the *demand*. The act of doing this will demonstrate its all-inclusive character. It cannot be confined to your class of corporations alone. It touches the interests of every corporation. It is not for industrial corporations only, it is for banks, trust companies and insurance companies as well. It is not for corporations, as such, at all. It is for investors in their securities and the users of their services as individuals. It is not for capitalists as such, at all. It is for those who toil and are are poor. Upon them the burden of taxation, however laid, by all indirect or unjust methods finally rests. It is for them and their welfare that I plead.

6. That the demand may be made clear and receive the criticism from all points of view necessary to establish its justness, I submit for your consideration, as an appendix to this paper, a suggested law to cover the entire broad question of state and local taxation. As discussion will show its defects and suggest changes to make it clearer, more perfect, more completely just, changes will be made in its text until it has passed the stage of being so changed. With this object in view, it should be brought before every association of citizens for dis

cussion, from the "Ministers' meeting" to the "Chamber of Commerce," from the "Garment Makers' Union" to the "Clearing House Association," when perfected, it should be made the shibboleth of no party, but in the next pending state election it should be presented to every candidate for the Assembly and Senate, with the direct demand that he shall endorse it with his written agreement to vote for the measure if elected. In such way only can it be made certain that the will of the people is to be enacted into law exactly as the people have agreed it shall be done.

7. One point must be kept clearly in mind in considering this proposed measure. If it is not constitutional in any of its bearings, those who demand its enactment have the right and the power to make it constitutional. Its relation to existing laws governing taxation should not be considered except for the purpose of showing why those laws should be set aside and a new law adopted, that will more nearly align itself with the natural laws of justice. This is the object and the purpose of the demand.

8. To secure the enforcement of this demand, "representation in every department of the government" is the ultimate education of individuals in the initiative source of power. This educational work must begin right here with yourselves. From you it must broaden to every stockholder, employe and patron of the corporations you represent; to every stockholder, employe and patron of every corporation in the state; and from them every person who asks justice only.

APPENDIX.

TO PROVIDE A JUST SYSTEM OF TAXATION. PROPOSED BY ALLEN RIPLEY FOOTE, WASHINGTON, D. C.

Author of the Discussion of the Economic Principles Involved in "The Law of Incorporated Companies Operating Under Municipal Franchises."

[NOTE.—Suggestions are invited from any person, firm, corporation or association, and from the taxing authorities of any municipality, county or state, designed to make this proposed law more certain in construction, more simple in its application, more completely just in its effects.]

TAXATION.

1. All charges for the support of the Government and for all other public purposes are taxes.

2. All property shall be assessed for taxation at its full value in current funds. All exchangeable products upon which labor has been expended, and the ownership of which is protected by law, are property.

3. The tax levy shall be laid at a uniform rate per cent. on the assessed value of all property for the same tax levied within the jurisdiction of the state and of each division thereof.

4. All property assessed for taxation shall be entered in the books of the tax assessor for the tax district in which it is located, in the name of the owner, user, or person having the property in charge.

5. Bills for taxes shall be made in the name of the owner, user, or person having the property in charge, as entered in the assessors' books, and the payment of the same shall be a legal payment for the full amount of the tax bill of any debt or obligation of any kind due from such person to the true owner of the property upon which the levy was made.

6. Tax bills shall be lien upon the property on which the levy was made, and may be sold for non-payment, as provided by law.

7. Property shall not be taxed in any way except as herein provided. Tax assessments shall be made but once in each year, and the levy for all state, county and municipal taxes shall be entered in the same bill. Charges shall not be made by state, county, municipal or other public authorities for the support of the Government or any other public purpose, except a property tax, for the right or privilege of engaging in any industry, business or vocation.

8. Securities representing the ownership and the value of property shall not be taxed.

9. The legislature may exempt the whole of any class of property from taxation, but it shall not make any partial exemption by authorizing a decrease in valuation, or of the rate per cent. of a tax levy for one or more classes of property less than the unexempted whole, or for a part of a class, nor shall it exempt a part of the property of any class.

10. Special assessments and tax levies may be made in consideration for special benefits accruing from public improvements upon all property securing an increment of value by reason of such improvements.

11. Fines may be assessed and collected for violations of law; charges may be assessed and collected for costs of courts in all legal procedures; for costs of records on all recorded instruments or documents; for all public inspections, supervision and audits; and license fees may be assessed and collected for the control of all places of public amusement; the regulation or suppression of all immoral practices; the protection of health; and the supervision of public nuisances.

12. The legislature shall not delegate the right to exercise the power of taxation for any purpose, to any political division of the state or other public authority, without providing by law that the books of accounts of such division shall be kept as directed by the State Comptroller, who shall audit all such accounts annually.

THERE has been chartered the Willow Grove & Hatboro Street Railway Company, of Hatboro, Pa.; capital $18,000. The president is John H. Fow, of Philadelphia; and O. E. C. Robinson, of Hatboro; J. F. Cottman, of Jenkintown; Charles F. Ehrenpfort, of Willow Grove, are some of the directors.

"The Perfection of the Electric Railway Motor."*

BY LINCOLN NISSLEY.

Mr. President and Gentlemen of the Convention.—The subject of this paper, which at first thought suggests a broad and inviting range, is, on examination, found to be closely defined. Instead of a fertile field, the past years stretch out more like a vast desert; the wayside thickly strewn with bleaching, or rather rusting, skeletons of commutators, gears, brush holders, controllers and empty pocket-books; while beneath the debris lie buried fond hopes and rosy expectations of some contrivance, which, at its birth, was to wax great, and going forth subdue the land, and as an everlasting monument to its inventor, go thundering down the ages, around curves of small degree, up steep grades on the other side and never slip a gear or miss a fare.

A study of the history of the electric railway motor shows us that from the beginning up to a few years ago there has been a great tendency toward complicated, fanciful and impracticable designs, including outlandish forms of field magnets, and unnecessary number of field cores and coils. In most cases, also, the mechanical construction has been very bad, the shaft being too small, the bearings being weakly supported and the general workmanship poor and not up to standard.

It has long been my opinion that the proper way to design a good railway motor is to consider very carefully and systematically each part, first by itself and then with reference to the other parts, and thus collect and build up the elements which are best.

Let us now take up the various parts of the electric motor and consider each as a simple problem in designing.

The size of the frame should be such that it can readily be placed upon any standard truck.

The machine should be completely shut in so as to make it thoroughly iron clad.

A good, substantial iron clad frame does more than anything else to give great stability and strength to the whole machine, and is highly desirable in a railway motor. The bearings should be directly and rigidly mounted in this frame, a simple fact that has often been disregarded, and all parts should be interchangeable. The armature and car axle should be in perfect alignment; and consequently perfect meshing of the gears is obtained, which experience has proved to be of vast importance. The gearings should be mounted closely to the frame so as to eliminate buckling and tendency to loosen parts. The field magnet should be bipolar. The field should also be of the single magnetic circuit rather than the consequent pole type, because the former is more economical in wire and current required, lessening the cost of renewals and repairs.

A single circuit requires only 70 per cent. of the weight of wire, and 70 per cent. of the energy of magnetization that is required by a double magnetic circuit. The field cores should, of course, be perfectly insulated. This can be accomplished with certainty by winding them on a solid spool of material which is firm and waterproof and highly insulating. The armature should be of the ring type, so that the winding does not slip out of place or pile out at the ends when running at high speed, a fact which will be appreciated by those who are operating cross country and suburban lines.

The armature should have teeth or projections upon it, in order to secure and protect the wires from mechanical injury, to reduce the reluctance of the magnetic circuit and the weight of wire and energy of current required to magnetize it. The perfect insulation of the armature core is of the utmost importance. The best material and the most complete covering should be used, and the greatest possible care should be exercised to avoid short circuits, grounds or broken wires.

The efficiency should, of course, be as high as possible, and is made a maximum by reducing all elements of loss as far as possible. These losses are current to magnetize field, loss due to armature resistance, friction, resistance of air and eddy currents. It has always seemed to me that if a machine can be run for several hours under field load without any part becoming overheated, the efficiency of that machine must be high. This fact is more absolute than any efficiency test can possibly be.

In looking over the past eight years of practice in the designing and perfection of the electric railway motor, we have much to commend and considerable to condemn. The boldness of the achievements, the problems that have been solved, the rapidity of development seem almost beyond comprehension. That the electric railway motor in less than eight years should reach the high state of perfection, economy and efficiency that it has, as compared with the long years of development of the steam engine, is remarkable.

In the perfect railway motor we have something entirely different from what we have in the steam engine. We have no reciprocating parts, but continuous rotary motion. The strains are all tangential, and this aids greatly in running and maintenance.

The railway motor of yesterday is not what the railway motor of to-day or a few years hence will be. Yesterday we were struggling with difficulties connected with the commutator and brushes which have been the great bug-bear of all types of motors. Commutators and brushes require more care outside of gearing connecting motors to axle than anything else we have to deal with. They have always been the weakest spot in the electric railway motor. The question arises, Can these difficulties be overcome? I think they can and have been to a great extent already overcome by several of our larger manufacturers.

In connection with the motor, we are laboring under very serious difficulties in regard to proper control and regulation. In the control

* Read at the Third Annual Meeting of the Pennsylvania Street Railway Association, held at Reading, Pa., September 5, 1894.

of the railway motor we cannot do exactly as we do in the locomotive, adjust our point of cut-off so as to secure the best results with a given load.

We have to govern our motors by varying the resistance in the circuit, which means loss necessarily, because the resistance has to be overcome to some extent by the current passing through it, or by reducing the intensity of the field magnet, which also means loss. If this is true then it seems to me that it is unfortunate, but is it necessary? I do not think so.

The ideal railway motor for the propulsion of our cars would be a motor running at a continuous and uniform speed and with a variable gearing giving the motor the advantage of power when the car was first started. You all know that when our motorman wants to change the speed of his motor, he moves a switch or controller handle around, which adjusts the current flowing through the motor. Now, as a matter of fact, the motor should adjust the current itself, and not the man, and the speed of the motor should remain absolutely constant, while for regulation between the motor and the gear on the driving wheels, you should depend on varying the mechanical advantages entirely.

It should be borne in mind that it is less than three years since the first single reduction motor was commercially introduced. The work was done under the most unfavorable circumstances. Compared with similar motors of to-day they were indeed crude and very costly. They answered the purpose, however, and it is generally admitted that they have been a financial success as compared with the use of former construction.

The single reduction motors have since been in continual operation, and those of recent manufacture, embodying the latest improvements are a great advance in the onward march towards perfection. That there are still annoying circumstances in connection with the mechanism no one who is charged with their practical operation will for a moment deny, but inasmuch as they are universally proving a financial success, it may be taken for granted that electrical and mechanical improvements will be gradually introduced until they become as nearly perfect as anything of the kind can be. The question is not, whether a motor is perfected, but whether it is enough of a success to warrant the improvements which will lead to perfection.

The modern "Atlantic liners" are simply an improvement upon the pioneers in the ocean service; there has been no sudden revolution in steam engineering. The screw propeller did not jump into immediate favor, but it was an important change which slowly forced its way to the front. So with the electric railway motor. Its advantages are not yet thoroughly appreciated, but they will be. Its future is assured. With this outlook will come better construction, better engineering, better mechanics, and the solving of the larger problems, which will place the perfected railway motor on a cheaper, better and more successful basis.

In the words of one of America's greatest philosophers, Emerson, "Our duty is plainly not to throw ourselves across the track, not to block improvement, not sit still until we are stone, but to watch the uprise of successive mornings, and to conspire with the new works of new days."

Economy of Power House Operation.*

By J. B. CRAVEN.

Mr. President and Gentlemen:—"Economy of Power House Operation" has been so often and so thoroughly discussed that I do not know that I can say much that is new on the subject, and yet being one that must ever come up before the management of a street railway system, I feel encouraged to beg the attention of this meeting for a few minutes, that we may see how, and where with intelligent management and proper attention the best results may be obtained on the most economical basis. Starting from the boiler room, we come at once to the place where in most cases the greatest waste will be found. It has been said that the waste due to improper firing is often of greater consequence than any other loss which is produced in the operating of of a steam plant. There are two causes for this: First, poor construction of the boiler. Secondly, poor firing and lack of care of the boilers. Most of us think that any man can fire a boiler, and whilst looking with awe and wonder at the engine and generator, forget that all the power comes from the coal pile and pay little attention as to the economy in transmitting that power from the coal to the engine. No greater mistake is made than to place the care of boilers in incompetent hands, for they require the highest degree of care, conscientiousness and constant attention.

The fireman must be ever on the watch to see that the water is kept at the proper level, to keep an even steam pressure, and to show by his steam, coal and water records that he is getting just as good cards as the engineer can show by the manipulation of the steam he uses in his engine. He must see that the fires are spread evenly over the grates and are of an even thickness that the proper amount of air is admitted into the furnace to obtain good combustion.

If you could realize how easily from 1 to 20 per cent. of coal can be shoveled into the furnace and up the chimney without generating any more power, you would see how essential it is to have something more than mere machines shoveling coal into a furnace. Another point of importance is to see that boilers are kept clean and free from scale, which is simply the result of improper attention.

If for a moment you will stop and think that in the construction of the boiler, the maker has reduced the thickness of the tubes as much as possible consistent with safety, and then look at a tube with from one-eighth to one-half an inch of scale on it, you will at once see how great the loss must be transmitting the heat through this scale; not only that, but it leaves the iron exposed to the effects of the heat without the proper circulation of water back of it, which causes rapid deterioration, and in some cases is liable to cause an explosion. I have used quite a number of boiler compounds for the prevention of scale, but have found the best to be plain coal oil. We have used it in Buffalo for the past two years with success, putting about one pint a day into each boiler and letting it enter with the feedwater by means of a sight feed lubricator. However, no one remedy will fill all cases, and each must be the subject of some experiment.

Another source of loss comes from insufficiently covered boilers and pipes; see that all exposed parts, that possibly can be, are covered with some good non-conducting material, and prevent as much as possible radiation and condensation. The steam pipes should be kept tight and all leaks followed up at once and stopped, and in this way have as little loss as possible between the boilers and engines. See that the piping is well drained, so that water will not carry over to the cylinder of the engine. This is accomplished by separators placed as near to the engine as possible, and the water thus separated is returned to the boilers. In a good many cases this water is allowed to go to waste; if this is found to be the case it should be remedied, as this water is separated at a very high temperature, and requires very little heat to turn it again into steam. Before entering the engine room, I would like to say something on the subject of feedwater heaters. If your engines are running non-condensing, the question is very easily settled; as, however, the majority of steam plants are run condensing other factors are brought in. In the power house of the Buffalo Railway Company, one-seventh of the engine capacity is run high pressure. In this way, taking the feedwater from the hot well, at an initial temperature of 110 degs. and passing it through two heaters in the exhaust line of the high pressure system, we get a final temperature of 194 degs. before the water enters the boilers. It is claimed by some that this method of taking the water from the hot well is not right, on account of the oil to be found in this water. But so small a portion of the hot well water is used, that the amount of oil in it is small, and by this method we do away with secondary heaters in the exhaust line, between the engine and condenser, and not only save in the first cost, but I think obtain slightly better results. However, one thing is important, whatever means are used to heat the feedwater, it should be done, for not only will there be a great saving in fuel, but the straining of the boilers, due to putting cold water in, will be done away with.

Passing from the boiler room, we come to the engines and generators, and the types seen here will be many and varied, from the high speed, belt driven machine to the slow speed, direct connected machine of large units; as you all know, the tendency of late has inclined to the use of the latter type. In my mind there is no doubt of the efficiency of the direct connected unit over the belted one. It is evident to all that where space is valuable it has the advantage of taking up less room. They can be thrown in and out of service with as much rapidity as the belt driven machine; there is a saving of from 1½ to 3 per cent. due to the slipping of belts, very little in itself, but when figured up at the end of a year in a plant of any size will amount to considerable.

Added to this there is the saving in labor and the decreased expense due to wear and tear, as this item is less in slow speed than high speed machinery. For the above reasons I have drawn the conclusion that direct connected units are more economical than high speed ones. Regarding the size of units used, it depends entirely on the output of the plant. I would advocate as large as possible, yet not so large that the breaking down of one would cripple the output. However, in plants that have not these latest types of machines, great saving may be made in the operating of the engines. In many cases after the constructing engineer has left, engines are ofttimes supposed to look after themselves, those in charge simply supplying them with steam and oil. What I said in reference to the man in charge of the boiler room applies with equal force here. Put a thoroughly competent man in charge and you will find it a paying investment. Intelligence and experience are the best safeguards and the real insurance against accidents. Fifty dollars a month more to a capable engineer will probably be repaid a hundred times by the care taken and the high state of efficiency at which the machinery is kept. In such a state an engine is a reliable piece of mechanism. If neglected it is liable to fail at any time, causing delays and worries, and not only adding to the expense in the cost of repairs, but a loss in the receipts outside.

A capable engineer will see that his engines are indicated at least once a month, to see that the valves are properly set and so keep the steam consumption down to a minimum. All pounding, knocking, and leaks should be followed up and remedied at once, and the engines kept in such a state as at all times to be ready to perform the severest service exacted from them. Always keep the load as near the normal capacity of the engines as possible, as engines at that point are most economical; besides you will have fewer machines in service and thus save in the oil supply. Here I will say a little on the subject of oil, as I think quite a saving may be made at this point; in fact I have had one engineer use $640 worth more of oil in six months than another engineer used in the same time, and the engine capacity was increased during the time the last man was in charge. The lowest priced oil is not always the cheapest; some oils will go much farther than others, and the question of what to use should be settled only by careful examination. After being used once it can be filtered and used again on the lighter parts of the machinery. If rags are used for wiping instead of waste, they can be washed and used again, and the grease and oil extracted will be found useful in some part of the system. By washing the rags 80 per cent. can be saved over what the cost would be if only used once and thrown away. Coming to the generator, we find a

*Read at the twelfth annual meeting of the New York State Association September 18, 1894.

machine that is usually well made and efficient. Keep them dry and thoroughly clean and have the commutator kept as smooth as possible. The principal trouble will be found in the sparking of the brushes and the heating of the armature and the field coils. The causes for these troubles are too many to enter into here; but on the appearance of trouble the machine should be stopped as soon as possible, for the old maxim "A stitch in time saves nine," can be applied here. Look out for the minor electrical apparatus in a station, every thing such as switches, connections, and all instruments should be kept clean and in working order, especially in the case of lightning arresters, as they may be the means of saving an armature.

In conclusion I would call your attention to the necessity of having ample copper in the outside lines, and the rails well bonded, and where the system is large enough put in return wires. What is the use of expensive and economical machinery in the power house if you allow 20 per cent of the power to be expended heating up poor connections in the return circuit?

The Electric Brake in Practice.*

By Elmer A. Sperry.

Examination of accounts of the electric street railway companies of our large cities reveals the fact that the item of damage, already very great, is one of growing importance. Investigation of the circumstances and detailed statements of numerous items taken at random from the damage account, point at once and in no uncertain way to the inefficiency of the present hand brake. In many instances, could the car or train have been stopped within a comparatively short distance, the accident and resultant damages would have been entirely averted. The first investigation led to others with the same result, and in consequence the writer is prepared to show that nearly 85 per cent. of the accidents directly occurring, are due to the inefficient operation of brakes. The growing frequency of accidents and the constantly increasing demands of the public for damages, are indications that have not been made to impress the mind of the engineer, or I am sure adequate means would have been forthcoming for the correction of so grave a fault inherent in all the present systems of power-operated street cars. Some of our municipal authorites are taking action with reference to the increasing frequency and severity of accidents, and although no thorough scientific investigation of the matter has been published, yet it is a startling fact that with the present hand brake, no electric or other equipment to-day stands provided with anything in the line of an emergency brake. In so grave and urgent a case, what can be done in the line of remedy? The question naturally arises, will any system of braking worked upon or in connection with the ordinary wheel of a vehicle be sufficient for the stop required? What is the maximum efficiency obtainable by the brake working through the wheels? Is it sufficient to arrest the car before accident in case of emergency? Can it be made in any event a sufficient accident-preventer? The popular notion that most accidents are due to brake failure is true, but in a way that is little understood, the failure being one of degree. It may not be known that under proper and standard conditions any car or train may be brought from a speed of ten miles an hour to absolute rest inside of ten feet. It is not generally appreciated that the wheel brake has ample capacity to accomplish this. The former investigations of the writer with reference to adhesion under conditions of acceleration and retardation, climbing and descending hills, afford ample proof that the rail adhesion through the wheels gives the wheel brake more than capacity sufficient to accomplish this result. For instance, assuming any weight and load, say 17,000 lbs., the stored up energy, 64,426 foot pounds can with ease be dissipated within twenty feet for the ordinary equipment, and less than half of this distance, or

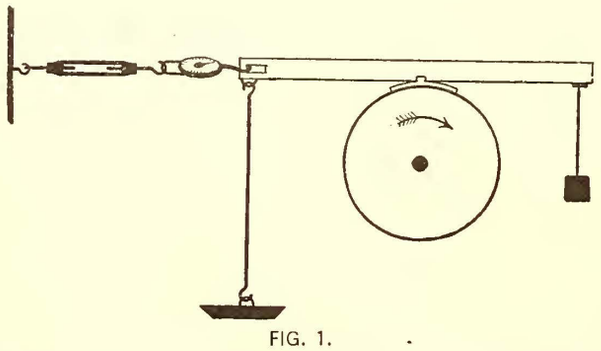


FIG. 1.

a little over nine feet under conditions of coupled drivers, or if the wheels are compelled to revolve in unison. This latter consideration will be seen to have quite an unexpected as well as pertinent relation to the problem. It will be seen that the center of gravity of the mass, is far above the wheel contact with the rail. The retarding effect takes place on the base line in a plane below that of the center of gravity, really the farthest projection downward of the mass as a whole. A sudden stop operating on this base line tends to pitch the upper portion forward, bringing nearly all of the weight, and with it the retarding capacity, upon the front pair of wheels. The brakes on the rear pair in the ordinary equipment will have but little effect; if, however, by any practicable method they are coupled to the forward drivers, the brakes on this rear pair still remain active and of full effect. This is true even if the back pair should be lifted clear of the track. With increased weight upon the forward drivers comes ample increased adhesion, thus preserving the full tractive effort of the total weight intact for purposes of stop, which is impossible in the ordinary equipment. These effects are all aggravated in case of a short wheel base. The present tendency toward a longer wheel base is a step decidedly in the right direction and should be encouraged. The effect of shifting the load in reference to the axles will be especially noticed in descending hills where the momentum of the rapidly retarded mass tends to shift the load centers still further forward, in some cases almost wholly onto the front drivers. It will be seen to have a greater effect than in *ascending* grades, where in stopping, the inertia tends to correct the position of the shifted load, whereas going down, in stopping, the momentum as stated tends to still further aggravate the condition.

Bearing these facts in mind, let us turn for an instant to the ordinary hand brake. The ratio in the brake levers will be found in the modern trucks to be anywhere from 6 to 11½, averaging about 8½ to 1. The lever arm of the brake staff will be found to be anywhere from 6 ins. to 13 ins. Assuming 11 ins. as the average, the radius from the center of the break chain to the center of the brake staff will be 1¾ ins., giving thus 6.28 to 1, or a total leverage of 53.4 to 1, from the operating handle to the brake beam. Two elements now have to be assumed. First, the friction coefficient of the brake shoes acting upon chilled wheels. Second, the power upon the brake staff. The writer has endeavored to cover both of these unknown quantities by actual experiment, giving the results in the tables. Table I was taken by a dynamometer being fastened directly to the brake staff handle in line of the pull of the motorman, a cast iron brake wheel sixteen inches diameter from center to center of a one and a quarter inch rim bearing the handle.

Table I.

Weight of motorman.	Gradual pull with one hand.	Jerk with both hands on hand wheel.	Emergency jerk with both hands on hand wheel.
140	112	135	275
200	135	275	385
287	145	235	312
175	125	212	285
153	125	245	310
185	150	200	300
170	150	275	350
155	135	210	325
135	110	175	325
135	125	250	350
160	125	250	405
176	100	200	400
185	176	250	375
	Av. 131.7	224	338.23

The tests show that the full power that can be maintained upon the brake lever for a sufficient length of time for the purposes in hand does not exceed an average of 180 lbs.

Table II.

Speed rev. per minute 33 in. wheel.	Brake pressure.	Traction.	Coefficient.
Varying, 150	900 lbs.	87.4 lb.	9.7 pr. cent.
125	900	91.7	10.2
100	900	99.8	11.1
78	900	118.	13.2
56	900	133.	14.8
38	900	150.4	16.6
20	900	154.	17.1
4	900	174.6	19.4
Constant, 105	300	29.4	9.8
	500	50.5	10.1
	750	91.	12.
100	1150	125.	11.2
	1500	178.	12.
	2200	305.	14.4
94	3780	488	13.2

Table II was obtained as shown in Fig. 1. A brake shoe that had been run in service about three or four days was taken with the axle carrying its co-operating wheel, lifted out of the truck and placed between the centers of a lathe, the load upon the brakeshoe accurately measured, and the shoe held from movement around the wheel by a dynamometer. Every precaution was taken to avoid handling the periphery of the wheel or the face of the brakeshoe, and even the dust was left upon it so as to conform as nearly as possible to the normal conditions of practice.

Tracing our 180 lbs. application to the brake beam with allowance

*Abstract of a paper read before the American Institute of Electrical Engineers, September 19, 1884.

for loss of friction, we have 3,840 lbs. applied to each of the two shoes which upon the chilled surfaces are found under ordinary circumstances by Table II to give a coefficient of about 12 per cent. This would give a retarding effect of 460 lbs., which is less than one-third that

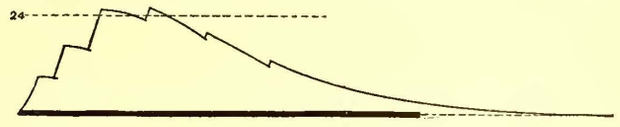


FIG. 2.

easily obtainable were the power needful for its application at hand. The coefficient under these conditions must have been about 37 per cent. to realize anything like the total value of the retarding effect of the wheel. This under condition of chilled and glazed surface is entirely out of the question, showing at once the necessity of power in the application of brakes, if anything like their full value and use is to be obtained. This is also amply borne out in practice, as those who have tested this point well know that under ordinary conditions it is next to impossible to slip the wheels of a motor car by the hand brake.

For years the writer has believed that electricity was vastly preferable to any other force for the application and control of brakes. Working first on the solution of the continuous brake problem for railway trains, he built his first electric brake apparatus in 1882 and has studied and experimented on the problem in its various phases almost continuously since that date, with more or less encouragement in the line of substantial progress. As to its application to electric cars, the apparatus was successfully applied on some double truck cars in Illinois, one of these cars weighing as much as twelve tons. The first equipment similar to that shown in Fig. 5, was con-

FIG. 3.

structed some five years since. This apparatus has been constantly undergoing alterations and has been experimented with, until for the past eighteen months a constantly increasing number of electric cars, equipped with it, have been in regular service, some of these running with change of motormen on each of thirteen daily trips, the same motorman having the car once in about three days, making it impossible for the men to become familiar with the operation of the brake. During this time one car has made upwards of 70,000 miles, hauling a trailer about 48,000 miles, during some special weeks of test, making from 178 to 220 miles daily.

The electric brake under discussion has been operated over a year on equipment upon different roads, from electricity generated independently of the trolley connection, the braking current not being derived from the central station, but produced by the power of the moving car, which power it is desired to get rid of, or destroy. The brake thus operates equally well with the trolley off, and, as will be understood from the following description, the trolley current has nothing at all to do with the car while the brake is being operated, except possibly to maintain the lighting circuit. The electric brake at the same time is entirely independent of the hand brakes, which may or may not be present upon the equipment. The braking action being altogether independent of the brake shoes, it is not found necessary to employ them in connection with the electric brake, although in the earlier forms they were used, and in the case of trail cars, especially in heavy service and on grades, some engineers prefer to use them at the present time.

The current employed by the writer for operating the brakes is developed by automatically turning the motor or motors into generators. As these are driven forward by the moving car, they develop current which is controlled as to intensity by the starting rheostat of the car. The braking current is thus produced at the expense of the mechanical energy stored up in the moving car, which, being consumed causes a retardation and final stopping of the mass as a whole. The current so generated may be furthermore led through a brake magnet as above seen, to apply the brake shoes; it may arrest the motion of the car direct by magnetic adhesion, or develop heavy retarding currents in the moving metallic mass by magneto-induction. When an active local circuit is used, the latter method is usually employed for reasons which will be made more apparent.

The connections, and in fact the whole arrangement of the electric brake upon the car, is extremely simple. This is shown by the fact that only one small extra wire needs to be run to the controller, in addition to the ordinary wiring of the standard equipment without the electric brake. The certainty of operation is evinced by the fact, that at present writing over 150 of the equipments have been placed, which are making upwards of 10,000 miles daily in regular service. Early in the experimentation a phenomenon was observed in reference to the persistence of the current even after the motor had stopped. This is due to the slow action of the decreasing magnetization, taken together with the reaction or self-induction effect of the fields and any brake coil or coils that may be in the circuit. The movement of the magnetic lines, which persist after, and in fact long after the motion of the motor has ceased, generates potential. In many instances it is possible to draw an arc from the rupture of the brake circuit one second after the motion has ceased, showing the presence of current in the local circuit. Fig. 2 has been developed from the average stop to show the curve of current in reference to the motion, the black line indicating the period of motion during the application of the brake, and the curve indicating the current intensity and its duration. The current flowing after motion ceases, though small, is found exceedingly useful in holding the car from starting itself, even on quite a heavy grade, as only a small quantity of energy added to the already great friction of quiescence will prevent the car from starting. This persistency of current is also found useful to kill or destroy the magnetism of the brake magnet, in case it is desired to suddenly move the car forward again.

The current required to be developed to stop a car when no other braking apparatus is used is found to be only a fraction of that required to accelerate the car in the same interval. This may be easily illustrated by the lines in diagram Fig. 3, A being the electrical energy applied in a given acceleration; B the resulting mechanical energy stored in the car after deducting all the wastes in the motor, and between the motor and the momentum; C the average mechanical energy in the car at the time of applying the brake; D being the electrical energy required to be developed for retardation after the efficiency losses have all been provided for out of the quantity C. Thus it will be seen that the so-called efficiency losses, act in a two-fold sense between A and B and between C and D, to reduce the amount of current required to be generated for braking purposes.

Automatic resistances were even at one time used in the endeavor to relieve the motorman of *all* responsibility in connection with the control in applying the brake, but superlative simplicity was found to be much more desirable than the superlatively automatic, and the

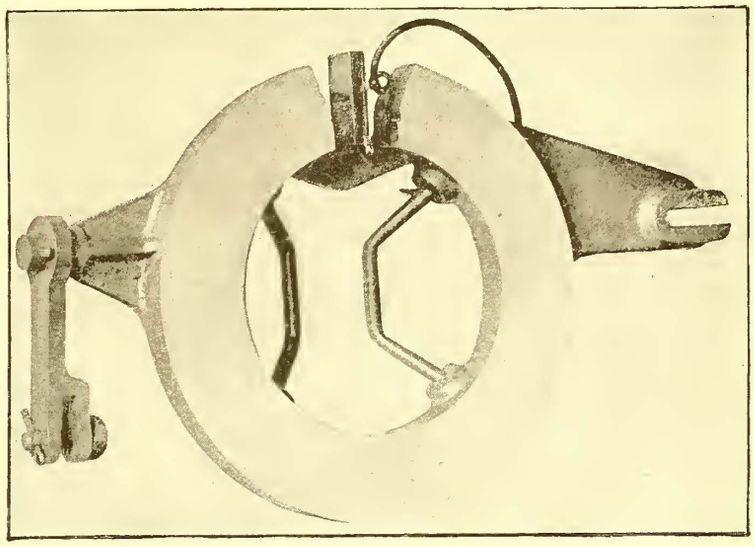


FIG. 4.

automatic devices were seen to be entirely unnecessary, the apparatus as at present constructed being of great simplicity.

The diagram of the braking current in Fig. 2, shows the automatic decrease in the intensity of the brake application so desirable with the decreasing speed referred to above. As the speed decreases, the generator runs more slowly and consequently produces less and less current.

With this style of brake, the life of the wheels is increased from two to three-fold, thus affording a saving in the item next in cost to the electric maintenance itself, to say nothing of the entire saving in brake shoes. This is emphasized in the fact that the brake shoes are being constantly besmeared with sand and grit thrown from the wheels, and when in this condition, they are brought against the wheels with the tremendous pressures noted above. A better method could hardly be devised for reducing both wheel and shoe. We little realize the great number of brake applications necessary in a day's run. Careful record has been kept of this point, giving in three days an average of 1,377 brake applications per day for a run of about 164 miles.

Another interesting feature in this connection is that a flat wheel from skidding is an impossibility. It will readily be seen that should the wheels stop, the generator connected with the axles ceases to produce current, and none therefore exists to farther apply the brake, and though they may be sliding forward on the rail, yet the wheels continue to rotate more or less, and constantly present new surfaces for the sliding contact.

The braking action is two-fold and is especially efficient. The rotating armature of the motor, instead of tugging ahead by its momentum, is itself pulling back and more or less powerfully braking the car through the gears by the retarding effort of the magnetism of its field while generating the braking current. The power required therefore to perform this work is taken from the energy of the moving car which it is desired to destroy; not only is the car thus retarded, but the electric brakes arrest the motion of the wheels direct with a force that is remarkably powerful and under perfect control of the motorman.

Two forms of braking magnets are used, one for winding up a brake chain usually employed in connection with the trailer, and another for directly arresting the motion of the axles, one magnet

only being used in connection with each axle. as shown in Figs. 4 and 5. These magnets are truck mounted, not an ounce of their weight being directly on the axle, and are so supported that their gravity acts to automatically retract from the brake face. The brake face is automatically lubricated to a slight degree, receives a high polish and does not cut or rapidly wear. The brake is noiseless in its operation. It will be seen from the cuts that inasmuch as it does not revolve, no commutating or contact device is necessary. Its crescent form accomplishes important technical functions and also eliminates the necessity of pulling off a wheel for its attachment, removal or inspection. The brake face is *solid unbroken metal* with no grooves or interstices for catching grit or sand, which in part explains the absence of wear above referred to. The brake magnet is practically indestructible, a few turns of stout wire constituting its one coil entirely enclosed and sealed in metal. No harm or moisture can reach it. The lubricator for the brake surface is dry, not sticky or adhesive, and does not gather sand or dirt and retain it upon the braking face. No mechanical pressures whatever are employed to arrest the car, and hence no strain or shoulder wear comes upon the journals.

As to the arrangement for application and control of the brake by the motorman, about a year ago the following appeared from the pen of the writer:

"Considering the inexperience of the operator and the responsibility which at times well nigh overwhelms him, I think that, as engineers, we should be willing to set a very high mark to be attained

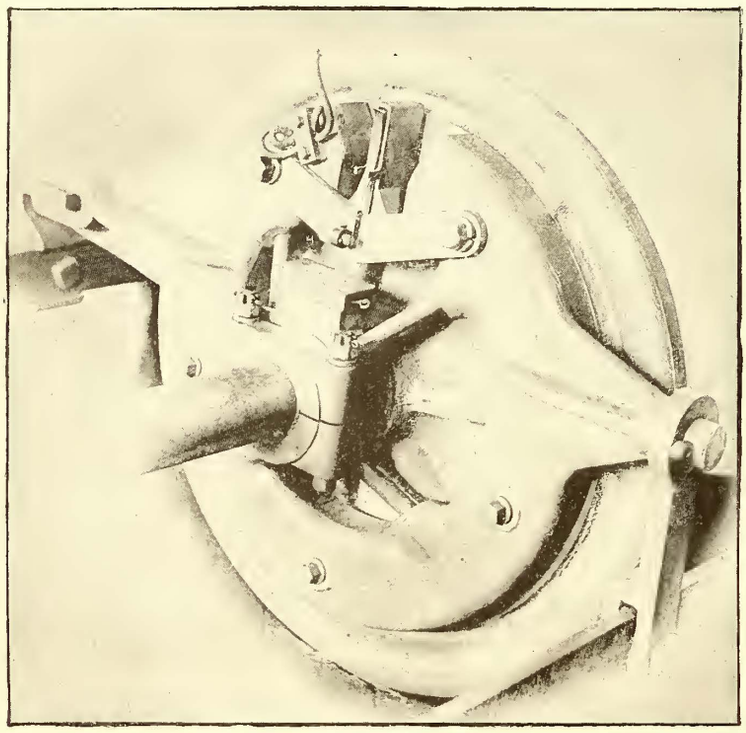


FIG. 5.

in the ideal brake for electric street railway service namely, the use of but *a single controlling handle for everything;* starting, accelerating, retarding and braking the trailer, or trailers and all. Let the motorman have nothing to think of except one handle, and two thirds of the accidents now occurring will be prevented. Let this handle require no more exertion in its operation than the present controlling handle. Let the motorman fulfil his functions with as little physical exertion as possible; he will then have a greater reserve for mental application when necessary. A motorman required to exert an enormous amount of brute force, constantly grinding at the brake, has but little life left to apply in case of emergency. I agreed with a prominent writer on this subject, where he says that a multiplicity of handles is fatal in time of emergency."

At the time the above was written, equipments controlled as therein set forth, namely, by the use of a *single controlling handle for everything*, had been in operation for upwards of a year. The methods employed for accomplishing this have been varied, but in the form most in use at the present time the resistance contacts are employed in a two-fold manner; the controller handle is made to operate back and forth over the same contacts for controlling both the application of the current to the motor and braking the car. A self-correcting and interlocking device is also provided, so if the motorman does not throw the handle clear over, the transformation is completed automatically before the movement of the lever can reach the operating contacts.

It will thus be seen that the brake is automatic and does its work without any special act or even the knowledge of the motorman. He simply "works a single handle" back and forth, and electricity "does the rest." Suppose the motorman wishes to stop his car, he turns off the current by simply swinging the lever over to the right. This operation is made to automatically convert the motor into a special dynamo for generating currents at very low speeds, and also simultaneously to cut off all connection with the trolley current. The brakes are then applied by simply swinging the handle back over the path it has just traversed; the farther it is swung to the left, the stronger the brakes are applied. The act of releasing or letting off the brakes, again automatically re-establishes connection with the trolley and re-converts the dynamo into a motor. The same rheostats and contacts are applied to control the motor while running the car, and also to control the slight amount of current generated by the transformed dynamo, which is sufficient to brake the train.

The motorman cannot turn on the current before the brakes have been released, nor can he apply the brakes before the current has been turned off. This is a result of construction, and constitutes a feature of merit in the new electric brake, effecting an economy in current and a saving in wear and tear. Freeing the conductor of all care in this connection, and leaving the braking of the train—including trailer or trailers and all—solely in the hands of the motorman by placing at his command a power with which he may with the utmost ease accomplish his task, constitutes an important advance in the art of control of electric railway equipment.

It has been found that the electric brake is practically incapable of abuse by any motorman, due to the fact above named, that no amount of over-application can cause flattening of the wheels, or any harm whatever to any part of the equipment through their locking and skidding.

The principal moving parts are simple and durable, being only two in number. The various portions of the controller have been subjected to the severest tests possible, one test made in 1893, consisting in 518,700, consecutive brake applications without appreciable wear, the parts being in regular service at the present time.

Operating the brake in this manner, it will at once be seen that the system is one of the utmost certainty of operation, surer even than the hand brake, from the fact that every time the car runs, the motor, which is depended on for the braking action, receives a test, and its fitness and capacity for the next brake application is constantly being demonstrated. On the other hand the motorman never knows whether his hand brake is sure to operate when called upon for the next application.

The advantages found to result from the practical use of the electric brake as compared with former brake systems; its qualities as an accident preventer, as well as its general commerical value may be recapitulated as follows:

1. The certainty of its operation.
2. The enormous power at instant command and under perfect control.
3. The absence of all power absorption at moneyed cost from the central station.
5. Its extreme simplicity.
6. Observed saving in wheels, two to three-fold.
7. Entire saving in brake shoes.
8. Lubrication of brake face; very little wear of either wheel or magnet.
9. Absolute silence of operation and release.
10. The low E. M. F. at which it operates.
11. The ease of its application and control.
12. Conserving strength and prolonging the usefulness of the motormen.
13. The smoothness of its operation.
14. The fact that its use cannot cause flat wheels.

Feeder Patent Decision.

A decision far reaching in its effect, was given September 12, by Judge Acheson in the United States Circuit Court of Appeals in Philadelphia, against the Edison Electric Light Company. The decision was on appeal of Westinghouse, Church, Kerr & Company, from the decision of the Circuit Court in New Jersey, in an infringement suit brought by the Edison Company to restrain the appellants from using one of their patent distribution systems of feed wires.

The patent contested was letters patent No. 264,642 granted to Thomas A. Edison for an electric distribution and translation system by reason of the construction and operations of an electric light plant at the city of Trenton, N. J., by the defendant Westinghouse, Church, Kerr & Company.

All through, the testimony of the defence was to show the great similarity between gas and water distribution and that of the electric distribution according to the specifications mentioned in this patent.

The judge after reviewing the facts of the case, says, "The plan of electric distribution covered by the claims in question is not 'the creative work of that inventive faculty which it was the purpose of the constitution and patent laws to encourage and reward.' To sustain these claims would be to sanction a monopoly in that which belongs to the public. In announcing this conclusion we cannot do better than quote some observations of the Supreme Court which apply with great force to this case, as we read the proofs."

THE New Castle, Minersville & Tremont Street Railway Company, of New Castle, Pa., was incorporated September 19, with a capital stock of $100,000, to construct and operate an electric railway in New Castle, Schuylkill County, Pa. W. F. Sadler, of Carlisle, Pa., is president of the company, and other stockholders are L. S. Sadler and Willard F. Thompson, of Carlisle, and Elias Davis, of Broad Mountain, Pa.

Wheels.

Just as we are going to press the following letters have been received upon the subject of cored wheels and their action on curves:

PASSAIC, N. J., September, 22, 1894.

EDITORS STREET RAILWAY JOURNAL:

I am becoming very much interested in the subject of the wear and behavior of the wheels under street cars. With the introduction of heavier cars, the life of those wheels which I have an opportunity to examine, is being very much shortened. This rapid wear is making trouble. Mr. Fitch in his article, published in your July issue, makes a number of exceedingly good points, but in speaking of the uses of the cone, he seems to me to omit one point. Wheels when fast on one axle and held square in the truck will travel, or tend to travel in a straight line, regardless of slight differences in size. In fact, experiment has shown that wheels may be thus fitted and of such differences of size as to run round a curve of a given radius without slipping; but if the axles are put into the truck square with each other and are fast on the axle, the tendency of the truck is not to follow the curve, but to go straight ahead. This has always seemed to me to be one of the strongest arguments against coning of wheels. If a pair of wheels has no tendency to go round a curve, because of their difference in size, then certainly the making of the individual wheel in such a way as to practically give two diameters can be of no advantage, since slipping must be encountered in any event. I suppose that it is pretty well understood that coning has some advantages on a straight track. It tends to keep the truck centered between the rails. J. F. T.

NEW YORK, September 24, 1894.

EDITORS STREET RAILWAY JOURNAL:

Mr. Fitch in the July number of the STREET RAILWAY JOURNAL presents a number of advantages which coned wheels have over those with cylindrical treads. He gives what has been, and what I suppose is to this day the generally accepted idea among car builders and railroad men. When I was a young man it was received as law and gospel. It is a real good theory, but it has no foundation whatever in fact. I do not believe that the centrifugal force in any ordinary street car work has anything to do with the behavior of the wheels on the track. Theoretically the trailing truck of a long car should have just as much centrifugal force as the forward end. The rear half of a long motor car ought not, theoretically, to have any less centrifugal force than the front half, yet the front half of the car jams its wheel hard against the outside rail, while the rear half will have its wheel slack to the rail, and perhaps grinding against the inner rail. That fact certainly ought to smash the cone theory.

All cars built with a due regard to the laws of nature and the rules and regulations laid down in the books, tend to go straight ahead. When a car reaches a curve the rail proceeds to push the wheel sideways and the first wheel gets a very large percentage of the push. The second wheel practically takes none at all of it, consequently cars go around curves cornerwise. In the old days when it was customary to let the outer wheels run around curves on their flanges it was almost universal to find that they cut a pair of grooves in the outer flat rail. In this case, theory may be all right for the forward pair of wheels, but how about the second pair? It is certainly all wrong for them. It used to be a common belief among railway men that coned wheels stayed in the middle of the track better on tangents than those which were cylinders, and in 1873 it was a question whether one of the popular systems of loose wheels and axles was not led into trouble because, using cylindrical wheels, they had difficulty with the swinging of the trains from side to side on straight tracks. But supposing the cone theory worked all right in practice as well as on paper, would it be of any practical use? I think the answer a very doubtful one, because after a comparatively little wear they become cylindrical, and with a little more wear they are coned in the opposite direction.

As Mr. Fitch showed, wheels on curves will slip and slide regardless of coning or being fast or loose on the axles. In fact a wheelbarrow wheel wont go round a curve with as little friction as it has on a straight line.

I can't agree with Mr. Fitch in the statement he makes in his sixth paragraph, at the bottom of the first column. I think the side motion seen in a car upon the track under the circumstances which he describes, is not so much due to the lagging of one wheel behind the other, as to irregularities in the surfacing of the track. He says that: "When one wheel is minutely smaller in diameter than the other, and lags behind, its direction of travel is changed from a straight line to an outward direction or path, until its own largest circumference next to the flange of the wheel is in contact with the ball of the rail." This may be an explanation, but it does not correspond with all the facts in the case. It does not to me seem to correspond with the fact that unequal diameters on the same axle held squarely across the track tend to travel in a straight line. It should think it more likely that there was a sliding of the wheels at right angles to the rails. This seems to me rational, but the slipping and lagging of one wheel behind the other does not. Most good trucks hold their axles rather too rigidly lengthwise of the track to make this seem probable.

FRANK ADAMS.

Fender Report in Baltimore.

Some time ago a car fender commission was formed in Baltimore, Md., consisting of the Mayor, City Register and City Commissioner, for the purpose of considering the subject of life guards for trolley cars. Mendes Cohen, past president Am. So. C. E., was employed to investigate and make a report on all fenders which came to his notice. In all, seventy different types were offered, but out of this number, which included nearly, if not all, of the best known fenders, none met with his unqualified approval.

The various fenders are grouped into classes, based on form or mode of operation. Class 1 are termed "combination fenders," meaning those which include in one design a projecting front fender, together with a wheel guard, being thus complete in themselves. The following are named under this head as patentees of fenders likely to prove effective in service: William C. O'Brien, J. W. Darley, Jr., William R. Will and W. R. Fowler, all of Baltimore, and the R. A. Crawford Manufacturing Company, Pittsburgh, Pa.

Class 2 are "front scoop or pick-up fenders," designed to save persons caught, either standing or fallen in the way of an approaching car, but which make no provision for the contingency of failure to pick up the victims. These are divided into two groups. In the first are included such fenders as failing to pick up the victim will not by their form cause injury in passing over him. As belonging to this group Mr. Cohen mentions two, of which Samuel C. Kindig and William J. Ogden, both of Baltimore, are inventors. Neither of these, however, came fully up to the requirements, but both inventions contain good and valuable features. Of course, as already explained, these fenders will each require an effective wheel guard to operate in connection with it.

Fenders of Class 3 assume to trip the person struck and cause his fall upon the platform, but which, like the fenders of Class 2, make no provision for those who are not successfully picked up or saved from falling. Of this class there are but three devices which merit attention, viz.: Louis Pfingst, Boston, the fender used by the Buffalo Street Railway Company, and that of Ferdinand Groshans, Baltimore.

This Buffalo car fender differs from the first only in the fact that it does not slide under the car. It is so arranged as to be readily attachable and, when the direction of the car is reversed, the fender is lifted off by the conductor and motorman and transferred to the other end of the car. Dr. Groshan's fender is not thoroughly worked out in its mechanical details and would not be entitled to notice, except for the elastic edge, which is good and may be fairly relied on to trip a person without seriously bruising or injuring him.

Class 4, or "wheel guard fenders," with or without scoops, are intended to protect from being crushed by the wheels any victim whom the front fender has failed to save. In this class several are mentioned. They are the fenders of which the Detrick & Harvey Machine Co., Baltimore; S. Wright, New York (in use in Philadelphia); George Blakistone, Baltimore (on entire equipment of the Central Railway Company of Baltimore); H. S. Robinson, Fallston, Md., and F. Groshans, Baltimore, are the patentees.

What is needed is a very simple piece of work, the more simple the better. Mr. Cohen's report concludes as follows:

"It is required that the front surface of the car, striking a standing human being, shall be so arranged as to afford a reasonable prospect of saving the person from being dashed to the ground; and, further, so arranged that it shall do the least possible damage by its own impact; and, further, if it fails to do the duty expected of it, and the person does fall to the ground, or is already lying there, that it shall be so devised as to pass over him without causing further injury; and that there shall also be on each car a suitably arranged wheel guard, preferably of angular or "pilot" form, which shall be automatically brought in close contact with the street and rails, in order to prevent the crushing of the victim, whom the front device has failed to save."

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We heartily invite correspondence upon all subjects of interest to street railway men. Information regarding changes of officers, new equipment, extensions, etc., will be greatly appreciated for our official directory and news columns. We especially invite the co-operation of all interested to furnish us particulars that the directory may be correct and of the greatest possible value.

Address all communications to

Street Railway Publishing Co.,
Havemeyer Building, 26 Cortlandt St., New York.

Atlanta is the city which many of our readers will visit this month at the annual meeting of the American Street Railway Association. For all who expect to attend the Convention, we can predict a most delightful trip, and we urge upon every company the desirability of being represented. The Convention promises to be the largest and most successful in the annals of the Association. The programme decided upon is a most attractive one, the papers being upon subjects having an important bearing upon street railway practice, while the social features of the meeting promise to be particularly pleasant and attractive.

Instances of Exorbitant Insurance Premiums are continually being brought to our attention, and bear added testimony to the soundness of our position in urging the advantages of mutual street railway insurance. We learn from insurance people that rates higher than even now are contemplated, on account of unprofitable business. On the other hand, we are informed that the losses of a certain mutual company, making a specialty of electric railway and lighting risks, have been a small fraction of their premiums received, and that a dividend or rebate of 50 per cent. on the business of the past year is about to be declared. These two statements do not seem consistent, and altogether, it is but fair to state that experience with mutual insurance in this field, is not sufficient to enable percentages of loss to be calculated with any degree of certainty, yet we are sure that the cardinal principles on which all successful mutual companies are founded are wise, and must inevitably lead to lower rates or better profits.

Leakage from Overhead Lines, unless special care is taken to provide good insulation, often amounts to a large percentage of the total output, and reduces the efficiency of the system materially. To provide against loss from this cause, the overhead line should be frequently and thoroughly inspected, and care taken to determine any faults or breaks in the insulation. Usually natural causes are the only agents of destruction which need be feared, but some remarkable performances of the amperemeter in a station near New York last month led to an investigation which disclosed other courses for the current. It was found after the engines had been called upon to deliver considerably more current than usual, that the manager of a neighboring road had been using the extra current to operate his cars, his own generating apparatus having broken down. The connection was made at a a point where the feeders of two lines passed close to each other. Hereafter linemen should be instructed to look out closely, not only for weakness in the insulation, but also for surreptitious connections with the overhead circuit made by other power users.

"Street Car Wheels and Axles," is the title of a paper to be read at the coming meeting of the American Street Railway Association in Atlanta, Ga., by D. S. Cooke, electrical engineer of the Trenton Passenger Railway Company. This should receive, as it deserves, the careful attention of the Association, and should have the fullest discussion. Since we are entering upon a new era in street railway traffic, and are introducing new methods of propulsion which have increased the scope of the street road beyond any precedent, we have encountered entirely new and perhaps unexpected conditions. With the change from animal power to electricity and the cable, the railroad manager is confronted with a change in the condition of his rolling stock. Among the exceedingly important of these conditions is the increasing wear of the wheel. Harder service, heavier weights, and greater brake power all combine to shorten the life of the wheel. Unfortunately, the conditions of street service differ so materially from those of any other railway work that the experience of the steam railway men is of comparatively little value; hence, it becomes necessary to study the problem in the light of the new and rapidly growing experience.

City Engineers and Local Street Railway Managers are often at loggerheads as to the best methods of track construction (including the type of rail and material for paving), when it is proposed to reconstruct or extend a system for mechanical traction. Several instances of this kind have occurred recently, and the reason has usually been that engineers in the employ of municipalities were not as well posted regarding existing street railway practice as those directly engaged in the business. The city engineer is supposed to be always on guard for the best interests of the city, but in his zeal he may insist upon the use of a new rail or of a type of rail that is employed in another city where the conditions differ widely from those in his own locality. The essential features of a rail to be considered are strength, so as to avoid the necessity of tearing up the streets for repairs, degree of obstruction to vehicular traffic, in some cases to provide a track for vehicles, and ease of draft. From a street railway standpoint a T or center bearing girder rail is most desirable, because of their ease of draft and strength with economy of material. In cities

where these types are not allowed, a compromise must be effected. A grooved girder rail may be employed in an exceptionally clean city with fair results, but will not fit the conditions of a city where the streets are habitually dirty. Other rail heads of almost every conceivable type have been tried with more or less satisfactory results, so that in the present state of the art it is almost folly for a person not fully informed on the results of past trials to undertake the design of a new rail and insist upon its adoption. Let such city engineers as may have to pass on any part of street railway construction keep thoroughly posted upon all improvements made in the industry, and it will then be found that their ideas and those of the managers will agree in all essential particulars.

Five State Street Railway Associations, those of New York, Pennsylvania, Massachusetts, Ohio and Michigan, held their annual meetings last month, and each, according to the report of its executive committee, was in active and prosperous condition. The increase in state associations throughout the country is evidence of the fact that they form an important aid to the industry in which their members are engaged. There are many important subjects, as we have repeatedly stated in these columns, which the American Street Railway Association, owing to its national character cannot take up, and with which the individual companies of the state acting alone are not able to cope. Yet the prosperity of all depends upon the prompt and effective action by some body or association in the common interest, either to prevent unjust legislative oppression, or to assist in the perfection of the operating department of railways by a general exchange of information or in other ways to be of benefit. The amount of capital invested in the street railway industry, through the general introduction of mechanical methods of propulsion, has increased so rapidly during the last few years that the need of united action is much greater than ever before. We feel confident that if the advantages to be secured by joining state associations were more generally realized, a much larger proportion of the operating companies of a state than at present would be enrolled in their lists of membership. For the small company, as for the large, the need for mutual help is equally important, and while the excuse is often made that the railway in the small city can add but little strength to an association, it should be remembered that, especially in securing legislative action and reform, a railway company in a small city or town can often use a greater influence in proportion to its size with a representative from its district, than one in a large city. As for those companies which are so shortsighted as to wish to profit by others' work without co-operating in the ends sought, a time may come when they will need assistance in their turn, but that assistance may not then be readily offered or available.

The Business Situation is Improving. Whatever may be the causes, there is no doubt about the fact. Eastern markets, particularly in New York, have been filled for nearly a month past with buyers from nearly all parts of the country. The pressure upon the custom houses of applications for the release of goods from bond has been so great that for several weeks their clerical forces have had to work late at night in the endeavor to satisfy the energy of the merchants who are seeing substantial profits in the growing volume of business. Boxes, bales and barrels are once more encumbering the sidewalks and trundling merrily through the streets on their way to the railroads. The dry goods industry has first felt the effects of this increasing confidence in the future. It is said that at one time over 4,000 purchasers of dry goods were in New York City alone, and under the stimulus of their demand, prices have been steadily advancing, and the large surplus stocks at the great manufacturing cities of New England have been rapidly drawn down to a point where increased production has necessarily commenced again, on a larger scale. A "straw," which has given great encouragement to those disposed to be optimists, was a recent sale at auction of an immense stock of silk, about 600,000 yds. in all, which went off at prices averaging less than 10 per cent. below the general market. Other departments of business are slowly but surely picking up, and stocks of goods, wholesale and retail, which for nearly a year past have been kept at the very smallest possible point in anticipation of lower tariff rates, are now being replenished everywhere. The prospects for a good fall trade and excellent spring business in the general industries of the country are exceedingly bright.

* * * * *

Financial markets—the most sensitive of all—have been encouraged by the business revival and although there is believed to be "a large short interest" in the stock market, composed of those who are inclined to think the general conditions not wholly favorable, the general feeling is one of cheerfulness and belief in the immediate future of American securities. Railroad stocks have gradually advanced with improved reports of freight earnings, and nearly all stock quotations other than railroad, have shared in the current hopefulness. Government finances, too, are improving, The gold reserve is steadily increasing, the enormous volume of custom receipts during the past few weeks has provided for all immediate necessities and it is confidently believed that the new tariff bill will permanently run the Government and leave a reasonable surplus. The money depots of the world, London, New York, Paris, Berlin, are full to overflowing with cash which the banks, as agents of the capitalists, will be only too glad to loan upon satisfactory security, and no security is, as a rule, more satisfactory than properly endorsed drafts secured by bills of lading. The best commercial paper is eagerly sought for at low rates of interest and it may be considered certain that when our manufacturers and merchants the world over are certain enough of their markets to again take up the work of production and distribution, the money supply will be, for some time at least, equal to the demand.

* * * * *

The street railway industry has borne its burdens in the great financial depression of 1893-94. Eighteen months ago the skies were bright, earnings were increasing and street railways were enjoying unexampled prosperity. Then came the crash. Earnings fell off at once, though proportionately less by far than was the case with the railroads of the country, and indeed less than with most industrial firms and corporations. Street railways have always the great advantage of a cash business, and where they are not overcapitalized they can easily stem any ordinary financial depression. Throughout the present one the necessary net earnings have generally been obtained by

severe retrenchments. It is probable that many of the properties have had experience in economizing, which is, to some extent, a practical offset to temporary financial troubles. The demand for new apparatus and supplies of all kinds has rapidly fallen away. New construction, except in a few large cities, has almost completely stopped. The great manufacturing companies, confronted with a rapidly contracting market, have effected great economies in their own organization, and have been putting down prices to a point hitherto unheard of. It is probably true that a street railway can be built and equipped to-day at a price less by fully 50 per cent. than was the case two years ago.

* * * * *

The time is ripe for action. It is not probable that prices for apparatus and for the major supplies necessary in street railroading will ever—or at least for years to come—be materially lower than at present. It is hard to believe that manufacturers can be making any reasonable margin of profit at the present figures. Electrical apparatus stands at prices less than one-third those of three or four years ago. Steel rails, even the patented sections, can be purchased at prices which compare favorably with those of the English market in spite of the far higher wages in this country, for our coal and iron production is so enormous and our processes of manufacture have been cheapened to such a degree that the time when we can compete with England in the world's iron and steel markets seems to be almost in sight. Ingot copper is at extremely low figures, and it is being drawn into wire at prices which represent a fraction of the profits of better times. Structural iron and building materials are cheap, and everywhere the cash purchaser can come into the most favorable market obtained in the experience of many years. These conditions, however, will not long obtain. "Those who know" are already purchasing, and from all sides street railway manufacturers and dealers report greatly increased inquiry. This strengthening demand will inevitably bring about higher prices, and those who are in the field first will reap the benefit of the lower.

* * * * *

The market for street railway bonds is beginning to show some life, and a few issues have recently passed out of brokers' hands to the investor at a reasonable profit. Generally speaking, however, Eastern bankers and brokers have not cleared their coffers of the more or less "choice" bond issues of all kinds, with which they have been loaded down during the financial depression, and are not disposed to assume responsibility for street railway bonds outside of those of the large systems and principal cities of the country, whose safety is beyond reasonable doubt. This, however, is not due so much to the lack of money or of credit, as to a more or less general feeling in banking circles that many street railways have been overcapitalized. In cases where there is no ground for such suspicions, street railroads are, even now, readily securing a hearing and can in many cases either borrow money on a deposit of bonds as collateral, or, if presenting exceptionally choice issues, can sell them outright at favorable rates.

* * * * *

For the reasons above stated, we are strongly advising our friends to complete their financial arrangements so long held in abeyance, and to go into the market at once prepared to take advantage of business conditions and opportunities, which may not be found again for many years.

Our Forthcoming Souvenir Edition.

As in a number of years past, we shall issue during the present month in honor of the Atlanta Convention and of our tenth anniversary, a Souvenir Edition of the Street Railway Journal, which we believe will be one of the handsomest and most comprehensive publications in the history of trade journalism. The contents will be devoted largely to the interests of street railways in the South, and will contain numerous illustrations of scenes in and about Atlanta, as well as street railway views from every principal Southern city. Other features of the publication will be portraits of a very large number of the officers of Southern street railway companies, portraits of the past presidents of the American Street Railway Association, executive committee and local committee of arrangements, with those of a number of Atlanta's prominent citizens. The table of contents will also embrace an article descriptive of the growth of the Street Railway Journal, and of the street railway industry during the last decade, together with numerous other interesting subjects.

Our headquarters during the Convention will be in Parlors B and 6 of the Aragon Hotel, and we shall also have a handsome booth in Exposition Building, near the entrance to the Convention Hall. In this connection we extend a cordial invitation to all the delegates, supply men and visitors to call and register with us, assuring all of a hearty welcome.

Electric Railway Ambulance.

As a result of a conference between Health Commissioner Dr. George Homan, of St. Louis, and President Scullin of the Union Depot Street Railway Company of that city, the latter company has decided to put in operation an electric street railway ambulance. The plans for this unique car have been drawn up by Dr. Homan, and the car is now being built by the St. Louis Car Company. It will be fitted up so as to be complete in every detail, and its line of service will be from 12th and Pine Streets over the line of the Union Depot Railway Company to the City Hospital, and the western terminus at Kings Highway and Arsenal Street, where patients will be transferred by ordinary ambulances to the Female Hospital a quarter of a mile distant, and also to other institutions in that vicinity.

Pending the completion of this car an ordinary car has been fitted up temporarily for the service. It runs on a regular schedule, making seven trips daily, handling each day from fifty to sixty patents, who are in charge of a competent physician.

On Saturday, September 15, 1894, the stockholders of the Orleans Railroad Company, of New Orleans, met to consider a proposition for a change of motive power. The plans and specifications had been prepared by H. J. Malochée, E. E., of that city, and a report was submitted by him regarding the estimated total cost. This report was approved as read, and the necessary two-thirds of the total number of shares were voted in favor of the proposed change.

Work on this line will begin very shortly when the contract will be let, the whole to be done under the supervision of the consulting engineer of the company. This road, which runs through a thickly populated section of the suburbs, reaches Canal Street by the narrow streets of the French quarter, but when leaving these, the cars run on several very wide and broad avenues, which are lined with beautiful residences. This line also reaches the famous French Market of the Crescent City, as well as the Fair Grounds where the winter races are held.

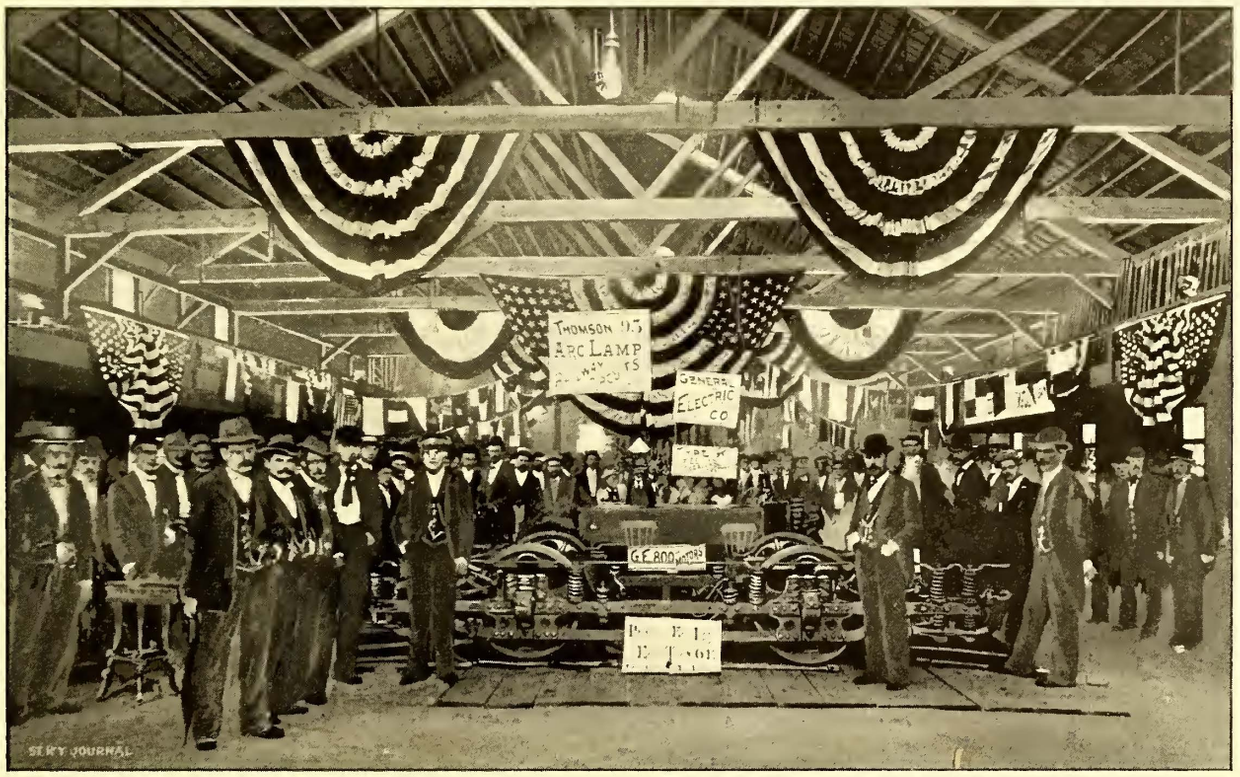
THIRD ANNUAL MEETING OF THE PENNSYLVANIA STREET RAILWAY ASSOCIATION.

The third annual meeting of the Pennsylvania Street Railway Association was held at Reading, Pa., Wednesday, September 5 and 6. There was a large attendance, and the meeting was a most successful one in every particular. An especially attractive feature of the meeting was the fact that an exhibit of street railway supplies was held in connection with it. Heretofore, supplies have been shown only in connection with meetings of the American Street Railway Association, but the exhibits were most complete both in number and variety, and reflected great credit on those represented, as well as upon J. A. Rigg, president of the Reading Traction Company, to whose efforts, we understand, the plan of making the exhibit was finally brought to a successful completion.

nual address. Richmond L. Jones, of Reading, welcomed the visitors to the city. He dwelt at length on the application of steam and electricity to transportation, and closed with a beautiful eulogy on the death of the late president of the Association, R. H. Rhoads.

A paper was then read by Lincoln Nissley, general manager of the Citizens' Passenger Railway, of Harrisburg, on "The Perfection of Street Railway Motors." This is published in another column.

In the business meeting which followed Mr. Nissley's paper, the subject was discussed as to the admission of supply men as members of the Association. It was finally decided to admit representatives of supply houses to the Association as honorary members, upon payment of an ad-



VIEW OF CONVENTION HALL, READING, PA., SHOWING EXHIBIT OF THE GENERAL ELECTRIC CO. AND PECKHAM MOTOR TRUCK & WHEEL CO.

The part of host was ably filled by Mr. Rigg, and the hospitable welcome and entertainment extended to all during their stay at Reading will long be remembered by all participants.

The official place of meeting was at the Neversink Hotel on the summit of Neversink Mountain, several miles from the center of the city. It is reached by the Neversink Mountain Electric Railway, which has been described in former issues, and which winds around the mountain, disclosing beautiful views of the neighboring hills, the city of Reading and the picturesque Schuylkill Valley, until the summit is reached at a height of some thousand feet above the city below.

The exhibits were held in Metropolitan Hall at the corner of 5th and Chestnut Streets. While some considerable distance from the Neversink Hotel, this hall was quite near the Mansion House, which was the headquarters of the Association during the last day of the meeting. A detailed account of the different exhibits is given in another column.

The meeting was called together at 11 A. M., September 5, in the parlors of the Neversink Hotel by Vice-President Wright, of Allentown, who delivered the an-

mission fee and annual dues, the honorary members to have the same privileges as other members, except that of voting and holding office.

At the afternoon session an interesting paper on "Power Stations" was read by L. H. McIntire, general manager of the People's Traction Company, of Philadelphia.

In the discussion that followed Mr. McIntire was asked in what sized roads it would, in his opinion, be advisable to use direct connected and belted generators. In reply, Mr. McIntire said that this question depended largely upon local conditions, especially the question of cost of real estate, since the belted plant took more room than the direct connected. As a general rule, however, where the units used were larger than 300 or 500 K. W., the direct connected method was preferable, and that even where the units were smaller, direct connected plants might be used to advantage. In plants where the unit was 1,000 K. W., or over, the direct connected plant, in his opinion, was the only practicable.

In the business meeting that followed the question was brought up of the best method of apprising the non-member companies in the state of the advantages of the

Association and enlarging it by the addition of new members. Remarks were made by Messrs. Given, Lanius, Bragg, Darlington, Lawless and others, and it was finally decided to refer this question to the executive committee for action.

The election of officers resulted in the following choice: President, John A. Rigg, Reading; first vice-president, Robert E. Wright, Allentown; second vice-president, G. L. Greenwood, Pittsburgh; secretary, S. P. Light, Lebanon; treasurer, W. H. Lanius, York. Executive committee, C. L. Magee, Pittsburgh; J. J. Patterson, Lancaster, and B. F. Myers, Harrisburg, with the president and secretary members ex-officio.

The place of meeting for next year was left to be determined by the executive committee.

In the evening a trip was made in special electric cars to the power station of the Metropolitan Electric Company, which supplies current to the cars of the Reading Traction Company as well as to an extensive lighting system. The party was shown through the station by J. L. Boyer, chief engineer of the Metropolitan Electric Company and also of the Reading Traction Company. The station is located on 7th Street, and the railway plant consists of a vertical, 600 H. P. Lake Erie engine, direct connected to a General Electric M. P. generator of 730 amperes and operating at a speed of 150 revolutions. The station also includes a Hamilton-Corliss 1,000 H. P. engine, which supplies power for the city and commercial lighting, and six Ide engines, manufactured by the Harrisburg Foundry & Machine Company in the light and motor department of the company. The arc lighting machines are of the Wood, American and Thomson-Houston patterns, and the incandescent lighting is done on the Edison three wire system. The company has also recently installed an M. A. Green 500 H. P. engine, which drives a General Electric 300 K. W. generator. Schieren belts are used.

The company has at present fourteen ninety horse power tubular boilers, and is installing a new National water tube boiler of 1,000 H. P. An interesting feature of the station is the method of cleaning generators by compressed air, described elsewhere.

From the station the party visited Mineral Springs Park, where they witnessed the act of DeLeon, the "Demon of the Deadly Current," on the electric wire, and listened to the concert by the Ringgold band.

Thursday morning the members visited the exhibits at Metropolitan Hall, and in the afternoon, in three special cars, the first of which contained a fine band of music, a trip was made over the Mount Penn gravity road. The ascent of the mountain was made by means of a steam locomotive of peculiar design to surmount the steep grades and pass around the sharp curves of the line. The delegates were regaled with a sumptuous repast at the hotel at the summit, after which the descent of the mountain was made. Further entertainment was provided at the Mansion House in the evening for those who remained for the late train.

THE EXHIBITS.

The exhibits were shown at Metropolitan Hall, corner of 5th and Chestnut Streets. The floor space, though large, was well occupied. The decorations of the hall were elaborate, consisting of bunting and draped flags, while illumination was provided by arc and incandescent lamps, the current for the former being supplied from the street railway circuit in front of the building. There were frequent exclamations of surprise and admiration at the enterprise of the manufacturers represented in presenting such an excellent exhibit, and commendation of the plan of exhibiting at state conventions. The hall was visited by a large number of the residents of Reading as well as delegates.

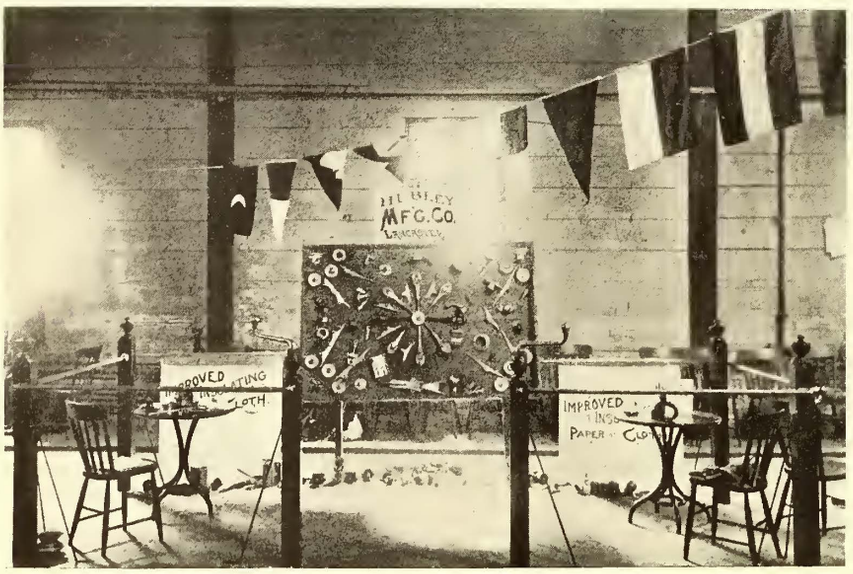


EXHIBIT OF THE HUBLEY MANUFACTURING CO. AT THE READING CONVENTION.

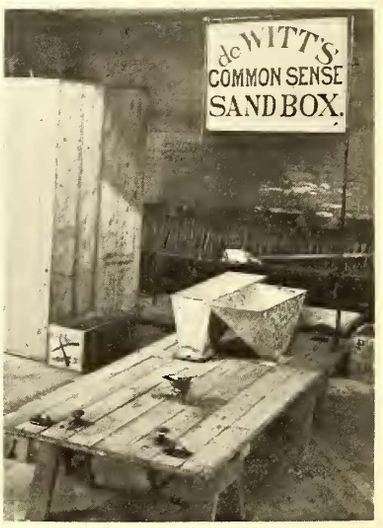


EXHIBIT OF E. F. DE WITT & CO.

We present below a detailed list of the exhibitors and of the articles shown:

THE EXHIBITORS.

F. J. Hanold & Company, of Reading, Pa., showed a large number of kinds of coal which the firm handles.

The Scarritt Furniture Company, of St. Louis was represented by H. D. Nourse who showed photographs of Scarritt car seats.

The E. S. Greeley & Company, of New York, was represented by Frank A. Magee, who showed several headlights manufactured by this company, and which were soon sold.

The Reading Wood Pulley Company, of Reading Pa., showed at the end of the hall a number of different sizes of wood faced pulleys. The company was represented by W. L. Laramy.

Charles A. Schieren & Company, of New York, were, of course, represented and in their space was a large belt designed for the Reading Traction Company. A section of electric perforated belt was also shown.

The Street Railway Advertising Company, of New York and Philadelphia, showed advertising racks and a number of very tasteful advertisements, and W. B. Le Van, Jr., of New York, and S. H. Taylor, manager of the Philadelphia office of the company, were present.

The Cutter Electrical & Manufacturing Company, of Philadelphia, distributed circulars of the well known C & S automatic magnetic cut-out. This cut-out has been described in the Street Railway Journal and has been found to be a most reliable device.

Locke Brothers, of Salem, Mass., were represented by E. Mather, of Harrisburgh, who also represents Warren Webster & Company in that city. One of the well known Locke damper regulators, which have given excellent results in street railway plants, was shown.

The Eureka Sand Box Company, of Lebanon, Pa., presented for inspection one of its sandboxes which can be worked by foot or hand power. The box was shown in operation on one of the cars of the Reading Traction Company. The company was represented by J. K. Raudenbush.

The Fairbanks Company, of Philadelphia, exhibited a full line of valves, cocks and other standard steam specialties manufactured by it. The company makes a specialty of the Jennings high pressure gate valve and the improved Williams rotary gauge cock, which attracted much attention. W. C. Jennings was the company's representative.

The American Car Company, of St. Louis, occupied a table in the center of the hall and showed a large number of photographs of the exterior and interior of different cars manufactured by them. E. J. Lawless, the well known Eastern representative of the company, was present and explained the advantages of the company's new truck and cars.

The Hale & Kilburn Manufacturing Company, of Philadelphia, occupied a space on the right hand side of the building, about half way from the entrance, and showed four car seats illustrating four varieties, the longitudinal and reversible, in rattan, plush and carpet. The company was represented by Charles E. Barrett of the New York office.

The Okonite Company, of New York, was represented by W. F. Forby, who found many users of Okonite wires among the delegates present. The company distributed as a souvenir of the Convention a leather pocketbook stamped with the trademark of the Okonite Company, and containing a trick catch which afforded no little amusement and interest.

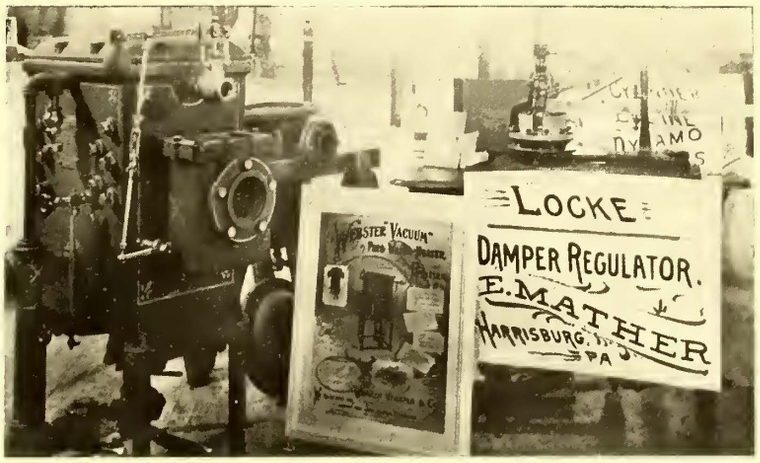
The Delaware Hard Fibre Company, of Wilmington, Del., exhibited samples of its fibre in different forms. Special interest was taken in the fibre bridge manufactured for controllers, a specialty being made of this by the Delaware Hard Fibre Company. The company's representative was C. H. Hammond, who also had a supply of catalogues for distribution.

Wm. E. Hooper & Sons, of Baltimore, exhibited a large number of samples of their well known cotton ropes. These were arranged in a handsome frame where they could be easily examined, and owing to the general interest felt in rope transmission for cable and electric roads received much attention from the delegates present. A number of samples of duck cloths were also shown.

Macan & Company, of Philadelphia, local agents for the Magnesia Sectional Covering Company, of Ambler, Pa., exhibited samples of the latter company's well known magnesia covering for steam pipes. Mr. Macan was present and was kept busy in answering the many inquiries in regard to the appliances manufactured by the Magnesia Sectional Covering Company, which are giving good satisfaction in a large number of steam plants.

attracted much attention. Mr. Field showed a section of roofing which illustrated the Berlin patent anti-condensation roof lining. This system is in use on a large number of railways, and its merits were appreciated by all present. The company has also done considerable work in the city of Reading, so that the delegates had an opportunity of studying the construction of the work in actual service.

E. F. DeWitt & Company, of Lansingburgh, N. Y., showed two standard sand boxes of the firm's Common Sense type. Mr. DeWitt was present and took great pleasure in showing the operation of the box to all delegates. He proved conclusively that the box can be relied upon to deliver sand wet or dry on the track whenever necessary. With this box, sifted sand is not a necessity since the box will operate even if there should happen to be stones in the sand. The box can be operated by a hand lever or by the foot as may be desired.



EXHIBITS OF WARREN WEBSTER & CO. AND E. MATHER AT THE READING CONVENTION.

Warren Webster & Company, of Camden, N. J., showed samples of their feedwater heaters, purifiers, exhaust and live steam separators and oil separators. These attracted a great deal of attention on account of their compactness, and the company's representative, A. T. Gahagan, was kept busy in explaining the merits of the devices. The company also showed views of the factory of Warren Webster & Company, as well as handsome photographs of different apparatus manufactured by the firm. Warren Webster & Company claim to have manufactured more horse power of the apparatus of which they make a specialty, than any other concern.

EXHIBIT OF WILLIAM C. HOOPER & SONS.

EXHIBIT OF H. W. JOHNS MANUFACTURING CO. AT THE READING CONVENTION.

The Western Electric Company, of New York, was represented by Jay Wiley of the railway department, and made a good showing of trolley line and overhead parts. These were arranged on a long table where they could be easily inspected by the delegates, and many favorable comments were passed on the design and finish of the articles shown. Directly back of the table was a full sized pole with the flexible bracket of the company, also rail bonds which proved of special interest to visitors.

Charles G. Smith, of New York, the famous lamp manufacturer, made a splendid exhibit of his varied line of lamps, which was the subject of most favorable and complimentary comment on the part of all present. On three sides of the space devoted to "Smith of New York" were arranged combination lamps, electric clusters, clusters with glass reflectors, headlights, lamp parts, automatic torches, etc. The exhibit also included samples of bell cord which the company supplies. Newton Clark was the company's representative.

The Berlin Iron Bridge Company, of East Berlin, Conn., was represented by John M. Field, and its system of station construction

John H. Graham & Company, of New York, was represented by C. A. Hoagland, who exhibited samples of the H. & C. sleet cutting trolley wheel manufactured by the Storm Manufacturing Company, of Newark, N. J., and for which John H. Graham & Company are sole agents. This wheel, which as been illustrated in the Street Railway Journal, automatically removes the incrustation of ice from the wires in winter, leaving them clear for the transmission of the electric current. All wheels are made of aluminum bronze bushed with graphite, and owing to the approaching winter season, Mr. Hoagland had many inquiries in regard to the wheel, as well as about New Departure bells.

The Brooklyn Car & Veneer Works, of Brooklyn, N. Y., occupied a space at the lower left hand corner of the hall, and made an exhibit which was a most extensive and creditable one. The company supplies railway car woodwork, mouldings, veneer seats, ceilings, etc., and in the exhibit were sample veneers for ceilings, upper deck advertising racks, advertising frames, side and end frames, railroad car seats, etc. The company also showed single and double seats made of veneer, and side seats for depots, the backs of which were made of perforated veneer. W. B. LeVan, Jr., represented the company. The company distributed a very tasteful business card printed on a sample of veneer.

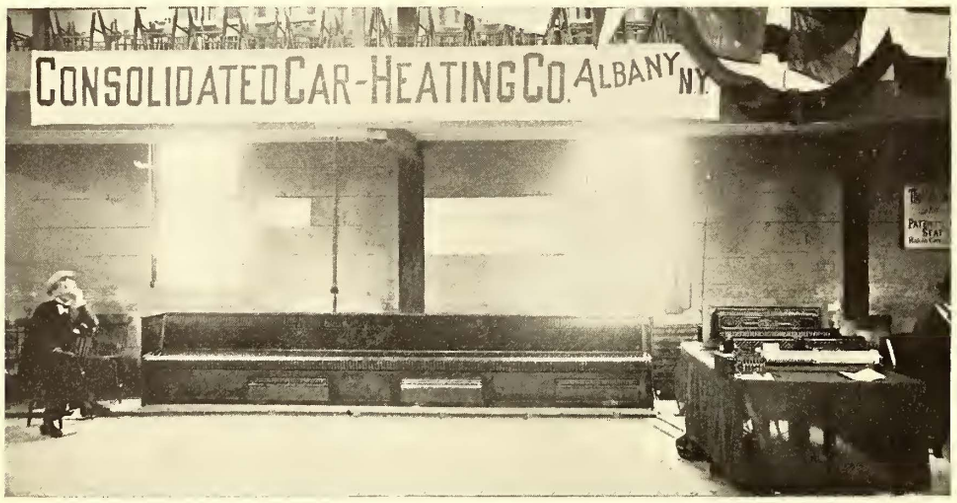


EXHIBIT OF THE CONSOLIDATED CAR HEATING CO. AT THE READING CONVENTION.

The Peckham Motor Truck & Wheel Company, of Kingston, N. Y., was represented by the company's Eastern manager, A. W. Field, and showed a 6 E Peckham truck ready for operation and equipped with General Electric motors, as mentioned later in the description of the General Electric exhibit. This truck has a six inch wheel base and a fourteen foot spring base, being, it is said, the longest spring base truck manufactured. The truck was equipped at each end with the Peckham standard fender, which has been described in the Street Railway Journal, and which sets within two inches of the ground. The operation of the truck was greatly admired by the street railway men who were present.

The Mark Railway Equipment Company, of Chicago, Ill., had at Reading a line of box joints shown in position on standard rails of various types and sizes. The joint bridges manufactured by this company are of malleable iron, and are not only desirable for electric roads, but are claimed to be the only joints suitable for cable tracks which have yet been brought out. The company has recently closed a large order for the Chicago City and Pittsburgh Traction Companies' cable lines. Samples of the joints were also shown for joining flat and girder rails, etc. The Mark Railway Equipment Company has a large call for these special joints, which are of course made to order. A sample of a box and chair for three point rails was also shown. J. K. Rogers, Jr., represented the company.

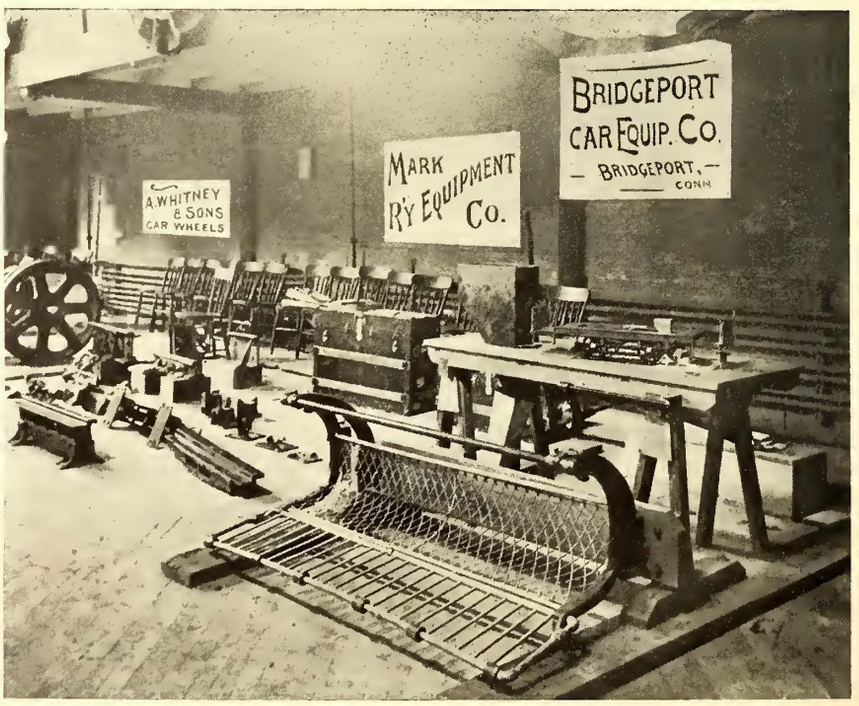
N. T. Kunkle & Son, of Reading, Pa., occupied a space in the center of the building, and made a very tasteful display of the different lubricating oils supplied by them. These oils were contained in fancy bottles which were arranged in the form of a pyramid. One tall bottle contained three kinds of oil of different specific gravities, which were shown very clearly, as the denser oil was at the bottom and the lighter at the top, with the medium heavy oil between the other two. The company also showed samples of its special motor, gear case and journal greases, also samples of oil in different stages of manufacture. A large block of paraffine for paraffine lights was also shown. The company was represented by Mr. Kunkle, who distributed a number of vials containing a sample of one of his products.

The Bridgeport Car Equipment Company, of Bridgeport, Conn., exhibited one of its standard fenders and sandboxes which attracted no little attention. These fenders have been adopted by the Bridgeport Traction Company for all of its cars, and are also in use on the Cincinnati Inclined Plane Railway, Troy City Railway, Fitchburg & Leominster Railway, Lowell & Suburban Railway and other prominent lines. The sand boxes of the company are also in use on the cars of the Pittsburgh Traction Company, as well as elsewhere where they are taking the place of other well known sand boxes, and are giving excellent service. The Bridgeport Car Equipment Company also supplies snow plows and other appliances for street railway companies, and promises to be a large manufacturer of street railway appliances. The company was represented by William Grunow, Jr.

The Safety Clutch Brake Company, of Philadelphia, showed both its upper and lower clutch brakes, and the railway representatives who saw the devices all spoke highly in its favor. Its accuracy and certainty of action were especially commented upon, and the general verdict was that it was a brake which would stop a car as quickly as might be required. The power is applied at the rail. The clutches are covered and protected from dust, and the durability of the brake is equal to the life of the car. Mr. Santee, who represented the company, has recently returned from a Western trip and reports that a most favorable reception has been accorded there, especially in Chicago, to the brake. The Pullman Company has adopted it, as have also a number of prominent railway companies of the city. The brake is also giving excellent results on the line of the People's Traction Company, of Philadelphia, as well as on other roads in the East.

A. Whitney & Sons, of Philadelphia, whose car wheels have achieved a wide reputation for durability, made an exhibit which attracted no little interest. A chief feature of the exhibit was a new type of car wheel which is described elsewhere in this issue. This wheel is cast with a general internal section similar to the ordinary wheel, but with a tread separated from the internal section by cellular cavities. In this way the chill on the tread of the wheel can be made more uniform and of a greater depth, as well as of greater density of metal, as smaller bodies of cast iron are denser than greater. The wheels can be cast with any type of chill, and the company can maintain the same weight in its manufacture as of an ordinary wheel. The merits of the wheel were pointed out to delegates by L. R. Faught, inventor, and F. A. Lex, of the company's Philadelphia office. Axles and other standard products of the works of A. Whitney & Sons were also shown.

Benjamin F. Shaw, of Wilmington, Del., was represented by H. R. Fothergill, of the Philadelphia office. A large line of the Shaw fine high pressure pipe fittings for power house equipment was shown, also copper bends for expansion purposes, which were much admired, as was also Mr. Shaw's trolley bracket for electric railways. Some tools exhibited by Mr. Shaw showed the quality of the work done by him, which is well known to our readers. The delegates had an opportunity to examine Mr. Shaw's products, since the power house of the Reading Traction Company was equipped by him, as was also that of the Scranton Traction Company, the Steinway Railway Company, of Steinway, New York, and other well known stations. An-



EXHIBITS OF BRIDGEPORT EQUIPMENT CO., MARK RAILWAY EQUIPMENT CO. AND A. WHITNEY & SONS.

other appliance which attracted a great deal of interest was the Spencer damper regulator which is most popular in power stations, and is giving good results. Mr. Fothergill explained that Mr. Shaw is ready to furnish plans and specifications to all persons ready to equip their stations.

THE J. G. BRILL COMPANY, of Philadelphia, was represented by Samuel L. Curwen, and as the company's cars are in operation on the lines of the Reading Traction Company, it was thought not necessary for the company to make any special exhibit. To enable delegates, however, to inspect carefully one of the Reading cars, the Reading Traction Company placed just outside the entrance one of its standard cars which had been in operation for about eighteen months, but which had been recently repainted and varnished. The car was thirteen feet over all and was mounted on a Brill No. 21 truck equipped with G. E. 800 motors. The interior finish was in mahogany with bronze trimmings and birdseye maple ceilings. The seats were covered with Wilton carpet. The windows, of which there were seven on each side, were of handsome plate glass. The exterior color was Tuscan red on the main panel, with gold lettering, "Reading Traction Company," edged with black and with silver trimmings. The lower concave panel was painted buff with red trimmings, the dashes being the same color as the main panel.

THE H. W. JOHNS MANUFACTURING COMPANY, of New York, had one of the most complete and handsome exhibits at Reading. It was in charge of James W. Perry. The space occupied was that on the right hand side of the hall directly next to the entrance, so that the attention of everyone entering the hall was immediately attracted to it. In the center of the exhibit was a large panel containing a complete line of the H. W. Johns Manufacturing Company's trolley insulators, hangers, pull-offs, strain insulators, ears, switches, brass and insulated crossovers, circuit breakers, etc. Particular attention was attracted by the company's Giant strain insulators, which are guaranteed to withstand a strain of over 6,000 lbs., and which are giving good results on a number of the principal street railways in the country. In front of the panel was a long table covered with all varieties of street railway supply parts manufactured by the H. W. Johns Manufacturing Company, including a Lincoln insulated crossover, Philadelphia circuit breaker and Perry mechanical clip. The latter has been adopted by a number of prominent roads throughout the country where soldered ears are considered objectionable. The exhibit was tastefully decorated with flags.

THE PRICE RAILWAY APPLIANCE COMPANY, of Philadelphia, was represented by James M. Price and presented an exhibit which attracted a great deal of interest. The exhibit consisted of samples of the well known Price joints and brace chairs for deep girder rails, including the "Little Giant" joint and K joint. With the joints were also shown samples of the Price bond. This consists of a plate of copper bent into shape, resembling a V in section, placed upon the flanges of the two rails on each side, and enclosed within the jaws of the joint plates by driving up. As will be seen, the copper is compressed between two stout surfaces of iron and steel with large and admirable contact with each. It is also not exposed to danger of decomposition from action of the salts of the earth. The simplicity and efficiency of the device made the exhibit of Mr. Price a most attractive one. Results were also shown of a series of tests made in the same current in the Drexel Institute with various bonds in common use, showing that the Price bond with an average current of 200 amperes had a lower average resistance, and consequently horse power loss, per mile, than that of any other of the bonds, and less than one-quarter that of one other well known bond.

THE GENERAL ELECTRIC COMPANY, of New York and Schenectady, occupied the most prominent location in the hall, the exhibit being in the middle of the building directly in front of the entrance. The exhibit consisted of two General Electric 800 motors mounted on a Peckham truck, which was blocked up so that the motors could be shown in operation. A type "K" series parallel controller was used and current was taken from a wire connecting with the circuit of the Reading Traction Company. This part of the exhibit attracted a great deal of attention and was the center of a large crowd whenever the motors were run. The railway department of the company also had a most practical exhibit on every street in Reading, from the fact that the cars in the city are equipped with General Electric motors. In the hall, close to the electric truck were also a number of tables on which were shown a line of overhead equipment supplies which attracted much attention. As the hall was lighted with Thomson "93" arc lamps, railway men had an opportunity of studying the merits of this system of lighting. These lamps are arranged to operate on railway circuits, and were connected ten in series. They burned very steadily without flickering, proving the claim made for them that by their means the distribution of arc lighting can be successfully accomplished by electric railway companies. The company was represented by H. J. Crowley, manager of the Philadelphia office, D. L. Huntington, electrician, and R. E. Moore, of the supply department.

THE HUBLEY MANUFACTURING COMPANY, OF LANCASTER, PA., occupied quite an extensive space at the lower right hand corner of the hall. Its exhibit included a full supply of the company's well known overhead line equipment parts. These were arranged on a large panel covered with blue cloth and placed in the center of the exhibit. The company's trolley harp and wheel attracted a great deal of attention. This device combines strength and lightness, while all sharp points on the harp are avoided, so that it will not catch in the trolley wire. The trolley wheel has a rolled edge so as to avoid cutting the trolley wire. The company also showed improved overhead frogs, samples of insulated paper and cloth and a new composition for motor bearings of which it is making a speciality. At the side of the entrance to the company's exhibit which was inclosed by a brass railing, was a sample of its car brake handle, the main feature of which is that it is practically unbreakable. A sample was shown of a handle which had been completely twisted out of shape in order to prove this quality. Other appliances shown were a Cope "come-along" for pulling the trolley wire taut; also a combination lamp bracket adopted by the Pennsylvania Traction Company for signals on the rear end of the car. These can be used at night for lamps, and in the daytime for flags. The company also showed a number of arc lamp parts which are carried in stock. At the side of the exhibit was a large roll of Roebling wire for which the Hubley Manufacturing Company is agent. The company was represented by W. H. Beatty, formerly of the Novelty Company, and Frank H. Stacey, secretary of the company.

THE CONSOLIDATED CAR HEATING COMPANY, of Albany, N. Y., occupied a large space on the right of the hall, and the exhibit was one of the most interesting as well as one of the most extensive in the hall. Along the side of the wall was a complete car seat for an eighteen foot car equipped with the company's heaters. Six heaters are usually used on each car, three being on a side, and the heaters are located under the seat, the hot air coming through the riser. The operation of the heaters is regulated by a switch giving five intensities of heat, and the heaters shown were operated from the power circuit of the Reading Traction Company. On a table, close to the sample seat already mentioned, were a number of single heaters with cases removed to give opportunity to examine the construction. Among them was a heater which has been in use for two seasons, yet a careful examination of the coil showed that no oxidization had occurred on the spiral conductor. H. N. Ransom, of Albany, the company's representative, stated that the record of the company that no coil of a heater supplied by it has ever burned out still remains unbroken. Delegates who wished to learn of the results secured on roads by the heaters had an opportunity for examining a large collection of testimonials showing that the Consolidated Car Heating Company's system had been most successful in its results and had proved to be a great favorite. Mr. Ransom mentioned among other recent orders the following: For the Poughkeepsie & Wappinger Falls Electric Railway, entire equipment; also for the entire equipment of the Derby (Conn.) Street Railway; Newburgh (N. Y.) Street Railway; New Haven & Centerville Street Railway, and an increase order from the New Haven Street Railway, covering all of the cars on that road not previously equipped by the company.

ATTENDANTS.

Among those present were the following:

Allen, E. H., Allen Electrical Supply Co., Philadelphia, Pa.
Allen, A. H., Westinghouse Elec. & Mfg. Co., Philadelphia, Pa.
Armstrong, W. A., Lancaster, Pa.
Arrowsmith, A. V., Reading Traction Co., Reading, Pa.
Ash, E. W., Schuylkill Traction Co., Ashland, Pa.
Aulenbach, M. C., Reading Traction Co., Reading, Pa.

Barrett, Chas. E., Hale & Kilburn Mfg. Co., Philadelphia, Pa.
Beatty, W. H., Hubley Manufacturing Co., Lancaster, Pa.
Billinger, Geo. S., York Street Railway Co., York, Pa.
Blake, H. W., STREET RAILWAY JOURNAL, New York.
Boyer, J. L., Metropolitan Elec. Co., Reading, Pa.
Bragg, C. W., Westinghouse Elec. & Mfg. Co., Philadelphia, Pa.
Breese, C. P., Walker Manufacturing Co., Philadelphia, Pa.
Breneman, B. F., Pennsylvania Traction Co., Lancaster, Pa.
Brightbill, S. L., Lebanon & Annville St. Ry. Co., Lebanon, Pa.

Carson, Robt. H., People's Traction Co., Philadelphia, Pa.
Clark, Newton, C. G. Smith, New York.
Clitz, Paul Randall, Johnson Co., Philadelphia, Pa.
Crowley, H. J., General Electric Co., Philadelphia, Pa.
Curwen, Sam. M., J. G. Brill Co., Philadelphia, Pa.

Darlington, F. W., Pennsylvania Traction Co., Philadelphia, Pa.
DeWitt, E. F., E. F. DeWitt & Co., Lansingburgh, N. Y.
Dickerson, J. W., *Street Railway Gazette*, New York.

Ellis, Harvey, Ellis Manufacturing Co., Philadelphia, Pa.

Fales, T. M., York Street Railway Co., York, Pa.
Faugh, L. R., A. Whitney & Sons, Philadelphia, Pa.
Ferree, S. P., Street Railway Advertising Co., New York.
Field, Arthur W., Peckham Motor Truck & Wheel Co., Boston, Mass.
Field, John M., Berlin Iron Bridge Co., East Berlin, Conn.
Fisher, G. H., Chas. A. Schieren & Co., New York.
Forby, W. F., Okonite Co., New York.
Fothergill, H. R., Benj. F. Shaw, Wilmington, Del.

Given, Wm. B., Columbia & Donegal Railway Co., Columbia, Pa.
Gahagan, A. T., Warren Webster & Co., Camden, N. J.

Haldeman, Thomas W., Pottsville, Pa.
Hammond, C. H., Delaware Hard Fibre Co., Wilmington, Del.
Hanold, F. W., Reading, Pa.
Harrington, W. E., Philadelphia, Pa.
Hayes, Wm. H., West Chester Street Ry. Co., West Chester, Pa.
Hirons, Wm. F., Lamokin Car Works, Philadelphia, Pa.
Hoagland, C. A., John H. Graham & Co., New York.
Hooper, James E., Wm. E. Hooper & Sons, Baltimore.
Huntington, D. L., General Electric Co., Philadelphia, Pa.

Janney, W. H., Electric Traction Co., Philadelphia, Pa.
Jennings, W. C., The Fairbanks Co., Philadelphia, Pa.
Jerome, R. S., Central Electric Heating Co., New York.
Jones, Richmond L., Reading, Pa.

Kenfield, F. L., *Street Railway Review*, Chicago.
Kunkle, H. T., H. T. Kunkle & Co., Reading, Pa.

Lanius, W. H., York Street Railway Co., York, Pa.
Laramy, W. L., Reading Wood Pulley Co., Reading, Pa.
Lawless, E. J., American Car Co., New York.
LeVan, W. B., Brooklyn Car & Veneer Works, Brooklyn, N. Y.
Lex, F. A., A. Whitney & Sons, Philadelphia, Pa.
Light, S. P., Lebanon & Annville Street Railway Co., Lebanon, Pa.

Magee, F. A., E. S. Greeley & Co., New York.
Mansfield, Frank, Walker Manufacturing Co., New York.
Mather, Edmund, Reading, Pa.
McIntire. L. H., People's Traction Co., Philadelphia, Pa.
Moore, R. E., General Electric Co., Philadelphia, Pa.

Nagle, James W., *The Car*, Philadelphia, Pa.
Nissley, Lincoln, Citizens' Passenger Ry. Co., Harrisburg, Pa.
Nicholson, S. L., James Boyd & Co., Philadelphia, Pa.
Nourse, H. D., Scarritt Furniture Co., St. Louis, Mo.

Ostrom, John F., Middletown & Highspire Railway Company, of Steelton, and Pennsylvania Steel Co., Steelton, Pa.
Owen, Benj. F., Reading & Temple Railway Co., Reading, Pa.

Padley, James C., Wissahickon Elec. Lt. & Pass. Ry. Co., Phila.
Patterson, John J., Pennsylvania Traction Co., Lancaster, Pa.
Perry, James W., H. W. Johns Co., New York.
Pratt, G. E., Jackson & Sharp, Wilmington, Del.
Pratt, Mason D., Pennsylvania Steel Co., Steelton, Pa.
Price, James M., Price Railway Appliance Co., Philadelphia, Pa.

Ransom, H. N., Consolidated Car Heating Co., Albany, N. Y.
Raudenbush, J. K., Eureka Sand Box Co., Lebanon, Pa.
Rigg, John A., Reading Traction Co., Reading, Pa.
Rigg, S. E., Reading Traction Co., Reading, Pa.
Rupp, D. A., York Street Railway Co., York, Pa.

Smith, Chas. H., Lebanon & Annville St. Ry. Co., Lebanon, Pa.
Smyser, Geo. P., York Street Railway Co., York, Pa.

Taylor, S. H., Brooklyn Car & Veneer Works, Brooklyn, N. Y.

Vosburgh, A. C., New Process Rawhide Co., Syracuse, N. Y.

Webb, H. E., Solar Carbon & Manufacturing Co., Pittsburgh, Pa.
Wiley, Jay, Western Electric Co., New York.
Wright, Robt. E., Allentown & Beth. Rapid Tran. Co., Allentown, Pa.

Yardley, John H., Philadelphia Car Wheel Co., Philadelphia, Pa.

Motor Repairs.

Tagging Wires—Sparking Controllers—Oil Rings—Commutator Short Circuits.

By James F. Hobart.

The proper tagging of every wire put into a car, should be insisted upon by master mechanics. Especially where the wires come up through the platform, and enter the controller, is a careful system of tagging necessary, for every time the controller is taken down, every wire must be disconnected and pulled down below the platform floor. If carelessly put on, a good many of the tags will get knocked off, or becoming loosened, will slide down the wires, often working back into the hose out of sight; then, when the controller is connected up again, and a couple, or more, of the tags are missing, a "cut and try" method must be followed to make sure that the controller is properly connected up; that is, the tagless wires must be connected by guess, and the cars tested with current to see if the connections are right, if not they must be taken down again, connected differently, and another trial made.

There is another method of picking out the wires, and it is by getting a magneto, testing each wire until the proper connection for each has been worked out, and then replacing the missing tags. This is the right way to do it, but it is seldom so carried out in any car house. In the first place, magentos are scarce, there is one somewhere, but it would take an hour to get it, and the car is wanted in fifteen minutes, so the fifteen minutes are spent in guessing, connecting up, testing with current, and then reconnecting until the proper connections have been found. Then the car is hustled out of the barn and the wires go tagless until the controller is again overhauled, when the whole business is repeated. Again, I have known the tags which have worked into the hose, to cut through the insulation and form a short circuit, cutting out perhaps one of the fields, in an armature, or even more, and having such an effect upon the car that it had to be pushed into the barn dead, by the next car to come along.

In case a Westinghouse car should come into the car house with the complaint that "the controller sparks," as a rule no repairs will be necessary. All that is needed is to remove the shield over controller, cut off current at switch underneath the hood of the car, and scrape the contact strips thoroughly with a screwdriver, or some other suitable tool. It will be found that the sparking was caused by partially or wholly short circuiting the controller connections by a collection of dust, fibre from the wire insulation and other matter which may have found its way into the controller box.

After scraping the contacts clean, let all the connections and the inside of the controller stand be swept clean of all dust, a small whisk broom being a good tool for the purpose. While cleaning out the dust and dirt keep a sharp lookout upon the shoes on ends of the contact bars. A good many of the shoes become badly melted, and probably the copper (or bronze) dust formed from the shoes, does much towards causing the short circuiting of the contact strips, which is the principal cause of the heavy sparking above mentioned. Removing every particle of dust from the controller and its case almost always effects a complete cure.

Armature trouble is the worst enemy of the repair man, and more than one armature is burned out by the oil containing fine particles of metal, which works down

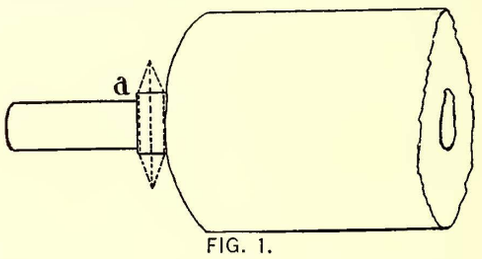


FIG. 1.

from the bearing on back end of motor shaft. For some time, a "grease ring" has been put between the commutator and the bearing upon that end of the motor shaft, and it has been found profitable to put a grease ring upon the shaft at the other end of the armature. The shoulder which projects about three quarters of an inch beyond the winding, *a* (Fig 1) may be trued up in a lathe, a thread cut therein, and a grease ring screwed on tight enough to prevent any oil from working between it and the shaft.

A grease ring need not be more than five-eighths of an inch thick (just enough to find a good bearing on the shaft) and project about two inches from the shaft. The

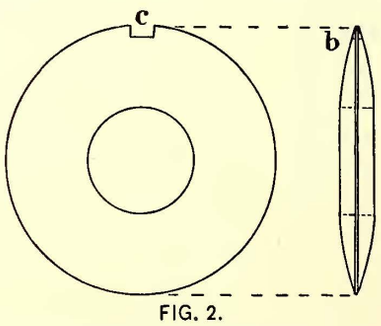


FIG. 2.

outer edge of the ring may be turned down to the thickness of one-sixteenth to one-twelfth of an inch, as shown at *b*, Fig. 2. The ring thus made would be about six and one-half inches in diameter, five-eighths of an inch thick, with very thin edges. The problem now is to screw that thin edged ring fast to the shaft. This is best done by making a "spanner" to fit the ring (Fig 3.), then to file a notch in edge of ring to fit the spanner hook, *d* (Fig. 3.), The notch (Fig. 2) may be one-fourth inch deep and three-eighths wide. After screwing on the ring, the notch should be filled with soft solder, or a bit of metal may be fitted in the notch and soldered fast.

With the ring in position any grease, which might work along the shaft from the bearing, is thrown off

by centrifugal force before it gets into the armature winding. Once there, the oil penetrates the insulation, and upon the armature becoming short circuited, or receiving a very heavy current from some other cause, the oil becomes carbonized and then, in connection with the

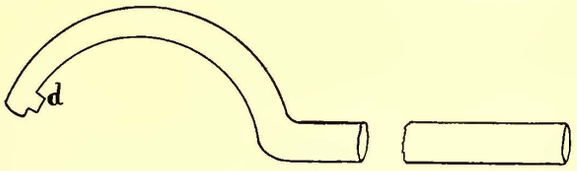


FIG. 3.

finely divided metal brought by the oil from the bearing, a pretty good path is provided from one armature wire to another and a case of burning out is some day brought to the repair shop. All this trouble, or a good deal of it, is prevented by the grease ring.

One of the principal causes of armature failure is in the cavity just back of the commutator, *a* (Fig. 4), where the wires curve downward from armature, and upwards to the commutator, leaving a cavity which completely encircles the armature shaft. In this cavity, close to the commutator, trouble originates. Perhaps a little oil gets into the cavity, or some moisture. The former causes short circuits between the commutator segments by be-

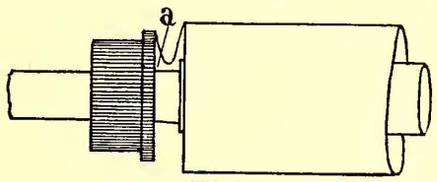


FIG. 4.

coming carbonized as noted above. The moisture does the damage in its own way, and seems to help fix particles of carbonaceous matter to the mica insulation until it is bridged completely across. Then trouble begins; the short circuit thus formed develops intense heat, the wire insulation is vaporized, and a continuous deposit is formed nearly or quite around the commutator, short circuiting the entire concern.

The only remedy for this trouble is to remove the commutation, clean it up, test out all short circuits, and resolder the armature wires. For taking down commu-

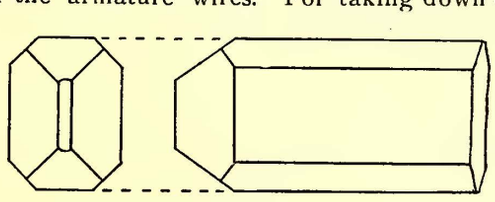


FIG. 5.

tator connections, a copper (soldering iron) is needed with a bit tapered down, about as shown by Fig. 5, to one-twelfth of an inch thick and five-eighths of an inch wide. This size of copper will just go into the wire slot in commutator, and is wide enough to heat the whole length of the slot at once. The secret of taking down armature

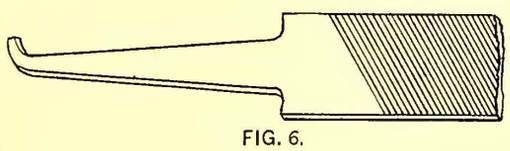


FIG. 6.

winding connections lies in having the copper well turned, and then keeping it well covered with solder while melting out the wires. If a "dry" copper, even when well heated, be put on to a wire, the solder will not be melted nearly as quickly as when there is plenty of solder on the copper. The solder makes a better contact between commutator and soldering copper—that's all it does.

The other tools required for taking down armature connections are a pair of lineman's pliers and a hook for prying out the wires after they have been loosened by unsoldering. Usually, the end of a file, bent up as shown in Fig. 6, is all the tool used for that purpose, and answers very well.

A commutator should be put on with a taper fit, a feather being cut in to prevent turning around, and a thin nut screwed up against the commutator to keep it tight upon the taper. Several three-eighths holes are drilled in the face of the nut, which is very thin, much like a grease ring, to take the pins of a spanner wherewith the nut may be turned up or taken off. A spanner for this purpose is supposed to be at hand in every repair shop, but the men take little time to look for such a tool. Instead, the nearest punch is picked up, and with it placed in one of the spanner holes, the nut is started by hammering on the punch. The nut is badly injured by such treatment and its life badly curtailed. Master mechanics should see that commutator nuts are not abused in this manner.

There are two holes diametrically opposite each other in every commutator into which studs may be screwed, and by means of a bar placed over the studs, and across the end of the shaft the commutator is pulled off by tightening the nuts on the studs. It requires ten or fifteen minutes to adjust, apply and use this commutator pulling rig, whereas, if each nut on the studs were replaced by a small gear, threaded to fit the studs, and a third gear placed between the two stud gears, then, by means of a crank applied to one of the gears the commutator could be pulled off in short order.

The commutator must be cleaned of all dirt. Sandpapering is the usual way of doing the work, the commutator being laid flat on a bench and sandpaper rubbed on until all the dirt and discoloration has been removed. Much better and quicker work can be done in this way, by providing a sort of vertical lathe to rotate the commutator with, instead of rubbing the commutator by hand. Something like a potter's wheel would be good for this business, and would save a good deal of time.

Trolley Parties in Philadelphia.

The leasing of electric cars for trolley parties, as mentioned in our last issue, has become very popular in Philadelphia, and as many as thirty-two cars have been chartered in one night for this purpose on the line of the People's Traction Company. The cars are leased at $10 for the evening and are often very tastefully decorated by the lessees. The cars are run the entire round trip down 4th Street to Snyder Avenue and up 8th Street and Germantown Avenue to Mount Airy and return to the starting point, a run which requires two hours and thirty-two minutes. The excursionists often take with them a band of music.

Originally tin horns were carried in great numbers, but as the residents along the line objected to the noise, the use of sleigh bells has been substituted.

Tar Burners in Melbourne.

The Melbourne Tramways & Omnibus Company, of Melbourne, Australia, has made some interesting experiments in the use of tar for fuel.

The tar, after being received from the gas company, is kept in 400 gal. tanks. It is kept in a liquid condition by means of exhaust steam pipes, which are coiled in the tanks, and is pumped to the feed tanks, which are above the boilers, as required. From these feed tanks, it is led, first, through a large strainer, then through a two inch pipe to the furnaces.

The tar is mixed in the burner with steam, and both tar and steam pipes are provided with flexible joints at the furnace doorplate, so that they can be easily swung back, as the furnace door is opened.

The results have been very successful from an economic standpoint.

The Wissahickon Electric Passenger Railway.

A well arranged electric station, at which current for operating both an electric railway and extensive arc lighting system is generated, is located at Wissahickon, a suburb of Philadelphia on the Norristown branch of the Philadelphia & Reading Railway. The railway has not been in operation a very great length of time, the first car having been run September 30, 1893, but a considerable traffic has already been created, and with six cars in operation last summer, from 3,000 to 4,000 passengers were carried daily. Arrangements for a number of additional turnouts and cars have been made, and a six minute headway will now be maintained during the busy portions of the day. The road is a single track line, of a length of from three and a half to four miles, and extends from the station at Wissahickon to Roxborough and Manayunk. It is a succession of severe grades, several of them being as high as 11 per cent., and there is one short grade of 13 per cent.

There are at present eight cars in regular service, two of which were built by the St. Louis Car Company, four by the John Stephenson Company, Ltd., and two by the J. G. Brill Company. The first two are mounted on St. Louis trucks and the other six on Brill trucks. The cars have an eighteen foot body and are furnished inside in mahogany with birdseye maple ceiling. Brass trimmings are used. Each car has six large plate glass windows on each side. The exterior color is an Indian red for the main panels and dashes, with the lettering on the former in gold, with black lining and silver trimmings. The lettering on the dash is in silver. The lower panel is painted a light buff.

The car house is located at the main terminus of the line close to the passenger station at Wissahickon, and not far from the power station. It is of brick and has a capacity for ten cars.

The track is substantial in character being laid throughout with a ninety pound, nine inch Johnson girder rail. The ties are placed two feet between centers and measure 7 × 9 ins. × 7 ft. 6 ins. in length. They are mounted on two inches of ballast. The track is paved for a considerable distance with Belgian block or brick. The joints are double bonded and connected with two supplementary wires, and cross connected at every third rail. A No. 0 extra B. B. Swedish galvanized iron wire is used for bonding.

Iron tubular poles supplied by the Walworth Manufacturing Company and the National Tube Works, of

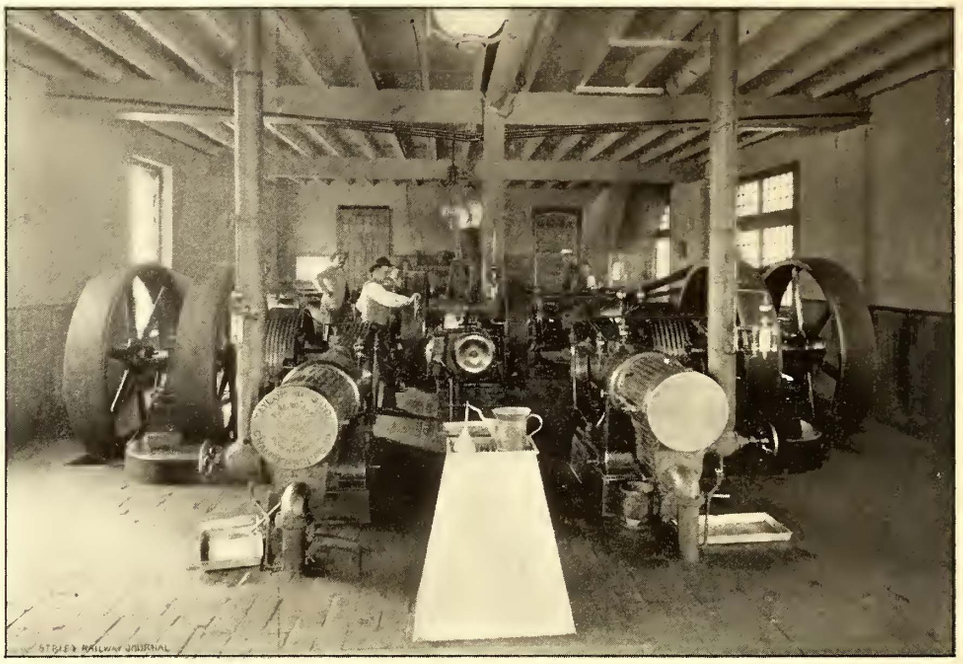


FIG. 1.—LIGHTING PLANT—WISSAHICKON ELECTRIC PASSENGER RAILWAY CO.

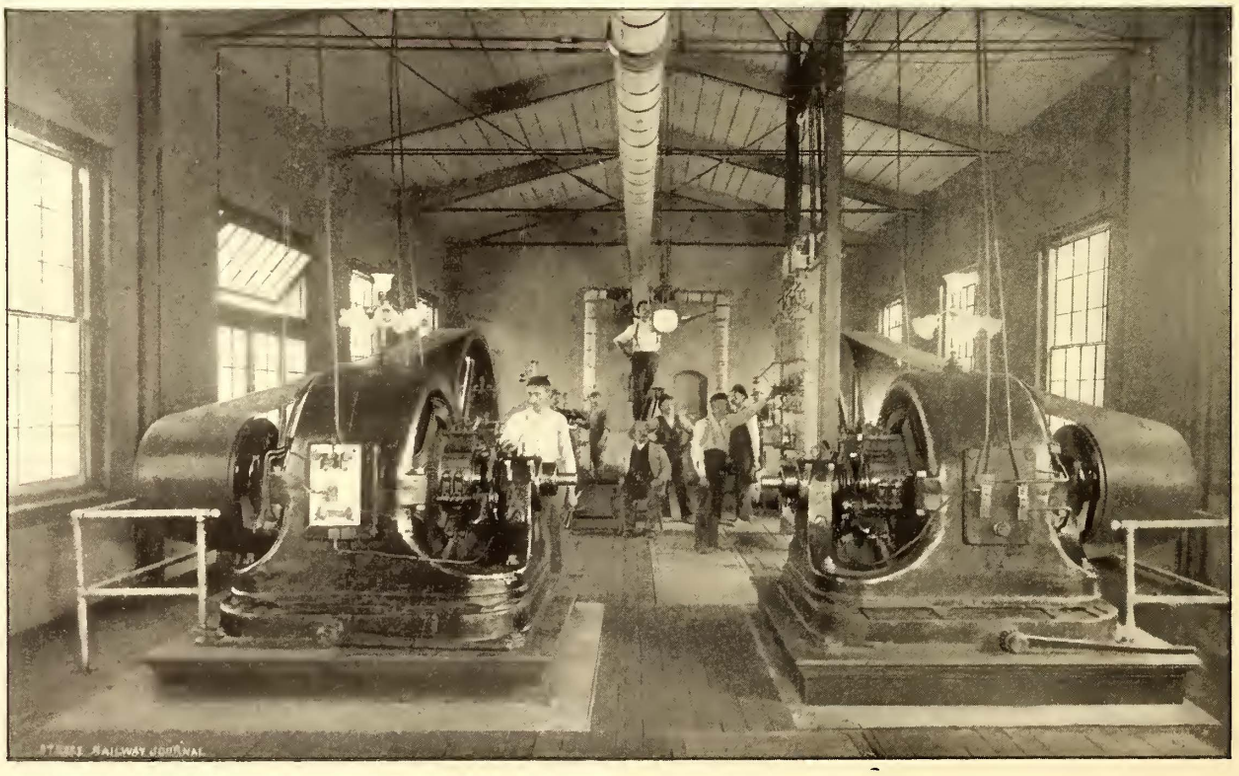


FIG. 2.—RAILWAY PLANT—STATION OF WISSAHICKON ELECTRIC PASSENGER RAILWAY CO.

McKeesport, Pa., are used. Roebling trolley wire and No. 0000, feeders supplied by Holmes, Booth & Hayden, are used, together with H. W. Johns overhead material, and Whitney car wheels.

Two interior views of the station are given in Figs. 1 and 2. It is located at Wissahickon, close to the Schuylkill River and on the side of a steep hill. Coal is received from a siding of the Philadelphia & Reading Railroad, and is dumped directly into a storage vault, from which it is admitted to the boiler room as required. The boiler room equipment consists of four 100 H. P., upright tubular boilers supplied by the Stearns Manufacturing Company, of Erie, Pa., and one eighty horse power, upright tubular boiler manufactured by Henry Warden, of Germantown Junction, Philadelphia. Pea coal is used, costing delivered about $2.55 per long ton.

The engine room contains both railway generators and arc light dynamos, the railway equipment being shown in Fig. 2, and lighting equipment in Fig. 1. The length of the engine room is 140 × 40 ft., and that of the boiler room 90 × 26 ft.

FIG. 3.—EXTERIOR OF STATION—WISSAHICKON ELECTRIC PASSENGER RAILWAY CO.

The railway plant consists of two Watts-Campbell single expansion engines, with cylinder dimensions, 14 × 36 ins. These are belted to two Westinghouse 112 K. W., M. P. generators, running at 625 revolutions per minute. The railway switchboard is placed between the two generators, and is of white marble panels mounted on an oak frame. It is supplied with Westinghouse circuit breakers, ammeters and lightning arresters, and Weston voltmeters. A Wells & Coutan steam gauge indicates the steam pressure.

The arc lighting equipment is located on the same floor as the railway equipment and consists of two single expansion engines, with cylinder dimensions, 12 × 15 ins., manufactured by the Taylor Manufacturing Company, of Chambersburg, Pa., and one of the Woodbury type, with cylinder dimensions, 11¼ × 14 ins., purchased from the Stearns Manufacturing Company. Each engine drives American arc light machines which have been fitted with Ball armatures. The switchboard is located at the end of the station and is supplied with General Electric lightning arresters. One steam main, seven inches in diameter, and covered with H. W. Johns' asbestos packing, extends the entire length of the room and supplies the steam to the engine equipment. Schieren belts are employed.

A considerable extent of territory is supplied with arc lights from the station, including Manayunk, Roxborough, Wissahickon, Falls, and all of East Fairmount Park as far as Green Street, Philadelphia. A total of 365 lights are operated from the station, and one circuit is fourteen miles in extent.

The railway plant is owned and operated by the Wissahickon Electric Passenger Railway Company, with the following officers: President, P. P. Liebert; vice-president, Isaac Wilde; secretary and treasurer, John Flanagan; superintendent, James C. Padley.

The lighting plant is owned by the Wissahickon Electric Light Company, with the same superintendent, secretary and treasurer, and with William Johnson, president, and James Christie, vice-president.

Extensions in New York.

By a resolution of the New York Board of Aldermen, passed on September 18, the Metropolitan Traction Company was authorized to construct a most important connecting link in its system of roads, which is destined to afford transit by electricity and cable from the upper end of Harlem down both sides of Central Park to the lower end of New York City. The link in question will connect the present Columbus Avenue line and the projected crosstown line at 116th Street, which is fed by the road now under construction in Lenox Avenue. If the expectations of the company are fulfilled, six months will see electric cars on the underground trolley system running on both the latter thoroughfares and connecting on the west and east, respectively, with the cable roads in Columbus and Lexington Avenues.

The Conti Compressed Air System in Paris.

As many of our readers are aware, the distribution of power by means of compressed air upon what is known as the Popp system is in very extensive use in Paris. At present there are two central stations representing altogether 13,000 H. P., as well as several stations for operating pneumatic clocks, refrigerating stations and other plants.

It is now stated that the General Omnibus Company, of Paris, will construct three new compressed air tramway lines in Paris, to be operated on the Conti compressed air system which has been experimented with elsewhere in Europe, and which differs from the Mekarski system. In the Conti system the reservoirs on the cars are not designed to carry the entire supply needed, but arrangements made so that the reservoirs can be re-stored at intervals along the route. Pipes are laid under the track to iron boxes sunk in the roadway, in which are located connections so that the reservoirs on the car can be stored. The time required for storing and making connections has been reduced, it is stated, to a few seconds.

The Helena Rapid Transit Railroad and Helena Electric Railway of Helena, Mont., have been consolidated.

TWELFTH ANNUAL MEETING OF THE NEW YORK STATE STREET RAILWAY ASSOCIATION.

The Twelfth Annual Meeting of the Street Railway Association of the State of New York was held at The Yates, Syracuse, N. Y., Tuesday, September 18, 1894. President D. B. Hasbrouck presided.

The following delegates of railroad companies were present:

Albany, John W. McNamara, Treasurer Albany Railway.
Auburn, A. H. Underwood, Treasurer Auburn City Railway Co.
Binghamton, J. Tracy Rogers, President, and J. P. E. Clark, Treasurer Binghamton Street Railroad Co.
Brooklyn, W. J. Richardson, Director Atlantic Avenue Railroad Co.
Buffalo, J. B. Craven, Electrician Buffalo Railway Co.
Charlotte, C. A. Derr, Superintendent Rochester Electric Railway Co.
Elmira, W. W. Cole, General Manager West Side Street Railroad Co.
Long Island City, P. J. Gleason, President Long Island City & Newtown Railroad Co.
New York City, D. B. Hasbrouck, Vice-President Metropolitan Railroad Co.
Rochester, J. H. Stedman, Transfer Manager Rochester Railway Co.
Rome, John S. Wardwell, President Rome City Street Railway Co.
Syracuse, W. R. Kimball, President, John A. Moffitt, General Manager, W. P. Gannon, Secretary and Paul T. Brady, Director, Syracuse Street Railway Co.

There were also present:

Belden, A, J., Railroad Contractor, New York City.
Blake, Henry W., Street Railway Journal, New York.
Brady, Paul T., Agent Westinghouse Electric & Manufacturing Co., Syracuse.
Cicott, Frank X., Railway Department, Pettingell-Andrews Co., Boston.
Coles, Stephen L., *Electrical Review*, New York City.
Crossman, T. E., Official Stenographer, Brooklyn.
Crowell, Howard H., General Electric Co., Syracuse.
Evans, H. C., Johnson Company, New York City.
Foote, Allen R., Washington, D. C.
Forby, William F., Okonite Co., New York City.
Foster, H. H., Dreher Manufacturing Co., New York City.
Fuller, Charles M., Davis Car Shade Co., Portland, Me.
Granger, John A., New York Car Wheel Works, New York City.
Harrington, W. E., Cutter Electrical Manufacturing Co., Philadelphia.
Hooker, Thomas, Syracuse Storage Battery Co., Syracuse.
Issertel, Henry G., H. W. Johns Co., New York City.
Lawless, E. J., American Car Co., St. Louis.
Le Van, W. B., Jr., Brooklyn Car Wood & Veneer Works, Brooklyn.
Magee, Frank A., The E. S. Greeley & Co., New York.
Mercur, R. J., New York Car Wheel Works, Buffalo.
Peckham, Edgar, President Peckham Motor Truck & Wheel Co., Kingston.
Porter, H. C., Syracuse Storage Battery Co., Syracuse.
Ransom, H. N., Consolidated Car Heating Co., Albany.
Russell, F. D., Rochester Car Wheel Works, Rochester.
Seely, John A., Railroad Contractor, New York City.
Taylor, John, Taylor Electric Truck Co., Troy.
Sharp, Edward P., Webster & Beach, Boston.
Stump, C. E., *Street Railway Gazette*, New York.
Vosburgh, A. C., New Process Raw Hide Co., Syracuse.
Wiley, F. W., Standard Underground Cable Co., Boston.
Wyman, Edward B., Central Electric Heating Co., New York City.
Young, Jefferson, Stilwell-Bierce Co., Syracuse.

At the conclusion of the roll call President Hasbrouck read the following address:

THE PRESIDENT'S ADDRESS.

Gentlemen of the Association:—As we "ring up" another point on the annual "indicator" of our Association, congratulations are in order.

Though we have, in common with our fellow citizens, felt the pressure of the times during the past year, we have *not* had a blizzard to obstruct the roads for a week, nor have we had a "tie-up," to vex us and deprive us of revenue for a like period. We may follow the example of that good Dutchman, who, when he had broken his leg, thanked the Lord that it was not his neck. The continued growth of our cities and towns has increased the demand for street railways, and it is our business to supply the demand.

The work of consolidation in many localities has gone on, by which many small companies have been merged in greater organizations, thus securing greater efficiency and economy in operation and a more satisfactory service to the public. That thousands of horses have been relieved by the tireless trolley, that thousands are given a rest by the substitution of the cable, is a matter of congratulation to every humanitarian. And "more to follow" What the next decade may bring forth none of us will venture to predict. We will endeavor to keep up with the times if the "powers that be" will permit us.

The "weary load" of taxation, under which we labor, has been so clearly set forth in the paper prepared by the Hon. G. Hilton Scribner

and read before this Association, at one of its annual meetings, that nothing can be said to add to its force. Measures have been taken to bring to the notice of the Constitutional Convention, now in session, the subject in which we are all so deeply interested. We think we are entitled to even handed justice. All taxes should be equal and uniform in their ratio to the value of the property taxed. Our present constitution is absolutely silent on this important matter, and the Legislature might, if it chose, put the entire public burden on any class of either property or persons. We confidently rely on the intelligence of the Convention to give the subject a careful consideration.

The selection of this city as the place of meeting brings to the speaker a bit of reminiscence. He was born hereabouts. At the date of his birth the site of Syracuse, and a long distance east of it, was a swamp, covered with blackened stumps. Hardly called by its present name, it was better known as "The Five Corners."

The completion of the Erie Canal, in the speaker's boyhood, gave an impetus to various business enterprises, and the "Salt City" has grown to its present proportions. In the early days of the canal it was regarded by travelers as the perfection of speed and comfort to take a packet boat here at evening, and find yourself safely landed at Utica the next morning.

We boys were on good terms with the Onondaga Indians. It is related that one of their chiefs, when the "Six Nations" were a powerful confederacy, once illustrated his point by taking a bundle of sticks, and, after endeavoring in vain to break them combinedly, found no difficulty in doing so when separated. In the language of Bunsby, "The bearings of this observation lays in the application on it," viz., the street railway companies of the State should act in concert in all matters in which they have a common interest; and there is no way in which they can better protect themselves than by acting together as members of this Association. The motto adopted by the Dutch founders of our city of Brooklyn, "Een Draght Mackt Maght," which may be freely translated, "One pull makes a strong pull," ought to teach us a profitable lesson. Measures have been taken which, it is hoped, will induce every company within the bounds of the State to unite with us for the common good.

Allusion will doubtless be made in the report of the Executive Committee, to one who has rarely, if ever, been absent from our annual gathering, but who, since our last meeting, has departed this life. Having known him from the beginning of his railroad life, and even longer, I am constrained to say that by the death of William Richardson, we are deprived of a genial associate, as well as a wise and prudent counselor. Next to his immediate family, the speaker has felt a personal grief in the loss of an old and faithful friend.

An employe of the company, of which Mr. Richardson was for a long time president, once said of him: "He was a fair man. We could always get a hearing when we appealed to him." He took a paternal interest in those under him, to an extent not usual in great corporations, and which, if generally cultivated, would help to lessen the friction between employers and employed, and ultimately make the fact apparent, that their interests are identical.

Finally, in giving place to the gentleman who shall be selected to preside over your deliberations, let me repeat my congratulations on the measure of success which has attended us under so many adverse influences, and to express the wish that you may long continue to serve the public acceptably, and achieve, at least, a "living profit" to yourselves.

The Report of the Executive Committee was then presented, as follows:

REPORT OF THE EXECUTIVE COMMITTEE.

SYRACUSE, September 18, 1894.

THE STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK.

Gentlemen:—Your Executive Committee respectfully submits the following report:

MEMBERSHIP.

The membership now consists of thirty companies, the highest number yet reached. The Forty-second Street, Manhattanville & St. Nicholas Avenue Railway Company has withdrawn, but the Syracuse Street Railroad Company, our host on this occasion, and the Hornellsville Electric Railway Company have more than taken the place of the first named company, its officers having always manifested but slight interest in the welfare of the Association.

This fact leads us to remark that the officers or members who have been most interested in the success of the Association have been those most intimately connected with its work, especially in legislative matters, which indeed is the essential reason of its existence.

SPECIAL REPORTS.

Inasmuch as the operation of the New York Broadway cable system had been necessarily delayed, it was impossible for the report on "Recent Improvements in Cable Traction" to be prepared in time for presentation at the meeting a year since.

We shall, therefore, have the pleasure at this meeting of listening to this report, and thereby learning something relative to the construction and operation of what must be, in many respects, the most interesting cable system in the world.

The subject selected by the author of the report on "Economy in Electric Power Stations," is one in which a large number of member companies using electric power are deeply interested. Economy is a word that is ever ringing in our ears, and he who produces the largest financial results at the least possible cost is the man for whom the sharp eye of the world is ever on the lookout.

Electric power has boomed into almost universal use in so short a time, that it is not at all strange that in a number of departments of the service there are places where greater or less waste is to be discovered and remedied by the economical mind. One of these departments will be carefully treated at this meeting from the standpoint of economy.

KINDRED ASSOCIATIONS.

We are glad to welcome to the Brotherhood of State Associations, the Michigan Street Railway Association, just organized. We hereby extend the hand of fraternal fellowship. The Street Railway Association, of the State of New York, having grown to be a sturdy youth, assures the newcomer of his hearty goodwill for a vigorous life.

SPECIAL COUNSEL.

One of the main features of the work accomplished by the Association, is that of giving careful attention to street railway interests, during and following the annual sessions of the legislature.

In order that the best possible care be taken thereof, the Association has secured the services for the past three years of special counsel, in the person of Charles J. Bissell, Esq., of Rochester, N. Y.

We hereby express our appreciation of his faithful, devoted attention to the interests of our business before the legislature and the Governor.

His work is faithfully and conscientiously performed, and by the exercise of rare tact, has been able to protect our business from the enforcement of unreasonable demands, that have from time to time been attempted to be made through the medium of the legislature.

This successful result has been in large measure accomplished through the assistance rendered counsel by the extensive membership of the Association, the officer of a relatively small company often having greater personal influence with his representative than the man in the great city. "In union is strength," and the truth of the adage has found very satisfactory demonstration in the history of our society.

For this special reason, therefore, is your committee desirous of having every street railway company in the state, no matter how small the company may be, a member of the Association.

OBITUARY.

William Richardson departed this life December 31, 1893, in the seventy-fifth year of his age. He had been actively engaged in the street railway business for the last thirty years, first with the Dry Dock, East Broadway & Battery Railroad Company, of New York, and afterwards with the Atlantic Avenue Railroad Company, of Brooklyn, both companies members of this Association. At the time of his death he was the acting president of the former company.

He rose to a high place in the esteem of all who knew him. He was always present at the meetings of this Association, and took a lively interest in its welfare. From ten years of age he earned his own living in the world, and by indomitable energy and high resolves secured the high position he occupied amongst his fellows at the time of his death. We shall miss his rare counsel in our deliberations, and we sorrow that we shall not look upon his kindly face again.

Henry W. Slocum died April 14, 1894, in the sixty-seventh year of his age. He had risen to great eminence during the Civil War, and was a major general in the Northern Army, with a brilliant record. Shortly after the close of the war he became interested in the Brooklyn Crosstown Railroad Company, and was elected president of the company in 1866, which position he held until the sale of the road to the Brooklyn City Railroad Company.

In 1889 he became president of the Coney Island & Brooklyn Railroad Company, holding the office until a few months before his death, when he was succeeded by his son, Henry W. Slocum, Jr.

General Slocum was a man among men; clear headed, far sighted, and withal a genial companion and friend. Those who had the pleasure of his acquaintanceship mourn a sincere friend.

Edward F. Drayton departed this life May 27, 1894. He was the secretary and treasurer of the Coney Island & Brooklyn Railroad Company, having been connected with the company since 1860. Of a retiring disposition, he lived a quiet life, faithfully serving the company of which he had been for so many years a highly esteemed officer. His death caused sincere sorrow to his many friends.

We shall greatly miss the faithful and true friends who have gone out from our companionship. Respectfully submitted

BY THE EXECUTIVE COMMITTEE.

The Report of the Treasurer was presented, and showed the financial transactions of the year to be:

Receipts	$5,860.09
Expenses	5,381.20
Balance	$ 478.89

The report of J. B. Craven on "Economy in Electric Power Stations" was then read. This paper is printed in full on p. 627 of this issue.

The president announced the subject to be open for discussion by any of the gentlemen present.

MR. COLE: I would like to ask Mr. Craven if he would advise direct connected engines on small roads, of fifteen to twenty-five cars, where the load is variable?

MR. CRAVEN: I think I should, yes.

MR. COLE: Would you advise that, over using the idler, and giving your belt good surface contact on the pulley?

MR. CRAVEN: Yes, I should.

Mr. Seely: I am not a member of the Association, but I would like to ask a few questions; you speak of injecting oil into the boiler; do you refer to crude or refined oil?

Mr. Craven: Refined oil.

Mr. Seely: Have you had any experience in the use of crude oil?

Mr. Craven: I have not. If you put in the refined oil, it reduces the scale from a hard substance into a slime, which is easily blown out, and when we open the boilers, as we do once a month, we find probably one-sixteenth of an inch of hard scale that is very easily broken off. We can clean the tubes in most cases and have them as clean as when first put in.

Mr. Seely: Do you inject the oil as you operate the machinery?

Mr. Craven: Yes, sir.

Mr. Seely: Not a hot well?

Mr. Craven: No; we inject a pint of oil in the course of ten hours' run.

Mr. Seely: I have heard it spoken of very highly; but never heard anyone who employed it express an opinion. It is entirely satisfactory?

Mr. Craven: It has given better satisfaction than anything we have used for that purpose.

Mr. Issertel: The report refers to roads of a certain size using a return wire. For how large a road, that is, for how many miles would you recommend such a construction?

Mr. Craven: Well, that would depend upon the number of cars, more than on the length of the road; but a road six miles long, with ten cars, I should say, would require a return wire, as well as the bonding of the rail.

Mr. Issertel: How large a wire do you use?

Mr. Craven: That has to be figured out. I should say a No. 0 for the bond itself; but when you commence to put in return wire, it has to be calculated according to the distance and number of cars.

Mr. Seely: Do you believe, in using return wire, that they should be put in conduits, or the rail bonded back in sections—do you think there is any saving in placing the return wire in contact with the earth, or should it be tapped in every 1,000 ft, and then returned in conduits? I think that is the ideal construction, but it is extremely expensive.

Mr. Craven: In Buffalo we run an underground feeder system, and we are bringing our return wires through these conduits. In cases where there is no underground system, lay the wire in the ground.

The paper of Mr. George W. McNulty, on "Recent Improvements in Cable Traction," was then read. This paper is published in full on page 621 of this issue.

On motion the papers of Messrs. Craven and McNulty were ordered to be received and printed in the minutes.

A voluntary paper by Allen R. Foote, of Washington, D. C., on "Taxation," was read by him. An abstract of this paper is given on page 624.

The paper was received and ordered to be printed.

The nomination of officers and selection of next place of meeting being the next business in order, Messrs. McNamara, Rogers and Gannon were appointed the Nominating Committee. The committee made the following report:

President, G. Tracy Rogers, Binghamton; first vice-president, John H. Moffitt, Syracuse; second vice-president, William W. Cole, Elmira; secretary and treasurer, William J. Richardson, Brooklyn.

Executive Committee: D. C. Hasbrouck, New York City; John N. Beckley, Rochester; Daniel F. Lewis, Brooklyn. Place of meeting, Albany, N. Y. The report of the committee was approved. The meeting then adjourned.

In the afternoon the visitors were driven around the city and shown the various points of interest. An inspection was made of the new track being laid by the Syracuse Street Railway Company.

In the evening a complimentary banquet was extended at the Yates House to all in attendance, and was a pleasant affair, breaking up just in time to enable those leaving the city to catch their trains.

While there was no regular exhibit made, models were shown by the following companies: H. W. Johns Co., Consolidated Car Heating Co., Taylor Electric Truck Co., Cutter Electrical Manufacturing Co, Davis Automatic Car Shade Co., Peckham Motor Truck & Wheel Co., New Process Raw Hide Co.

Seventh Annual Meeting of the Massachusetts Street Railway Association.

The Seventh Annual Meeting of the Massachusetts Street Railway Association was held at Young's Hotel, Boston, September 20. The election of officers and committee to hold office for the ensuing year was held. The following officers were elected: President, J. H. Cunningham; 1st vice-president, Amos F. Breed, of Lynn; 2d vice-president, Frank S. Stevens, Fall River; 3d vice-president, Samuel Winslow, Worcester; secretary and treasurer, A. E. Butler, of Lawrence. Executive Committee: Chairman, Alfred A. Glasier, Boston; E. C. Foster, Lynn; Charles Odell, Salem; P. F. Sullivan, Lowell; E. P. Shaw, Newburyport; Prentiss Cummings, Boston; R. S. Goff, Fall River; Charles B. Pratt, Worcester; John Graham, Quincy.

Col. J. H. Cunningham has been associated with the street railway interests of Massachusetts for a number of years, and is at the present time the president of the Plymouth & Kingston Street Railway Company. He is one of the pioneers in the matter of the introduction of electricity as a motive power for street railways, and he was among the earliest purchasers of electric apparatus in the country. Col. Cunningham has served the Association as its president for two years, and has given excellent satisfaction. During his administration, the Association has increased its membership until at the present time there are approximately thirty different street railway companies composing the membership of the Association.

J. H. CUNNINGHAM,

PRESIDENT MASSACHUSETTS STREET RAILWAY ASSOCIATION.

Addresses were made by President Cunningham and by Mr. Glasier, chairman of the Executive Committee, Hon. E. P. Shaw, P. F. Sullivan, manager of the Lowell & Suburban Street Railway Company, and others.

The Philadelphia postal authorities are considering the question of operating postal cars on the electric railway lines in that city.

The street railway war in Savannah resulted last month in a reduction of fares to one cent.

Kinks in Station and Railway Practice.

COMPRESSED AIR FOR CLEANING GENERATORS.

An ingenious system for keeping generators, commutators and other parts clear from copper dust is employed at the power station of the Reading Traction Company, of Reading, Pa. A Westinghouse air compressor maintains a pressure of eighty pounds of air in a receiver which is connected by pipes to various parts of the power station. The ends of these pipes are provided with short pieces of rubber hose which end in nozzles, so that a blast of air can be directed against any part of the commutator or any part of the generator while in operation or when shut down. Thirty-four dynamos are in use at this station, but the management has had no difficulty in keeping them all clean and preventing short circuits by this process.

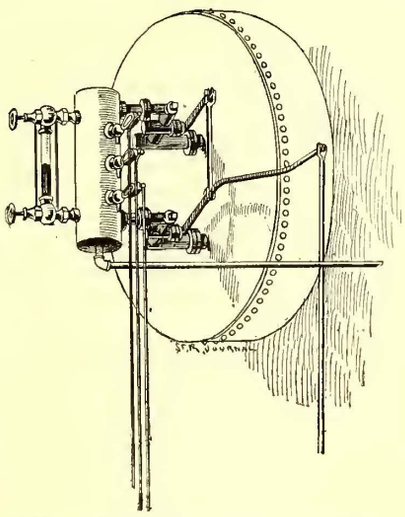
BOY CONDUCTORS.

About two years ago, as a matter of economy, the Nashville (Tenn.) Street Railway Company commenced the experiment of employing boys as conductors, at one-half the amount of wages that were paid to men and, in the opinion of the officers of the road, experience has shown the advantage of the practice. The boys range from sixteen to eighteen years of age, and it is found that they give as good satisfaction in performing the duties of conductors as did the men, and the company has no difficulty in securing all the boys needed at $5 per week.

Further economy in this department has been secured by requiring three conductors to run four car lines, four conductors to run five car lines, etc., by requiring conductors to leave their cars just before reaching the end of the line and board the returning car. The motorman, of course, remains on the car and takes it to the end of the line, and brings it back to the first meeting point without a conductor. There is seldom any passenger who will board the car between the last meeting point and the end of the line, but if this does occur the motorman collects the fare and turns it over to the conductor on his return trip. This plan, as stated, has worked very satisfactory, and a saving of 25 per cent. or more is made in the wages of conductors.

WATER GAUGE SHUT-OFF DEVICE.

A new device for instantly shutting off the water and steam for water gauges, in case the gauge glass should break, is shown in the accompanying engraving. The device was designed by James Anderson, chief engineer of the eastern power house of the Brooklyn City Railway.



WATER GAUGE SHUT-OFF DEVICE.

The boilers in this plant are of the Babcock & Wilcox type, and were described in the December, 1893, issue of the STREET RAILWAY JOURNAL. They are run at a high pressure, and as the water gauges are some feet above the the reach of the attendants standing on the floor, it was desirable to have some arrangement for instantly shutting off the water in case of breakage of the gauge glass. The pipes connecting the gauge to the boiler are provided with shut-off cocks, the handles of which are connected together by a connecting rod. One of the handles has an extension, in the end of which is attached a rod extending down within easy reach of the workman.

This rod is provided with a handle which is held by a catch to the boiler front, holding the shut-off cocks in the open position. Should the gauge glass break, the valves are instantly closed by a single pull on the handle.

TRANSFER OF PASSENGERS WITHOUT TICKETS.

The system of transferring passengers employed on the line of the Nashville (Tenn.) Street Railway is different in a number of points from the usual method. The company has seventeen different lines, radiating from the Public Square, which is about the central point of the city. At a point within 200 ft. of the Public Square the company has erected a transfer station, built similar to a railway station building, through which all of the cars of the various lines pass. From this station passengers may transfer from one line to another.

At the entrance of this station is located a registering turnstile, through which people may pass, having paid their fares at the gate, and occupy comfortable seats in the waiting room of the station until their car arrives. Passengers coming in on cars are supposed to have paid their fare on the car, and are therefore entitled to transfer to another line. The company has transfer agents at this station, who register all the passengers who get on a car, and then issue to the conductors special tickets with the number of people transferred punched out, which the conductors turn in with their trip reports. The conductors do not handle tickets, except those issued to them by the transfer agents, which they turn in the same as money, as they are registered by the transfer agents on each trip, and the conductor is charged according to the register. This is necessary in order that the register may show at all times the correct number of people on the car, and also to enable the company to keep account of the number of passengers transferred each day.

The transfer station is equipped with all of the conveniences of a railway station; a lunch counter, where confections, fruits, etc., can be obtained, and it has been found to be a great convenience to patrons, especially during inclement weather. If a passenger should go outside of the station, unless he leave on a car, he loses his right to transfer; this prevents any exchange of transfer tickets sometimes practiced with other methods of transferring.

Mekarski Motors in Paris.

The Mekarski system for street railways by means of compressed air has been adopted on three lines operated by the General Omnibus Company, of Paris, according to *Engineering*. The lines in question are amongst the most important of the whole Paris system, and one, that from the Louvre to Sèvres and Versailles, has a length of about twelve miles. The two other lines are 6.3 and 5.7 miles long respectively. Trains of three cars, seating fifty-one persons each, and drawn by a compressed air locomotive, will be used. The locomotives will be supported on six wheels, all coupled. They will weigh eighteen tons each, considerable adhesion being required to mount an incline of 1 in 23, which occurs on the Sèvres line, when towing three cars, each of which, in the loaded condition, weighs eight tons. Twenty three of these locomotives are to be built, of which six will be kept in reserve. The air pressure to be carried in the reservoirs will be 1,138 lbs. per square inch, and a sufficient quantity of air will be carried to enable the locomotives to run twelve miles without recharging.

AFTER a year and a half of delays, owing to the City Council, the St. Charles Street Railway Company, of New Orleans, has at last obtained permission to equip with electricity. The stockholders, several months ago, made the necessary financial arrangements, and it will not be long before this large and important line will be converted to more modern methods.

THE Indianapolis & Broad Ripple Rapid Transit Company put its line in operation September 14. The company was only able to run one car per hour, but these were crowded with passengers, and a more frequent service with trailers was commenced shortly after. The road is now running very successfully.

THE COMING CONVENTION AT ATLANTA.

The Thirteenth Annual Convention of the American Street Railway Association at Atlanta promises to be the largest, livest, and in every respect the most successful in the history of the Association. The local committee has been extremely busy preparing for the reception and entertainment of the delegates and to insure a pleasant time for all. It wishes particularly to call attention to the importance of securing rooms in advance, and any who wishes to do so should address Wm. W. Kingston, Chairman Local Committee on Hotels, Equitable Building, Atlanta.

The topics upon which papers will be read by regular committees are printed on the cover of this issue. In addition, special papers will be read on the following subjects: "A Practical System of Long Distance Electric Railway Work," "Brake Shoes," "Power Brakes vs. Hand Brakes," "Taxation," and "Destructive Arcing of 500 Volt Fuses."

HOW TO GO TO ATLANTA.

The Secretary of the Association has issued a circular giving the arrangements made for reduced fares. All the traffic associations, except the Western Passenger Association, have authorized the sale of tickets at reduced rates—namely, a fare and one-third for the round trip. This concession applies to all attending the meeting—delegates, supply dealers and accompanying friends. The traffic associations that have extended this courtesy are the Trunk Line Association, the Southern Passenger Association, the Central Traffic Association, the New York and Boston Lines Passenger Committee, the Boston Passenger Committee and the Railway Association of Michigan.

Some of the rules governing reduced rates are as follows:

Each person must purchase (not more than *three* days prior to the date of the meeting) a first-class ticket (either unlimited or limited) to Atlanta, for which he must pay the regular tariff fare, and upon request, the ticket agent will issue a certificate of such purchase, properly filled up and signed by the said ticket agent.

Where the journey is made over more than one line it may be necessary for the passenger to purchase separate local tickets, and procure certificates thereof for each of the lines over which he travels in going to Atlanta, as some lines do not honor the certificates of any other line. The passenger should ascertain from the ticket agent what portion (if not all) of his journey can be covered by the certificate procurable of him, and purchase his ticket and secure a certificate filled in accordingly. In case a ticket on the certificate plan cannot be procured at the starting point, the person should purchase to the nearest point where such a ticket can be obtained, and there repurchase through to Atlanta, requesting a certificate properly filled out by the agent at the point where the repurchase is made.

Tickets for the return journey will be sold by the ticket agent at Atlanta at one-third the highest limited fare, to those *only* who hold certificates signed by the ticket agent at the point where through tickets to Atlanta were purchased, and countersigned by the clerk of the Convention, certifying that the holder has been attending the Convention. Mr. N. W. L. Brown of the Atlanta Consolidated Street Railway Company, has kindly consented to serve as clerk of the meeting for this exclusive purpose.

The secretary suggests to all who will attend the meeting, who desire to transact business at any other city *en route* to arrange to do so on the trip to Atlanta, as the going ticket will, of course, carry with it in most cases stop-over privileges, while the return ticket will not.

The annual dinner will take place on Thursday evening, October 18. Each company that is a member is entitled to the free admission to the banquet of two of its officers. Each additional officer, or any other gentleman in attendance at the meeting, not an officer of a member company, will be charged $10; ladies' tickets, $5 each. In order to facilitate the work of the executive committee, the secretary has requested that all who expect to attend the banquet give him notice to that effect in order that definite arrangements may promptly be made.

Special provisions, as already announced, will be made for the entertainment of all ladies who may attend the Convention.

HOTEL ARAGON, ATLANTA.

HOTEL ACCOMMODATIONS.

There will be ample hotel accommodations for all who attend the meeting. The rates at the hotels are as follows: Hotel Aragon, American plan, $3 to $5 per day; European plan, $1.50 to $3 per day. Kimball House, $2.50 to $5 per day. Markham House, $2 to $4 per day. Hotel Marion, $2 to $4 per day. National Hotel, $2 to $3 per day.

The headquarters of the Association are to be at the Aragon, which is located on Peachtree Street in the principal residence portion of the city, and at the highest elevation in Atlanta. Adjoining the Aragon is the Grand Opera House, said to be the third finest in the United States. The Capitol City Club is opposite, and the Governor's mansion is on the same street one block away. The hotel is comparatively new, having been opened on the 14th of last November, and is conducted on the American and European plans. The building is of the Spanish Romanesque style of architecture, is six stories in height and has a frontage of 104 ft. on Peachtree Street and 200 ft. on Ellis Street. The first story is chiefly in Georgia marble and the other five stories are constructed of pressed brick with terra cotta and marble trimmings. Half of the sixth story is fitted up as a roof garden, where musical entertainments are held during the summer months. The main entrance is on Peachtree Street, and is 20 × 60 ft., with marble floor and quartered oak wainscoting nine feet high, the wood work being of cabinet finish.

The café is located on the first floor fronting Ellis Street and is 40 × 70 ft., adjoining which are two private dining rooms, 15 × 20 ft., each. These rooms are beauti-

fully furnished, draped with velours and laces, and adorned with tropical plants. The main dining room is on the second floor and is 40 × 60 ft., furnished in quartered oak, with large buffets and fireplaces on each side, and is brilliantly lighted by two elliptical windows of thirty feet each. The ceiling is paneled with heavy oak beams, and is decorated in the center in Sixteenth Century style. The breakfast room adjoins the dining room and is appointed in pure Castilian style. The parlors front on Peachtree Street, and are richly furnished in keeping with the other appointments. The rooms are single and en suite, ranging in size from 10 × 12 to 20 × 26; all the suites are provided with baths, and there are public baths and lavatories on each floor. The gas, electric light, heating fixtures and call bells are of the most modern design. The store rooms, kitchen, power plant and heating apparatus occupy separate buildings. There are many unique and striking features about the interior finish and furnishings of the hotel, which must be seen to be appreciated, as a description fails to convey a correct idea of their richness and beauty. The attention paid to the guests on the part of the management and the cuisine are quite in keeping with the furnishings and designs above described, so that the delegates who seek a home here during the Convention may be assured of superior accommodations.

The Kimball House, is the oldest, largest, and probably the most extensively known hotel in the city. It is situated in the very heart of the city, in close proximity to the Union Depot. The building is practically a fireproof structure, six stories in height, with 450 rooms and accommodations for about 1,000 guests, and has a reputation of being one of the most perfectly planned and best arranged hotels in the South. The main office occupies the rotunda on the ground floor, with entrances from the three principal streets. The center arcade is open to the skylight and is 60 × 100 ft., with light and airy corridors and spacious arcades on each floor, so that the guests are afforded delightful promenades, and ample room for social parties, while from each corridor a full view is had of the office and of the movement of the guests on the ground floor. The main dining room is located on the parlor floor and is well arranged for light and ventilation. The table is abundantly supplied with the best the market affords, and the cuisine being perfect in all its details. The large rooms opening on the corridors and balconies of the second and third floors are especially well adapted for the headquarters of manufacturing firms, and for the display of such small plans and appliances as they may wish to bring to the attention of the delegates. This hotel being larger than the others will doubtless entertain a greater number of delegates and supplymen.

LOOKOUT INN, LOOKOUT MOUNTAIN, CHATTANOOGA.

THE KIMBALL, ATLANTA.

LOOKOUT INN ON LOOKOUT MOUNTAIN.

Delegates and their families going to the national convention of the American Street Railway Association will find it exceedingly pleasant to stop over a few days at Chattanooga and visit Lookout Mountain, on top of which is located the magnificent Lookout Inn, a marvel of architectural beauty, one of the most commodious, the most luxuriously furnished and best equipped all-the-year-round resort hotels in America. The handsome structure faces the rising sun, and from its towers may be seen some of the most glorious sunsets in the world, rivaling even the wondrously beautiful Italian skies.

The Inn is an entirely modern structure, is four stories high and has a frontage of 365 ft. It has accommodations for 500 guests. The table is very superior, the menu embracing all the delicacies of the season, from the tropics to the arctics. The service and appointments are unsurpassed. It is lighted by electricity and heated by steam. There are billiard, reading and smoking rooms, and all the comforts and conveniences of the finest city hotels.

A broad tableland, covered with forests of pine and oak, surrounds the hotel. The tableland varies from one-quarter to five miles in width and extends southward for seventy-two miles. There are splendid drives in all directions, and a fine boulevard built at a cost of thousands of dollars. The readers of the Street Railway Journal who have visited Lookout Mountain, will agree with us when we state that the world-famous view from the Point Rock is a magnificent one. Some views in the Alps may

excel it in rugged grandeur, but none in the sublimely peaceful prospect. With the faint blue outlines of the Great Smoky Mountains in North Carolina in the distance on the east, and Waldens Ridge on the west, and the silvery waters of the Tennessee River in the foreground, describing that picturesque convolution known as "Moccasin Bend," the scene is one which will repay the traveler for a journey across the continent. From this point, too, may be viewed some of the most celebrated battlefields of the Civil War. The street railway officials will be interested in the toboggan railway, down which ordinary electric cars run for nine miles at high speed, propelled alone by gravity.

Lookout Inn will be one of the regular stopping points of the Convention delegates en route to and from Atlanta, and those who visit the historic heights will find it one of the most interesting and delightful spots in all the Southland.

EXHIBITORS AT THE ATLANTA CONVENTION.

The number of manufacturers of street railway appliances and others who have expressed their intention of exhibiting at the Atlanta Convention seems to be larger than ever before. The facilities for exhibiting, as we have already mentioned, are excellent, and all those to whom space has been awarded may be confident that they will have opportunity of showing their exhibits to excellent advantage.

The list of applicants, with the space awarded, includes the following:

	Sq. ft.
Baltimore Car Wheel Co., Baltimore Md	240
Bass Foundry & Machine Co., Ft. Wayne, Ind	200
Brill, J. G., Co., Philadelphia, Pa	800
Brooklyn Car & Veneer Works, Brooklyn, N. Y	100
Card Electric Co., Mansfield, O	400
Carnegie Steel Co., Ltd., Atlanta, Ga	200
Central Electric Heating Co., New York	160
Chapman Valve Manufacturing Co., Chicago, Ill	160
Consolidated Car Heating Co., Albany, N. Y	320
Crawford, R. A., Manufacturing Co., Pittsburgh, Pa	160
Creaghead Engineering Co., Cincinnati, O	320
Cutter Electrical & Manufacturing Co., Philadelphia, Pa	160
Davis Car Shade Co., Portland, Me	200
De Witt, E. F., Co., Lansingburgh, N. Y	320
Fitzgerald-Van Dorn Co., Lincoln, Neb	160
Fulton Truck & Foundry Co., Mansfield, O	400
General Electric Co., Atlanta, Ga	400
Genett Air Brake Co., New York	80
Georgia Equipment Co., Atlanta, Ga	120
Graham Equipment Co., Providence, R. I	160
Hale & Kilburn Manufacturing Co., Philadelphia, Pa	100
Hartford Woven Wire Mattress Co., St. Louis, Mo	100
International Register Co., Chicago, Ill	120
Jackson & Sharp Co., Wilmington, Del	800
Johns, H. W., Manufacturing Co., New York	240
Johnson Co., The, Atlanta, Ga	600
Keller, H., Printing Co., New York	100
Lewis & Fowler Manufacturing Co., Brooklyn, N. Y	240
Loughridge, J. E., Philadelphia, Pa	100
McGuire Manufacturing Co., The, Chicago, Ill	300
McLean Armature Works, Chicago, Ill	100
Mark Railway Equipment Co., Chicago Ill	100
Mather Electric Co., Manchester, Conn	400
Meaker Manufacturing Co., Chicago, Ill	160
Michigan Electric Co., Detroit, Mich	160
Munson, C., Belting Co., Chicago, Ill	160
New Haven Car Register Co., New Haven, Conn	240
Niles Tool Works, Hamilton, O	160
Nuttall, R. D., Co., Allegheny, Pa	160
Ohio Brass Co., Mansfield, O	160
Paige Iron Works, Chicago, Ill	1200
Peckham Motor Truck & Wheel Co., New York	320
Pennsylvania Steel Co., Philadelphia, Pa	100
Price Railway Appliance Construction Co., New York	100
Rochester Car Wheel Works, Rochester, N. Y	160
Scarritt Furniture Co., St Louis, Mo	100
Smith, C. G., New York	160
Standard Railway Supply Co , Chicago, Ill	160
Sterling Supply & Manufacturing Co., New York	400
Stirling Co., The, Chicago, Ill	160
Street Railway Advertising Co., New York	100
STREET RAILWAY JOURNAL, New York	100
Street Railway Review, Chicago	100
Veneer Seating & Church Furniture Co., Brooklyn, N. Y	100
Wadhams Oil & Grease Co., Milwaukee, Wis	160
Walker Manufacturing Co., Cleveland, O	200
Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa.	1120

EXHIBITS AT THE ATLANTA CONVENTION.

THE STIRLING COMPANY, of Chicago, will be represented by Thos. Deegan.

THE JOHN STEPHENSON COMPANY will be represented at the Convention by John A. Tackaberry and D. W. Pugh.

THE FIBERITE COMPANY expects to have a very handsome exhibit at Atlanta, one that will do credit to the Medbery insulation.

THE FULTON TRUCK & FOUNDRY COMPANY, of Mansfield, O., will exhibit trucks, double and single, wheels of special double tread, sand boxes and other specialties.

THE SIEMENS & HALSKE ELECTRIC COMPANY, of Chicago, will probably be represented at the Convention by Augustine W. Wright, the vice-president of the company.

THE STANDARD RAILWAY SUPPLY COMPANY, of Chicago, will, as usual, show its various specialities, including the car stove, of which it has made a specialty for a number of years.

J. E. LOUGHRIDGE, of Philadelphia. will make an interesting exhibit which at the present time cannot be fully described owing to certain foreign patents which are now pending.

THE STERLING SUPPLY & MANUFACTURING COMPANY, will have an exhibit of its registers, fenders and sand boxes. Mr. Carson will represent the company and have charge of its exhibit.

THE CUTTER ELECTRICAL & MANUFACTURING COMPANY, of Philadelphia, will exhibit the C—S automatic cut-out, and will be represented by W. E. Harrington and Charles E. Bibber.

THE NEW HAVEN CAR REGISTER COMPANY, of New Haven, Conn., will make a special exhibit of fare registers, and will have a number of representatives on the ground to look after its interests.

E. F. DE WITT & COMPANY will exhibit two sand boxes operated by foot power, of a new type in which the sand and knives are in the car itself, thus requiring a smaller hole through the car floor.

THE JACKSON & SHARP COMPANY, of Wilmington, Del., is building two cars for exhibition at the Atlanta Convention, and may be depended upon to do its share toward making a creditable exhibition of street cars.

THE CENTRAL ELECTRIC HEATING COMPANY'S exhibit will consist of the American car heater only. The company will be represented by Edward B. Wyman, manager of the railway department, and one or two other representatives.

THE BALTIMORE CAR WHEEL COMPANY. of Baltimore, will show two of its Lord Baltimore electric trucks. which are now well known to street railway men. The company will be represented by J. Paul Baker, secretary of the company.

THE FITZGERALD-VAN DORN COMPANY, will show its regular drawbar, and also drawbars for elevated railroads similar to those furnished to the West Side Metropolitan Elevated of Chicago. W. T. Van Dorn, manager, will have charge of the exhibit.

THE KELLER PRINTING COMPANY'S railroad ticket department will exhibit improved fare, transfer and time limit tickets, as well as a dating machine in operation. J. F. Bushe, manager of this department, will be present at the Convention exhibit.

THE DANIELS STEEL RAILROAD TIE COMPANY, of Youngstown, O., will probably be represented by Thomp Burton, president and manager of the company, who, though quite ill at present, expects to be able to attend the Convention in October.

THE LEWIS & FOWLER MANUFACTURING COMPANY will show, as usual, a very complete line of registers, stoves, car trimmings and other street railway supplies. The company will probably be represented by L. E. Robert, S. A. Morrell and George Whipp.

THE J. G. BRILL COMPANY, of Philadelphia, will have a simple, but very extensive exhibit, which will include three cars and an electric sweeper in operation; a snow plow, several trucks and a number of other general appliances in the way of street railway supplies.

THE MCGUIRE MANUFACTURING COMPANY, of Chicago, will make an extensive exhibit consisting of car trucks and car stoves, air brakes and a combination snow plow and sweeper. The company will be represented by W. A. McGuire, president, and W. J. Cooke, vice president.

THE INDUSTRIAL MUTUAL INSURANCE COMPANY, of Boston, Mass., will be represented by Benj. Taft, secretary and assistant treasurer of the company. Mr. Taft will be accompanied by his wife, and expects to give some time to the enjoyment of the social features of the Convention.

THE BASS FOUNDRY & MACHINE WORKS, of Fort Wayne, Ind., expects to have an exhibit at the Convention, which will consist of street car wheels both chilled cast iron and steel tired, and axles both hammered iron and hammered steel. P. F. Leach will represent the company.

THE HARTFORD WOVEN WIRE MATTRESS COMPANY, of Hartford, Conn., will exhibit its woven wire and link fabric car seats covered with plush and rattan; also its new armless car seats, reversible, intended for electric cars, etc. The company will be represented by its St. Louis agent, H. E. Evans.

C. G. SMITH, of New York City, will make an elaborate display of all of the company's manufactured articles intended for use on street railways, such as headlights, both oil and electric, combination center lamps, etc. Thos. C. Millen, the Western salesman, will be present to look after the interests of Mr. Smith.

THE MATHER ELECTRIC COMPANY, of Manchester, Conn., will have a prominent exhibit consisting of its 100 K. W., new type multipolar railway generators and several of its new Manchester type slow speed motors. The company will be represented at the Convention and at its exhibit by Thos. C. Perkins, the vice-president.

THE GENERAL ELECTRIC COMPANY, will make quite an elaborate display of its different styles of motors, including the G. E. 800. Type K controller will be shown. Motors will be mounted on different exhibition cars, which will be shown in service on the street railway lines in Atlanta. Motors and generators and a complete outfit of overhead material will be shown.

THE FULTON TRUCK & FOUNDRY COMPANY will make an exhibit of one single steel truck "Imperial," one double steel truck "Imperial," the company's motor lift, sand boxes, drawbars, track cleaners, door fasteners, and a ticket destroying machine. The company will be represented by W. E. Haycox, president and manager, and Frank A. Rogers, special sales agent.

THE DAVIS CAR SHADE COMPANY, of Portland, Me., will have an exhibit consisting of a full sized section of an open street car, containing a sample of its waterproof curtain for use on such cars and also a *fac simile* of one side of a closed railway car showing various styles of curtains adapted for use in closed street cars and railway coaches. The company will be represented by C. M. Fuller.

THE CARD ELECTRIC COMPANY, of Mansfield, O., will make an exhibit which will consist of one single motor equipment of thirty-five horse power, one double interurban equipment, one commutator turning device, a new series multiple controller, some canopy switches and fuse blocks for street railway service, pneumatic switches, etc. Geo. F. Card, the engineer of the company, and Reid Carpenter, the president, will probably represent the company at the Convention.

THE PAIGE IRON WORKS, of Chicago, have secured space in section F of the exhibition hall, and will show special work both in girder and T rails. A feature of the T rail exhibit will be a section of track laid on steel ties using suspension joints, brick pavements, etc., like that now in service at Terre Haute, Ind. The company's engineer, E. S. Nethercut, will have charge of the space, and Alonzo W. Paige, the president of the company, will also be in Atlanta during the Convention.

THE CONSOLIDATED CAR HEATING COMPANY, of Albany, N. Y., expects to show two full sized car seats with complete electric heater equipment, several special patterns of cross seat, panel, office and house heaters, a temperature regulating switch, special snap switch, and a special automatic cut-out. The company's consulting engineer, Jas. F. McElroy, its agent for electric heaters, N. H. Ransom, and its general western agent, Edwin A. Smith, will represent the company at the Convention.

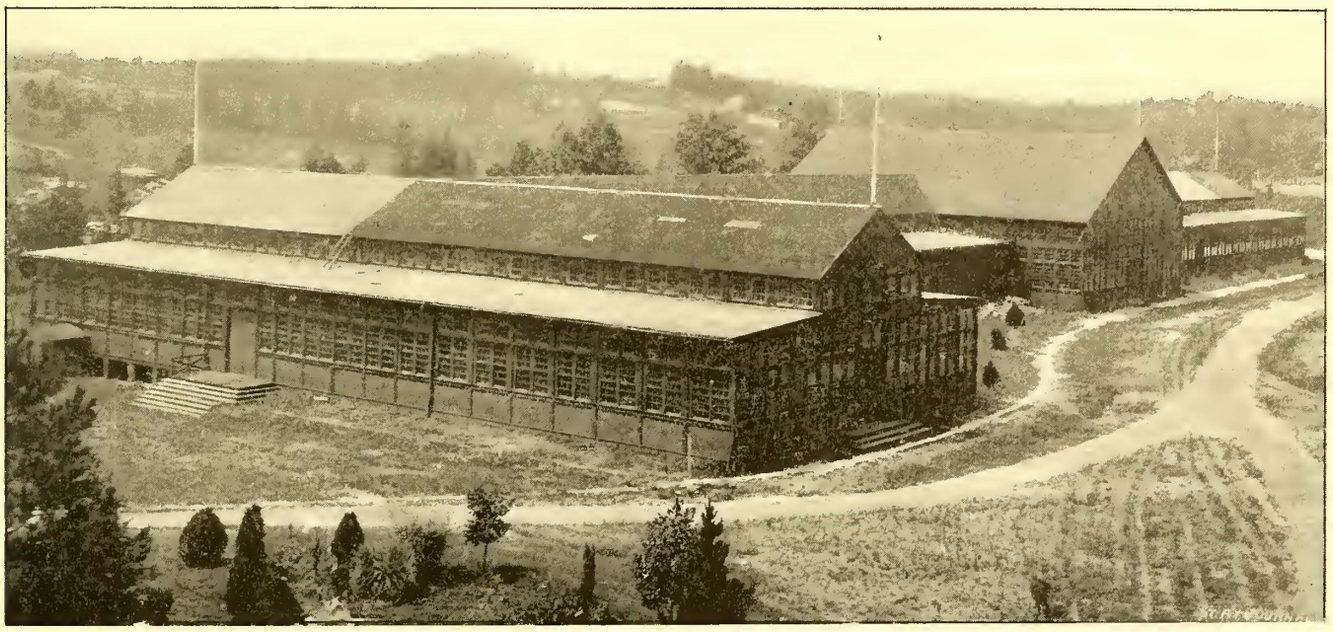
THE R. A. CRAWFORD MANUFACTURING COMPANY, of Pittsburgh, Pa., will have its pick-up fenders and wheel guard fenders on exhibition. It has been arranged to display the company's four different types in the Convention Hall. The wheel guard fender will be attached to a Peckham truck, on which will be mounted a special Sperry electric car. The company will be represented by its president, R. A. Crawford, and its general agents, C. N. Wood, of Boston, and C. J. Mayer, of Philadelphia.

THE WADHAMS OIL & GREASE COMPANY, of Milwaukee, Wis., will place on exhibition samples of Wadhams high grade cylinder, dynamo and engine oils, especially adapted to Corliss engines, special, graphite greases for motors, Wadhams graphite curve grease and special curve grease brushes, as well as various styles of compression grease cups for the crankpin, main and line shafting and other journals. The exhibit will also contain Wadhams truck soap and soapstock for cleaning greasy floors. E. A. Wadhams and G. A. Streeter will represent the company.

THE PECKHAM MOTOR TRUCK & WHEEL COMPANY will have an elaborate exhibit, which will include a Peckham truck under a Sperry electric car, another truck under a Jackson & Sharp open car, the Peckham "Standard" extension truck, and the "Extra Long" cantilever truck. The truck under the Sperry car will be equipped with Sperry electric brakes. Mr. Peckham will also exhibit car wheels, parts of his trucks, etc. Mr. Peckham himself will be in attendance at the Convention, and will also have several other representatives there.

THE OHIO BRASS COMPANY, of Mansfield, O., will be represented by C. K. King. This company has 160 sq. ft. of floor space, and will exhibit a full line of the materials which it manufactures, including the well known type W construction material, Wood's adjustable pole bracket, Wood's flexible pole bracket, adjustable switches, Mansfield strain insulators, Wood break strain insulators, motor bearings, trolley wheels, trolley harps and the reversible and adjustable track brush holder which the company has recently made arrangements to handle exclusively.

THE GRAHAM EQUIPMENT COMPANY, of Providence, R. I., will exhibit one of its steel snow plows for service on electric railways of both single and double track. Those in attendance at the convention will be directed to the company's excellent exhibit of eight trucks now in service on the Atlanta Traction Company's line. These trucks were sold in April, and are now in daily service. J. H. Graham, president, G. S. A. Gardiner, vice-president and treasurer, and C. O. Lenz, electrical engineer of the company, will be in attendance to look after the interests of the Graham Company.



VIEW OF CONVENTION HALL—PIEDMONT PARK, ATLANTA.

THE CREAGHEAD ENGINEERING COMPANY, of Cincinnati, will make an exhibit of its specialties, which will be in charge of T. J. Creaghead, president, and G. R. Scrugham, who will represent the company. The exhibit will include a full line of flexible brackets for single and double track construction made for wood and iron poles, Creaghead trolley insulators, trolley ears, overhead frogs, section insulators, strain insulators, trolley wire splicers and other devices for overhead equipment. Printed matter regarding all of these specialties will be furnished in abundance for the information of those attending the Convention.

THE MICHIGAN ELECTRIC COMPANY, will have an exhibit, which will consist of a complete line of the "Michigan" electric railway specialties, covering trolley wire hangers of all styles (span wires, single and double curve, angle iron and pipe bracket-hangers) splicing plates, strain insulators, switches and crossovers. This is the line of specialities formerly known as the "Zimmerman." The company will also exhibit a signal light for electric street cars for which it is making some very decided claims. The company's exhibit and its interests will be looked after at the Convention by J. E. Lockwood, the president.

THE ROCHESTER CAR WHEEL WORKS, of Rochester, N. Y., will make a handsome exhibit of car wheels of its manufacture, both for street railway and steam railroad service. Street car wheels will be shown ranging from 20 ins. to 36 ins. in diameter, and in weight from 140 to 400 lbs. Steam railroad wheels will be exhibited ranging from 24 ins. to 36 ins. in diameter, and from 250 to 750 lbs. Some fractures of wheels will also be shown, as well as other details of interest in this line. The company will be represented by F. D. Russell, general manager of the street car wheel department, and George C. Morse, the general sales agent.

THE INTERNATIONAL REGISTER COMPANY, of Chicago, will have on exhibition various samples of its well known portable registers, as

well as special registers made for the West Chicago Street Railroad Company and the Kansas City Cable Company. Samples of its standard form of aluminum stationary register will be shown, as well as samples of the new stationary register type "F," which will be here shown for the first time. This machine is an exact reproduction of the company's portable register on a larger scale. It will show the trip register in large, plain figures instead of by pointer, as in the standard machines. The company will be represented by its secretary and manager, A. H. Englund.

The R. D. Nuttall Company, of Allegheny City, Pa., which is one of the oldest and most reputable supply houses in the country, will have an extensive and exceedingly interesting exhibit of its manufactures at the Convention. Among its other exhibits the company proposes to display all the latest and most improved overhead supplies now on the market, the well known Nuttall improved trolley, the company's trolley harps, wheels, gears, pinions of different styles and construction in steel, iron and malleable iron. The Nuttall trolley harps in malleable iron and brass will form a special feature. In addition, there will be displayed by the company a number of turnbuckles, and in fact a complete line of overhead material made by this company. F. A. Estep, the president of the company, is expected to personally attend the Convention.

The Genett Air Brake Company, of New York City, will show quite an elaborate exhibit, which will include the first air brake apparatus made by the company. This will be shown for the purpose of comparison with the most recent apparatus. The newest enclosed double acting compressor and brake outfit will be shown, as well as a brake compressor testing pump for the purpose of showing how little power the compressor consumes. Besides this, the controller handles, showing how the grips and brakes are operated simultaneously or individually, will be exhibited, as well as various detail parts and the materials used in their manufacture. The company will be represented by its general manager, E. J. Wessels, and its master mechanic, Geo. S. Lee. The Company, in addition to its other exhibit, is equipping two cars on one of the Atlanta lines with its air brake system, which will be in working order by the time of the Convention.

Samuel P. Ferree has secured a space twenty feet square, which he will divide into four parts, to be given up to his separate interests namely, the Brooklyn Car Wood & Veneer Works, the Veneer Seating & Church Furniture Company, the Price Railway Appliance Construction Company and the Street Railway Advertising Company. The Brooklyn Car Wood & Veneer Works will make the same exhibit as at Reading, Pa., on September 6 and 7, and laterat Syracuse, N. Y., on the 18th and 19th. Some additions will be shown. The Veneer Seating & Church Furniture Company will display seats and seatings. Both of these exhibits will be in charge of Wm. B. LeVan, Jr. The Price Railway Appliance Construction Company will exhibit joints and electric bonds, as shown at the Reading Convention, and it is expected that James M. Price, the inventor of the system, will be in attendance. The Street Railway Advertising Company will exhibit a series of advertising cards in racks. Samuel P. Ferree will attend the Convention as an interested representative of all these exhibits. Mr. Ferree will be accompanied by his wife and daughter.,

The Walker Manufacturing Company has secured space and will exhibit a complete car equipment of its manufacture. There will be one truck with two motors, with all the necessary appliances to operate these, including two series parallel controllers, one rheostat, one lightning arrester, one canopy switch, one trolley, one fuse box. In addition there will be a single motor, not mounted, but open so that the inside of the machine can be inspected. Extra gears, pinions, gear housings, etc., will also be shown. These motors will be supplied with current, so they can be operated, and every facility will be given to the street railway managers to thoroughly examine and inspect the apparatus in operation. The Walker Company will also exhibit a 200 H. P. generator at the Convention, which will be run as a motor. This exhibit will, therefore, show the general design and construction of the entire street railway equipment, both generators and motors, of the company. The Walker Manufacturing Company will be represented at the Convention by the following: Frank Billings, vice-president, W. H. Bone, manager, S. H. Short, H. McL. Harding, Ed. Kohler, J. M. Atkinson, B. M. Barr, H. A. Darrall, The Breese & Mansfield Company and a number of other representatives.

The H. W. Johns Manufacturing Company, of New York, will be represented by an exhibit of its moulded mica trolley line insulators and a full line of overhead frogs, crossovers, rail bonds, section insulators and other pieces which go toward making a complete line of overhead materials. The exhibit will be situated in section E at one of the main entrances to the building. Some of the pieces to be on exhibition will be the well known round top hangers, the new five-eighths inch swivel hanger, the hinged sleeve bracket arm hanger, the Giant strain and swivel pull over, the No. 1 and No. 2 Giant strains with combination large eye and clevis ends, the Brooklyn strain with Giant strain combination for affording double insulation for feed-in span-wires, the most successful "H. W. J." mechanical clip, which has no loose parts and requires but an instant for the insertion and secure retention of the trolley wire, the Perry mechanical clip, the Philadelphia trolley wire splicing sleeve, the iron clad feed wire insulators with seven-eighths and one and a quarter inch top grooves of No. 0000 B. & S. and 500,000 C. M. feed wires respectively, the Emerson, Grautan and and Philadelphia section insulators, "Noiseless" frogs, plain and adjustable brass crossings, the Lincoln insulated and also adjustable insulated crossings, the Grautan, Johnson and other rail bonds, tree insulators, moulded mica, weatherproof sockets, vulcabeston field magnet spools, commutator rings, controller insulating pieces, etc. It is expected that W. F. D. Crane and Henry G. Issertel, of the New York office of the company, J. W. Perry, of the Philadelphia branch, E. B. Hatch, and Herbert Luscomb, of the Johns-Pratt Company. of Hartford, will be in attendance, with possibly one or more of the local salesmen of the H. W. Johns Manufacturing Company.

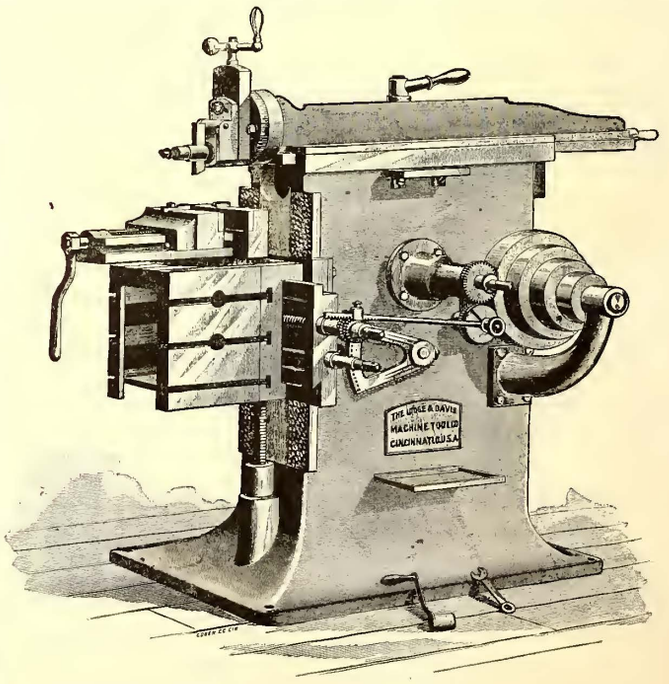
The Westinghouse Electric & Manufacturing Company. The guests at the Convention will have a very good opportunity of inspecting a number of Westinghouse generators and motors, as well as general station appliances in full operation. On the Atlanta Consolidated Street Railway Company's station are operated two 300 K. W., belted generators, and a short time since the company also shipped to the same place, a 500 K. W. generator for direct connection to a Rankin & Fritsch engine, running at ninety revolutions per minute. The generators in the power house of the Consolidated Street Railway Company are connected to a marble panel switchboard of the Westinghouse standard type, which is arranged to accommodate three generators and two feeders. The instruments on this board are all of the Westinghouse marble and glass construction. The generator circuit breakers, instead of breaking only one side of the circuit, are arranged to break two of the connections between each generator and the board, and in this way prevent all possibility of the machine bucking. The Atlanta Consolidated Street Railway Company is also operating four cars, each equipped with two thirty horse power motors of the Westinghouse type, No. 12, and controlled by the Westinghouse No. 14 series multiple controllers. The Atlanta Traction Company is operating four double equipments of No. 3 Westinghouse single reduction motors, which have been in use about three years, and judging by the fact that two more double equipments of the No. 12 motor were recently purchased by the Atlanta Company from the Westinghouse people, the Westinghouse would seem to be giving satisfaction.

The Westinghouse Company does not expect to have any special exhibit at the Convention, but it has shipped two No. 12 motors of thirty horse power each, with No. 14 series multiple controllers, to the Brill Company, of Philadelphia, and its apparatus will be used to equip one of the Brill cars; three No. 3 motors, two of thirty horse power and one of twenty-five horse power, for the equipment of a snow sweeper; two thirty horse power motors will propel the sweeper, and one twenty-five horse power motor will be used to drive the brooms. The latter will be controlled by a "D" controller, while the two motors will be controlled by No. 14 controllers. The Brill Company proposes to send this sweeper and car to Atlanta, and will have them in operation on the tracks of the Atlanta Consolidated Street Railway Company during the Convention.

Sixteen Inch Shaper.

The illustration presented herewith is of a sixteen inch pillar shaper, which employs the usual slotted lever for obtaining the quick return motion, and means are provided for taking up wear between the sliding block and slot. The upper end of the lever carries a roller which works in a slot formed in a nut, which is fitted to slide upon the under surface of the ram, and can be adjusted to any desired position, while the machine is in motion for adjustment of the ram.

The length of the stroke is adjusted by a screw, which holds the crankpin in any position without the necessity for locking it, and this can also be done while the machine is in motion, the graduated arc, seen at the right of the machine, having the same angular movement



SIXTEEN INCH SHAPER.

as the slotted lever, and plainly indicating the length of stroke for which the machine is set.

The rack which moves the feed pinion on the horizontal screw is so supported that it works the same regardless of the angle at which it

stands, and it requires no attention or adjustment whatever when the cross rail is moved up or down.

The cross feed screw can be operated from either end of the cross rail, and the elevating screw is turned by applying the crank to the squared shaft at the right of the cross rail.

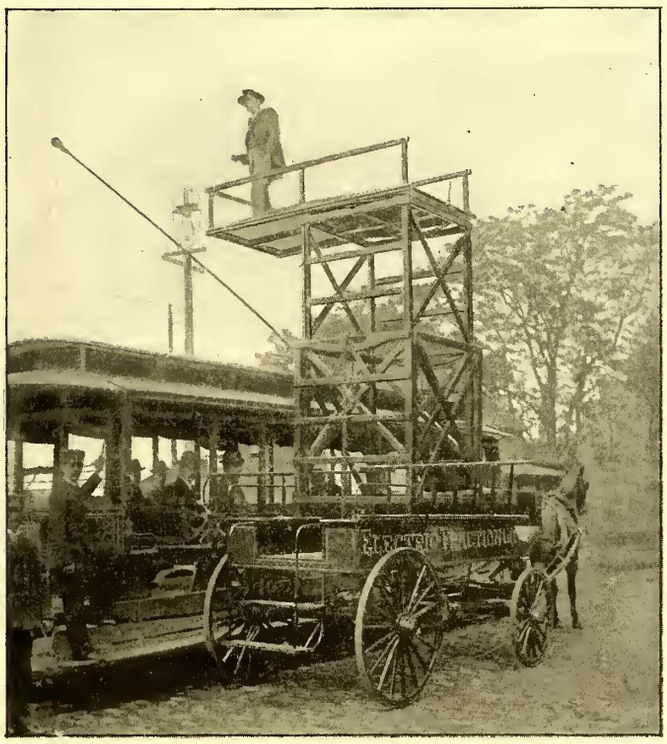
The table is detachable, and, when removed, leaves a surface to which work or special fixtures can be attached. Other features of the machine are indicated by the engraving. It is made by the Lodge & Davis Machine Tool Company, Cincinnati, O.

The Trenton Trolley Wagon.

The accompanying illustration shows a new wagon for use in overhead electric railway construction, which is manufactured by Linburg, Sickel & Company, of Trenton, N. J. The wagon itself is constructed of thoroughly seasoned white oak. The best steel Concord express axles with chilled boxes are used, and oil tempered springs of special construction are provided. The body is furnished with lockers for tools, and with steps and hand rail at the rear end.

The tower is very strongly constructed and firmly braced. The corners are fitted with four angle-iron slides on each section of the tower, and so adjusted that the corners of the upper section slide easily within the corners of the lower section. The upper section of the the tower is elevated by an iron chain passing over revolving sheaves fitted on sliding bearings and winding on an iron cylinder secured under the sills of the body. The cylinder is revolved by a compound gear, by means of which the tower can be quickly elevated by one man.

The swinging platform at the top, which in the illustration is shown in its extended position, is lightly but strongly made. It is secured at the center of the tower by a heavy wrought iron pivot,



TRENTON TROLLEY WAGON.

which passes through an iron transom plate suitably fastened. Stout iron rollers are let in and secured to the lower surface of the framework of the platform, and these rollers pass over the upper surface of a large, flat, iron circle firmly secured to the top of the tower. At the inner end of the platform is a positive iron clutch, which can be adjusted in an instant, and which holds the platform firmly in any position in which it may be placed. The platform is provided with folding guard rails

When not in use the upper section of the tower can be lowered, the platform extended in line with the body, and the guard rails on the platform folded, making a compact, well balanced wagon which can be driven rapidly without danger of upsetting. With the tower and platform extended the whole structure is perfectly rigid, and will sustain the weight of several men on the extended platform without tipping or swaying. The wagon can be placed outside the tracks, and all work can be done on the wires from the platform without interfering with the running of the cars. The tower can be raised sufficiently high to string or repair all trolley, guard or feed wires without difficulty or inconvenience, and can be set at any height desired. The platform can be turned to extend over either side of the wagon.

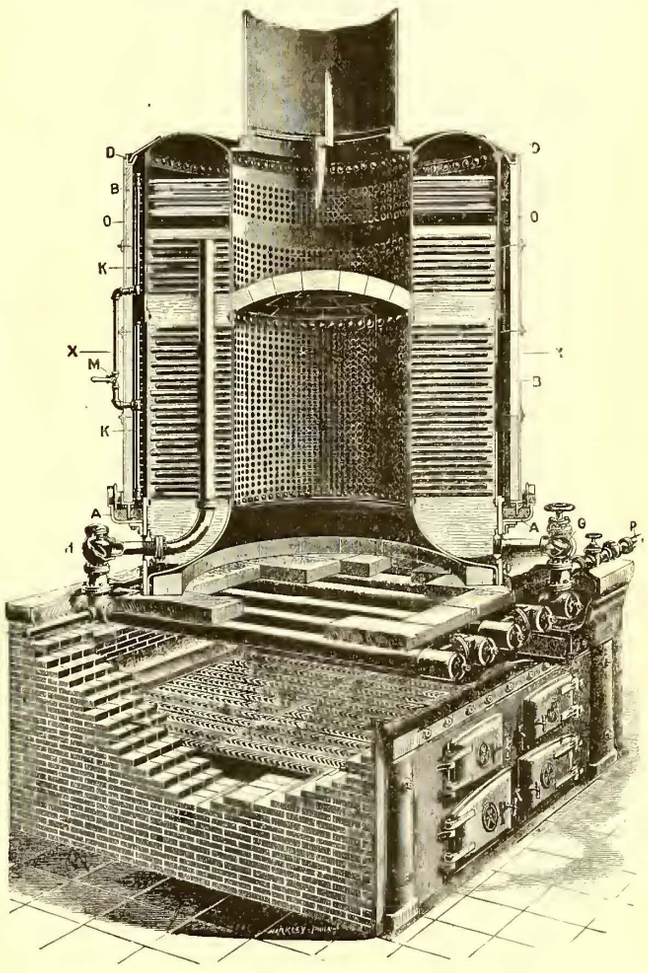
The Chicago Interurban Street Railroad Company, has been incorporated, with a capital stock of $1,000,000. The incorporators are E. Hervey Plummer, Ellsworth Ansen and George P. Taylor.

The Berry Boiler.

Reference is made on page 605 to the use of the Berry boiler by the Philadelphia Traction Company in its station at 32d and Dauphin streets, Philadelphia. A view of the boiler, which was supplied by Robert Wetherill & Company of Chester, Pa., is presented herewith. It consists of two vertical cylindrical shells one inside of the other, united at the top by a crowned ring and at the bottom by a cone-shaped ring or crown sheet. Since these heads cover a comparatively narrow space, they are of thin steel and do not require bracing, and are, therefore, sufficiently flexible to accommodate any inequality of expansion in the two shells, and because the fire is applied to all sides of the boiler alike, no destructive strains can arise from this cause.

Tubes of small diameter (never larger than two inches outside diameter) radiate from the inner to the outer shell in every direction, forming braces for each. These tubes are placed in vertical rows in the inside sheet and are alternately diverged or "staggered" in the outside sheet. By this arrangement the rapid circulation of the steam and water upward, near the inner shell, is not obstructed, and the downward movement of the cooler water near the outside sheet is afforded the same facility, while the strength of the outer shell is not reduced below the percentage of the seams.

Secured to the heavy base sheet of the boiler is a circular ring or trough, *A*, which is partly filled with sand, and the outside rim of which forms a track upon which a casing or smoke jacket is mounted



BERRY BOILER.

so as to revolve around the boiler, the lower edge of the casing projects into the sand, and prevents the passage of air, while it allows the casing to freely revolve. This casing is lined throughout with fire-clay tile, *B*, which provides an insulating air space inside the casing.

Secured to the inner side of the revoluble casing is a flue cleaning device, consisting of a pipe, *K*, having a series of blast nozzles arranged to stand opposite the center of each tube in one of the vertical rows. This pipe is connected through the casing to a three-way cock, *M*, which is supplied with steam from the boiler through a flexible pipe. By revolving the casing the nozzles are made to register successively with each row of tubes, and a blast may be sent alternately through the upper and lower sections of tubes to clean them of soot. To aid in this effect a gate is provided in the arch, which may be opened to change the course of the draught directly up the chimney. A series of doors is also provided in the casing of sufficient width to allow of the cleaning of any of the tubes with a brush or scraper.

To avoid arches and other unsatisfactory brick work in the furnace, a continuous coil of four-inch tubes is provided to carry the furnace covering. Through this coil all the feed water passes as well as all the blow-off water, in addition to which a continuous circulation of great rapidity is maintained by means of the arrangement of pipes in the boiler.

The points of excellence claimed, as determined from practical performances are:

First. The economy of space occupied, which, owing to the great concentration of the heating surfaces, their high efficiency and the upright design, is very small—one square foot of floor space per horse power allows ample room for boiler and firing room.

Second. Economy in cost of maintenance and operating service.

Third. The convenience of cleaning inside and outside surfaces, (a) by means of the circulating and purifying coil which is a part of each boiler and which effectually prevents the deposit of scale or sediment upon the heating surfaces, and (b) the revoluble casing and flue cleaner which keeps the fire surfaces always clean.

Fourth. Perfectly dry or superheated steam is uniformly furnished.

Fifth. Simplicity and economy in first cost of installation. No purifiers or separators or other expensive accessories are needed with this boiler.

Sixth. The highest degree of safety and durability, due to the character of the materials used (all steel); the enormous strength of the structure, entire freedom from the destructive strains or unequal expansion; the wide range of the water line above the danger point, the "sectional construction" of the circulating coil over the fire, the perfect circulation of the water in the boilers, and the entire freedom from scale or sediment on the heating surfaces.

Seventh. The highest economy of fuel, resulting from "perfect combustion" in a convenient and roomy furnace, ample draught area, close contact and slow movement of gases over the surfaces, large ratio of heating surface to grate surface, perfect insulation, perfect circulation of water and uniformly clean surfaces inside and out.

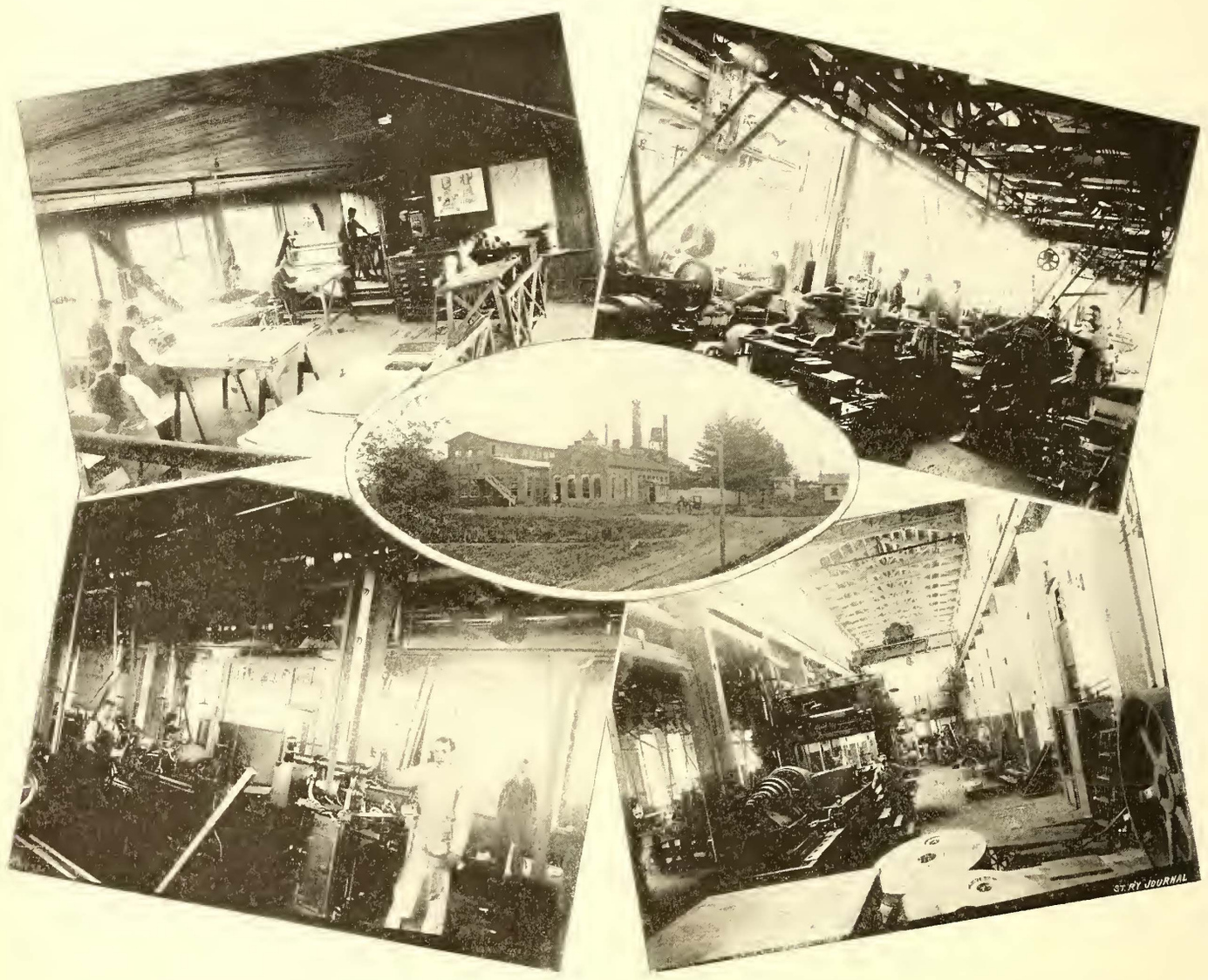
Large area through the tubes and upward draught requires a much smaller smokestack to obtain requisite power compared with other boilers.

The Works of the American Engine Company.

The extensive works of the American Engine Company, at Bound Brook, N. J., occupy a large plot of ground between the Lehigh Valley and Reading Railroads.

The buildings are substantial brick structures, mainly two stories in height, and cover a space of about 150 × 300 ft. The accompanying illustrations show a few of the various departments. The main machine shop, shown in the lower right hand engraving, measures 144 × 64 ft., and is thoroughly equipped with new and special machinery, and has the last modern facilities for handling work, the machine tools were supplied by the Niles Tool Works, Bement & Miles, the Putnam Machine Company and the Bridgeport Machine Tool Works. A ten ton, three-motor electric crane, built by the Industrial Iron Works, of Bay City, Mich., is provided for lifting and transporting heavy parts, and hand traveling cranes for small individual pieces. Among the special machine tools is a 6 × 6 × 26 ft. planer, built by the Niles Tool Works. On this machine the engine beds are finished complete, the planing, boring for the bearings for the main shaft, and the bolt holes for the cylinder heads being done at one setting, insuring perfect alignment of all parts.

Adjoining the main shop is a smaller machine shop, measuring 64 × 50 ft., equipped with the latest type of machine tools. Next to this department is the grinding room, which is fitted with Brown & Sharp grinding machinery for grinding the bearing surfaces of the engines.



VIEWS AT THE WORKS OF THE AMERICAN ENGINE CO.

The erecting and testing shop is located in the eastern end of the building, and is not shown in the illustrations. This department measures 40 × 80 ft., and is provided with a twenty ton electric crane, built by the Morgan Engineering Company. Foundations for setting up and testing both vertical and horizontal engines are provided.

The blacksmith and forging department is located in a well lighted building adjoining the erecting shop, and is equipped with all the necessary apparatus for turning out a high class of work. Among the tools is a Morgan Engineering Company 12,000 lb. steam hammer.

The draughting and pattern shops are located in large, well lighted rooms in the second story of the building. A view of one of the draughting rooms is shown in the upper left hand engraving.

The company makes a specialty of simple and compound, medium speed, horizontal side crank engines, and simple, compound and triple expansion vertical engines.

These engines have a special gear, which, it is claimed, gives all the advantages of the Corliss steam distribution, while maintaining the simplicity of the single valve gear.

The shipping facilities are of the best. Sidings from the Lehigh Valley Railroad extend into the grounds, while the Central Railroad of New Jersey and the Reading Railroad pass close to the works.

New Vertical Engine of the Ball Engine Company, Erie, Pa.

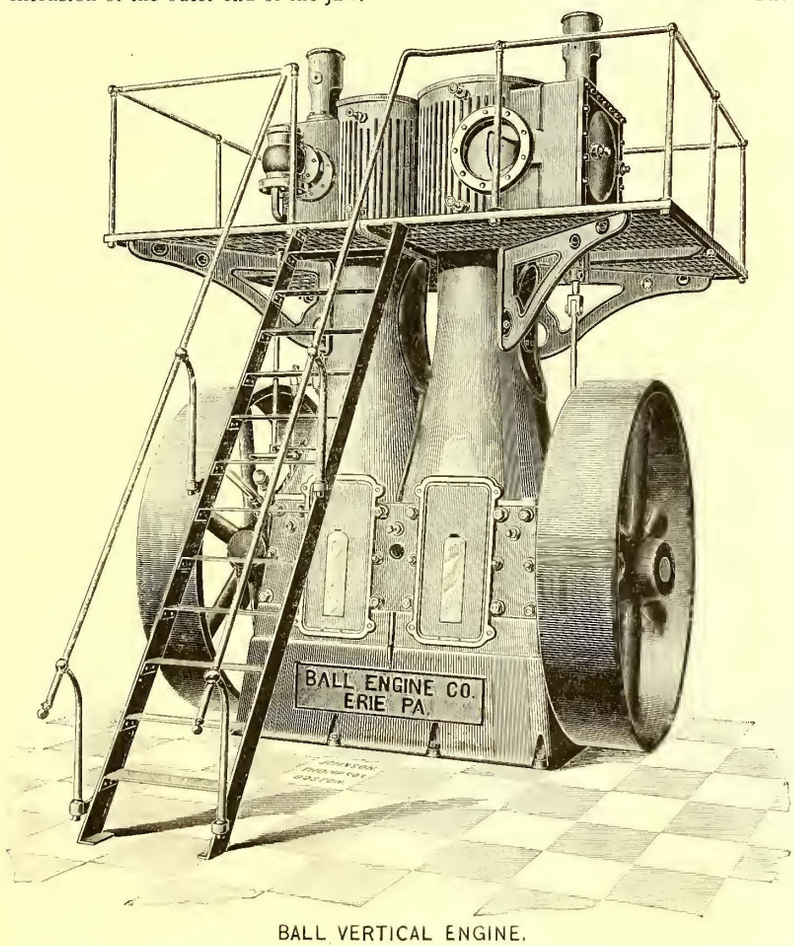
In the design of this engine the makers—taking advantage of their large experience of engine driving in electric stations—have tried to place themselves in the position of station owners and operators.

It was desired to arrange an engine whose structure should be of such a form that the main pieces should be absolutely rigid and indestructible, and, while having this feature, allow ease of access for adjustment or removal of any part that is subject to wear, and while covering these points, to produce an engine whose steam distribution is symmetrical on both sides of all the pistons, whether one, two, three or four are used; in other words, an independent valve motion for each and every cylinder employed, and each of these being a perfect engine in itself.

By reference to the cut it will be seen that the main proposition as to strength and indestructibility is fully covered in the symmetrical form of the upright housings which are made to constitute one double housing, by having one side of each planed and bolted together in the center of the middle shaft bearing. This substantially is still further increased by the operation of planing the bottom of both housings to one continuous flat surface, to meet the planed surface of the top of the single base plate to which the bottoms of the housings are substantially bolted.

The introduction of the shaft into this engine is accomplished by arranging the shaft boxes in a large jaw, cutting into one side of the housing deep enough to bring the center of the shaft in a plane with the center of the housing, finished spots being provided to meet correspondingly finished surfaces upon the cast iron boxes.

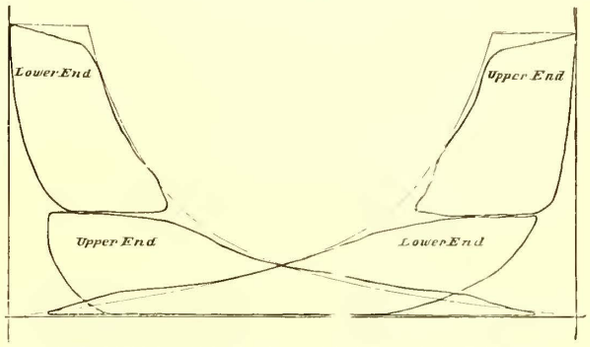
These boxes consist of one lower, two quarter, and one top box for each journal, and these are provided with removable babbit metal shells, upon which the journals bear. These shaft box jaws are in turn closed by the use of heavy struts or plates, having on their inner faces a V-shaped tongue on each end, which fits into a corresponding groove planed on each side of the jaw. These struts are fitted so that when bolted in solidly by the four bolts in each, the jaw is closed and completes the symmetrical strength of the four corners of each housing, each strut being fitted so that there can be neither contraction nor extension of the outer end of the jaw.



BALL VERTICAL ENGINE.

Each housing is also pierced by the large rectangular opening on each side (shown covered by a door bolted on) as wide as the space between the inner edges of the struts, and extending both high and low enough to allow the cranks with their connterbalancing disks to pass. Hence, with shaft, boxes and struts in place to close up the engine, it is only necessary to put up and secure large doors, which in turn are provided with a small shutter plate covering an opening large enough for the insertion of one's hand, to feel the connecting rod strap when the engine is in motion, and the necessary wrenches to keep up the crank boxes when so desired, while the adjustment of the journal boxes is accomplished by turning the three set screws shown in each strut, the two in the center reaching the quarter boxes, while the third one above operates either in or out a wedge which fills between the upper side of the jaw in housing and the top box; thus giving independent adjustment for three parts of each box, which is perfectly free to move at right angles to the axis of the shaft, thereby giving for all positions of adjuststment of the quarter boxes a full bearing for the shaft.

Above the openings for the shaft the housing becomes a round taper column, having on two sides of its inner surface the cross-guide surfaces which are cast in place and bored out coincident with the boring and facing of the upper end for the reception of the cylinders and the lower end for its seat upon the base. The other two sides of each housing are pierced by elliptical openings, making easy access to the crosshead and upper end of the connecting rod.



INDICATOR DIAGRAMS—BALL VERTICAL ENGINE.

With all of the above in view, it will seen that in adopting this form of housing a structure is obtained that is strong, convenient of access when desired, clean as to any dirt leaving the engine, and entirely closed as to any dirt from the outside entering the engine, along with a natural ventilation past the shaft boxes, up the column and out of the ellipitical openings therein.

The shaft is of one piece of forged steel from end to end, the crank pins being 180 degs. apart and cut out of the solid, down to their round diameter and, as are the journals, ground to a perfectly round, smooth running surface. The pins are provided with centrifugal oiling holes in addition to the regular supply through the usual tube reaching from the upper to the lower end of the connecting rod.

Covering each pair of crank bells is a pair of disks carrying a sufficient amount of counterweight to give a perfect running balance to the cranks and the reciprocating parts, so there is practically no vibration to be communicated to the housings and hence to the upper works of the engine.

The connecting rods are of forged steel, the upper end being solid and cut out for the reception of the brass crosshead box and the removable crosshead pin, the latter being very carefully tapered through the crosshead and held in place by a fine threaded nut; the lower end being provided with an excellent design of strap which, owing to the arrangement of bolts and cross keys, constitutes a solid end rod for the crank as well as the upper end, and both ends are provided with the very best arrangement of wedge adjustment that can be conceived of, and which in operation does not alter the length of the rod. The crossheads are of the double plate, pocket type, as used in many makes of Corliss engines, are provided with taper shoes to compensate for any wear that may occur against the guides, the shoes being of cast iron with the running surface entirely covered with babbit metal, the area of which has been made exceedingly liberal. The piston rods are of crucible steel screwed into the crosshead. The stuffing boxes are adapted for the use of fibrous packing unless otherwise ordered. The pistons are of the double plate held up to a solid collar and taper by a well fitted nut. The piston packing is made up of two self adjusting, parted rings and a broad junk ring for centering and guiding the piston in the cylinder.

The cylinders are made of charcoal iron, mixed in such proportions of hard and soft as to produce a very strong, close grained iron, which enables the surface to take a mirror polish. They are provided with single valves each of which is practically one piece so far as the motion and wear are co ncerned.

The high pressure valve is of the double faced, telescopic, relief type, with boiler pressure on the inside and sufficient amount of unbalanced area being left on the faces that the force of the steam on the inside forces the two faces apart, causing each to rub against the seat with sufficient force to keep the surfaces polished and steamtight through the entire life of the engine. The low pressure valve is of the common letter D type with improved proportions and construction, is provided with a round relief area upon its back and operating against the chest cover, thus having a large, well proportioned valve that runs with the greatest ease and yet follows up its wear without attention from the outside.

In substantiation of the main proposition contained in the production of this engine, there is presented an indicator diagram showing that where single valves of proper design are used the steam distribution can be made so perfect that it is simply folly to continue the chase

after an ideal perfection that involves a vast amount of complication as an increase of first cost, maintenance and continuous attention, which is not justified by the results obtained.

To state this in another way, the one great governing fact in the use of steam is recognized; namely, that a small leakage will more than destroy the useful effect of very elaborately worked out valves and motions. The makers have, therefore, confined themselves to the work of perfecting and simplifying the simplest and best form of steam valve that is possible.

As an instance in point showing the absolute control which a correctly adjusted governor may have when such a governor has a good valve to handle, we wish here to relate a few facts that were developed in a recent test:

The engine is employed in electric railroad driving and is supplied with steam at 125 lbs. gauge pressure, and exhausts into a practical uniform vacuum of twenty-four inches, and was driving (at the time this test for total variation from standard speed was made) 425 to 435 I. H. P. To observe the variation a tachometer was attached to the main shaft. When all was in readiness and the full load was on, the switch controlling the whole current leaving the station was opened, thus dropping the entire load instantly, and the engine made a momentary flutter up to 235 revolutions and back again to 233 revolutions. The circuit was kept open while the attendant counted ten and was closed as suddenly as it had previously been opened, when the tachometer showed the engine making the same momentary flutter down to 231 revolutions and back again to 233, taking up instantly a load of about 400 I. H. P.

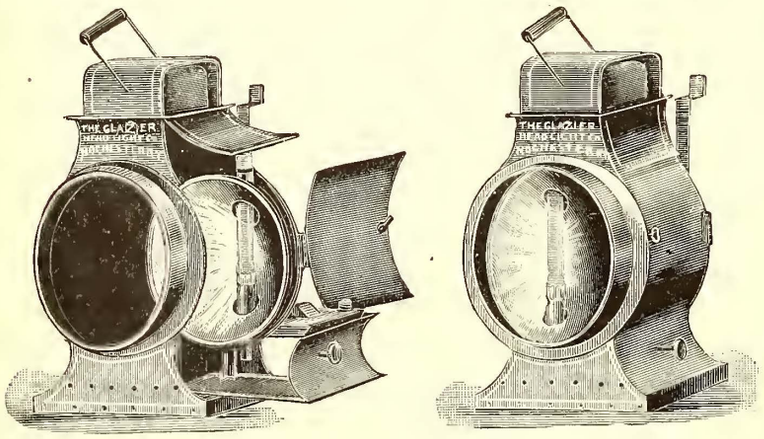
This test demonstrated that the governor was in absolutely isochronous adjustment, that the valves were absolutely steamtight, and that this degree of control over an engine of this magnitude, using such a pressure and discharging into a vacuum, has never been and probably never will be excelled.

This engine is guaranteed not to vary in speed from full load to no load, and *vice versa*, more than 1 per cent.; hence as the test showed but .86 of 1 per cent. it was conceded that the guarantee was fulfilled in very good form. The governor is made of the best materials, the points of severe contact being provided with hardened pins and renewable soft bushings, thus throwing the wear into those parts that are easily and cheaply replaced. The outward appearance of the engine is neat, symmetrical, and at once demonstrates that in this arrangement has been accomplished a great reduction of floor space required for this amount of power.

Referring again to the indicator diagram, there is shown an arrangement of combined diagrams, which shows clearly the grade of expansion realized in a non-condensing engine, showing a good argument for the claim that when the various theories of steam distribution with their attendant complication are carefully considered, where single solid valves with their simple driving mechanism can be made to do as well as these diagrams demonstrate, it is a waste of energy and money to extend into mere complications.

New Headlight.

The Glazier Headlight Company is placing in the market a new motor headlight illustrated in this page. A headlight of this design with door, in side of case, is very unique and practical in many ways. The reflector slides in at the bottom therefore, has something to stand upon, when taken out of the case. The hand wheel is outside of the case



NEW HEADLIGHT.

so that the wick can be raised and lowered without opening the door, a very desirable point in a windy night. The chimney does not have to be removed to draw the reflector and oil fount out of the case.

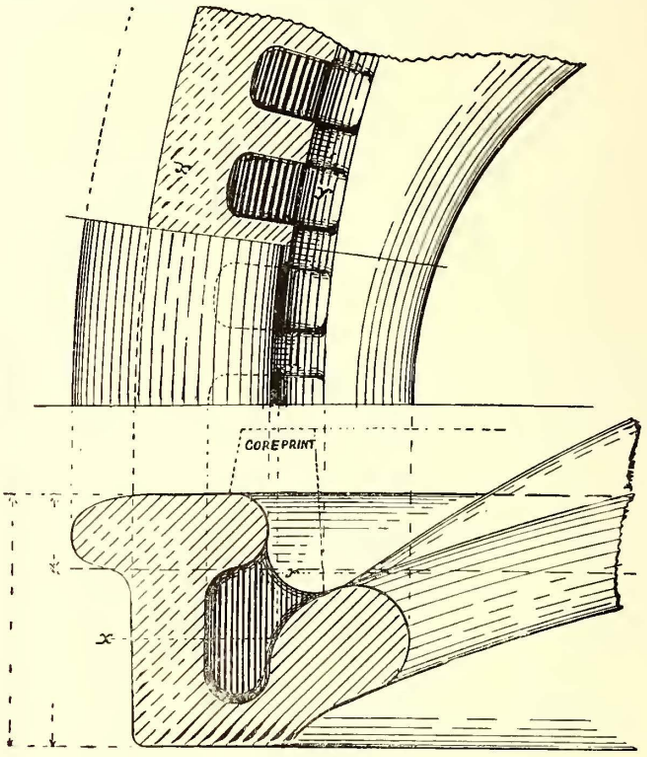
The lamp is made of heavy tin, reflector copper with a student burner, and to stand the jolting of motor cars. All that have inspected this headlight pronounce themselves as well pleased with it. The lamps are made in two sizes, ten and twelve inches.

The Indiana Electric Railway Company, of Elkhart, Ind., which has been endeavoring for some time to get a franchise for this city, but has not succeeded, has decided to operate under the old franchise of of the defunct Citizens' Street Railway Company. This will be a part of the electric line between this city and Goshen, a distance of ten miles.

A New Type of Car Wheel.

A new type of car wheel has been brought out by A. Whitney & Sons, of Philadelphia, made under a patent granted to L. R. Faught, their mechanical engineer. A section and also a side view of the wheel showing the construction and appearance are given herewith.

As will be seen, the peculiarity of the wheel consists in the rim being divided circumferentially into a series of independent but connected cavities or cells, located between the inner and outer diameters of the



ELEVATION AND PLAN OF CELLULAR CAR WHEEL.

rim of the wheel. These cells diminish the heavy body of metal usually massed in the rim, reducing particularly the thickness of the part which forms the tread, but in such a manner as not to decrease its strength.

Several advantages are claimed for this form of wheel.

First.—It overcomes the difficulties ordinarily attending the production of a deep, durable and uniform chill on the tread of heavy wheels intended for use under severe conditions of service. In casting a heavy wheel of ordinary form, the heat of the mass of metal in the rim and also that communicated through the arms or spokes, has a tendency to reduce the depth of the chill, so that the necessary strength is obtained at the expense of durability of the tread, and this in spite of the fact that heavy loads carried call for increased rather than diminished hardness on the tread, as well as greater strength.

Second.—The rim of the wheel is more elastic under the strains and concussions of severe service.

Third.—The comparatively light section of the rim insures the metal being more dense, and consequently harder in the chilled portion, from the well known fact that smaller bodies of cast iron are denser than greater ones. The light section also reduces any tendency to blow holes and shrinkage cavities.

Fourth.—The cellular section equalizes the shrinkage strain on the wheel at the time of casting, lessening any tendency to fracture from heating caused by excessive or prolonged use of brakes.

The cellular form of rim does not necessarily alter the weight of the wheel, but wheels of this form are considered stronger for the same weight than the ordinary form. It is held that the principle of a cellular tread is applicable to all forms or cast iron or cast steel wheels.

Samples of this wheel will be shown at the forthcoming convention of the American Street Railway Association at Atlanta.

At the half-yearly meeting, held August 17, at Bristol, of the Imperial Tramways Company, which controls a number of street railways in Great Britain and Ireland, a dividend of 6 per cent. for the preceding year on the preferred stock and one-half per cent. for the year on the common stock was declared. The Dublin South District Tramways, which are controlled by this company, reported gross receipts of £11,000 a year. Arrangements have been made for equipping this line by electric power. The Reading Tramways reported an increase in passengers of 63,000 during the previous six months. An increase on the Corris Railway was also reported. J. Clifton Robinson, the managing director, was extended a vote of thanks by the stockholders.

Flexible and Adjustable Bracket for Poles.

The steel or iron pole and flexible adjustable bracket and fixtures for electric railway construction, illustrated herewith, are manufactured by the Wrought Iron Bridge Company, of Canton, O. The pole No. 1 is constructed of four tee irons. The tees are as long as the pole, so there will be no splices in the latter. The connecting pieces, or bands, are accurately forged to shape, and riveted to the stem or leg of the tees, and abutting against the head of the tees, making a very strong pole, and yet elastic enough to prevent its bending from any sudden blow or strain. For first class construction and neat appearance, the lattice, or built-up iron pole, has proven most substantial. Owing to its open construction, the pole is easy to paint inside, as well as outside. There is also an advantage in the open construction in setting the pole, as the concrete can run inside the base of the pole as well as around the outside of the pole, and owing to the fact that there are no joints in this pole, it is not apt to become loose from jars to which poles are subject.

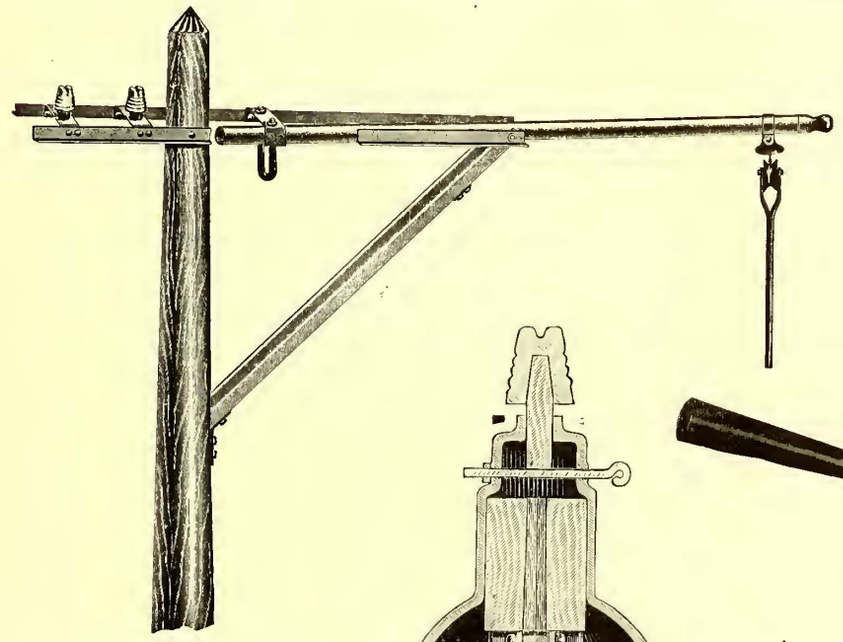


FIG. 1.—FLEXIBLE AND ADJUSTABLE TROLLEY BRACKET.

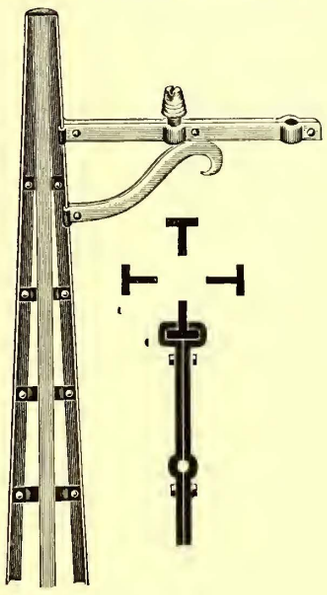


FIG. 2.—ADJUSTABLE CROSS ARM.

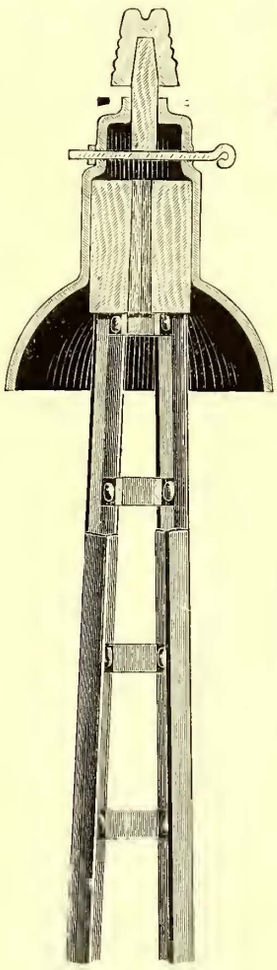


FIG. 3.—POLE TOP WITH HARD WOOD INSULATOR.

The bracket No. 3 has a number of special advantages, as it is neither too rigid nor stiff. The horizontal arm, or pipe, that supports the trolley wire, is pivoted, so that the trolley wire is suspended in an even more flexible manner than that attained with the span wire construction, since the end of the supporting arm next to the pole acts as a counterweight, enabling the trolley wire to yield to the upward pressure of the trolley wheel with no jar or shock. The horizontal member of the bracket that supports the pipe, or arm, embraces the top of the pole, and cannot pull off the poles when the trolley wire breaks.

Practical tests of this bracket on one of the largest electric railways in the United States has proven it to be an arrangement of great value. It not only saves the expense of constructing one extra line of poles, but there is a great saving in overhead material, such as trolley wheels, insulators, clamps, overhead switches, etc. The poles and brackets are made in any lengths, to suit requirements.

Fig. 3 represents the pole top of the same manufacturers, made of one solid casting. It is insulated from the pole proper by the hardwood blocks, as is plainly illustrated. This makes a very strong top, with the eye-bolt through the top of the hood. Any slack in the trolley suspension wire can readily be taken up. Fig. 2 represents an adjustable cross arm, for wire suspension in telephone and telegraph work. The cross arm or bracket can be put on the pole at any height, and may be shifted without taking down the wires.

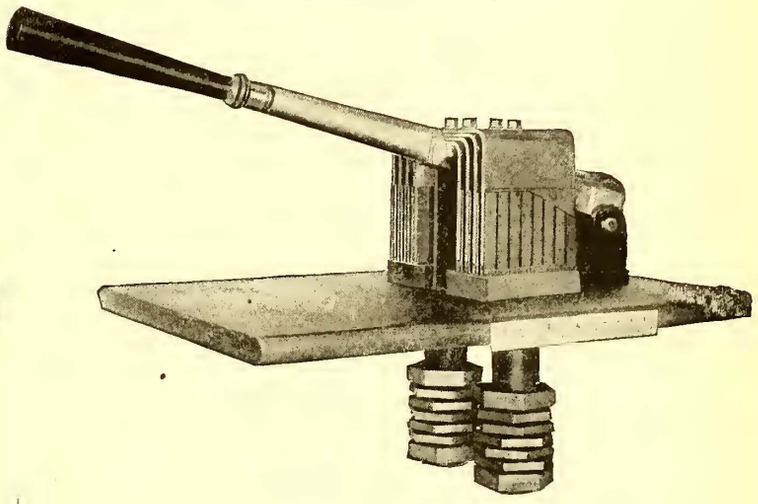
These poles and brackets were designed and patented by Leroy S. Pfouts, of Canton, O.

7,000 Ampere Switch.

With the advance of electric traction and the consolidation of street railway interests, there has been a gradual tendency toward larger power stations with larger generating units, and consequently, proportionately larger station apparatus.

As late as April, 1893, a switch which was guaranteed to successfully rupture a circuit carrying 3,000 amperes of current, at a potential of 500 volts, was considered a giant in breaking capacity; and it remained for the Ajax switch, described in the technical papers of that date, to demonstrate the utility of such large, quick break switches, and the ability to open a circuit carrying 2,000 H. P. of electrical energy at 500 volts potential, without the slightest injury to either the operator or the apparatus. During the interim, Ajax switches have been designed for 4,500 amperes (50 per cent. larger than any attempted before), and several such are in actual service on street railway circuits.

We now are enabled to illustrate another advance in switches; the switch in the cut representing a new "plunger type" Ajax switch of 7,000 amperes capacity. This switch is guaranteed to break its full rated capacity at 500 volts potential, or nearly 4,700 H. P. It was



7,000 AMPERE SWITCH.

ordered by the Electric Traction Company, of Philadelphia, through the General Electric Company, which is building the switchboard for its new Delaware Avenue power house.

Except the carrier and stand, which do not form any part of the circuit, the entire switch is made of commercially pure copper, and provision is made for clamping direct to a laminated bus bar, consisting of six bars, each $5 \times \frac{1}{4}$ ins., or a total of seven and a half inches sectional area; which is also the minimum of sectional area in any part of the switch. The contact area, finish and action are of the well known Ajax formula. The switch is compact in form, and occupies a space only 14×13 ins. on the switchboard. A handle of unusual length is required to operate these large and close fitting blades, which overhangs the switch proper, several inches; the total length of the handle from the pivot is forty-one and a half inches, and terminates in a highly polished piece of old mahogany.

As a continuous current circuit breaker, it is believed the subject of this sketch is the largest yet attempted. It is needless to say that it has not yet been tested to its limit.

THE JOHN STEPHENSON COMPANY, LTD., has many contracts on hand. This company seems to have no difficulty in securing orders for cars, its works being always busy—an excellent commentary on the high standard of work which this company maintains. Many railway managers who have employed the cars of the Stephenson Company for many years insist on using them, and will be satisfied with no other make. Among the recent contracts closed by this company are cars for Jacksonville, Fla.; Bridgeport, Conn.; Metropolitan Traction Company, of New York, Columbia Railroad Company, of Washington, D. C.; St, Petersburg, Russia; Cape Town, South Africa, and Mexico. The Washington order is for forty closed cable cars with a twenty foot body, very similar in design to those used on the Broadway Railway in New York.

Rail Joints and Bonds.

By James M. Price.

If there be a "sore place" in the great railroad system, covering the land with a network of tracks for the flying locomotive trains, which no physician has yet healed, probably it is found in the defects of rail joints, everywhere seen in low joints, rails battered down at their ends, while elsewhere fit for service, and in the perpetual "knocking at the joints," which makes all motion tremulous, while wearing away the rolling stock. The rail itself is year by year improving in its section for strength and endurance, and the quality of the track, as regards the ballast and the laying, is steadily attaining a higher average, yet the defects of the joints seem, like the poor, to be "always with us," and the annual breakage of splices adds alike to the expenses and the risks of the railroads.

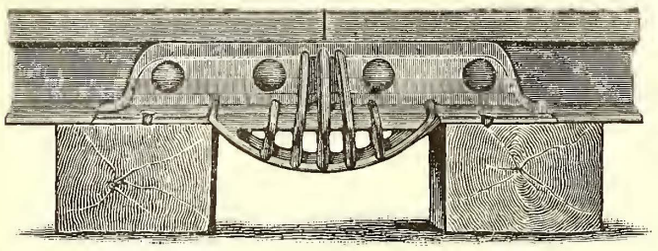


FIG. 1.—LITTLE GIANT JOINT.

Is there no cure for this? The defects of splice bars have been under discussion for years in the various societies of engineers; is it not time to look for something better? Probably no railroad man will assign a higher value, as a splice, to any form of splice bars than to the heavy angle bars in use on several trunk lines, and weighing per pair of plates from 54 to 80 lbs., without the bolts, while they run in length from 30 ins. upwards. Now, as to these, the longer they are the more they are exposed to the constantly reversed strains, upwards and downwards, at their center, since every wheel as it approaches, comes over and recedes from that center. These are numerous, and not at all confined to three severe wrenches upon the splice, but the most damaging are these three, two of them upward in their strain at the middle of the splice and the middle one downward. The two arise from the leverage at the center from the ends of the splice, with the tie as a fulcrum, the splice being boxed in its whole length, between the flange of the rail on which it sits and its head. Not less than 15 per cent. of the splices may be expected to break, from this tearing strain, during the life of a good steel rail. Meanwhile, from the day of their first use, the inevitable wear begins on the two slanting surfaces which constitute their upper and lower faces, with a tendency to become loose, and without giving the slightest help to the rails in the way of a footing upon the tie or resistance (except by the bolts) to a lateral strain. I believe it to be possible so to adjust the metal of the joint, without increase to the number of its parts, as to double its footing upon the tie, and to add, quite independently of the bolts, a great lateral security to the rails, arising from the spikes, and, of course, still further increased by the action of the bolts. This will eliminate the tendency to roll at the ends of the rails.

The joints proposed are the "Little Giant" and the "Eagle" joints—the former for rails of 70 lbs. in weight per yard, or less, the latter for rails 70 to 100 lbs. in weight. As these are similar, a description of the "Little Giant" will answer for both. It consists of a jaw, embracing the flanges of the two rails at their ends, in combination

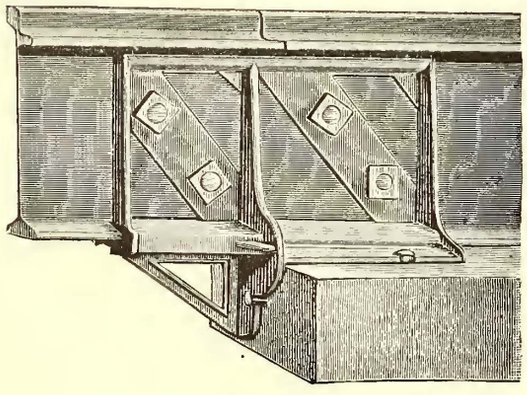


FIG. 2.—K JOINT.

with encircling ribs, a suspended arch or truss attached to the ribs, and feet placed well forward upon the ties. The truss is also attached to the inner edge of these feet, and suspended from one to the other between the ties. All is one piece of metal. In other words, the enormous strength of this combination of parts arises from bestowing the most metal upon the points of greatest strain, securing these beyond peradventure, and, at the same time, attaining by their relative shape and position a permanence for the joint not to be hoped for in splice bars. The joint plate carries the flanges of the rails, as well as their heads. This, too, without leverage from the tie against the center of the splice, as with splice bars, for these joints are never extended beyond the ties.

It will be noted that the grasp of the flanges by the jaw of these joints, while the heads of the rails are supported by the top of the joint plate, assures a continuity of level for the upper surface of the rails never before attained. Meanwhile, the expansion and contraction of the rails take place within these jaws, without disturbance to them. These conditions assure the attainment of the long desired continuous rail, for whatever vibration the rails may undergo at their ends, they will take together, these joints holding their grip. The action of the feet upon the ties and of the jaws grasping the flanges concurs in delivering a steady inward pressure at the top of the joint plate. Here an alignment ledge presses against the top of the "web" of the rails. It follows, therefore, that as wear occurs the inward pressure from these sources will keep the top of the joint plate against and under the heads of the rails, without regard to the action of the bolts—the precise opposite of the result of wear with splice bars. Remove the bolts from a pair of these, letting the spikes remain in place, and no train can pass over that joint without throwing the splice bars out, from the vibration of the flanges. The exact converse has been proved with the Price joints. Two plates had been put to place in the track, without spikes or bolts, when a heavy train bore down upon the workmen. After the train had passed they were unable to loosen the joint plate from the rails by the bare hand. It was pried off, after jarring, to measure roughly the strength of its adherence.

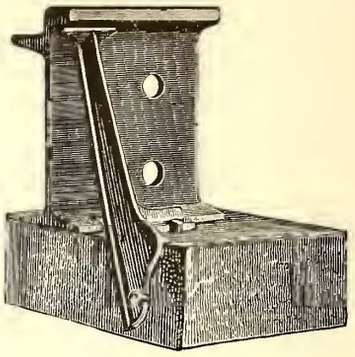


FIG 3.—BRACE CHAIR.

The K Joint for Girder Rails.—A brief examination of the cuts will show that this joint has been devised upon similar lines to the "Little Giant" and the "Eagle" joints. The K joint is, however, a "supported," they are "suspended" joints.

The leading variations in the type of this joint from its fellows, is the powerful diagonal bracing, and the attachment of the joint to the tie, by spiking an under brace to the side of the tie, while the foot upon the tie is spiked to the upper surface. This arrangement gives to the joint unprecedented steadiness, by committing the tie itself to it.

The spikes, driven in planes at right angles to each other, protect one another. In like manner with the "Little Giant," the pressure from the jaw and feet is delivered against the top of the joint plate, with its alignment ledge, keeping it steadily to place, no matter what the wear. To do away with the tie plates and the inefficient tie rods, I substitute for these brace chairs, as shown in the Fig. 3, used com-

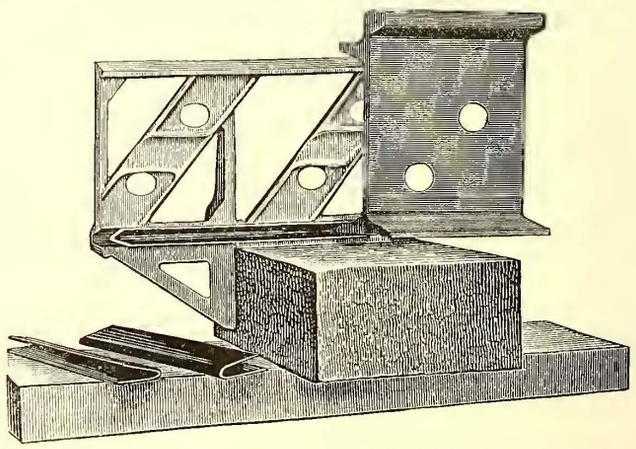


FIG. 4.—K JOINT WITH BOND.

monly on alternate ties, on the outside of the rails and coming closely under their heads, while intermediately and on the inside always, I place socket chairs, to receive and grasp the flanges, with a vertical plate alongside of the tie, and spiked to it.

All parts, therefore, of this construction for girder rails, have a base plate upon the tie, as part of their structure, which constitutes the flat bottom upon the ties of joints, brace chairs and socket chairs, alike.

These base plates do not meet under the rails, and therefore give to the construction increased elasticity over any to be had with tie plates, which they replace. So great is the economy of metal in this construction over the cumbrous array of high splice bars, sure to double the defects of those of half the height in use upon trunk lines, tie rods and tie plates now being largely sold and laid, that this new construction, which doubles the footing of the rail upon the ties at the joints, and which asks no help from the paving to hold the rails erect, can be furnished for about the same cost.

The base of rail and joint together covers a span of ten inches for a nine inch girder rail, and for the "Little Giant" of about eight and one-half inches for a height of T rail of four and one-quarter or four and one-half inches.

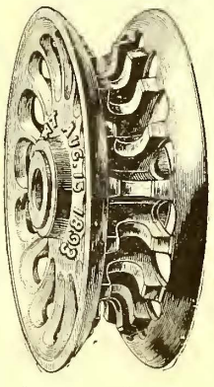
The Price Bond.—A trouble greater than "low joints" for steam

roads, and far more menacing to the management of street railways, confronts these gentlemen and many other interests, in the increased damage of electrolysis to water mains and gas pipes. To meet and master the liability of this, wherever there is waste current flowing from the trolley lines, copper bonds of wires or rods are extensively in use. Yet, as the section of a nine inch girder rail is practically about nine square inches, allowing for the greater conductivity of copper over iron, the ratio of 6 to 1, the section of copper which would be an equivalent in conductivity to the rail itself, should measure about one and one-half square inches. I am aware of no bond now on sale which measures the sixth part of this area. Besides this inequality of the bond to the rail in the power of conduction, I do not find that one of them is being laid with entire exclusion of the earth from direct contact. But the earth is of itself a composite body, in a chemical sense, and besides the salts of which it is largely composed, there are several wastes liable to be found in it, which came from deposit. Now all of these, under the influence of a steady current of electricity, however weak, are liable to engender the destruction by electrolysis of adjacent metals, all the more if these be of different natures, as copper and iron, copper and lead, lead and iron, etc.

It is also apparent that the manufacturers of these various bonds have, in every instance known to me, asked the electric current to leave the rails for the copper at a distance of some inches from the end of the rail, the current to return to the next rail at the same distance beyond their point of meeting. The only motive for this, apparently, is to accommodate the bond to the splice bar joint, instead of making the substitution of a joint far better in lieu of it, a joint, too, that will receive the bond within it; and so exclude the earth from all contact whatever. Add to this, that by so locating the bond, we get "the short haul," much esteemed in railroading, for the electricity. To ask it to pass, under satisfactory cover, altogether excluding the earth, from any share in the business or from any chance of meddling, from edge to edge of the rails, with a contact of the copper with them exceeding by many fold that of the bonds in use, appeared to me an object to be earnestly striven for. The Price bond, as applied to each of the joints described above, consists of a plate of copper, bent into shape resembling a V in section, placed upon the flanges of the two rails on each side, and inclosed altogether within the jaws of these joints, by driving up. As the jaw has the effect of a double inclined plane, it will hold all it gets of pressure, when spiked and bolted. It will be seen that the copper is thus compressed firmly between two stout surfaces of iron and steel, with large and admirable contact with each. The electric current is, therefore, not asked to traverse a slender copper rod, embedded in the earth, and with a very small contact at either end with the rail. It is thus not liable to produce electrolysis from the action of the salts of the damp earth, under the influence of a steady current of electricity, upon the copper of the bond and the iron of the rail at their point of junction. A recent test of this bond in comparison with others, each without its joint plates, made by Prof. A. Rowland, of the Drexel Institute, Philadelphia, showed a very large saving in power for the Price over other well known bonds.

Ice and Sleet Cutting Trolley Wheels.

In our last issue we noted the fact that the Storm Manufacturing Company, of Newark, N. J., had recently obtained control of both the U. S. and Canadian patents on the ice and sleet cutting trolley wheel, formerly manufactured by Messrs. Haight & Clark, of Albany, N. Y. Last year this wheel was introduced to a few of the prominent trolley lines in this country, and we are informed, without a single exception, every line which tried it and used it was enthusiastic in its praises. The object of it is to provide a trolley wheel that will automatically remove the incrustation of ice from the wires so as to leave the latter clean and in perfect order for the transmission of the electric current. When a coating of ice forms on a trolley wire it is usually on the lower side. This is caused from the water flowing down preparatory to dropping off of the wire, but becoming congealed, remains until it is removed by mechanical means or is melted by the heat of the atmosphere.



ICE AND SLEET CUTTING TROLLEY WHEEL.

The manufacturers have recently issued a circular describing fully the merits of this wheel, and also containing a number of indorsements from well known roads who have used it, which they will send upon application. They expect to make a display of these wheels and to be represented at the Convention in Atlanta in October, by C. A. Hoagland, of John A. Graham & Company, who will explain the merits of the invention to all who are interested in it.

THE firm of Warren & Lozier are very busy at their shops, 465 Greenwich Street, New York, where a general repair work of all kinds is carried on. The firm has been awarded all the electrical repair work for a number of prominent electrical firms, and has a completely equipped electrical and mechanical shop. The firm is composed of A. K. Warren and R. T. Lozier, both of whom have had a long training in electrical work.

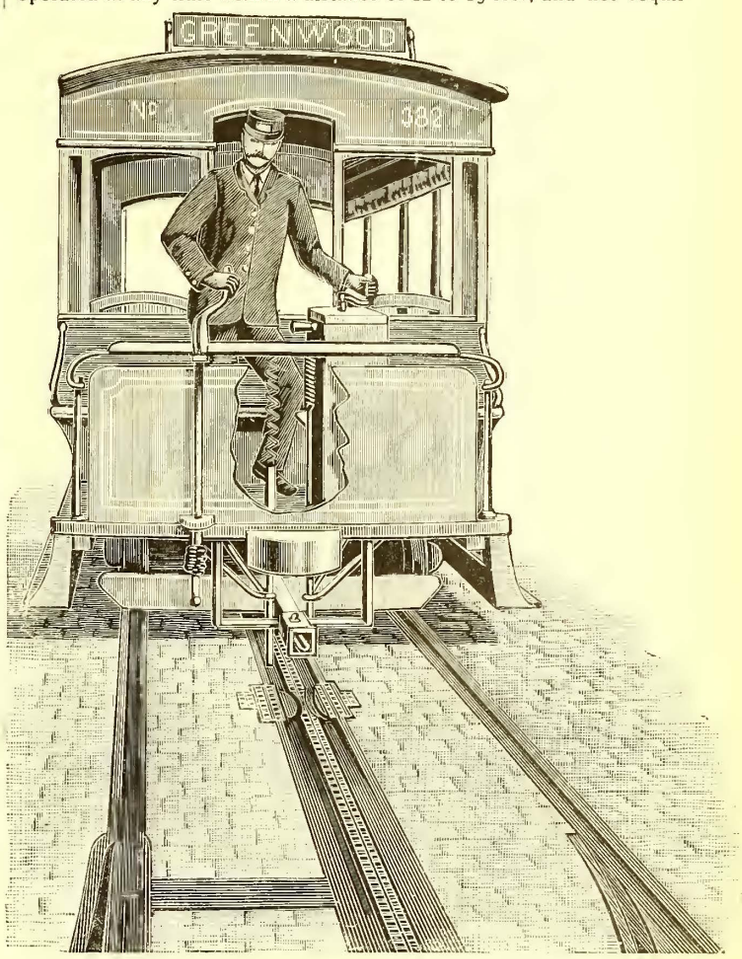
A DISASTROUS fire occured in Portland, O., September 23, by which eighteen car loads of electric machinery, consigned to the Portland General Electric Company, were destroyed.

The Battie Automatic Switch.

A simple and effective automatic switch has recently been patented by Dr. F. B. Battie, of 345 West 45th Street, New York, and is shown in the accompanying engraving.

The switch consists of an iron plate 22 feet long and 13 inches wide, located in the centre of the track. In this plate are two movable lugs.

Passed through the lugs underneath is a horizontal bar on which the lugs are pivoted. Two vertical steel rods are attached to the front platform of the car by a spiral spring 12 inches in length. These rods are provided with steps by which they are pressed down to engage the lugs, which throw the switch. By pressing down one or the other of the vertical rods the car is switched to the right or left as desired. The length of the switch plate is sufficent to allow the switch to be operated at any time within a distance of 12 to 15 feet, and not requiring the motorman to press down the vertical rod at any given moment. The operation can be seen from the platform of the car 15 feet before the car wheels reach the switch tongue.



THE BATTIE AUTOMATIC SWITCH.

The centre plates are only 13 inches wide, and equally adaptable to electric or cable roads.

The switch has been in operation on the Atlantic Avenue Railway of Brooklyn for the last six weeks, and has given excellent satisfaction.

Recent Work of the Mather Electric Company.

The Mather Electric Company, of Manchester, Conn., reports the sale of one of its 180 K. W., improved, new type multipolar railway generators, with complete station equipment, to the Hartford & West Hartford Horse Railway Company, for the Hartford (Conn.) power house. The generator is to replace a 200 K. W. generator of other manufacture, which after a two weeks' attempt on the part of its makers to make run successfully, was thrown out. In thirty-six hours after placing the order, the Mather Electric Company had the road running successfully. In that time, the old generator had been removed and two temporary generators installed. The Mather Company reports, as a sign of the revival of the electrical business, the closing in three consecutive days of contracts for more than 1,500 H. P. of its standard apparatus, consisting of direct connected and belted generators and Manchester type slow speed motors. This with the other work the Mather Company now has on hand will compel it to at once increase its working force, although part of the works is now being operated at night. The company also reports the sale of one 125 H. P., direct connected, new type multipolar generator to the South Chicago Street Railway Company. This order was secured through J. Holt Gates, of Chicago, the well known and energetic Western contractor of the Mather Company.

Thirteenth Annual Meeting of Ohio State Tramway Association.

The thirteenth annual meeting of the Ohio State Tramway Association was held at Toledo, September 26, 1894, and a report of the proceedings was received as we were about to go to press.

The meeting was called to order by President A. E. Lang at the Boody House at 11.30 A. M. In opening the meeting President Lang made the following remarks:

"Thirteen years ago the Ohio State Tramway Association was organized and held its first meeting in Cincinnati.

"In our article of association we announced as our object—our reason for being: 'The promotion and advancement of knowlege, scientific and practical, in all matters pertaining to the construction, equipment, maintenance, operation and management of street railways, and the establishment and maintenance of a spirit of fraternity between the members of the association, by social intercourse and exchange of information and ideas to the end that the best railway service may be attained at the least cost.'

"We have found that our annual meetings have accomplished their purpose; that we have gone home each year richer in knowledge, for each has shared with the others; richer in fraternal spirit, for the sharing of the one involves the increase of the other; and with that increase a conviction that the interest of one road and one locality is the interest of all.

"Thirteen years ago we had nothing but horse railways in Ohio. Now we have 900 miles of electricity, 46 miles of cable road, 100 miles of horse road, with the certainty that in a brief period of time the long-suffering horse will have severed all connection with street railways.

"We have concluded a year chequered with light and shadow. The financial depression, so widespread and so deeply felt throughout the country, touched us all, but the return of better times touches us also as promptly, and we can look with confidence to a time of renewed prosperity. 'Age cannot wither nor custom stale the infinite variety' of problems and perplexities which we have to meet and solve. Some of these we must discuss at this meeting.

"One which is thrusting itself upon our notice, is the suburban road. Within the last two years many miles of suburban roads have been built, and many more will follow. These desire entrance into our cities, or some satisfactory arrangement for the transfer of passengers and packages. This, therefore, opens up a new field for our consideration. Unless suburban roads are encouraged to contract with existing companies, they will seek independent entrance to the centers of our municipalities, and in so doing are likely to strongly compete with, if not seriously to injure established lines of travel.

"The suburban lines are not inimical to the interest of the city lines, and their building should be encouraged. If they desire an exchange of traffic, or entrance to business centers, it is better for the community, and for ourselves, that we contract with them, upon fair terms, and so let them enter. The company of which I am president has recently contracted with a suburban road, whereby the cars of the same are received by us and brought into the city. At the last session of the legislature an act was passed authorizing such contracts.

"Another problem is that of protection against loss by fire. It has been suggested that the street railway companies of the United States form an association, similar to certain New England associations, in which contributions are made to a fund for liquidating the loss. Recent excessive increase in rates on the part of existing insurance companies has a tendency to excite immediate consideration of this important subject.

"There is, perhaps, no other enterprise which to-day urges one forward to such a degree, which calls for the consideration of so many different subjects—subjects involving the interests and welfare of the public and the preservation of vested capital, as does the enterprise we represent. It is, therefore, wise and prudent that we seek to extend the membership of our Association, and that we come together annually to discuss these questions and to exchange ideas.

"In conclusion I desire to express to the Association my thanks for the honor of being elected to serve a second term as its president—especially as I was absent at the time of my election.

"This meeting will end my official career, but I shall still remain an active member of the Association and shall do all that lies in my power to promote its best interests."

The following members and visitors were present:

A. E. Lang, president Toledo Consolidated Street Railway Company, Toledo, O.

Chas. L. Wight, secretary Toledo Consolidated Street Railway Company, Toledo, O.

W. S. Jewell, manager Toledo Consolidated Street Railway Company, Toledo, O.

D. Robison, president Toledo Electric Railway Company, Toledo, O.

Jas. J. Robison, superintendent Toledo Electric Railway Company, Toledo, O.

B. P. Foster, manager Toledo & Maumee Valley Railway Company, Toledo, O.

J. K. Newcomb, president Delaware Electric Street Railway Company, Delaware, O.

I. Kelly, superintendent Columbus Street Railway Company, Columbus, O.

Reid Carpenter, president Mansfield Electric Railway Company, Mansfield. O.

M. A. Hanna, president Cleveland City Railway Company, Cleveland, O.

J. B. Hanna, secretary and treasurer Cleveland City Railway Company, Cleveland, O.

Chas. Wason, engineer Cleveland Electric Railway Company, Cleveland, O.

John J. White, Fort Wayne, Ind.

J. A. Hanna, the McGuire Manufacturing Company, Chicago, Ill.

W. E. Cox, Wharton Rail Company, Philadelphia, Pa.

R. Mitchell, Bartholomew Rail Joint Company, Maumee, O.

H. H. Foster, Dreher Manufacturing Company, New York City.

C. M. Fuller, Davis Car Shade Company, Portland, Me.

E. P. Sharp, Webster & Beach Railway Supply Company, Boston, Mass.

E. A. Smith, Consolidated Car Heating Company, Albany, N. Y.

Jno. H. Dale, Dale Manufacturing & Electrical Supply Company, New York.

Jno. B. Bennett, Street Railway Journal, New York.

The following Street Railway apparatus was exhibited:

The Bartholomew Rail Joint Company showed its new rail joint.

The Davis Car Shade Company had samples of its shades and fixtures.

The Webster & Beach Railway Supply Company showed samples of its new overhead material.

The Consolidated Car Heating Company showed an improved switch in connection with its electrical heating apparatus.

The McGuire Manufacturing Company showed its latest design in trucks.

The new companies admitted to the Association are the Delaware Electric Street Railway Company and the Toledo & Maumee Valley Railway Company.

At 2 P. M. the Association went into executive session and elected the following officers for the ensuing term: W. F. Kelly, Columbus, president; Reid Carpenter, Mansfield, vice-president; Wm. A. Lynch, Mansfield, chairman executive committee; J. B. Hanna, Cleveland, secretary and treasurer. There were no papers read, but the following interesting subjects were thoroughly discussed by all the members: "The Best Means of Detecting Dishonest Conductors," "A Desirable and Satisfactory Fender or Life Guard," "The Best Qualifications for Conductors and Motormen," "The Treatment of Low Joints, and How Best to Prevent Them," "The Best Method of Controlling Employes and the Collection of Our Fares."

At the invitation of Mr. Foster, manager of the Toledo & Maumee Valley Railway Company, the members and guests had a charming ride over the new line of this road, which extends down the Maumee Valley some twelve miles.

In the evening a banquet was given to the members and visitors by the Toledo Club at its beautiful club rooms, and was a thoroughly enjoyable affair in every respect. Of the toasts given, one was "The Press and Street railway Companies and the Relations of the Press and of the Street Railways," which was very happily responded to by Robinson Locke, of the Toledo *Blade*. Mr. Locke is the son of "Petroleum V. Nasby."

The next meeting will be held in Sandusky, and will be a two days' session, one day to be given up to boating and fishing at Kelly's Island.

Street Railway News.

Extensions and Improvements.

Battle Creek.—There is considerable talk in the city about rebuilding the electric railway. L. N. Downs, of New York, and F. N. Rowley, of Kalamazoo, are interested in the matter.

Caldwell, N. J.—The North Jersey Traction Company has applied for permission to construct an electric railway through Bloomfield Avenue. The application has developed a violent opposition on the part of the anti-trolley citizens.

Charlottesville, Va.—A plan is on foot to consolidate the Charlottesville & University Street Railway Company and the Charlottesville & University Electric Light Company. In this event the present horse car line would be changed into an electric one.

Chicago, Ill.—The Lake Street elevated road is to be extended immediately to Wabash Avenue, and is to be equipped with electric motive power.

The North Chicago Street Railroad Company has applied for a permit to construct a system of poles for its electric lines on the North Side, for a distance covering a territory of over five miles.

Dayton, O.—The City Railway Company has received the consent of property holders for the construction of an electric street railway from 3d Street, along Broadway to Dayton View

Galt, Ont.—The electric railway between Galt and Preston has proved such a success that it is now to be extended to Hespeler.

Laredo, Tex.—The Laredo Electric & Street Railway Company has just received two new boilers of 140 H. P. each, and will have an engine of 240 H. P.

Marion, Ind.—The Queen City Electric Railway Company is seeking a franchise for an extension of its line to the Soldiers' Home.

Marion, O.—An application, signed by Godfrey Leffler and three other members of the Marion Street Railway Company, has been made to the Council, asking for a franchise to cover a route from Reed Avenue to Center, to connect there with the line now being built.

Newark, N. J.—The North Jersey Traction Company has applied for a franchise to run electric cars from the terminus of the Irvington trolley line through Union County, the line to pass through Hilton, Maplewood and Millburn.

Norwalk, Conn.—The Norwalk Tramway Company intends to extend its line to Rowayton before winter.

Oakland, Cal.—The Oakland Consolidated Street Railway Company contemplates making an extension of its track three miles in length. The company has also made an application for a franchise to the Berkeley trustees, for the laying of a track on Blake Street from Shattuck Avenue to Dana Street and on Dana Street to Dwight Way.

THE Highland Park & Fruitvale Electric Railway Company has asked the Council to extend its franchise on 11th Street for one year, in consideration of its surrendering a franchise which it holds on a number of side streets in East Oakland.

Pawtucket, R. I.—The council has received a petition from the Pawtucket Street Railway Company asking for permission to build and operate an electric road over the same route that was covered in the petition of the Moshassuck Valley Railroad presented lately.

Plainfield, N. J.—The line of the Plainfield Street Railway Company will soon be extended to both Dunellen and Netherwood. Later it will be run to Hillside Cemetery and the Crescent cycling track.

Quincy, Mass.—The Quincy & Boston Street Railway Company has been granted a location in Neponset, from the bridge to the tracks of the old Mattapan branch of the New York, New Haven & Hartford Railroad.

Royersford, Pa.—The Town Council has granted street franchises to the Pottstown and Norristown Passenger Railway Companies. The tracks of the former company, which now run to Sanatoga Park, will be extended to Royersford, where they will connect with those of the Norristown Company, which will extend its line by the route of Collegeville and Trappe.

Rutland, Vt.—The Rutland Street Railway Company has contracted with the Westinghouse Company to equip its road. It has also ordered five electric cars from the J. G. Brill Company of Philadelphia.

St. Louis, Mo.—The Citizens' Railway Company, it is reported, will replace the cable system with electricity. The change will be made by November 1. The line will also be extended to the city limits.

New Roads.

Akron, O.—The Cleveland & Akron Electric Railway Company has filed an amendment of its charter so as to enable the company to extend its lines over the streets and highways of any municipality in Cuyahoga or Summit County, also to furnish electric light, heat and power, to deal in electrical appliances of any kind and own and operate pleasure resorts.

Aurora, Ill.—The franchise of the Aurora City Railway Company and the Elgin, Aurora & Fox River Valley Electric Railroad Company have both been extended one year by the Supervisors.

Charleroi, Pa.—The Charleroi, California & Brownsville Electric Street Railway Company, of Charleroi, Washington County, Pa., was organized August 29. James McKean, of Pittsburgh, is president. Other stockholders are C. F. Thompson and A. C. McKean, of Charleroi; J. W. Crawford, of Duquesne; William I. Berryman, of Washington, Pa.

Chicago, Ill.—The Chicago & Grand Avenue Street Railway Company is a new company. The capital stock is $50,000. The incorporators are John Gnaedinger, H. F. Kolze, Lesser Franklin, Cassius C. Clark and Edwin D. Seaton.

THE Southwestern Suburban Rapid Transit Company, of Chicago, has been incorporated, with a capital stock of $1,000,000. The incorporators named are Arschan H. Minassian, Newton Wilcoxson and Frank M. Sherman.

Harrisburg, Pa.—The Riverside Electric Railway Company, has been incorporated with a capital stock of $50,000. Wm. K. Alricks, of Harrisburg, is the president of the company, and others interested are J. Q. Denney and T. D. Greenawalt, of Harrisburg.

Hartford, Ind.—The Hartford Electric Street Railroad Company is a new corporation having a capital stock of $10,000. The directors are G. E. Reynolds, Albert Reynolds and Merle Allen Walker.

Hatboro, Pa.—There has been chartered the Willow Grove & Hatboro Street Railway Company; capital $18,000. The president is John H. Fow, of Philadelphia; and O. E C. Robinson, of Hatboro; J. F. Cottman, of Jenkintown; Charles F. Ehrenpfort, of Willow Grove, are some of the directors.

Hempstead, L. I.—The Hempstead Traction Company has been incorporated to build and operate a street railway four miles long. The capital stock is $50,000, and some of the directors are William Kennelly, of New York City; John F. Davis, of Brooklyn, and J. S. Lawrence and A. D. Lewis, of Hempstead.

Indianapolis, Ind.—The company which proposes to build the new gas belt electric road was formally incorporated September 5, under the name of the Indianapolis, Anderson, Alexandria & Marion Electric Railway Company. Among the directors of the company are Francis M. Dice and N. J. Clodfelter, of Crawfordsville; A. M. Painter and V. C. Quick, of Alexandria. The capital stock is $100,000.

Lancaster, Pa.—The Lancaster & Susquehanna Railway Company was incorporated September 4, with a capital stock of $100,000. John L. Graybill, of Lancaster, is the president of the company, and other stockholders are John B. Bausman and John Hertzeler, both of Lancaster.

Lewisburg, Pa.—A charter has been granted to the Milton & Lewisburg Street Railway Company. The capital stock is $36,000. Officers: President, Benj. H. Throop, of Scranton; directors, Horatio N. Patrick, Charles T. Bellamy, Henry H. Sivelly, of Scranton; Geo. E. Stevenson, of Waverly.

Lower Pottsgrove, Pa.—The Sanatoga, Royersford & Collegeville Electric Railway Company was recently incorporated, with a capital stock of $150,000, to construct and operate an electric railway at Lower Pottsgrove, Montgomery County, Pa. John C. Lynch, of Royersford, Pa., is the president of the company, and the other stockholders are P. W. Smith and C. R. Eberle, of Philadelphia.

Lyons, Ia.—The City Council has granted a twenty-five year franchise to the Electric Railway & Park Company, for an electric line extending to Joyce's Park. The new road will be two miles long, and in operation within three months.

Newburgh, N. Y.—Steps have been taken for the incorporation of a company to construct an electric railway from Newburgh to Walden. Benjamin Norton, H. B. Norton, Joseph Dickey, Major W. H. Weston and B. B. Odell, Jr., are the parties interested.

North Attleboro, Mass.—An association of local capitalists has notified the Board of Selectmen of its intention of forming a company and applying for a charter to run an electric railroad between North Attleboro and Attleboro.

Peekskill, N. Y.—A company is being formed here to build and operate an electric trolley railroad through the principal streets of the village. Charles E. Hammond, Dr. J. N. Tilden, of Peekskill; G. D. Hiscox and B. J. Rogers, of New York, are among the directors.

Philadelphia, Pa.—The Northern Electric Passenger Railway Company, was incorporated September 12, with a capital stock of $100,000, to construct and operate an electric railway in Philadelphia and Montgomery Counties, Pa. A. C. Milliken, of Pottsville, Pa., is the president of the company, and other stockholders are Charles S. Davis and S. S. Evans, both of Philadelphia.

THE Philadelphia Suburban Passenger Railway Company was incorporated September 19, with a capital stock of $600,000. Geo. D. Widener, of 1202 N. Broad Street, Philadelphia, is president of the the company, and other stockholders are David H. Lane, Geo. R. Yarrow and R. F. Bower, all of Philadelphia.

Pittsburgh, Pa.—The Highland Park & Pietler Street Railway Company was incorporated September 17, with a capital stock of $12,000. H. S. A. Stewart, of Pittsburgh, is the president of the company; others interested are Jas. J. Donnell and Jno. B. Jackson, both of Pittsburgh.

Reading, Pa.—The Reading & Pottstown Electric Railway Company was incorporated September 12, with a capital stock of $100,000, to construct and operate an electric railway from Woodvale in Berks County, to Pottstown in Montgomery County. John A. Rigg, of Reading is the president of the company, and other stockholders are R. L. Jones and S. E. Rigg, both of Reading.

Syracuse, N. Y.—There has been incorporated the Syracuse & East Side Railway Company, to construct a street surface road, about ten miles in length, from here to the town of DeWitt; capital, $200,000.

Waukesha, Wis.—Col. A. M. Jones, George Harris, P. J. Buckley, Thomas McGill and T. E. Ryan are said to be stockholders in a company organized to build an electric line between here and Pewaukee.

New Publications.

The Ajax Lightning Arrester. Published by C. S. Van Nuis. New York.

Mr. Van Nuis's name is well known to all station managers through his well known "Ajax" switch, lightning arresters, etc. This catalogue is descriptive of the lightning arrester, and is handsomely illustrated and printed.

Hints to Engineers Operating Small Electric Light Plants. By E. P. Roberts and W. B. Stewart. Published by the Correspondence School of Technology, Cleveland, O. Price 10 cents.

This little pamphlet, which contains twenty-seven pages of reading matter, is just what its name indicates, and is made up of various hints intended for the advice of operating engineers. Its practical nature is its striking characteristic.

Toronto as Seen From the Street Cars: A Tour by Trolley. Published by the Toronto Railway Company, Toronto, Ont.

We have mentioned occasionally in these columns publications of the nature of that whose title is given above, published by street railway companies, and covering the interesting features in the cities in which they operate. A very tastefully arranged book of this kind is that published by the Toronto Railway Company. It is illustrated by a number of good engravings of views along the line, also of the power station of the company. It is well written and reflects great credit on the compiler and publishing company.

Steam Tables and Engine Constants for Facilitating all Calculations upon Indicator Diagrams, etc. Compiled from Regnault, Rankine and Dixon. By Thos. Pray, Jr. 125 pages, 85 of which are tables. New York. D. Van Nostrand Company. 1894. Price $2.

This work, by an accomplished engineer, has been carefully and conscientiously compiled as a serviceable manual for steam engine calculations. Every table in the work was carefully computed and has not been copied from other sources. Numerous rules for calculations are given, and the whole matter has been given a great deal of care in its preparation.

Alternating Current Wiring and Distribution. By William LeRoy Emmet. 76 pages, 29 illustrations. New York. *The Electrical Engineer.* 1894. Price $1.

This little book is very practical in its nature, concise in its descriptions, and presents in a clear and intelligent way some of the exceedingly difficult problems connected with alternating current distribution. The author states that the object of the work is to point out the practical significance of some of the laws governing the distribution of alternating currents, and to explain those laws in such a manner that their nature and relative importance may be realized by practical men without further study of more complete works. Mathematical expressions and scientific terms have been avoided wherever possible.

Steam, its Generation and Use. Twenty-eighth Edition. LaVapeur, sa Production et Son Emploi, and Dampf, dessen Erzeugung und Verwendung. Published by the Babcock & Wilcox Company, New York.

The demand for "Steam," the well known treatise on this subject published by the Babcock & Wilcox Company, has been so large as to call for another edition, the twenty-eighth of the series, and to induce the publishers to issue French and German editions of the work. A Spanish edition was published some time ago. The work, as our readers probably know, takes up the subject of the generation of steam from a broad standpoint, comparing the advantages of water tube and tubular boilers for different classes of work and giving the reasons which led to the adoption of the Babcock & Wilcox type. A partial list of users of Babcock & Wilcox boilers is given in the work.

Electric Lighting Plants, Their Cost and Operation. By W. J. Buckley. 8vo. 275 pages. Numerous diagrams and folding plates. Chicago. William Johnston Printing Company. 1894. Price $2.

The purpose of this book, as expressed by the author in his preface, is to give to intending purchasers of lighting plants such details as may aid them in forming a fair estimate of the cost of construction and operation of the proposed station. The book is written expressly for the buyer, and with this end in view many details are given regarding the first cost as well as the cost of operating by different methods of steam and electric plants. The writer has had much practical experience in the employ of what is now the Fort Wayne Electric Corporation, with which he has been identified as a salesman since 1885. As might be expected, therefore, the book deals very largely with the Fort Wayne Company's apparatus, but there is no intention on the part of the author to conceal this fact. The book ought to be an exceedingly valuable one for buyers.

A Laboratory Manual of Physics and Applied Electricity. Arranged and Edited by Edward L. Nichols, Professor of Physics in Cornell University. 8vo. 436 pages, 245 diagrams and two folding plates. New York. Macmillan & Company, 66 Fifth Avenue. 1894. Price $3.25.

This is the second volume of this manual, and comprises "Senior Courses and Outlines for Advanced Work", as arranged by Professor Nichols and his assistants, Messrs Moler, Bedell, Hotchkiss and Matthews. Its four parts are devoted to experiments with direct current apparatus, experiments with alternating currents, senior courses in heat and photometry and outlines of advanced work in general physics. The work as a whole cannot be too highly commended. Its brief outlines of the various experiments are very satisfactory, its descriptions of apparatus are excellent; its numerous suggestions are calculated to develop the thinking and reasoning powers of the student. The diagrams are carefully prepared, and its frequent citations of original sources of information are of the greatest value. Part II on alternating currents is the work of Dr. Bedell who is a well known writer on this class of subjects. Part IV is the special work of Dr. Nichols whose broad gauge character as a physicist is admirably shown in the brief introductory chapter in which he outlines the requisites of the successful investigator. Typographically the book is very clean; only a few errors are to be found such as that in the name of Professor Thompson's well known work on page 8, and that in Professor Dugald C. Jackson's name on page 82.

Electricity at the Columbian Exposition, including an account of the exhibits in the Electricity Building, etc. By J. P. Barrett, Chief of Department, Chicago, R.R. Donnelley & Sons Company, 1894. 8 vo., 501 pages, illustrated.

This is a very handsomely illustrated volume, describing the various exhibits of electrical apparatus at the World's Fair, last year. The matter is arranged under twenty-eight chapter headings, such as dynamos, switchboards, telegraphy, etc., and in each of these the most prominent exhibits in that class are more or less briefly described or rather, to be more accurate, the apparatus shown in the exhibits is given a brief description, very similar to that which would be found in the trade catalogues of the various companies. In general, these descriptions are plain statements of the merits claimed by the makers for the different apparatus, but the statements as to the simplicity of construction, low cost and cheapness of operation have not been edited out of the text quite as often as they might have been. Several names of companies are misspelled, appearing as "Sturdevant," "Schuckertt," "Wurtz," etc. One of the special merits of a certain switch is spoken of as "worthy of mention as the light is on till off." Of a certain measuring instrument we are informed that "in the arc light field it has no peer." The author's well known and well understood prejudice against the overhead trolley is set forth at some length in the introduction of the chapter on electric railways. Here we are told in all seriousness of that "inconvenient, uncomely and highly objectionable feature, the overhead trolley," and of many cities that prefer "to contend with the disadvantages of horse cars and steam until some solution could be found for the evil." The author confidently predicts, "the early and complete retirement of the overhead trolley." The author's fellow townsmen seem to think differently, since the Chicago companies, notwithstanding the professor's solemn prediction, have, perhaps, 100 miles of trolley construction well under way. One of the best features of the book is its description of the Intramural Railway, with figures of traffic and operation not before published. The pictorial features of the work are also worthy of special notice.

Personal.

Mr. Robert J. Hill, chief engineer of the Chicago City Railway Company, was in New York last month, and called at our office.

Mr. James M. Hopkins, of the Barney & Smith Car Company, of Dayton, O., was in New York last month and reported an excellent business.

Mr. Samuel L. Phillips has been elected president of the Metropolitan Railroad Company, of Washington; *vice* W. J. Stephenson, deceased.

Mr. C. E. Schaff was appointed assistant general manager of the Cleveland, Cincinnati, Chicago & St. Louis Railway Company last month. Mr. Schaff will have his office at Cincinnati, O.

Messrs. C. A. Andrews, Jr., treasurer of the Pettingell Andrews Company, of Boston, and F. X. Cicott, manager of the railway department of the company, were in New York last month on a business trip.

Mr. W. M. Ramsay has resigned his position as general manager of the Federal Street & Pleasant Valley Railway Company, of Pittsburgh, and is now in California. W. H. Foster has been appointed in his place.

Mr. R. H. Yeats, the consulting engineer of the Calumet Electric Street Railway Company, of Burnside, a suburb of Chicago, was in New York City last week and made a pleasant call at the office of the Street Railway Journal.

Mr. A. J. Elias, president of the Third Avenue Railway Company, New York, and Supt. John H. Robertson, of the same company, recently made a visit to Chicago, for the purpose of observing the operation of the continuous power brakes employed on the cable railways of that city. Mr. Robertson expresses himself as being well pleased with the operation of the brakes, and states that he will equip an experimental car at once with these brakes, for operation on the Third Avenue lines.

Mr. Charles F. Uebelacker, has been appointed electrical engineer of the Consolidated Traction Company of New Jersey, *vice* E. J. Emerson, resigned. Mr. Uebelacker has been connected with the Consolidated Company for nearly two years, latterly in the position of division superintendent of the Newark and New York electric line, which has been developed under his management to one of the most important in the company's system. Mr. Uebelacker is but twenty-six years of age, was graduated from Princeton in the class of 1890, and immediately obtained a position in the machine shops of the Brush Electric Company of Cleveland. He was soon placed in charge of the entire mechanical arrangement of these important shops, and planned several valuable features tending to economy in production. A little later he was made Mr. Short's private technical assistant, and with him had a most valuable experience in the design and construction of the new types of railway motors and generators. During the year 1892, Mr. Uebelacker was associated with Prof. E. P, Roberts, of Cleveland, as independent consulting engineers, and in December, 1892, accepted a position with the Consolidated Traction Company.

CHARLES F UEBELACKER.

Much credit is due to the Consolidated Traction Company for their quick appreciation of the value of Mr. Uebelacker's engineering training and experience, and we predict for him a highly successful and prosperous career.

Obituary.

We are pained to record the death last month of William J. Stephenson, president of the Columbia and Metropolitan Railway Companies, of Washington, D. C., and vice-president of the American Street Railway Association. Mr. Stephenson was fifty-three years old, and was a native of Washington, where the greater part of his life was passed. Just before the commencement of the late civil war, he entered the office of the Quartermaster General, where he remained for a number of years. He was afterwards connected with the Baltimore & Ohio Railroad Company, and later established a coal and wood business. He was elected president of the Columbia Railway Company several years ago, and in July, 1893, accepted the office of president of the Metropolitan Railway Company, of Washington, upon the resignation of that office by his brother-in-law, George Pearson. He leaves a wife and one son.

Mr. Stephenson was a man of great executive ability, and greatly honored and respected by all who knew him. He always took a great

interest in the meetings and workings of the American Street Railway Association, and was a regular attendant at the conventions.

CESARE ZANETTI, who was connected with the engineering force of the Broadway & Seventh Avenue Railway Company, of New York, for a considerable time during the construction of the cable railway on Broadway, and who has recently been in the employ of the Johnson Company of Johnstown, Pa., as a designer, died at the home of his parents at Turin, Italy, August 6, of consumption. Mr. Zanetti came to the United States from South America about five years ago. He was educated at the University of Turin, and spoke a number of European languages fluently. He was an occasional contributor on engineering subjects to the STREET RAILWAY JOURNAL.

PAYSON K. ANDREWS, who represented the American Car Company at Chicago, died of heart disease, August 22. Mr. Andrews was well and popularly known among street railway men. He was born in Massachusetts, and after engaging in the manufacture of steam engines for a short time, entered the supply business. For a number of years he represented the J. G. Brill Company in Chicago.

Equipment Notes.

The Central Electric Heating Company, of New York, is in receipt of an order from the Chicago North Shore Street Railway Company for the equipment of its cars with the American electric heater.

The Peckham Motor Truck & Wheel Company, of Kingston, N. Y., was awarded an order last month for 165 trucks by the People's Traction Company, of Philadelphia. The wheels for these cars will be supplied by the New York Car Wheel Works, of Buffalo, N. Y.

The Okonite Company, Ltd., 13 Park Row, New York, is doing a good business in its famous insulated wires and cables, and reports that its August sales exceed those for any other month during the current year. The company anticipates an excellent fall and winter business.

"Electric Power," of New York, has commenced the publication of an index to current periodical technical literature. This index gives in a systematic way the titles to the principal articles which have appeared in the electrical press, with brief synopses. This department is under the charge of Max Osterberg, E. E.

The Ellis Manufacturing Company, of Philadelphia, Pa., reports that the new cars for the Delaware County & Philadelphia Electric Railway Company, the contract for which has just been placed, will be fitted with Hansell equalizing motor trucks. These trucks are manufactured by the Ellis Company for either electric or cable railways.

The Consolidated Car Heating Company of Albany, N. Y., has recently received a contract from the Union Railway Company, of Providence, R. I., said to be the largest contract for electric heaters for street cars ever placed. It covers the equipment of 200 cars. The Consolidated Car Heating Company is at present also equipping a number of other street railways.

The Standard Paint Company, of New York, finding its business in the West on the increase, has reopened its Western office at 871 The Rookery, Chicago. This will be in charge of J. C. Shainwald. The electrical branch of the Standard Paint Company's business in the West, will continue, however, to be looked after by the Metropolitan Electric Company, of Chicago.

The Paterson Handle Works, of Paterson, N. J., continue to do a flourishing business in their specialties. The business is now under the management of E. J. & W. E. Hopper, instead of the gentlemen whose names were mentioned in our last issue. They are making a specialty, among other things, of cobble and Belgian rammers. which are mentioned in this issue.

The Ball Engine Company, of Erie, Pa., has received an order from the Alameda, Oakland & Piedmont Electric Railway, Alameda, Cal., for a 400 H. P., tandem compound, condensing Ball engine. The perfect running of two former engines furnished, the good results obtained, together with the absolute freedom from repairs, has decided the Alameda people to again order this type of engine.

James Boyd & Brother, of 14 North 4th Street, Philadelphia, have added to their established business in belting, packing, hose, etc., a department for the manufacture and sale of electric railway supplies. It is their intention to carry a complete stock of such goods after October 1. This department will be in charge of Samuel L. Nicholson, formerly with the Short Electric Railway Company of Cleveland, O.

George Cradock & Company, of Wakefield, Eng., whose ropes have been making exceptionally good records in this country, especially on the tunnel line in Chicago, installed a rope in the tunnel, May 10. It was removed September 8, having run 122 days. The rope was a Lang's lay, and at the time of removal there was not a broken wire in the rope, but it had worn so much, that it was too small for the grippers.

The Sterling Supply & Manufacturing Company, of New York, is doing a large business in fenders, registers and other street railway supplies manufactured by it. Among its recent sales the company mentions a large order from the Columbia Railway, of Washington, D. C., for registers, also an order from the Metropolitan Traction Company, of New York, for the equipment of cars of the Columbus Avenue line. The company has also received a number of additional orders from Yonkers.

The White-Crosby Company, of Baltimore, Md., has been awarded the contract for the proposed electrical subways in that city. The company's bid was $63,487, and while not by considerable the lowest bid, was regarded as the best on account of the excellence of the designs submitted, which in the judgment of the engineer who reported upon the various plans, were the most complete and fulfilled the requirements of the specifications more nearly than those submitted by the other bidders.

The R. A. Crawford Manufacturing Company, has appointed C. J. Mayer, of Philadelphia as its Eastern representative, and C. N. Wood, of Boston, to represent the company in the New England states for the Crawford pick-up fenders and wheel guard fenders for all kinds of electric and cable car service. The company has also just received an order from the Paterson, Passaic & Rutherford Railway Company, of Paterson, N. J., for the equipment of its cars with the Crawford safety appliances.

The Manufacturers' Advertising Bureau & Press Agency, of New York City, which is presided over by Benj. R. Western, has just issued a neat little pamphlet entitled "Advertising for Profit." Mr. Western makes a specialty of trade journal advertising, and numbers among his customers some very prominent manufacturers. The little pamphlet contains a list of these, as well as a number of letters of commendation from clients on the one hand and trade journals with which Mr. Western has done business on the other.

Edward P. Thompson, M. E., and Prof. William A. Anthony have established a firm at No. 5 Beekman Street, New York, to act as consulting engineers for corporations, cities, architects, etc. The firm will make a specialty of electric patent and engineering cases. Both members of this firm are well known, Professor Anthony having been for fifteen years Professor of Physics at Cornell University, past president of the American Institute of Electrical Engineers, and consulting electrician of the Mather Electric Company, and Mr. Thompson a prominent patent attorney and expert in New York City.

The Harrisburg Foundry & Machine Works, of Harrisburgh, Pa., has recently published a series of handsome circulars which are certainly very tasteful and artistic. In one of these publications the company shows views of the Ide and Ideal engines direct connected to various types of generators and dynamos. These are taken from photographs of actual installations, and on the margin of each page is printed a sketch of the plant in which the installation was made. Another publication is that entitled "The Harrisburgh Double Engine, Steam Road Roller." This is handsomely illustrated, and gives in addition full particulars in regard to the rollers.

The Joseph Dixon Crucible Company, of Jersey City, N. J., has recently issued a little circular giving a record of service tests in hoisting tackle recently made by Robert Grimshaw, M. E., at the Brooklyn Navy Yard. Pulley blocks using the Dixon waterproof graphite grease were used, and the report states that this lubricator was employed "as it is the best adapted for anchor handling tackle, which is exposed to both rain and sea water. Graphite being unaffected by sea water or extremes of temperature, and the best lubricant for bearings getting heavy loads and rough usage, is admirably adapted for all machinery and tackle aboard ship, in rigid, temperate or torrid zones."

The Fiberite Company, of Mechanicsville, N. Y., states that among the roads that have recently adopted and made large purchases of the Medbery insulation are the following: The Buffalo Street Railway Company; Union Railway Company, Providence, R. I.; Cumberland Valley Traction Company, Harrisburg, Pa.; Chicago City Railway Company; Philadelphia Traction Company; Consolidated Traction Company, Jersey City, N. J., and Montreal Street Railway Company. The contractors for the Pennsylvania Traction Company are using the Medbery insulation for the forty-five miles of road now being built between Lancaster and Lititz. The North and West Chicago Railway Companies have also adopted the Medbery insulation in their equipment.

The United States Car Fender Company, Bennett Building, corner Fulton and Nassau Streets, New York, of which Lampson S. Harrison, of South Brooklyn, N. Y., has recently been elected president, has placed on the market a new fender for electric and cable cars, entitled the Modemann fender. The fender when not in use is folded up on the dashboard so as to take little room or no room when the car is housed. When in operation, however, it extends in front of the car and completely protects the wheels. It is also provided with wings on each side, covering the steps of the car. In case any person should fall in front of the car the netting will collapse, breaking the fall and receiving the person as though in a basket. A number of prominent railway men have spoken in flattering terms of the fender.

The Berlin Iron Bridge Company, of East Berlin, Conn., is building a large addition to the machine shops of Henry R. Worthington, at Brooklyn, N. Y. This company has also received the contract for an annealing room building for the Naugatuck Malleable Iron Comprny, at Naugatuck, Conn. The building is 94 × 175 ft., with brick walls and iron roof trusses covered with corrugated iron. The Berlin Iron Bridge Company has also received from the Union Metallic Cartridge Company, of Bridgeport, Conn., an order for three large buildings, and from the Larchmont Electric Company, of Mamaroneck, N. Y., the contract for its power station. The building will be 50 × 90 ft. The Berlin Iron Bridge Company reports also having erected for the Mather Electric Company a new building 300 × 50 ft., equipped with improved electrical machinery, and a forty ton electric traveling crane, especially adapted for building large direct connected generators for railway work. The unfinished castings are brought in at one end of the shop and are loaded on the cars at the other end as finished generators.

WESTERN NOTES.

The Stirling Company, of Chicago, last month closed a contract with the West Chicago Street Railway Company for 8,000 H. P. water tube boilers. This is said to be the largest boiler order on record, and aggregates nearly $100,000.

The Fitzgerald-Van Dorn Company, of Lincoln, Neb., reports that business has been very satisfactory so far this year, in fact much beyond its expectations. The company is continually equipping new roads, and from every source letters are received showing the universal satisfaction resulting from the use of the Van Dorn coupler.

Stiebel & Kisinger, of Cincinnati, O., report that they are having a remarkable rush of business, on account of which they have been compelled to order new machinery. They make a specialty of wire connectors and other electrical appliances, the centrifugal street sprinkler, cable carrying sheaves, brake shoes, car wheels, etc.

The Barney & Smith Car Company, of Dayton, O., numbers among its recent orders one for fifty-five cars from the Metropolitan West Side Elevated Railway Company, of Chicago. These cars will be forty-five feet in length, supplied with rattan seats extending lengthwise of the car. A novel feature will be the employment of steel underframing, making a most substantial car.

The International Register Company, of Chicago, Ill., has published a neat pamphlet (pocket edition) containing a short description of the Pratt portable register and accompanied by copies of testimonials from users of the register. These show a unanimity of opinion in regard to the value of the portable register, which speaks volumes for the device. The pamphlet also contains a partial list of the street railways using the register.

The Lodge & Davis Machine Tool Company, of Cincinnati, O., has closed a contract for the equipment of the works of the Speeder Cycle Company, of New Castle, Ind., a recent corporation organized for the purpose of manufacturing a patent bicycle. This company is now erecting quite an extensive plant, and its equipment will include engine lathes, turret lathes, screw machines, milling machines, grinding machinery, etc.

The Siemens & Halske Electric Company, of Chicago, Ill., has just issued two new catalogues, one of which deals with generators and motors, "Type I," consisting of internal pole machines, while the other deals with bipolar generators and motors known as "Type L H." Both pamphlets give illustrations and descriptions of the respective machines, together with lists of the prominent plants in operation and under construction using the Siemens & Halske machines.

The Stilwell-Bierce & Smith-Vaile Company, of Dayton, O., has issued in pamphlet form the extended article published in the July issue of the Street Railway Journal on the water power plant of the Portland General Electric Company. This pamphlet contains twenty very fine illustrations of the Victor wheels, and general views of the Portland plant, together with some illustrations of the Stilwell-Bierce factories at Dayton, O., where the wheels are manufactured.

L. J. Highland, of Chicago, has secured the contract for building and equipping the Manchester & Northern Railway for $296,000. The road will extend from Manchester, Adams County, O., north via West Union to Winchester on the C. P. & U. R. R., amounting to twenty-five miles of construction. It will be built on the county turnpike most of the way. Fifty-six and sixty pound T rail will be used, and has already been contracted for. The road will do both passenger and freight business, using thirty-six foot passenger cars, which will be equipped with Highland motors, with a maximum speed of twenty miles per hour

List of Street Railway Patents.

U. S. Street Railway Patents Issued July 17, 1894, to September 4, 1894, Inclusive.

July 17.

Electric Railway Supply System—William A. Butler, New York, assignor to John Gilmore Boyd, same place. No. 523,104.

Covers the combination in an electric railway system of overhead contact devices arranged at intervals and mechanically connected by a guide, with an elongated conductor carried by a car and having one or more guiding devices which follow said guide.

Conduit Electric Railway—Charles D. Jenney, Indianapolis, Ind. No. 523,146.

Covers the combination in an electric conduit system, of a trolley frame supported on swinging links, whereby it is enabled to swing freely in one direction, and a conductor bar mounted to permit a vertical movement, a framework carrying said conductor bar and capable of a lateral movement, and springs attached to said bar and to said frame and operating to support or carry a portion of the weight of said bar. The conductor rail is placed on one side of the center of the conduit.

Switchpoint for Street Railways—Herbert S. Smith, Brooklyn, assignor to himself, and Frank E. Knight, New York. No. 523,154.

The combination with a switchpoint having a downwardly projecting double incline, of two levers pivoted below the track and having inclines that act against the double incline of the switchpoint, and a cross lever connecting the two levers at one end.

Trolley—Joseph Guzowski, Chicago, Ill. No. 523,163.

Covers the construction in a trolley, a frame having an oil chamber, a trolley wheel having side plates and an independently revoluble bushing between said plates provided in its side with a recess or groove, a tube or duct extending from said oil chamber to said bushing, and a wick dipping into said oil chamber and extending through said tube or duct and having its end arranged in said recess or groove.

Supply System for Electric Railways—Edward H. Johnson, New York, and Robert Lundell, Brooklyn, assignors to the Johnson Subtrolley Company, New York. No. 523,164.

The second claim for this patent, which has seventeen claims, reads as follows: "In an electric railway system a current feeder or main insulated throughout its length, a series of sectional trolley conductors adjacent thereto and provided with circuit connections and means for connecting them in sequence to the current feeder or main; a second set of sectional trolley conductors having circuit connections with electro-magnetic switching devices for connecting the first set of sectional conductors to the feeder or main, in combination with an electrical generator, having one pole connected to the current feeder or main and the other to a return conductor located throughout its length between the two sets of sectional trolley conductors."

Supply System for Electric Railways—Edward H. Johnson, New York, and Robert Lundell, Brooklyn, assignors to the Johnson Subtrolley Company, New York, No. 528,166

Covers, different forms and details of No. 523,164.

Supply System for Electric Railways—Edward H. Johnson, New York, and Robert Lundell, Brooklyn, assignors to the Johnson Subtrolley Company, New York. No. 523,165.

Covers, different forms and details of No. 523,164.

Ventilator for Railway Passenger Cars—John Krehbiel, Cleveland, O., No. 523,167.

In a railway car, the combination with the roof extending unbroken entirely across the car of a furring below, and extending across the roof parallel therewith or substantially so, and forming a chamber between and a ventilator at the sides adapted to communicate with said chamber.

Electric Railway Crossing Insulator—Henry B. Nichols and Frederick H Lincoln, Philadelphia, Pa. No. 523,172.

An electric railway crossing insulator, comprising an arm of insulating material having channeled metal wings, a seat of insulating material engaging the recessed portion of said arm and supporting channeled metal arms formed with a recessed casting provided with ends engaging the walls of the recessed portion of said arm, and means for supporting and preventing displacement of said wires seated to the channeled members of said device.

Guard Rail for Street Railways—Gleason F. Starkweather, Chicago, Ill. assignor to the Paige Iron Works, same place. No. 523,182.

A guard rail, for railways consisting of an integral piece vertical on one side from top to bottom, a base protruding horizontally outward from the other side of the web, and a head also extending outward from the web at the upper part of the same and substantially parallel with said foot or base.

Conduit Electric Railway—John W. Eisenhuth, San Francisco, Cal. No. 523,271.

In an underground system for electric railways the combination of supporting chairs, an insulated conduit, mounted thereon, an insulating partition dividing said conduit, conducting wires mounted on each side of said partition in said conduit, but insulated therefrom and a trolley adapted to engage said conducting wires.

Electric Rail Bond.—James G. Hallas, Waterbury, Conn. assignor to the Benedict & Burnham Manufacturing Company, same place. No. 523,278.

A bond for the rails of electric roads consisting of a body of uniform size having one or more coils formed from the metal of the bond, ends adapted to be passed through adjoining rails, angular shoulders formed by bending the metal at a right angle, and which are adapted to be set up against the under sides of the rails, and the ends of the bonds to be headed down on the upper side thereof.

Bonding Joint for Electric Railways—Andrew L. Johnston, Richmond, Va. No. 523,284.

The combination of a rail having a tapered perforation, with a bonding wire, a sleeve fitted to said wire, and adapted to fit snugly in the tapered perforation of the rail and having a flange bearing against one side of the rail, and a nut adapted to bear against the opposite side of the rail, and to draw the tapered sleeve into the opening in the rail, the contact area of the connection being greater than the cross sectional area of the bonding wire.

Electric Railway—Henry A. Doty, Janesville, Wis., assignor to Mary E. Doty, same place. No. 523,306.

In an electric railway, the trolley comprising a frame or body, and conducting shoes on opposite sides thereof, the shoes being arranged in pairs, each pair having meeting faces and diverging ends terminating in coils which are fastened to supports on the trolley.

Electric Railway System—Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company of Boston, Mass. No. 523,313.

In an electric railway the combination of a generator and working conductors, with one or more electric lamps arranged in one or more branch circuits in shunt connection with the line circuits, and one or more electric lamps arranged in series with the line circuits or working conductors.

Electrical Conductor for Trolleys—John W. Eisenhuth, San Francisco, Cal. No. 523,319.

An electric conductor for trolleys, etc., comprising a main con-

ductor and a series of short tubular conductors surrounding the main conductor, and having permanent electrical connection therewith, but being partially insulated therefrom.

JULY 24.

ELECTRIC RAILWAY SYSTEM—Albert C. Crehore, Ithaca, N. Y. No. 523,396.

In an electric railway system, the combination of a series of working conductors, a series of electro-magnetic switches for connecting the same to the line normally operated by current taken from the power line, an auxiliary conductor over which the magnets for operating said switches are energized, and a storage battery in the car placed in a branch around the switch magnet, and charged by a portion of the line power current which flows in the motor.

FARE REGISTER AND RECORDER—Charles S. Sergeant, Winchester, and Louis J. Hirt, Boston, Mass. No. 523,446.

The combination of a movable trip register and actuator therefor with counting mechanism operated by said actuator, and the movable support for the said counting mechanism, said actuator and support being constructed and arranged so that each when in abnormal position locks the other from movement.

ELECTRIC SNOWPLOW—Louis J. Hirt, Somerville, Mass. No. 523,471.

The combination with an electrically propelled snowplow, of a metallic truck frame consisting of metallic side bars, each comprising two bars and end bars and intermediate cross bars firmly secured together.

STREET CAR GUARD—Charles A. Barrett, Malden, Mass. No. 523,507.

In a street car, the combination of a guard hinged to an attachment on the car, a latch adapted to engage the guard above its pivotal center and hold it in a raised position, and a latch displacing or tripping device extending to a position to be operated from on board the car, whereby the guard may be released and allowed to drop to operative position.

CAR FENDER—Franklyn S. Hogg, New York, assignor to himself and Barton B. Higgins, same place. No. 523,526.

The combination with the fender having a forwardly and an upwardly extending portion and means for pivoting the fender to a car truck, of sliding rods engaging the rear side of said upwardly extending portion, bearings in which the rods slide, nuts on the rods in front of the bearings for adjusting the forwardly extending portion toward and from the roadbed, and springs forcing the upwardly extending member rearwardly.

CAR FENDER—Eldridge J. Smith, Washington, D. C., assignor to the Automatic Car Fender Company, same place. No. 523,551.

The combination of a vertically swinging pick-up fender, composed of a number of independently movable fingers extending forward from a suitable support, finger raising mechanism and trip devices for holding the finger raising mechanism, and maintaining the fender fingers in their raised position until an obstruction is encountered which actuates the trip devices.

TROLLEY CATCHER—Edwin M. Drummond, Louisville, Ky., assignor of one-half to Joseph O. Haddox, same place. No. 523,625.

A trolley pole support comprising a trolley pole or pole socket, an independently movable spring held ratchet segment, a locking pawl therefor, and a connection between the pole or pole socket and the said ratchet which is adapted to trip the said locking pawl.

GRIP SLOT CLOSER—Frederick W. Gremmels, Kansas City, Mo., assignor of one-half to Andrew Hamilton, same place. No. 523,636.

In a grip slot cover, the combination with the grip rails, casing located upon the grip slot rails, and having the inwardly and downwardly inclined chambers opening at their inner sides and above the grip slot, cover plates mounted in said chambers, and springs also mounted in said chambers and holding the cover plates yieldingly together at their inner margins.

JULY 31.

FARE REGISTER FOR STREET CARS—Edmund H. Duchemin, Newburyport, Mass. No. 523,660.

A duplex fare register with a curved oblong case and dial plate having the circular dial scales of the totalizer at one end, a curved oblong slot for sighting the trip-indicating disk in the opposite end, together with mechanism for operating same.

LIFE GUARD FOR STREET CARS—George A. Parmenter, Cambridge, and Charles S. Gooding, Brookline, Mass., assignors to the Parmenter Car Fender Company of Maine. No. 523,683.

A life guard consisting of a scoop pivoted to swing, combined with a mechanism for automatically depressing said scoop, and with a stop behind the upper end of said scoop, which when the lower end is depressed will securely hold it in position.

CAR FENDER—Edgar Thomas, Pittsburgh, assignor of one-half to Philip M. Amberg, Allegheny, Pa. No. 523,693.

A car fender comprising one fixed and one movable member pivoted together, the latter provided with a rearwardly extended arm, a vertically adjustable hanger co-operating with said arm, and a vertically disposed cushion acting on the said arm to normally keep it in engagement with the hanger.

FARE REGISTER—Leo Ehrlich, St. Louis, Mo. No. 523,930.

A fare register, the combination of a trip register, two or more permanent registers, means for connecting the trip register at will with either one of the permanent registers, and a single handle or operating device for actuating the trip register and controlling its connection with the permanent registers, whereby said device may be operated to actuate the trip register and either one of the permanent registers at will.

AUGUST 7.

TROLLEY WIRE SUPPORT—Levi Yakel, Allegheny, Pa. No. 524,014.

An electric insulator combining a bolt, the lower end of which is adapted to be secured to a fin for an electric wire, a series of asbestos and mica disks alternately strung thereon, a ring, a cap adapted to be secured thereto and means of securing said bolt in said ring and cap.

TROLLEY FOR ELECTRIC CARS—George C. Bourdereaux, Peoria, Ill. No. 524,017.

A trolley consisting of a fork constructed of two separable parts having enlarged hollow heads, bearing blocks retained within said heads, a shaft having tapering ends let into the said blocks, and a trolley wheel mounted upon the shaft and composed of two separable halves enclosing a ring.

CONDUIT ELECTRIC RAILWAY—Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. No. 524,025.

In an electric railway, the combination of a working conductor arranged along the railway, an electrically propelled vehicle, an electric motor for said vehicle connecting with the power or drive wheels, and an independent truck propelled by said vehicle having a collector making contact with the conductor.

MOTOR SUSPENSION FOR RAILWAY WORK—Edwin W. Rice, Jr., Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Conneecticut. No. 524,117.

In an electric railway motor, a supporting frame sleeved on the car axle and consisting of two side and two cross pieces formed in one piece, one of such yoke pieces constituting the yoke piece or bar for the field magnet of the motor.

CAR FENDER—Alexander Kidd, Brooklyn, assignor of one-half to Robert Wood, New York. No. 524,175.

A car fender comprising a series of members which are coupled together and held by yielding tension devices to present a continuous barrier in advance of the car wheels both when in their normal position and when moved laterally with respect to the track by contact with an obstacle in the path of the fender.

FENDER FOR TRAM CARS—William Dryden Brooklyn, N, Y. No. 524,198.

A safety guard for tram cars consisting of a body, a fender located in the forward lower portion of the body and spring controlled doors or gates located above the fender and constituting the upper front of the body.

STREET RAILWAY CAR FENDER OR GUARD—Emil Kemnitz, Memphis, Tenn. No. 524,207.

A fender comprising a body provided with upright rollers arranged practically in the form of the arc of a circle of large diameter, that is, avoiding marked prominence at any portion of the curve.

INSULATED TROLLEY WIRE SUPPORT—Frank M. Zimmerman, Detroit, Mich. No. 524,232.

In an insulating trolley wire support, the combination of an outer shell, a central screw threaded nut secured to, but spaced from, said shell by an insulating disk, a supporting stirrup engaging with said nut, and a saddle piece adapted to form a grip therewith.

ELECTRIC RAILWAY POLE RATCHET—Thomas J. McTighe, New York, assignor, by mesne assignments, to Frederick, K, Fitch, same place. No. 524,282.

A metallic pole ratchet in combination with a metallic clamping device for attachment to the pole, and insulation electrically separating the ratchet from the clamping device.

TROLLEY WIRE CIRCUIT BREAKER—Thomas J. McTighe and Sumner W. Childs, New York, assignors, by mesne assignments, to Frederick F. Fitch, same place. 524,283.

A trolley wire circuit breaker composed of two end castings united by two lateral parallel insulated rods fixed in said castings, but insulated therefrom.

AUGUST 14.

CAR FENDER—James T. Duff, Pittsburgh, Pa. No. 524,316.

The combination with a car, of a fender comprising a frame having its rear edge pivotally connected to the car and adapted to have its forward end lowered into a position adjacent to the rails, an apron carried by said frame, and a second apron arranged transversely of the car in rear of the fender, and means for operating the fender.

ELECTRIC RAILWAY SYSTEM—Theodore B. Wilcox and Henry Wilcox, Newark, N. J. No. 524,366.

In an electric railway system, a surface plate adapted to be charged by an independent magnet, a main wire leading to the said plate, and connected by a branch to a movable magnetic contact maker within the said plate, one or more magnets, carried by a motor car, for actuating the said contact maker, and charging the said surface plate, the exposed portion of said plate consisting of parts made respectively of magnetic and of non-magnetic material insulated from each other.

ELECTRO-MAGNETIC CONTACT MAKING DEVICE FOR ELECTRIC RAILWAY SYSTEMS—Theodore B. Wilcox and Henry Wilcox, Newark, N. J. No. 524,367.

Electro-magnetic contact device for use with No. 524,366.

ELECTRIC RAILWAY SYSTEM—Theodore B. Wilcox and Henry Wilcox, Newark, N. J. No. 524,368.

Covers different forms of No. 524,366.

Controller for Electric Motors—Joseph H. Jenkins, Lynn, assignor to the General Electric Company, Boston, Mass. No. 524,385.

A controller for electric motors comprising an actuating shaft or spindle mounted in suitable bearings, a circuit modifying device carried by said shaft and means for removing such device from the shaft, without removing the shaft from its bearings.

Controller for Electric Motors—William B. Potter, Lynn, assignor to the General Electric Company, Boston, Mass. No. 524,396.

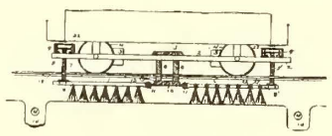
The combination in an electric controller, of a switch having a multiplicity of contacts, and a blow-out magnet having a common pole piece extending from a common core to points adjacent to the several circuit breaking points of the switch.

Radial Car Truck—William Robinson, Boston, Mass. No. 524,402.

The combination of a car frame, a main truck frame, a radial frame pivotally connected to said main truck frame, and one or more radiating pins or equivalent mechanical devices secured to said car frame outside of the longitudinal center thereof, said pins or devices engaging said radial frame and guiding and controlling the swiveling movement thereof relatively to said main truck frame.

Conduit Cleaning Device—Charles O. Ehlert, New York. No. 524,434.

A device or apparatus for cleaning the interior of slotted underground conduits suitable for electric railways, carried by an electrically propelled vehicle adapted to move above said conduits, consisting of



NO. 524,434.

one or more sweeping brushes or brooms suspended within the conduit from points upon the car, remote from each other, and connected thereto by self adjusting connections, whereby the said sweeping brooms can be adjusted to curved sections of said conduit.

Trolley Wheel and Support—David R. Thomas, Baltimore, Md., assignor of one-half to William E. Harendt, same place. No. 524,517.

The combination with a trolley yoke, of a wheel journaled therein, a plug in each end of the bore of the wheel, the outer ends of which plugs are each provided with a shoulder to fit against the side of the wheel, and the inner ends of the plugs being at a distance from each other, each plug being provided with an axial opening, and a pin adjustably secured in the outer end of each arm of the yoke, the inner end of which pin fits within the outer end of the axial opening of its respective plug and forms a support or journal for the wheel.

Device for Operating Street Railway Switches—Carl E. R. Christensen, Brooklyn, N. Y. No. 524,540.

A switch operating device adapted to be mounted on the platform of a car, comprising a guide socket with a laterally flared bore, a stem mounted non-rotatively in the bore of the guide, a head piece on the upper end of said stem, a wedge of clam shell form on the lower end of said stem, and a retracting spring.

Automatic Circuit Breaker—Anatole C. Carles, Portland Me., No. 524,630.

In a circuit breaker for broken electric wires, a metallic bridge supported in a suitable case and insulated therefrom, a pivoted carrier mounted in said case, a circuit breaking rod having an inclined end set in said carrier and insulated therefrom, the inclined end of said carrier having a plate pivotally attached thereto and adapted to rest loosely upon said metallic bridge, but adapted to be disconnected therefrom by the breaking of the wire.

Insulating Turnbuckle—Louis McCarthy, Boston, Mass. No 524,684.

An insulator comprising two shells having oppositely projecting connections placed within the same and insulated therefrom, a turnbuckle device having the opposite ends of the same placed within the respective shells and insulated from each of the said connections by an interposed mass of insulating material.

August 21.

Street Car Fender—Thomas C. Rice, Worcester, Mass. No. 524,734.

A shield attachment for a street car adapted to be attached to and extend in an upright position at the end of the car, and consisting of a wire netting or cushion surface curved or bowed outwardly, and provided with a spring or resistance device upon its inner surface to engage the buffer, or other projecting part of the car.

Sanding Device for Cars—Henry F. Rooney, Randolph, assignor of one-half to Mary Chisholm, Boston, Mass. No. 524,735.

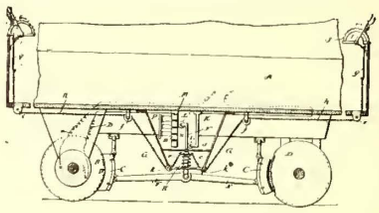
A sanding device for cars, comprising sand tubes uniting in front in a single tube, the closures at their rear ends actuated by levers, rods extending from said levers to an actuating lever in convenient position for the driver, springs holding the closures normally against the mouths of the sand tubes, and shaking devices extending longitudinally in the sand tubes, and with their front ends secured to a rod or bar connecting with an actuating lever in convenient position for the driver.

Electric Railway Supply System—Malone Wheless, Washington, D. C. No. 524,773.

An electrical railway system comprising a car provided with a pair of shoes insulated from each other and from the body of the car, a source of electrical supply having its opposite poles connected to said shoes respectively, and a motor connected by one of its poles to one of said shoes only, and having its opposite pole connected to one of the track rails in combination with track terminal pins in pairs held in boxes set at such intervals apart that the contact shoes on the car will reach one pair before they leave the other, a table and feeder therefrom connected to those track terminals through which the motor circuit is completed, normally open contacts in each feeder connection, an armature for closing said contacts, a pick-up magnet for each armature, having its energizing coil connected to its appropriate pair of track terminal pins whereby when the car shoes meet a pair of track terminals a circuit, including the pick-up magnet of those terminals, and the source of electrical supply on the car will be closed, with the result of energizing the pick-up magnet and thus closing the normally open contacts in the feeder connection appropriate to the track terminals on which the car shoes rest.

Controller for Electric Cars—Marion B. Monroe, New Orleans, La. No. 524,785.

In an electric car, the combination of a motor, a source of electric supply, a rheostat arranged in an electric circuit between the source of



NO. 524,785.

supply and the motor, a vertically movable plunger arranged in the electric circuit and contacting with the rheostat and a suitable means for moving the said plunger.

Electric Railway Car—John C. Henry, Westville, N. J. No. 524,823.

An electric car having at one end a swiveling bogie and at the other end a swiveling pony truck, a motor mounted on the pony truck

NO. 524,823.

and a tongue projecting from said pony truck and connected with the bogie by an attachment allowing it to have lateral play.

Car Fender—James Rumrell, Boston, Mass. No. 245,841.

A car fender provided with spring actuated grasping and retaining devices, the latter being mounted at the ends to slide in the arms of the fender.

Fender for Trolley or Other Cars—Elmer Bockman and Joseph E. Hagan, Philadelphia, Pa. No. 524,883.

A frame having a cross bar hinged to an arm pivotally mounted on a support, hangers on said frame with wheels on their lower ends, wheels on the sides of said frame, and a roller in front of the same having a vertical play in its journal bearings.

Car Fender—Robert Thomson, Brooklyn, N. Y., assignor of one-fourth to Joseph Norwood, same place. No. 524,918.

The combination, with a car fender and two braced arms rearwardly extended from standards on the fender, of two sets of clamping boxes at the ends of the car along its sides, and keeper wedges adapted to slide into slots of the front boxes and clamp upon collars on the arms.

Electric Railway Supply System—James F. Cummings, Detroit, Mich., assignor of one-half to Eugene M. Engelman Milwaukee, Wis. No. 524,976.

In an electric power system for railways, the combination with two insulated supply conductors, two distributing conductors divided into sections independently connected by feeders to main supply conductors, of a switch at a central station having contacts connected by independent test lines with the sections of the distributing conductor, an independent source of electricity having one terminal connected to the movable contact of the switch and the other to the ground and an electric indicating device in circuit with said source of electricity.

August 28.

Trolley—Naaman W. Haskins, Brooklyn, N. Y. No. 525,015.

Covers a trolley having a plurality of grooved annular bearings formed at right angles to a common axis.

Trolley Wire Switch and Crossing—Naaman W. Haskins, Brooklyn, N. Y. No. 525,016

Covers a switch and crossing suitable for use with a trolley wheel made in the form described in the previous patent.

DEVICE FOR PREVENTION OF ACCIDENTS ON STREET CARS, ETC.—Alexander McKerlie, Hamilton, Canada. No. 525,055.

This device has front projecting side arms which have a front bearing provided with a cap. The through angle shaft in the bearings is equipped with brush roller or blades at each side of a centrally located chain wheel.

COMBINED CAR FENDER AND BRAKE—Hampton W. Evans, Philadelphia, Pa. No. 525,071.

This is a combination in a car having wheels and brake shoes adapted to engage therewith and a brake operating lever, of a fender provided with a frame having bent ends or wings. The frame is secured to movable arms connected with the truck frame of the car. There are springs in movable engagement with the arms of the fender for supporting the same at an angle from the truck frame and above the track rails, toggle and bell-crank mechanisms on each side of the car in connection with said fender and brake shoes. The construction and arrangements are such that the brake shoes are either applied by means of the brake operating lever or automatically by means of the fender under the impact of an object brought against the same.

SAFETY GUARD FOR STREET CARS—William H. Rice, Rochester N. Y. No. 525,115.

There is a supporting frame with a roller at the outer end of the frame provided with spring sprockets which stand eccentrically to the roller. A flexible guard is attached at one end to the sprockets and is partially wound thereon, and at the other to the car.

MEANS FOR MOUNTING AND DRIVING DYNAMO-ELECTRIC MACHINES—Andrew L. Riker, New York. No. 525,118.

This is the combination with the armature pulley and driving pulley of a belt for transmitting motion from one to the other. There is a swinging idler around which one side of said belt is looped, so that the pull of the latter operates to draw said idler against the armature pulley, gripping the belt against the same, and means for automatically taking up the slack in the other side of the belt.

CIRCUIT BREAKER—Cummings C. Chesney, Pittsfield, Mass., assignor to the Stanley Laboratory Company, same place. No 525,134.

A pivoted bridge piece is adapted to be placed and maintained in engagement with said terminals. There is a pivoted weight engaging with the bridge piece, but having a determined range of movement independent of the same, and a tripping device is provided for holding the weight in an elevated position against the force of gravity.

CAR FENDER—Charles E. Struck, Newark, N. J., assignor of one-half to John A. Baldwin, same place. No. 525,167.

This is the combination with the platform of a car of a bumper pivotally secured to the car in front of the platform, and a knuckle connecting the lower extremity of the bumper with the platform.

STATION INDICATOR—Athean C. Allyn, Boston, Mass. No. 525,176.

A roller and curtain of nippers are pivoted to the roller and adapted to extend over the curtain and clamp the same against the roller. The nippers have flanges projecting on the outer sides of their pivots, and a fixed cam having a section which co-acts with said flanges, moves the nippers against the roller and a tapered blade over which the flanges may take when the nippers move away from the roller, and springs impel the nippers away from the rollers.

SAFETY FENDER FOR TRAM, ELECTRIC OR CABLE CARS—Henry S. Robins Philadelphia, Pa. No. 525,233.

The fender has a frame, a yielding bed, carried by the frame and a tubular guard formed of soft, elastic or yielding material. The guard is located at the forward portion of the bed, and means are provided for holding said tubular guard expanded.

STREET CAR—William F. S. Robinson, Somerville, Mass. No. 525,281.

The car has a guard situated in front of the dashboard and extending substantially across it and adapted to be raised from a position in front of the bunter to a position above and clearing the bunter, and to be sustained in either of said positions.

CAR FENDER—William F. S. Robinson, Somerville, Mass. No. 525,285.

The fender is adapted to run on the track in front of the car. A pivoted connection between the fender and truck consists essentially of a substantially horizontal tubé or cylinder pivoted at its front end to the fender and a rod pivotally connected at its rear end with the truck. At its front end is a piston playing in said tube.

SEPTEMBER 4.

CONTROLLING DEVICE FOR ELECTRIC RAILWAY CARS—William H. Conrad, Lebanon, Pa., assignor of two-thirds to Jacob M. Shenk and Willim P. Coldren, same place. No. 525,336.

The combination of an electric switch, a shaft provided with means for turning on and off the current, a revoluble sleeve secured to said shaft, a ratchet wheel secured to the sleeve, a pawl, and an arm on the shaft to release the pawl and a brake chain attached to said sleeve.

CONTROLLER FOR ELECTRIC OR OTHER MOTORS—Elmer A. Sperry, Cleveland, O., assignor to the Sperry Electric Railway Company, of Ohio. No. 525,394.

In combination with electric machines, an electric circuit, an operating handle, means connected with such operating handle for varying the electric conductivity of such circuit, another and separate operating handle, means also connected with it for varying the conductivity of an electric circuit, each handle having a zone or position known as its critical position, the arrangement being such that by manipulation of either handle to or from such critical position, the conductivity is gradually increased or decreased, in combination with interlocking devices between the handles, whereby either is locked when the other is out of said critical position.

SYSTEM AND APPARATUS FOR CONTROL OF ELECTRIC MACHINES—Elmer A. Sperry, Cleveland, O., assignor to the Sperry Electric Railway Company, of Ohio. No. 525,395.

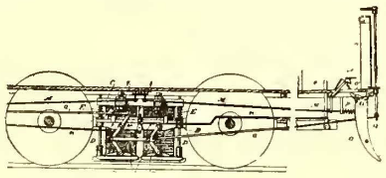
The combination, with a motor, of a current supply, means for gradually increasing the current in the motor circuit from such supply, up to some predetermined point, means for then decreasing the counter electro-motive force at constant speed of such motor and simultaneously decreasing the current flowing in the motor circuit from said supply, as compared with that flowing previous to said change in the counter electro-motive force, and means whereby the current in the motor circuit may be gradually increased from this point.

ELECTRIC RAILWAY SYSTEM—Francis B. Badt, Chicago, Ill. No. 525,480.

The combination of a movable vehicle with a motor transformer thereon adapted to be operated by an external multiphase supply circuit, conductors leading from this supply circuit to such movable vehicle, one or more direct current motors on such vehicle attached or geared to the vehicle axle or axles, and connections from the motor transformer to such direct current motor or motors.

ELECTRO-MAGNETIC CAR BRAKE—Robert T. Murray and Charles M. Allen, San Francisco, Cal. No. 525,505.

A brake for railway cars, consisting of vertically moving brake shoes adapted to form contact with the line of rails, and an electro-magnet which carries the brake shoes and moves with them, independent coils surrounding the core of the magnet, said coils being connected



NO. 525,505.

in series, and with switch plates arranged about a center, a lever pivoted at this center and movable to make connection between the various pairs of plates, whereby the power of the magnet is increased, diminished or destroyed.

CAR FENDER—Thomas Ross, Westerly, R. I. Filed March 8, 1894. No. 525,516.

The combination with a car dasher of a fender composed of an upright member and a pilot member pivotally secured together, each being formed of strips of spring metal, the strips of the upright member curving over at the top and being furnished with roller bearings at their ends.

ELECTRO-MAGNETIC TRACTILE DEVICE—Charles M. Allen, San Francisco, Cal., assignor of one-half to Robert Murray, same place. No. 525,523.

A means for increasing the tractile force of motors, consisting of an electro magnet or magnets vertically movable towards and from the rails, and movably inclined planes engaging the magnet or magnets for raising them, the latter being depressed by gravitation or attraction when energized.

CONDUIT ELECTRIC RAILWAY SYSTEM—Oscar A. Enholm, New York, assignor to W. Dean Smith, same place. No. 525,539.

An underground electric railway system comprising a main conductor, an auxiliary conductor composed of separate or insulated sections, switch mechanism for connecting said sections successively with the main conductor, and positive mechanism connecting said switch mechanisms together so that the operation of one switch to close the circuit from the main conductor to an auxiliary conductor section will mechanically operate to cut out another of said sections from circuit with the main conductor.

STREET CAR TRUCK—Ferdinand E. Canda, New York. No. 525,590.

In a car, a supporting spring, the same comprising an elliptic spring and a coil spring located one above the other, a follower arranged on top of the upper spring and adapted to rest on the lower spring when the upper spring is compressed to its full capacity, and a hollow, verttcal column stand in which the follower has guided movement.

CAR FENDER—Henry W. Eaton, New York. No. 525,592.

The combination, with a car, of a forwardly extending frame hinged thereto, a second frame hinged to the first frame and provided with inwardly extending arms, suspending chains secured to the arms and adapted to be secured to the car, a network covering for the second frame and a netting connecting the chains.

OVERHEAD SWITCH FOR TROLLEY WIRES—Hugh M. Greenwood, Brookiyn, N. Y. No. 525,598.

In an overhead frog, switch or crossing for trolley lines a body and wire arms, one of said arms adjustably connected to said body, whereby its position can be shifted to adapt it to the wires of the trolley line.

We will send copies of specifications and drawings complete of any of the above patents to any address upon receipt of twenty-five cents. Give date and number of patent desired. THE STREET RAILWAY PUBLISHING COMPANY, HAVEMEYER BUILDING, NEW YORK.

QUOTATIONS OF STREET RAILWAY STOCKS.

ALBANY STOCKS AND BONDS.—Corrected by Spencer Trask & Co., Bankers and Brokers, corner State and James Streets, Albany, N. Y., Sept. 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Albany R. R. Co	100	750,000	Q Feb.	1½	1890	116½	117½
Watervielt Turnpike & R. R. Co	100	240,000	.....	...	1863	10	.....

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Albany R. R. Co., 1st Mort	1865	40,000	J. & J.	5	1905	101½	.....
" " " 2d Mort	1873	20,000	M. & N.	7	1893	101½	.....
" " " 3d Mort	1875	28,500	J. & J.	7	1895	101½	.....
" " " 4th Mort	1880	11,500	M. & S.	6	1905	100	.....
" " " 5th Mort	1888	50,000	M. & S.	5	1913	101	.....
" " " Consol Mtg	1890	350,000	J. & J.	5	1930	103½	.....
" " " Debenture	1891	200,000	M. & N.	6	1901	111	.....
Watervliet Turnpike & R. R., 1st Mort	1889	350,000	M. & N.	6	1919	112	114
Watervliet Turnpike & R. R., 2d Mort	1889	150,000	M. & N.	6	1919	111½	113

BALTIMORE STOCKS AND BONDS.—Corrected by Hambleton & Co., Bankers, 9 South Street, Baltimore, Md., Sept. 19. Stock quotations are prices per share,

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Balto. City Pass. Ry. Co	25	2,500,000	Sem-an	4	.....	64	65
City & Suburban Ry. Co	50	3,000,000	.....	1	.....	40	42
Central Pass. Ry. Co	50	300,000	.....	...	.....	68	70
Balto. Traction Co. (Cable)	25	5,000,000	Quart.	1	.....	16½	17

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Central Pass. Ry.	1882	250,000	J. & J.	6	1912	110	112
" " " cons. mort	1892	500,000	.....	5	.....	111½	112
City & Sub. Ry. Co. gen. mort	.....	2,000,000	J. & D.	5	1922	107¼	107½
Balto. Traction Co. (Cable)	1889	1,500,000	M. & N.	5	1929	107¼	107¾
Balt. Trac. Co., No. Balt. Div	1892	1,750,000	J. & D.	5	1942	102	102½
" " "	1891	1,250,000	M. & S.	6	1901	102	102½
City Pass. R. R. Co	1891	2,000,000	"	5	1911	113½	114

BOSTON STOCKS.—Corrected by R. L. Day & Co., 40 Water Street, Members of Boston Stock Exchange, Sept. 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
West End Pref	50	$6,400,000	J. & J.	4	1887	80	82
West End Com'n	50	9,085,000	J. & J.	3	1890–1892	55¾	56

BROOKLYN STOCKS AND BONDS.—Corrected by C. E. Staples & Co., 215 Montague Street, Brooklyn, Sept. 19. Stock quotations are per cent. values.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Brooklyn City R. R. Co	10	6,000,000	Q.—J.	2	.....	.....	170
Brooklyn Traction Co., pref	100	3,000,000	.....	...	1893	65	.....
" " common	100	6,000,000	.....	...	1893	16	.....
Coney Island & Brooklyn R. R. Co	100	500,000	Oct. 1.	4	.....	.....	160
Long Island Traction Co	100	30,000,000			1893	.....	15

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Broadway R. R. Co	.....	350,000	J. & J.	5	6 m. notice	100	.....
Brooklyn Traction Co	1893	3,000,000	.....	...	.....		
Coney Island & Brooklyn R. R. Co., 1st bonds	.....	300,000	J. & J.	5	Jan. 1909	103	.....
Coney Island & Brooklyn R. R. Co., certificates	.....	300,000	J. & J.	6	July, 1894	100	.....
South Brooklyn Central R. R. Co., 1st	.....	125,000	F. & A.	7	Aug. 1897	.....	107
South Brooklyn Central R. R. Co., 2d	.....	150,000	F. & A.	6	July, 1941	100	.....
Brooklyn City R. R. Co., 1st	.....	3,000,000	J. & J.	5	July, 1916	112	115

CHARLESTON STOCKS AND BONDS.—Corrected by A. C. Kaufman, Charleston, S. C., Sept. 20. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Charleston City Ry. Co	50	$100,000	J. & J.	0	.....	.....	70
Enterprise Ry. Co	25	250,000	.....	...	.....	.....	5

BONDS.	Date of Issue	Amo'nt Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Charleston City Ry. Co	.....	100,000	J. & J.	6	1915	.....	.....
Enterprise Ry. Co	.....	50,000	J. & J.	5	1906	.....	.....

CHICAGO STOCKS AND BONDS.—Corrected by William B. Wrenn, 108 LaSalle Street, Chicago, Ill., Sept. 22.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Chicago City	100	$9,000,000	Q.—J.	3	.....	310	315
Chicago Passenger	100	1,000,000	A. & O.	2½	.....	100	.....
North Chicago City	100	500,000	Q.—J.	7½	.....	500	.....
North Chicago Street	100	5,500,000	J. & J.	4	.....	246½	247
West Division City	100	1,250,000	Q.—J.	8¾	.....	625	.....
West Chicago Street	100	13,189,000	Q.—F.	1½	.....	131¾	132¼

BONDS.	Date of Issue	Amount Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Chicago City	.....	4,619,500	J. & J.	4½	.....	100⅛	101½
Chicago Passenger	1883	400,000	F. & A.	6	1903	109½	.....
North Chicago City, 1st mort	.....	500,000	M. & N.	6	1900	105	.....
" " "	.....	1,850,000	M. & N.	4½	1927	100	101
North Chicago Street 1st mort	.....	2,413,000	J. & J.	5	1906	.....	103½
West Chicago Street	.....	4,160,000	M. & N.	5	.....	101⅞	102⅜
West Chicago Street, Tunnel	.....	1,500,000	F. & A.	5	.....	100	101½
" " " Deb. 6's	.....	2,000,000	J. & D.	6	.....	102	102½

CINCINNATI STOCKS AND BONDS.—Corrected by Geo. Eustis & Co., Bankers and Brokers, 26 West Third Street, Cincinnati, Sept. 19. Stock quotations are per cent. values.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Cincinnati	50	$7,500,000	Q.—J.	5	.....	105¼	105½
Mt. Adams & Eden Park	50	1,600,000	Q.—J.	5	.....	106½	107
Mt. Auburn Cable	100	300,000	.....	...	.....	.....	.....
Cin. Inclined Plane Ry	100	500,000	.....	...	.....	63	65
" " " Pref.	100	100,000	.....	6	.....	98½	99½
Cin. Newport & Cov. St. Ry.	100	3,000,000	.....	.	.....	22⅝	23

BONDS.	Date of Issue	Amount Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Cincinnati St. Ry	.....	50,000	J. & J.	7	July, 1895	101⅛	104
" "	.....	50,000	J. & J.	7	July, 1896	104	106
" " extended	.....	100,000	J. & J.	4	.....	99¼	100
	.....	150,000	J. & J.	5	.....	100¾	101¼
Mt. Adams & Eden Park	.....	50,000	A. & O.	6	July, 1895	101	103
" " " "	.....	50,000	A. & O.	6	July, 1900	107½	110
" " " "	.....	100,000	A. & O.	6	July, 1905	110⅝	111½
" " 10-20's	.....	200,000	J. & D.	6	Je. '94-1924	102½	.....
" " Cable	.....	280,000	M. & S.	5	Mar. 1906	104⅞	105¼
Cin. Inclined Plane Ry	.....	125,000	J. & J.	7	July, 1899	107	108
" " " "	.....	300,000	J. & J.	6	Jan. 1914	105	106
Mt. Auburn Cable	.....	200,000	J. & D.	5	June, 1907	.....	90
" " 5-20's 2d	.....	100,000	A. & O.	7	Ap. '93-1908	.....	.....
S. Covington & Cincinnati	.....	250,000	M. & S.	6	Mar. 1912	114	115
S. Cov. & Cin. 2d Mort. gold 6's	.....	250,000	J. & J.	...	1932	113½	114½

CLEVELAND STOCKS AND BONDS.—Corrected by W. J. Hayes & Sons, Bankers, Cleveland, O., Sept. 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
The Cleveland Electric Ry. Co.	100	12,000,000	.....	....	1893	49	50
The Cleveland City Ry. Co	100	8,000,000	.....	....	1893	58	59

BONDS.	Date of Issue	Amount Out-standing	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
The Cleveland Electric Ry. Co.	1893	2,000,000	M.—S.	5	1910	100	102¾
" " City " "	1893	2,349,000	.....			100	102

DETROIT STOCKS.—Corrected by CAMERON CURRIE & Co., Bankers and Brokers, 82 Griswold Street, Detroit, Sept. 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Fort Wayne & Belle Isle Ry. Co.	100	$250,000	.....	...	.....	200	.....
Detroit Citizens Street Ry. Co.	100	2,000,000	.....	...	.....	.....	100
Wyandotte & Detroit River Ry.	100	200,000	.....	...	.....	100	110

HOLYOKE STOCKS.—Corrected by J. G. MACKINTOSH & Co., Bankers, Holyoke, Mass., Sept. 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
Springfield Street R. R. Co.	100	1,000,000	J. & J.	4	.....	200	225
Holyoke Street R. R.	100	250,000	J. & J.	4	.....	200	225
Northampton Street R. R.	100	50,000	.....	...	.....	125	150

LOUISVILLE STOCKS AND BONDS.—Corrected by ALMSTEDT BROS. Stock and Bond Brokers, 510 West Main Street, Louisville, Ky., Sept. 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Louisville St. Ry. Co., pref.	100	$2,000,000	A. & O.	5	Jan. 1891	87½	88½
Louisville St. Ry. Co., com.	100	4,000,000	.....	...	Jan. 1891	35	36

BONDS.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Louisville St. Ry. Co., 1st mort	1890	6,000,000	J. & J.	5	1930	100	101
Louisville City Ry. Co. Cons.	1884	1,000,000	J. & J.	6	1909	116	117
Central Passenger Ry. Co.	1888	400,000	M. & N.	6	1908	116	117
New Albany St. Ry. 1st Mort.	1888	150,000	J. & J.	6	1913	85	90

NEW HAVEN STOCKS AND BONDS.—Corrected by H. C. WARREN & Co., Bankers and Brokers, New Haven, Conn. Sept. 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
F. Haven & Westville R. R. Co.	25	$600,000	J. & J.	4	.....	45	47
New Haven & W. Haven R. R. Co	25	.....	.....	...	.....	.....	.....
New Haven & Cent'lle H. R. Co.	.....	.....	.....	...	.....	.....	.....
Hartford & Wethersfield Horse R. R. Co.	100	200,000	J. & J.	3	.....	125	.....

BONDS.	Date of Issue	Amo'nt Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
New Haven Street Ry. Co.	1894	600,000	J. & J.	5	Jan. 1919	.....	100
New Haven & W. Haven R. R. Co	1892	500,000	M. & N.	5	Nov. 1912	100	102
Bridgeport Traction Co.	1893	2,000,000	J. & J.	5	July, 1923	95	100
Hartford & Wethersfield Horse R. R. Co., Deb. Series A.	1888	100,000	M. & S.	5	Sept., 1908	.....	.....
Hartford & Wethersfield Horse R. R. Co., Deb. Series B.	1890	100,000	M. & N.	5	May, 1910	.....	.....
Hartford & Wethersfield Horse R. R. Co., Deb. Series C.	.....	100,000	M. & N.	5	May, 1910	.....	.....

NEW ORLEANS STOCKS AND BONDS.—Corrected by GEORGE LE SASSIER, 188 Common Street, New Orleans, La., Sept. 21. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Carrollton R. R. Co.	100	1,200,000	Quart.	1½	1867	122	124
Crescent City R. Co.	100	1,150,000	"	3	1866	77	80
Canal & Claiborne R. R. Co.	40	240,000	Semi.	2½	1888	37	40
New Orleans City & Lake Co.	100	1,500,000	Quart.	2⅞	1860	106	.....
Orleans R. R. Co.	50	185,000	"	2	1868	27	.....
St. Charles Street R. R. Co.	50	600,000	"	2½	1863	58⅜	60

Bonds.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Canal & Claiborne Sts. R. R.	1892	150,000	M & N	6	1912	....	.....
Crescent City R. R. 1st Mort.	1883	75,000	M & N	6	'95-'99	100	.....
do do	1893	2,000,000	J & J	6	1943	86½	.....
N. O. City R. R. Co.	1879	416,500	J & D	6	1903	114	.....
N. O. & Carrollton R. R. Co.	1882	250,000	F & A	6	'97-'06	....	.....
N. O. City & Lake R. R. Co., 1st Mort.	1893	1,725,000	J & J	5	1943	88¾	90
St. Charles Street R. R. Co.	1881	105,000	J & D	6	'95-'01	...	.....

MONTREAL STOCKS AND BONDS.—Corrected by GORDON STRATHY & Co. Members Montreal Stock Exchange, 9 St. Sacrament Street, Sept. 20. Stock quotations are per cent. values.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Montreal St. Ry. (old stock)	50	$2,000,000	M. & N.	4	May, '91.	157¼	158
" " (new stock)	50	2,000,000	.....	...	May, '94.	152	153

BONDS.	Date of Issue	Amount Outstanding.	Interest Period.	%	Principal Due.	Bid.	Ask'd
Montreal St. Ry.	1885	£60,000	.....	5	1905	.....	.....
	1893	700,000		4½			

NEW YORK STOCKS AND BONDS.—Corrected by JAMES MCGOVERN & Co., 6 Wall St., New York, Sept. 22.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Bleecker St. & Fulton Ferry	100	900,000	J. & J.	¾	.....	.....	30
Broadway & Seventh Avenue.	100	2,100,000	Q.—J.	2½	.....	185	188
Cen'l Park, North & East River	100	1,800,000	Q.—J.	2	.....	154	160
Central Crosstown	100	600,000	Q.—F.	1¾	.....	154	160
Dry Dock, E. B'way & Battery.	100	1,200,000	Q.—F.	2	.....	135	.....
42d & Grand St. Ferry	100	748,000	Q.—F.	4½	.....	300	.....
42d St., Manhat. & St. Nich. Av.	100	2,500,000	.....	...	.....	49	52
Eighth Avenue	100	1,600,000	Q.—J.	3	.....	250	.....
Houston, W. St. & Pav. Ferry.	100	1,000,000	Q—F.	2	.....	200	.....
Second Avenue	100	1,862,000	Q.—J.	1	.....	134	135
Sixth Avenue	100	1,500,000	Q.—J.	1¾	.....	200	206
Third Avenue	100	5,000,000	M.—N.	4½	.....	186	188
23d St.	100	600,000	Q.—F.	2½	.....	290	.....
Ninth Avenue	100	800,000	Q.—J.	1½	.....	140	.....
Union Railway Co.	100	2,000,000	.....	...	.....	.....	.....

Bonds.	Date of Issue	Amount.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Bleecker St. & Fulton Ferry	.....	700,000	J. & J.	7	July, 1900	110	111
B'way & 7th Ave., 1st mort.	.....	1,500,000	J. & D.	5	June, 1904	106	.....
2d mort.	.....	500,000	J. & J.	5	July, 1914	106	.....
Broadway Guaranteed 1sts.	.....	1,125,000	J. & J.	5	July 1924	107	.....
" 2ds interest as rental	.....	1,000,000	J. & J.	5	July, 1905	103	.....
Broadway Consolidated	.....	7,650,000	J. & J.	5	 1943	109⅞	110
Cen'l Park, North & East River	.....	1,200,000	J. & D.	7	Dec., 1902	111	.....
Central Crosstown—1st mort.	.....	250,000	M. & N.	6	Nov., 1922	119	120
Dry Dock, E. B'way & Battery. 1st mort.	.....	.....	J. & D.	5	 1932	109	.....
Scrip (can be called at par)	.....	1,200,000	F. & A.	6	Aug. 1914	100	101
42d St. Manhat. & St. Nich. Av 1st mort.	.....	1,200,000	M & S.	6	Sept., 1910	110	112
2d mort. income bonds	.....	1,200,000	J. & J.	6	1915	53	.....
Eighth Ave., Scrip	.....	1,000,000	F. & A.	6	Aug., 1914	100	105
Houston, W. St. & Pav. F'ry, 1st	.....	500,000	J. & J.	7	July, 1894	100	.....
Second Avenue, 1st mort.	.....	1,600,000	M. & N.	5	Nov., 1909	102	.....
Third Avenue	.....	7,000,000	J. & J.	5	Jan., 1937	117	.....
Union Railway Co.	.....	2,000,000	F. & A.	5	Feb., 1942	.....	.....

PHILADELPHIA SECURITIES.—Corrected by HUHN & GLENDINNING, 143 South Fourth st. (Bullitt Building), Philadelphia, Sept. 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Citizens'	50	$500,000	Q.—J.	4	1858	260	265
Continental	50	1,000,000	J.—J.	6	1873	124½	126
Frankford & Southwark	50	1,250,000	Q.—J.	5	1854	318	325
Germantown	50	1,500,000	Q.—J.	2¾	1858	111	113
Green & Coates	50	500,000	Q.—J.	3	1858	124½	126
Hestonville	50	2,050,000	.....	...	1859	56	57
Lombard & South	25	500,000	A.—O.	8	1861	90	91
People's Traction Co.	50	10,000,000	.....	...	.....	58½	59
Philadelphia City	50	1,000,000	J.—J.	7½	1859	155	160
Philadelphia & Gray's Ferry	50	617,500	J.—J.	3½	1858	80	85
*Philadelphia Traction (50 pd.)	50	7,000,000	M.—N.	3	1883	95	95½
Ridge Avenue	50	750,000	Q.—J.	5	1872	227	235
Second & Third	50	1,060,200	Q.—J.	5	1853	209½	213
Thirteenth & Fifteenth	50	1,000,000	J.—J.	9	1858	210	212
Union	50	1,250,000	J.—J.	9½	1864	226	230
West Philadelphia	50	750,000	J.—J.	10	1857	195	200
Metropolitan (N.Y.) Traction	100	30,000,000	Q.—F.	1	.....	116½	117¾
Baltimore Traction	25	5,000,000	.....	1	1889	16¾	17
Buffalo (N. Y.) Railway	100	6,000,000	.....	...	.....	52	54
Newark (N. J.) Passenger	100	6,000,000	.....	...	.....	25	29
Pitts. & Birmingham Trac. Co.	50	3,000,000	J.—J.	...	.....	12⅝	12¾

*Ex. Allotments.

BONDS.	Date of Issue	Amount Outstanding	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Baltimore Traction 1st Mort.	1889	1,500,000	M.—N.	5	1929	107¼	108¾
" " Imp.	1892	1,250,000	M.—S.	6	1901	101	102
Balt. Tr., No. Balt. Div., Gold	1892	1,750,000	J. & D.	5	1942	100¾	102
Germantown, 1st mort.	.....	67,000	J.—D.	5	1904	105	.....
" 2d mort.	.....	160,000	A.—O.	5	1899	103	.....
Hestonville, 1st mort.	.....	300,000	M.—N.	6	1895	103½	.....
" "	.....	124,500	J.—J.	6	1901	105	.....
" 2d mort.	.....	75,000	M.—S.	6	1902	105	.....
People's, 1st mort.	.....	219,000	J.—J.	7	1905	115	.....
" " "	.....	285,000	J.—J.	5	1911	100	.....
" Cons. mort.	.....	247,000	M.—S.	5	1912	95	.....
West Philadelphia, 1st mort.	.....	246,000	A.—O.	6	1906	117	.....

OMAHA STOCKS AND BONDS.—Corrected by Richard C. Patterson, Banker and Broker, 907 N. Y. Life Building, Omaha, Neb., Sept. 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Omaha St. Ry. Co	100	5,000,000	M. & N.	....	Jan. 1, '89	60	.....
BONDS.	**Date of Issue**	**Am't Out-stand-ing.**	**Inter'st Paid.**	**%**	**Principal Due.**	**Bid.**	**Ask'd**
Omaha St. Ry. Co	1889	2,250,000	M. & N.	5	M'y 1, 1914	95	98

PITTSBURGH STOCKS AND BONDS.—Corrected by John B. Barbour, Jr. 306 Times Bldg., Pittsburgh, Pa., Sept. 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Central Traction R. R. Co	50	1,500,000	.....	...	.....	19½	20
Citizens' Traction R. R. Co	50	3,000,000	J. & J.	3	.....	59¾	60
Pitts. & Birmingham R. R. Co	50	3,000,000	.....	...	.....	12⅝	12¾
Pittsburgh Traction R. R. Co.	50	2,500,000	.....	3	.....	.....	63½
Federal St. & Pleasant Valley	25	1,400,000	J. & J.	...	.....	19⅝	20¼
Pittsburgh, Allegheny & Man	50	3,000,000	.....	...	.....	35	38½
West End R. R. Co	50	1,000,000	J. & J.	1	.....	16	20
Second Avenue R. R. Co	50	1,000,000	J. & J.	2	.....	.....	.....
Penn Incline Plane Co	50	250,000	.....	...	.....	.....	.....
Monongahela Incline Plane Co	50	140,000	F. & A.	...	.....	.....	.....
Fort Pitt Incline Plane Co	50	60,000	.....	...	.....	.....	.....
Mount Oliver Incline Plane Co	50	100,000	J. & J.	3	.....	.....	.....
Pittsburgh Incline Co	100	100,000	J. & J.	5	.....	.....	.....
Duquesne Traction Co	50	3,000,000	.....	...	.....	26	26½
BONDS.	**Date of Issue**	**Amount Out-standing.**	**Inter-est Paid.**	**%**	**Principal Due.**	**Bid.**	**Ask'd**
Citizens' Traction R. R. Co	1887	1,250,000	A. & O.	5	.927	107	110
Pittsburgh Traction R. R. Co.	1887	750,000	A. & O.	5	1927	106	110
Pitts. & Birmingham Traction Co	1892	.....	.....	5	.....	90	92
Pleasant Valley Ry	1892	1,250,000	J. & J.	5	1919	.....	100
P., A. & M. R. R. Co	1891	1,500,000	J. & J.	5	1931	104¼	104½
Duquesne Traction Co	1890	1,500,000	J. & J.	5	1930	101¾	.....
Second Ave. Electric R. R. Co		500,000	J. & J.	5	1923	.....	.....
Central Traction Co	1889	375,000	J. & J.	5	1919	.....	.....
Union R. R. Co	1881	100,000	A. & O.	5	1901	.....	.....
West End R. R. Co		500,000	J. & J.	5	1922	101	102
Birmingham, Knoxville & Allentown Tract. Co	.....	.....	.....	6	.....	.....	.....
Suburban Rapid Transit	.....	.....	.....	6	.....	.....	.....
Fort Pitt Incline Plane Co	1881	30,000	.....	6	1901	.....	.....
Mount Oliver Incline Plane Co	1871	44,500	M. & N.	6	1901	.....	.....
Penn Incl'e Plane Co. 1st Mort	1883	125,000	.....	6	1903	.....	.....
Monongahela Incl'e Plane Co.	1887	50,000	A. & O.	5	1897	.....	.....
Pittsburgh Incline Co	1889	200,000	J. & J.	6	1910–19	.....	.....

PROVIDENCE STOCKS AND BONDS.—Corrected by Chace & Butts Bankers, Providence, Sept. 18.

Company	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
United Traction & Electric Co.	100	.....	.....	...	.....	.....	.....
BONDS.	**Date of Issue**	**Amo'nt Out-stand'g**	**Inter-est Paid.**	**%**	**Principal Due.**	**Bid.**	**Ask'd**
United Traction & Electric Co.	1893	8,000,000	M & S	5	1993	95	100
Newport St. Ry. Co	.....	50,000	J & D	5	1910	100	.....

ROCHESTER, BUFFALO, PATERSON, COLUMBUS, WORCESTER AND BOSTON STOCKS AND BONDS.—Corrected by E. W. Clark & Co., 139 So. Fourth St. (Bullitt Building), Philadelphia, Sept. 18.

Company.	Par.	Capital.	Period.	% last div	Date of Issue.	Bid	Ask'd
STOCKS.							
Rochester (N.Y.) Ry	100	5,000,000	.....	...	1890	27	30
Buffalo (N.Y.) Ry	100	6,000,000	.....	...	1891	58	60
Paterson (N. J.) Ry	100	1,250,000	.....	...	1891	12	18
Columbus (O.) St. Ry	100	3,000,000	Q.—F.	1	1892	38	40
North Shore Traction Co. (Boston) Pref	100	2,000,000	A.—O.	6	1892	70	75
do do Common	100	4,000,000	.....	...	1892	19½	20
Worcester Traction Co. Pref	100	2,000,000	F.—A.	6	1892	75	80
do do Common	100	3,000,000	.....	...	1892	14	18
Consol. Trac. Co. (N. J.)	100	.....	.....	...	1893	36	38
BONDS.	**Date of Issue**	**Amount Out-standing.**	**Inter-est Paid.**	**%**	**Principal Due.**	**Bid**	**Ask'd**
Rochester (N.Y.) Ry	1890	3,000,000	A & O	5	1930	98	99
Buffalo (N.Y.) Ry	1891	5,000,000	F & A	5	1931	100	102
Paterson (N. J.) Ry	1891	850,000	J & D	6	1931	90	95
Newark (N. J.) Pass. Ry	1890	6,000,000	J & J	5	1930	97	98
Columbus (O.) St. Ry	1892	2,600,000	J & J	5	1932	91	95
Consol. Trac. Co. (N. J.)	1893	.....	J & D	5	1933	86	88

SAN FRANCISCO STOCKS AND BONDS.—Corrected by Philip Barth Broker, 440 California Street, San Francisco, Cal., Sept. 12.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
California St. Cable Co	100	1,000,000	Monthly	...	.....	.....	100
Geary St., Park & Ocean R. R. Co	100	1,000,000	Monthly	...	.....	.....	102
Market Street Cable Co	.....	18,750,000	.....	...	.....	37½	38
Metropolitan Electric	.....	1,000,000	Monthly	...	.....	.....	35
Oakland, S. L. & Haywards	.....	.....	.....	...	.....	.....	100
Presidio & Ferries R. R. Co	100	1,000,000	.....	...	.....	15	20
Sutter St. R. R. Co	.....	2,000,000	Quart'ly	...	.....	90	.....
Bonds.	**Date of Issue**	**Am't Out-stand-ing.**	**Interest Paid.**	**%**	**Principal Due.**	**Bid.**	**Ask'd**
Cal. St. Cable R. R.	.....	.....	J. & J.	5	.....	105½	.....
Ferries & Cliff House	.....	650,000	M. & S.	6	1914	.....	107
Geary St., Park & Ocean	.....	671,000	A. & O.	5	.....	105¼	.....
Market Street Cable Co	.....	3,000,000	J. & J.	6	1913	117¾	119½
Omnibus Cable Co	.....	2,000,000	A. & O.	6	1918	.....	117¾
Park & Ocean R. R.	.....	250,000	J. & J.	6	1914	112	.....
Park & Cliff House R. R.	.....	350,000	J. & J.	6	.....	.....	99
Powell Street R. R.	.....	700,000	M. & S.	6	1912	107½	.....
Sutter St. Cable Co	.....	900,000	M. & N.	5	.....	106	.....

ST. LOUIS STOCKS AND BONDS.—Corrected by James Campbell, Broker, Rialto Building, 218 N. 4th St., Sept. 19. Stock quotations are prices per share.

Company.	Par.	Capital Issued.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Cass Ave. & Fair Grounds	100	2,500,000	.....	...	1876	58	60
Citizens'	100	1,500,000	Oct. '93	4	1887	80	85
Jefferson Avenue	100	112,000	Dec. '88	2	1885	125	135
Lindell	100	2,500,000	.....	...	1890	99½	101
Missouri	100	2,000,000	Q.—J.	2	1891	200	210
People's	50	1,000,000	Dec. '89	50c	1889	20	25
St. Louis	100	2,000,000	J. & J.	3½	1890	147	149
Fourth Street & Arsenal	50	150,000	.....	...	1872	5	10
Union Depot	100	4,000,000	Jan. '94	8	1890	150	200
St. Louis & Suburban	100	2,500,000	.....	...	1891	17	19
Southern, Pfd	.....	800,000	Jan. '94	3	.....	80	85
" Com	.....	700,000	.....	...	.....	15	25
BONDS.	**Date of Issue**	**Amount Out-stand-ing.**	**Inter-est Paid.**	**%**	**Principal Due.**	**Bid.**	**Ask'd**
Cass Avenue & Fair Ground	1892	1,800,000	J. & J.	5	1912	98	100
Citizens' Cable	1887	1,500,000	J. & J.	6	1907	105	107
Fourth St. & Arsenal	1888	50,000	J. & J.	6	1898–1903	98	100
Lindell	1890	1,500,000	J. & J.	5	1895–1910	101	102½
Missouri Cable	1887	500,000	M. & S.	6	1907	100	102
People's 1st mort	1882	125,000	J. & D.	6	1902	99	100
" 2d mort	1886	75,000	M. & N.	7	1902	100	102
People's Cable	1889	800,000	J. & J.	6	1889–1914	90	95
St. Louis Cable	1890	1,500,000	M. & N.	5	1900–1910	101	103
Union Depot	1890	4,000,000	A. & O.	6	1900–1910	104	105
Southern	1884	200,000	M. & N.	6	1904	103	105
Southern	1889	300,000	M. & N.	6	1909	100	104
St. Louis & Suburban	1891	1,400,000	F. & A.	5	1921	84	86
St. Louis & Suburban (Incomes)	1891	300,000	.....	6	.....	70	80

WASHINGTON STOCKS AND BONDS.—Corrected by Crane, Parris & Co., Bankers, 1344 F Street, N.W., Washington, D. C., Sept. 21. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Wash'ton & Georgetown R.R.	50	500,000	Q. F.	5	1863	285	300
Metropolitan R. R.	50	750,000	Q. J.	2	1864	90	100
Columbia R. R.	50	400,000	Q. M.	1	1870	60	65
Belt R.R.	50	500,000	Q. J.	...	1875	...	40
Eckington & Soldiers' Home.	50	352,000	.....	...	.....	30	40
Georgetown & Tenallytown	50	200,000	.....	...	.....	.....	85
BONDS.	**Date of Issue**	**Amount Out-standing.**	**Inter-est Paid.**	**%**	**Principal Due.**	**Bid.**	**Ask'd**
Wash'tn & Geo'tn conv't. 1st.	'83–'99	3,000,000	J. & J.	6	1899-1929	132	135
" " " 2d.	.....	500,000	J. & J.	6	1903–1943	132	135
Eckington & Soldiers' Home.	.....	150,000	J. & D.	6	1896-1911	100	102
Belt	1921	240,000	J. & J.	6	1921	80	85
Metropolitan R. R. convert.	1901	200,000	J. & J.	5	1901	100	102

Financial.

THE petition for a receiver for the Savannah (Ga.) Electric Railway has been denied by Judge Falligant, of the Superior Court of Georgia.

$ $ $

THE directors of the Baltimore City Passenger Railway Company have voted to declare dividends semi-annually, instead of quarterly as heretofore.

THE Lynn & Boston Railway Company has petitioned for the right to issue $5,500,000, 5 per cent. bonds, for the purpose of consolidating all the bonded indebtedness of the corporation.

$ $ $

THE Brockton (Mass.) Street Railway Company has applied for permission to increase its stock to the amount of $289,000, and to issue $750,000 bonds, for the purpose of securing absolute control of the leased lines now operated by it.

$ $ $

THE receipts of the Baltimore Traction Company for the first twelve days in September were $36,650, against $32,700 for the same period last year. This is an increase of about $325 per diem. It was estimated that the earnings for the month of September will show an increase of $10,000.

$ $ $

JOHN E. KRAFT, of Kingston, N. Y., and Arthur E. Walradt have been appointed receivers of the Colonial Electric Railway Company, by Judge Alton B. Parker. The Colonial Electric Railway is one of the projects of Goodwin & Swift, of New York City, who recently made an assignment to Mr. Walradt, of New York.

$ $ $

THE following is a comparative statement of the operations of the Scranton Traction Company for the month of July: Gross earnings, 1894, $25,036.31; 1893, $23,058.37; increase, $1,977.94. Operating expenses, 1894, $13,664.38; 1893, $11,921.77; increase, $1,742.61. Net earnings, 1894, $11,371.93; 1893, $11,136.60; increase, $235.33.

$ $ $

THE following is a comparative statement of the operations of the North Shore Traction Company for the month of July: Gross earnings, 1894, $159,720.71; 1893, $160,714.63; decrease $993.92. Operating expenses, 1894, $74,596.34; 1893, $71,399.90; increase, $3,196.44. Net earnings, 1894, $85,124.37; 1893, $89,314.73; decrease, $4,190.36. For the ten months ending July 31, 1894: Gross earnings, 1894, $962,040; 1893, $926,890; increase, $35,150. Operating expenses, 1894, $613,543; 1893, $679,294; decrease, $65,751. Net earnings, 1894, $348,497; 1893, $247,596; increase, $100,901.

$ $ $

THE following is a comparative statement of the operations of the Worcester Traction Company for the month of August: Gross earnings, 1894, $33,628.05; 1893, $28,375.71; increase, $5,252.34. Operating expenses, 1894, $17,602.58; 1893, $28,688.47; decrease, $11,085.89. Net earnings, 1894, $16,025.47; loss, 1893, $312.76; increase, $16,338.23. For the eleven months ending August 31: Gross earnings, 1894, $318,797.53; 1893, $308,518.42; increase, $10,279.11. Operating expenses, 1894, $211,609.41; 1893, $239,878.44; decrease, $28,269.03. Net earnings, 1894, $107,188.12; 1893, $68,639.98; increase, $38,548.14.

$ $ $

THE following is a comparative statement of the operations of the Columbus (O.) Street Railway Company for the month of August: Gross earnings, 1894, $46,593.23; 1893, $49,045.13; decrease, $2,451.90. Operating expenses, 1894, $23,106.25; 1893, $26,606.38; decrease, $3,500.13 Net earnings, 1894, $23,486.98; 1893, $22,438.75; increase, $1,048.23. For the eight months ending August 31, the company reports: Gross earnings, 1894, $362,153.25; 1893, $359,491.17; increase, $2,662.08. Operating expenses, 1894, $174,307.18; 1893, $225,899.86; decrease, $51,592.68. Net earnings, 1894, $187,846.07; 1893, $133,591.31; increase, $54,254.76.

Issue of Trust Notes by the Brooklyn Heights Railway Company.

Owing to the expense of changes from horse to electric power of the Brooklyn City Railway, the Brooklyn Heights Railway Company, lessees of the Brooklyn City Railway, some weeks ago proposed to issue trust notes to the amount of $3,000,000, and these were to be sold at a discount of 15 to 20 per cent., making a total discount of about $450,000. Those who opposed the issuing of these notes contended that the discount was excessive, and Counselor James C. Church was engaged to draw up papers in an action to restrain the issue of $3,000,000 collateral trust notes by the Brooklyn Heights Railroad Company, and to have the company enjoined from disposing of the notes.

The company became aware of this move and resolved to defeat it, and before action was brought found a market for the notes with the New York Guaranty & Indemnity Company. This company took the whole amount, and its action of course upset the injunction proceedings.

The Atlanta Convention

Promises to be largely attended by Chicago and Northwestern members and friends. The Monon Route has made arrangements to sell tickets, giving members a choice of routes, via Cincinnati and the Queen & Crescent Route, passing through the Blue Grass regions of Kentucky and Lookout Mountain, or via. Louisville and the Louisville & Nashville Railway, affording an opportunity of exploring the wonders of the Mammoth Cave, and passing through Nashville, the capital and largest city of Tennessee. Every convenience will be offered members to make the trip an enjoyable one. Detailed information regarding routes, time of train, tickets and sleeping car accommodations will be cheerfully given by calling on or addressing City Ticket Office, the Monon Route, 252 Clark Street, Chicago.***

Norfolk & Western Railroad Company.

Shenandoah Valley Route.

The Royal Blue Line & Shenandoah Valley Route will run a special train to the Atlanta Convention of the American Street Railway Association, leaving New York, October 15, 1894, at 3 P. M., and reaching Atlanta at 6 P. M. the next day.

This train will carry the representative men in the street railway and supply business. Among those who have declared their intention of going on this special train are the following named gentlemen:

Benj. Norton, president Atlantic Avenue Railroad Company.
Jas. H. McGraw, Street Railway Journal.
E. Peckham, Peckham Motor Truck & Wheel Company.
Henry C. Payne, president American Street Railway Association.
P. C. Ackerman, American Electric Company.
T. E. Crossman, assistant to secretary American Street Railway Association.
E. Martin, vice-president Hamilton Street Railway Company.
C. O. Baker, Complete Electric Construction Company.
Wm. J. Richardson, secretary American Street Railway Association.
Lewis Perrine, Jr., president Trenton Passenger Railway Company, Trenton, N. J.
E. J. Wessels, Gennett Air Brake Company.
Geo. F. Porter, secretary National Electric Light Association.
J. B. Griffith, manager Hamilton Street Railway Company.
W. J. Clark, General Electric Company.
Wm. W. Cole, superintendent West Side Railroad Company, Elmira, N. Y.
H. E. Evans, The Johnson Company.
J. H. Woodward, Benedict & Burnham Manufacturing Company, Waterbury, Conn., and a number of others.

A special car will be reserved for gentlemen accompanied by ladies.

As the time is fast approaching when final arrangements should be made by those going to Atlanta, we would be glad to have your order to reserve accommodations for your party on this train.

The railroad fare will be the usual for such occasions, namely, one and a third fare for the round trip on the certificate plan, one fare going and one-third of regular rate returning.

The sleeping car fare will be the regular fare in each direction, or $6.00 a berth, New York to Atlanta; $5.50, Philadelphia to Atlanta; $4.50, Baltimore to Atlanta; $4.00, Washington to Atlanta; and double these figures for sections. Remittance for the going trip from New York, including sleeping car accommodations, one berth and meals is $34.00; from Philadelphia, $31.00; from Baltimore, $26.20; from Washington, $24.50.

If you are going, I will be pleased to receive your check at as early a date as suits your pleasure. Should you find later that you cannot go, money will be refunded on due notice.

Yours truly,
L. J. Ellis, Eastern Passenger Agent.

The Lake Shore Route.

The Lake Shore Route, between Buffalo and Chicago, is celebrated all over the world as affording the embodiment of luxury in travel. Its new Day Coaches are sixty feet in length, and will seat fifty-eight people, comfortably. They are fitted with the Gould platform and automatic coupler, Westinghouse air brakes and signal, heated with steam taken from the locomotive, and at night are brilliantly lighted with Pintsch gas, for which purpose five elegant bronze chandeliers depend from the roof of the car.

The interior of the coaches is finished in mahogany, highly polished and paneled. Each coach has a nice lavatory and toilet. The latest models contain separate toilet rooms—one for ladies and one for gentlemen. The car seats are of the style known as the Mason tilting, with high, spring backs and broad seats. They are richly upholstered in crimson plush. The windows, which are of plate glass, are large, and each is fitted with a spring-roller curtain, in shade to blend with the interior finish, and every feature is of the best.

The Lake Shore operates a most perfect sleeping car service between the cities of Chicago, Cleveland, Buffalo, New York and Boston, in connection with the New York Central and Boston & Albany Railways. This is not only the direct, best and only double track route between the cities mentioned, but the Lake Shore is the only line from Chicago conveying passengers into New York City without a ferry transfer.***