
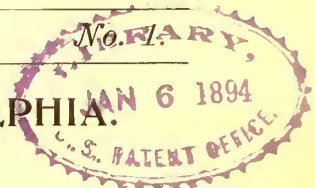


THE STREET RAILWAY JOURNAL



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ELECTRIC RAILWAY CONSTRUCTION IN PHILADELPHIA.

The long fight between the advocates of rapid transit and the city authorities in Philadelphia, to secure the right, on the part of the street railway companies, to employ electricity as a motive power for their cars, is of so recent a date as to be still fresh in the minds of our readers. In Philadelphia, perhaps, more than in most cities, the needs of rapid transit were exceedingly pressing, and the old horse car had outlived its usefulness. In that city, however, the advocates of improvement in street car methods, as in other cities, found a considerable portion of the community ignorant of the features of the system which it was proposed to install, and opposed to any change. This class, by petitions and otherwise, brought

systems controlled by the following companies: The Philadelphia Traction Company, the Electric Traction Company, the People's Traction Company and the Hestonville, Mantua & Fairmount Passenger Railway Company.

The construction now being carried on by each company is very interesting, and a general review of the work installed or under contemplation by each company will be found below.

THE PHILADELPHIA TRACTION COMPANY.

The Philadelphia Traction Company has progressed farther in the equipment of its system with electric power



FIG. 1.—EXTERIOR OF 13TH STREET STATION—PHILADELPHIA TRACTION CO., PHILADELPHIA, PA.

a considerable pressure to bear against the permission for any change in the methods employed to operate cars, and it was only after a long time that the necessary rights were finally secured. When the overhead franchises were granted, however, steps were immediately taken by the different street railway companies to install electric cars, and during the summer and fall a great deal of work in this direction has been carried on.

A number of consolidations and leases among the street railway companies have been effected recently, so that all the lines of that city can now be divided into four

than any of the others. This company operates thirty-four miles of cable road in Philadelphia, and it is its horse lines which are now being equipped with electric power. The sub companies controlled by this company are: The Seventeenth & Nineteenth Streets Passenger Railway Company; the Thirteenth & Fifteenth Streets Passenger Railway Company; the Union Passenger Railway Company; the West Philadelphia Passenger Railway Company; the Philadelphia & Gray's Ferry Passenger Railroad Company; the Ridge Avenue Passenger Railway Company; the Empire Passenger Railway Company,

the Schuylkill River Passenger Railway Company; the Continental Passenger Railway Company; the Catharine & Bainbridge Passenger Railway Company; the Philadelphia City Passenger Railway Company; the Philadelphia & Darby Railway Company, and the Twenty-second Street & Allegheny Avenue Passenger Railway Company.

The officers of the Philadelphia Traction Company are: President, P. A. B. Widener; first vice-president, W. L. Elkins; second vice-president, George D. Widener; treasurer, D. W. Dixon; general manager, J. T. Gorman. The chief engineer of the company is F. W. Darlington.

Power Stations:—This company has now in operation, or is about to install in the immediate future, three power

completed, will consist of twenty Babcock & Wilcox boilers of 375 H. P. each, arranged in two parallel rows, with a central passageway twenty feet three inches in width. As shown in the cross section, the coal for fuel is dumped, on the Andress Street side of the station, directly into vaults provided for the purpose. It is then carried by mechanical conveyors through an elevator shaft, provided for the purpose, to the top of the building whence it descends by chutes. The coal conveyors for hoisting the coal to the top of the building, are supplied by the Link Belt Company, and consist of 7 × 14 in. buckets located every eighteen inches on an endless chain. The ashes descend into ash tunnels, one located under each row of boilers, whence they are removed by a similar system of

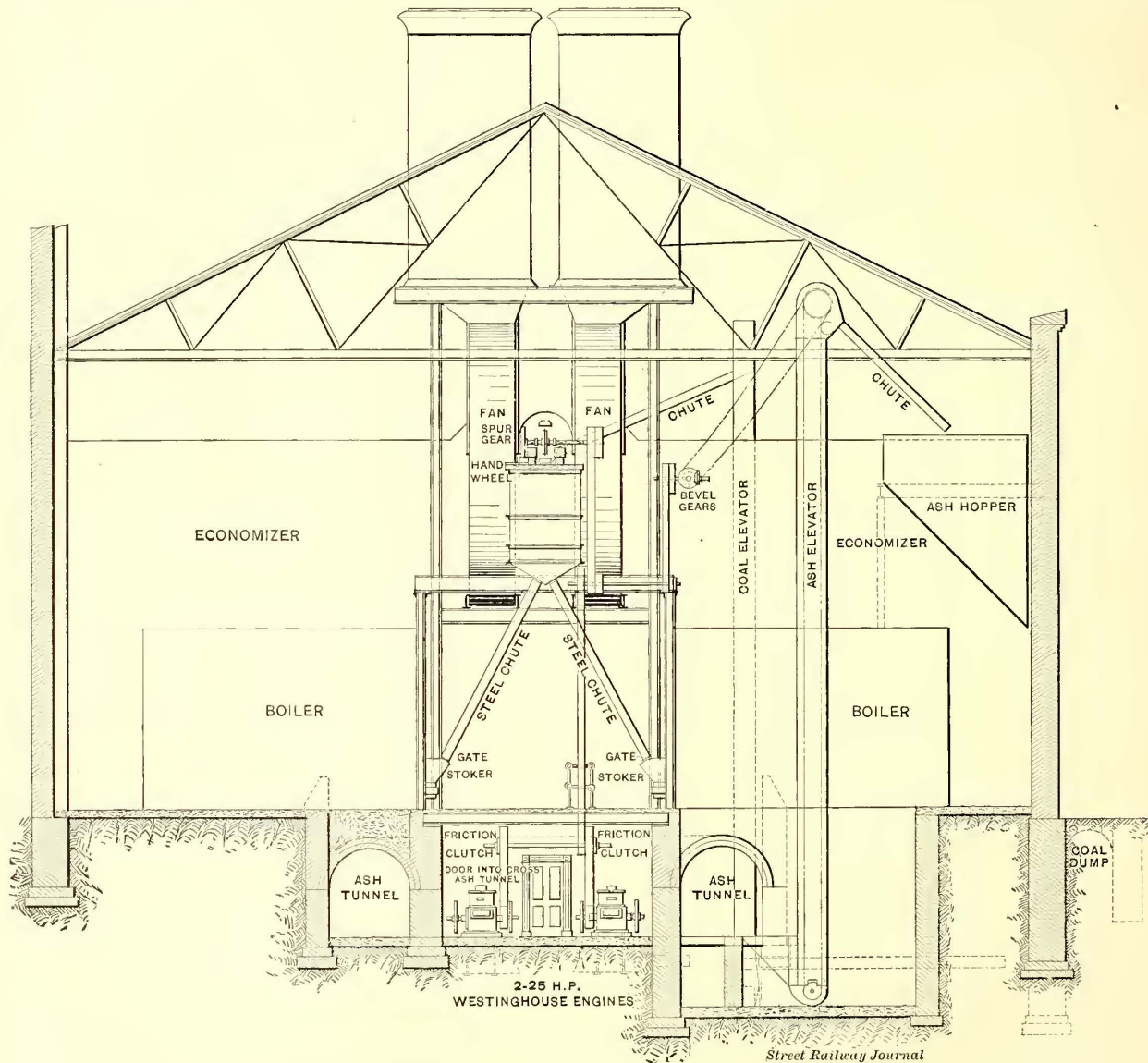


FIG. 2.—CROSS SECTION OF BOILER ROOM—13TH STREET POWER STATION OF PHILADELPHIA TRACTION CO.

stations, of 10,000, 7,500 and 3,000 H. P. ultimate capacity each, and located, respectively, at the corners of 13th Street and Mount Vernon Avenue, 33d Street and Market Street, and Southerland Avenue and Kansas Street. A view of the first mentioned station is given in Fig. 1. This station is of brick, with brownstone trimmings, and occupies an area of $171\frac{1}{2} \times 186$ ft. At present about one-third of the equipment has been installed, and this is now employed in furnishing power for the Thirteenth & Fifteenth Streets line. On January 1, it was hoped that the Twelfth & Sixteenth Streets line would be in operation from this station.

The power house is composed of two buildings separated by a wall two feet in thickness, and is fireproof throughout. The arrangement of the boiler room is shown by the two diagrams (Figs. 2 and 3) which are, respectively, the cross and longitudinal sections of this portion of the station. The boiler equipment, when

mechanical conveyors on the ash hopper, shown in Fig. 2, from which point they can be removed.

Below the coal storage vaults, which are located under the boilers, as shown in Fig. 3, are two water tanks. These will contain the feedwater, which will be supplied by an artesian well, now being sunk for the purpose. Connection will also be made with the city mains for taking water from this source if necessary. The equipment of the boiler room also includes Chapman valves and Stratton separators. Four Goubert heaters of 2,000 H. P. each will be used.

An especially interesting feature of the plant is the forced mechanical draft system which was installed by Westinghouse, Church, Kerr & Co., and by means of which the necessity of the erection of large and costly stacks has been avoided. The system of forced draft in use here is the most extensive ever installed. The waste gases after leaving the boilers impart the greater part

of their heat to the feedwater by being passed through the economizers. These are of the Green type, manufactured by the Fuel Economizer Company, of Matteawan, N. Y., and are located in the center of the boiler room, on each side of the stack. Just beyond the economizers the smoke flues, which are two in number, contain two Sturtevant fans, one for each flue, which are driven by independent Westinghouse engines. These force the gases up the two iron stacks (see Fig. 2) which are ten feet six inches in diameter and only twenty-seven feet in height. The gases are so cooled during their passage through the economizers as not to burn the blades of the fan. The operation on so large a scale of the forced draft principle, as installed at this station, will be watched with interest by all steam users.

The engine room is well lighted and well ventilated, and measures 158 x 98 ft. An interior view of this room,

of the girders at the point of attachment to the end trucks, consequently it is extremely well adapted for such a long span.

The bridge is provided with steel tired wheels twenty-eight and a half inches in diameter, double flanged, operated by gearing at each end of the bridge, the two trains being joined by a squaring shaft to insure simultaneous action. Hand chains and sprocket wheels are provided at each end of the bridge for the bridge travel.

The trolley is operated by a hand chain operating a pinion gearing into two spur wheels attached to the truck wheels. The trolley is provided with a swivel clevis and a ten ton hoisting block, and the load is automatically sustained at all points by the patent retaining device of the makers of the crane. The length of the runway is about 145 ft.

A crane similar in arrangement, and of the same

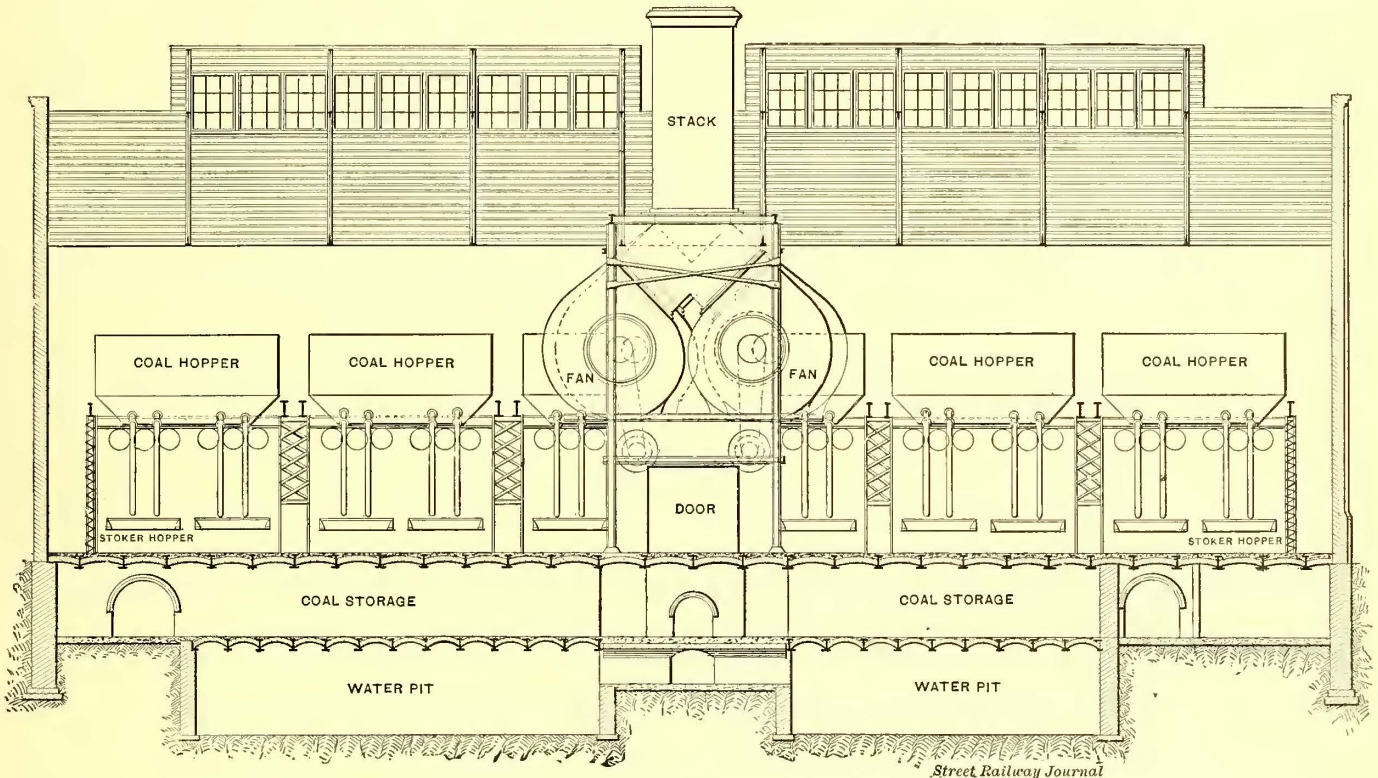


FIG 3.—LONGITUDINAL SECTION OF BOILER ROOM—13TH STREET STATION OF PHILADELPHIA TRACTION CO.

with the four compound engines, which are at present in place, is given in Fig. 6. The engines were manufactured by the Westinghouse Machine Company, and furnished by Westinghouse, Church, Kerr & Company, and are of a rated horse power of 600 H. P. each. There is room provided for the installation of twenty of these engines before the capacity of the engine room is reached. The cylinder dimensions of these engines are 23 and 40 x 20 ins., and each is direct connected to a No. 6 Westinghouse M. P. generator, having an output of 746 amperes at 500 volts. The equipment of the engine room also includes a Sellers hand crane.

This crane has a span of ninety-nine feet one inch from center to center of the carrying wheels, and is fully capable for a load of ten tons. The bridge consists of two plate girders, each five feet six inches deep, and of equal depth throughout their length. They are connected together at the top by heavy horizontal and diagonal cross braces and by plates at the ends, thus forming a compound girder of great lateral stiffness in proportion to its weight. On the inner side of each girder, near the bottom, is placed a T rail, upon which the trolley wheels run, these rails being carried on shelf angles forming a portion of the lower flange of the girders. The eccentric load is met by diagonal struts on the outside, connecting the lower flange of the girders with the cross braces on top. The hoisting trolley runs upon these rails entirely within the bridge, and the whole arrangement insures freedom from vibration, and prevents any danger from the racking

capacity, but for a span of eighty feet from center to center of the carrying wheels, was built by the same makers for the power house of the Philadelphia Traction Company, at 33d and Market Streets, Philadelphia. Both cranes work very satisfactorily.

At the southwestern end of the building is a handsome double decked switchboard. This, when completed, will be in the form of an L whose sides measure sixty-five and thirty-three feet, giving a total length of ninety-eight feet of board on each deck. The portion of the board already in place is shown in Fig. 5. The board has an iron framework, and the instruments are mounted on slate. The equipment includes Weston and Westinghouse appliances, lightning arresters, meters and other switchboard appliances. The switches used are of the Hill type. The upper deck of the switchboard, which is devoted entirely to the feeder connections, is set sufficiently back of the lower deck to afford a commodious passageway, or platform, in front of the appliances. The edge of this is protected by a handsome brass railing, giving a very handsome appearance to the board. The lower part of the board is devoted to both feeder and generator connections. The panel system has been adopted, and each panel contains the connection for two feeders or one generator. The board is some distance from the wall of the station, making all connections most easy of access.

South of the engine room are located the engineers' offices, men's reading room, store room and the electrical

testing room. The latter, a view of which is given in Fig. 4, has been constructed with a care unusual in railway power station construction, and forms a very interesting feature of the plant. The system of feeders in use necessitated the having of facilities for making careful electrical tests of insulation resistance, etc., and all the apparatus necessary for use is contained in the testing room. In the center is a table, 10 × 4 ft., for supporting the instruments. This table consists of a single slab of stone mounted on a solid brick pier carried down to solid rock and entirely disconnected from any of the walls of the power station building. In this way any of the vibrations of the building from the operation of the machinery will not be communicated to the supports of the instruments. The room is also protected from all external magnetic induction by being completely lined with corrugated iron. The instruments in use include all those necessary for careful insulation tests, including latest types of bridges, galvanometers, etc., all of which were supplied by Queen & Company, of Philadelphia.

The Line.—The feeder system adopted throughout all the lines in Philadelphia, except on the outskirts of the city, is underground, and a good idea of the immensity of the system can be appreciated when it is stated that the Thirteenth & Fifteenth Streets line alone, forming a small part of the entire system, required about 70,000 ft. of cable. The cables adopted by the Philadelphia Traction Company were manufactured by the Standard Underground Cable Company, of Pittsburgh, Pa., and run in size from 211,600 to 850,000 circular mills. The center of the cable is of stranded lake copper. This is surrounded by an insulating material saturated with Ozite, this in turn being surrounded by a layer of lead. Outside is a fibrous jacket saturated with the Standard Underground Cable Company's anti-corrosive compound, as a protection against chemical action and mechanical injury. The insulation resistance maintained is 1,500 megohms per mile.

The cables have all been placed in conduits, principally of the National type, manufactured by the National Conduit Manufacturing Company, of New York, and consisting of cement lined, wrought iron tubes. On part of the underground feeder system, the Wickoff wooden tubes, made at Williamsport, Pa., are employed, instead of the

per conductor for the return. This is for the most part of 1,000,000 circular mills.

The trolley wire, which was supplied by J. A. Roeb-



FIG. 5.—SWITCHBOARD—13TH STREET POWER STATION OF PHILADELPHIA TRACTION CO.

ling's Sons Company, of Trenton, N. J., is No. 0, B & S hard drawn copper. This is supported by a No. 3 B & S silicon bronze wire. Both the guard wires and the trolley wires are anchored with diamond guys every 1,000 ft., and the guard wires in addition to this are put up in insulated sections of 2,500 ft. All of the line appliances are of the H. W. Johns Company's type.

The poles are supplied by Morris, Tasker & Company. Almost every maker in the country submitted designs, but before a decision was arrived at a test was made of some of the leading makes. After this, without exception, the contracts were awarded to Morris, Tasker & Company, of Philadelphia. Some cases there were in which the contract was placed with them without the formality of asking bids from other manufacturers. From New Castle, Del., where its plant, with a daily capacity of 240 poles, is located, this firm has, within the past seven months, delivered upwards of 10,000 poles to Philadelphia and vicinity, while present prospects indicate a still larger demand for 1894.

The type of pole adopted for most of the work in Philadelphia is Morris, Tasker & Company's "Philadelphia Standard," 28½ ft. long, made up of three sections of 7, 6, and 5 in., extra heavy pipe. This pole has stood successfully the severest tests and it has been practically demonstrated that it will stand without measurable permanent deflection a continued strain of 2,300 lbs. on the span wire. In its construction the makers use the swedged

telescopic joint.

The poles in Philadelphia, as a rule, have been set in a hole six and a half feet deep by twenty-two inches in diameter, the hole being filled in with a concrete of broken stone and cement. This combination of heavy pole and deep setting gives a staunchness and stability amply suf-

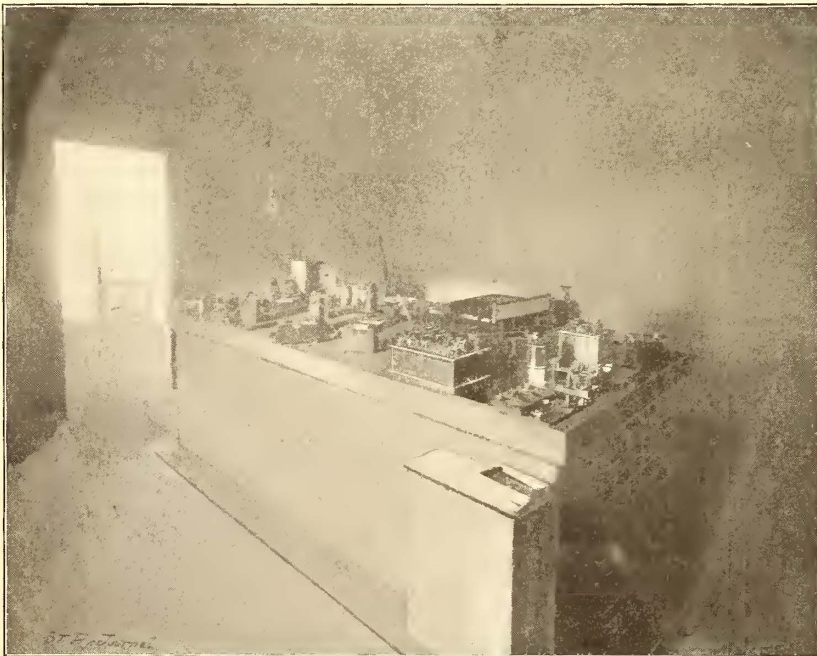


FIG. 4.—TESTING ROOM—13TH STREET POWER STATION OF PHILADELPHIA TRACTION CO.

National conduit. Junction boxes are located on an average of every 1,600 ft., and at such points the feeders are connected to the trolley wire. Manholes are placed at suitable distances to enable careful and efficient handling of the wires, and are equipped with cast iron covers and watertight plates. The conduits also contain a bare cop-

ficient to meet the most trying contingencies. No strain has yet developed any weakness or suggestion of inefficiency in either the pole or the setting. Many of the poles had to be set in deep subcellars, and other unlooked for complications were continually cropping up. For all these varying conditions special poles had to be made to surmount the difficulties presented. An innovation on what has been regarded as a precedent is the doing away with the familiar insulating cap at the pole top. The iron "petticoat casting" and wooden insulating plug, have been abandoned, and a wrought iron collar now supports the span wire with the insulation made in three places on the span wire.

The return circuit is made by connecting the ends of the rails with a No. 0, soft drawn, tinned copper wire. This is laced back and forth one and one-half times so as to present three times the conductivity of a single No. 0 wire. It is held in place in the rail by bonding chucks. The return is also supplemented by connecting the rails at intervals with the underground return consisting of bare copper wire already mentioned as being carried in the feeder conduits. To still further improve the return circuit, galvanized iron rods are driven down into the ground at every manhole, and connected with the return feeder already mentioned. In the suburban dis-

tributions, where the underground feeders are not used, an ordinary supplementary wire is employed.

For laying the conduit, the manufacturers of the conduit; for driving the galvanized iron rods, bonding and overhead system, Pepper & Register, of Philadelphia;

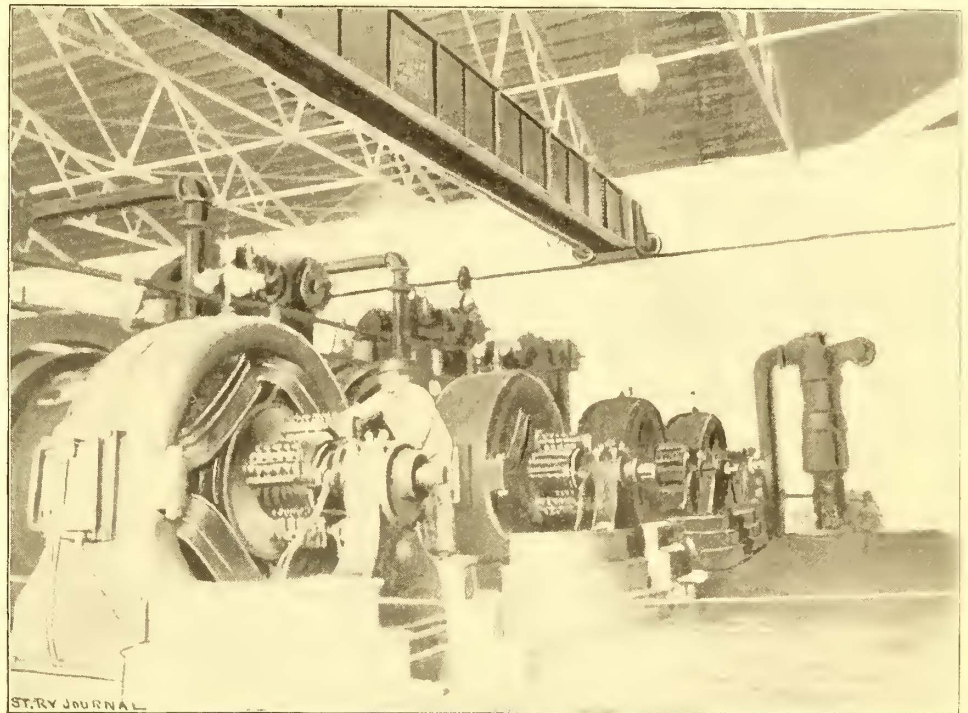


FIG. 6.—GENERATORS—13TH STREET STATION OF PHILADELPHIA TRACTION CO., PHILADELPHIA.

tributions, where the underground feeders are not used, an ordinary supplementary wire is employed. for all lines except the Twelfth & Sixteenth, Thirteenth & Fifteenth, Morris & Tasker and Gray's Ferry lines and the Long Lane extension. The greater part of the work on

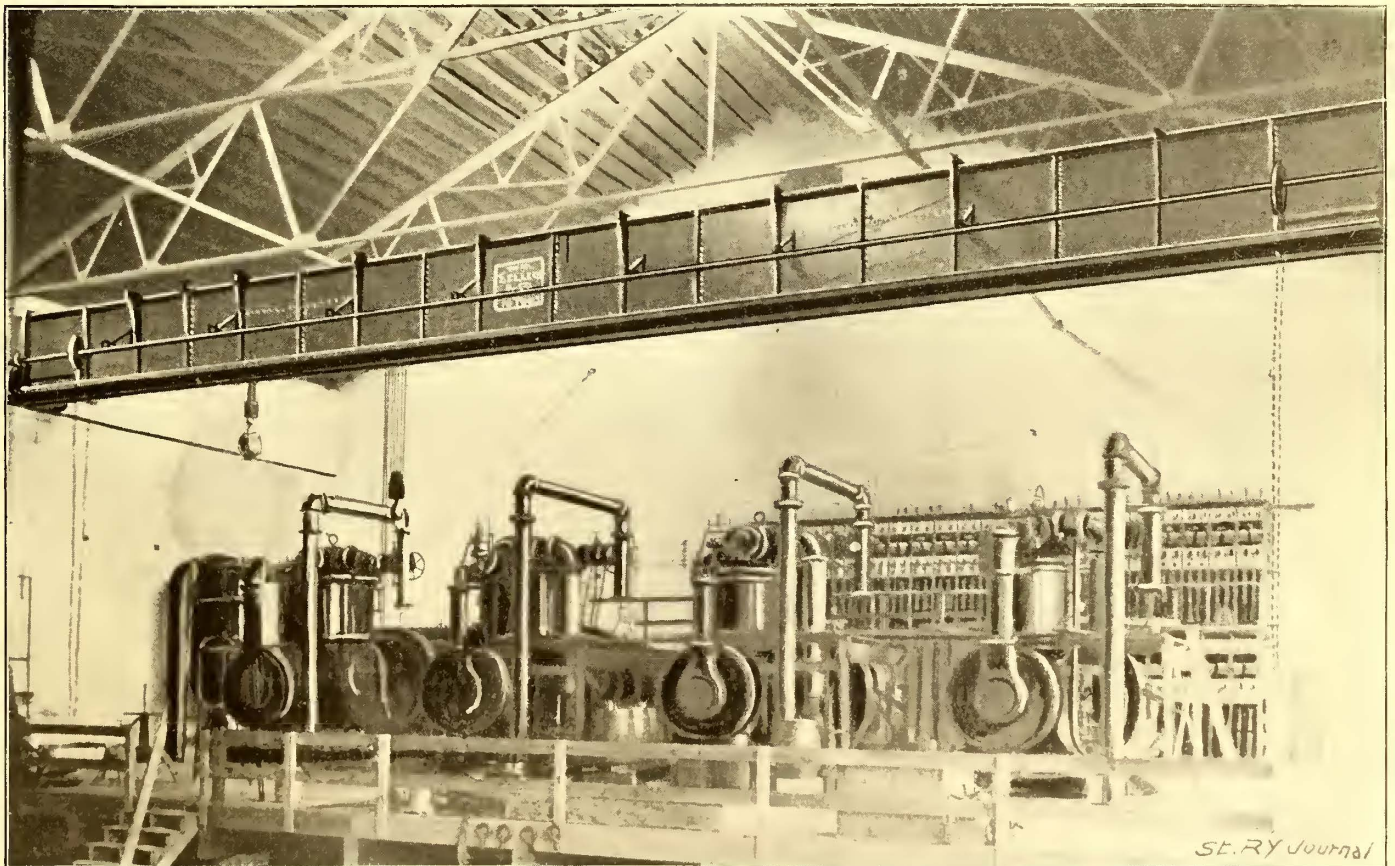


FIG. 7.—VIEW OF PART OF ENGINE ROOM—STATION OF PHILADELPHIA TRACTION CO, PHILADELPHIA.

tributions, where the underground feeders are not used, an ordinary supplementary wire is employed.

The contractors for the outside electrical construction

these lines was performed by Stern & Silverman, of Philadelphia, some of the work being done by the Field Engineering Company of New York. The mileage built by

Pepper & Register has been, up to date, about fifty miles, including the location and setting of about 4,000 poles, leaving nearly 100 miles yet to construct.

Fig. 8 gives a view of the feeder vaults at the 13th Street and Mount Vernon Avenue Station. All conduits lead to this vault which is fourteen feet high and quite commodious, occupying an L under the corner of the building at 13th Street and Mount Vernon Avenue. Junction boxes are placed in these vaults at the terminus of each conduit, and from these the cables are led directly to the switch-board.

Track.—The track construction adopted by the Traction Company is most substantial. The rail laid is a 90 lb., 9 inch girder with Philadelphia head, and was supplied by the following three manufacturers: Wm. Wharton, Jr., & Company, the Johnson Company, of Johnstown, Pa., and the Pennsylvania Steel Company, of Steelton, Pa. A section of the track at a tie rod is given in Fig. 11, and a section of the rail in Fig. 10. The ties are spaced three feet between centers, and on each tie are steel tie plates, $6 \times 10 \times \frac{3}{8}$ ins., with three $5 \times \frac{1}{2}$ ins. hookhead spikes to each plate at each tie. The joints are standard eight bolt joints, twenty-six inches long, with eight seven-eighths of an inch bolts and nuts and lock washers; tie rods are used, measuring $1\frac{1}{2} \times \frac{3}{8}$ ins., three-quarters of an inch round ends, and spaced every six feet. Under the ties, at each joint, is a longitudinal tie which takes in the joint tie and one on either side of it. This method of construction was installed last year on the Catharine & Bainbridge Streets line of the Philadelphia Traction Company, and has been most successful in preventing the rolling of the joint tie. Every joint on that road is to-day in as good shape as it was originally.

All the special work, except the steam railroad crossings, is of the Wharton patented "Integral" style, and in

pany include the erection of three stations altogether, the other two being at the corner of 33d and Market Streets and Southerland and Camden Streets, respectively. The plans for the former, which is to be of 7,500 H. P. capacity, have not yet been fully decided upon. The latter has now a capacity of 750 H. P., has been in operation for some time, and was described in our issue for November, 1892.

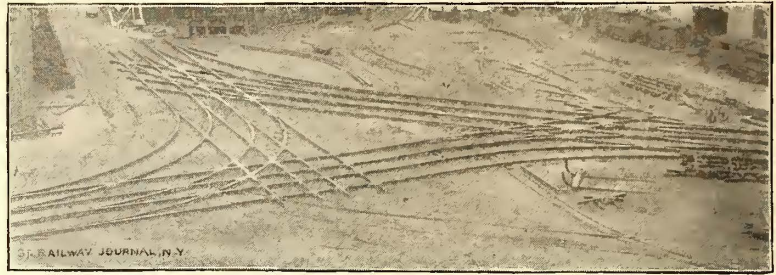


FIG. 9.—PIECE OF SPECIAL WORK—PHILADELPHIA TRACTION CO.

This station was installed by the Field Engineering Company, of New York. The engines are three in number, of 250 H. P. each, and were furnished by Robert Wetherill & Company, of Chester, Pa. They are of the horizontal Corliss type, and are belted each directly to three four pole Westinghouse railway generators which run at 525 revolutions per minute. The engine cylinders are twenty-two inches in diameter by forty-eight inches stroke.

The boiler equipment consists of six horizontal, return tubular boilers which are seventy-two inches in diameter and twenty feet long, and were supplied by Robert Wetherill & Company who were also the manufacturers of the feedwater heater which is of the water tube type. Monitor injectors, Snow duplex feed pumps, and Chapman valves are used. Arrangements have been made for increasing the capacity of the plant to 3,000 H. P., when necessary, with-



FIG. 8.—VIEW OF FEEDER VAULTS—13TH STREET STATION OF PHILADELPHIA TRACTION CO.

many places where switches were used for emergencies, the unbroken main line switch of the same manufacturers was used. The car house of the Fifteenth & Sixteenth Streets line, at Cumberland Street, contains over a mile of track alone, which is connected with the straight tracks by curves made of Wharton grooved, No. 6, eighty-six pound rail. All curves on the line are made of this rail. A piece of an interesting piece of special work is shown in Fig. 9.

Other Power Stations.—As has already been mentioned, the plans of the Philadelphia Traction Com-

pany include the erection of three stations altogether, the other two being at the corner of 33d and Market Streets and Southerland and Camden Streets, respectively.

Rolling Stock.—The Philadelphia Traction Company, some time ago, placed orders for cars with the Laclede Car Company, of St. Louis, and the J. G. Brill Company, of Philadelphia, for cars. The Laclede Company's order was for 300 cars, which will be used largely on the most recently equipped lines of the company. These cars (see Fig. 12) are eighteen feet inside and eighteen feet seven inches over corner posts, and twenty-six feet seven inches over platforms; they are equipped with auto-

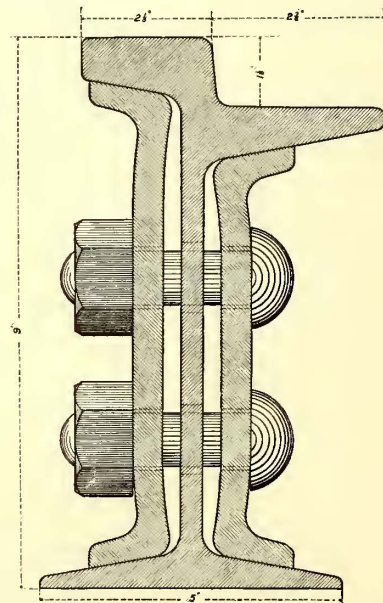


FIG. 10.—PHILADELPHIA NINE INCH RAIL.

matic double doors similar to those in use on the Broadway cable line of New York City, also built by the same company.

The interior of these cars presents a very handsome appearance, being finished throughout in natural cherry highly polished. The seats and backs are upholstered with

the R. D. Nuttall Company, of Allegheny, Pa., and are similar to the well known type manufactured by this company, though possessing a number of novel features necessary for the peculiar conditions to be met. The poles are rolled steel tubes, butt welded and tapered from a point about two-thirds above their base. They are perfectly smooth, and as they are rolled while cold, they are very stiff and their temper is uniform.

At one point of the line where the tracks run under a bridge, the trolley wire changes in height above the rails from twelve feet six inches to twenty-two feet within a length of eight feet, requiring the use of a pole tension which would respond to these abrupt changes, and yet not be excessive at any point. The base, which is of a special type, utilizes the well known Nuttall principle of compression springs with hinged poles and swiveling features similar to those of the standard Nuttall base. The standard is particularly novel and designed with reservoirs of oil, so as to avoid all possibility of oil and grease getting on the car roof. Tests with these poles, it is said, have shown a uniform upward pressure at all positions of the pole, from horizontal to practically perpendicular.

The Bemis truck used under these cars is of the type designed for service under twelve and twenty foot box

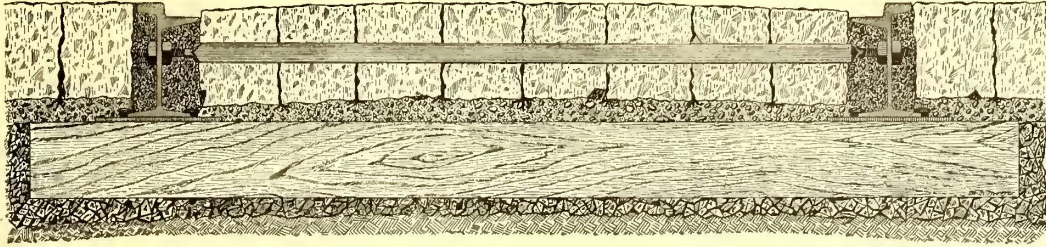


FIG. 11.—SECTION OF TRACK—PHILADELPHIA TRACTION CO.

curled hair and covered with crimson plush. The ceilings are of birdseye maple veneer very beautifully decorated. These, instead of being nailed in place, are secured by screws, with cherry mouldings secured in the same manner, thus facilitating their removal. The cars have six large windows on each side, are equipped with roomy platforms, and have two folding gates of the latest type on each platform, with standards running from the platforms to the hoods. The general design of the cars is graceful in outline, close attention having been paid to make all lines conform so as to produce a light and, at the same time, substantial appearance.

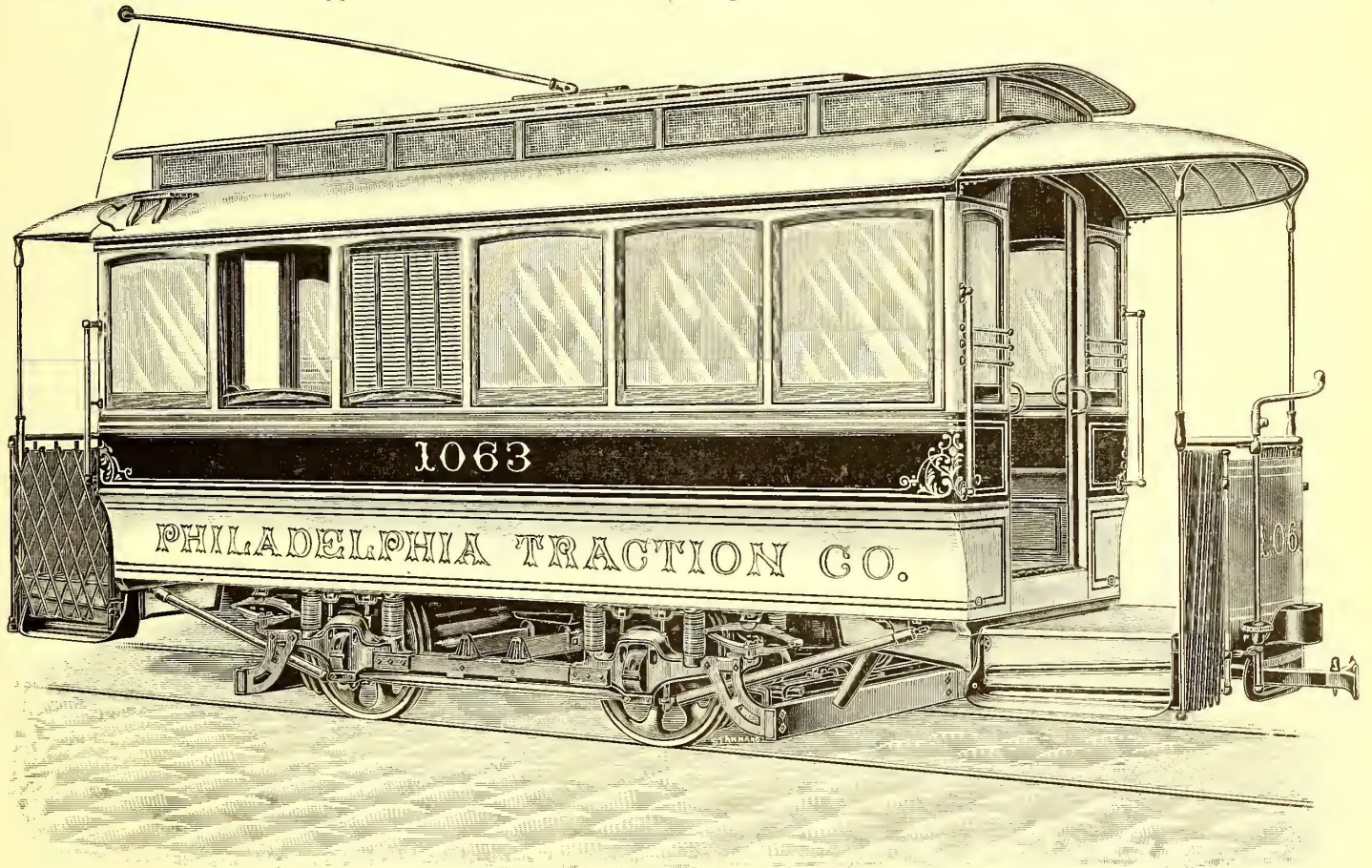


FIG. 12.—PHILADELPHIA TRACTION CO.'S CAR—LACLEDE CAR CO.

The open cars are twenty feet four inches long over corner posts, and twenty-eight feet four inches over platforms. The seats run longitudinally through the center of the car, with an aisle on each side. There are four doors, one at each corner. The inside finish is of natural cherry, with birdseye maple ceilings. The design is similar to the open cars built for the Duquesne Traction Company, of Pittsburgh. These cars will all be equipped with the Crawford fender. St. Louis registers are used.

The trolley poles used on these cars were supplied by

cars and long open cars. It has few parts, is light, strong and durable, and carries the car without undue end motion. It is equipped with a noiseless, powerful and quick acting brake, which is easily adjusted.

A view of the type of car furnished by the J. G. Brill Company, for the Catherine & Bainbridge Streets line is given in Fig. 13. These cars, which are very handsome, are sixteen feet long in body and six feet six inches at sill, and are finished on the inside with burl ash panels and decorated veneer ceilings. The seats are upholstered

with plush covered cushions, and the cars are mounted on Brill No. 21 independent, rigid motor trucks with six foot six inch wheel base, and thirty-three inch wheels. The platforms measure four feet from end panels to crown rails. The Brill gate and Brill patented ratchet brake handles are portions of the equipment. The cars, which the Brill company is now under contract with the Philadelphia Traction Company to deliver, are identically the same as the above, except that the length of the body will be eighteen feet.

Motors.—The electrical equipment for all of the cars was furnished by the Westinghouse Electric & Manufact-



FIG. 13.—PHILADELPHIA TRACTION CO.'S CAR—J. G. BRILL CO.

uring Company, of Pittsburgh, Pa. Each car is fitted with two Westinghouse single reduction motors, together with the controlling stands, switches, lighting arvester, fuse box, incandescent lamps and other parts which go to make up a complete equipment. The Westinghouse single reduction motor is so well known that an extended description of it is unnecessary. It may be said, however, that its reputation for reliability, strength and efficiency had an important bearing upon its selection by the Philadelphia Traction Company. An important feature of the Westinghouse motor, it will be remembered, is the manner in which the field is constructed in two halves, which are hinged to a frame. This arrangement secures the greatest accessibility, while the frame holds the armature shaft and the axle parallel, thereby assuring always an even meshing of the gears. The armature of the motor is of the drum type, and the winding of the armature is in the shape of lathe wound coils, each of which is wound and heavily insulated before being placed in the grooves in the core.

Paving.—In connection with its work of track laying, the Traction Company has done an immense amount of street paving, the performance of this work being part of the conditions under which its franchise was awarded. 12th, 13th, 15th and 16th Streets have been laid with asphalt from Cumberland to Spring Garden Streets; from Spring Garden to South Belgian blocks have been used, and from there down asphalt; Chestnut and Walnut Streets are practically finished as far as Broad Street, asphalt being adopted for these streets as far as 5th, and Belgian blocks from that point to the river. Ridge Avenue has been paved for almost its entire length with block, making, with other streets paved, a total of between forty and fifty miles of paving as the record for the year.

PEOPLE'S TRACTION COMPANY.

The People's Traction Company is a corporation recently formed, with J. Lowber Welch, president; C. Kruger, secretary and treasurer, and L. H. McIntire, chief engineer. This company controls, by ownership of stock, the People's Passenger Railway Company, with the following officers: President, H. C. Moore; secretary and treasurer, David C. Golden; general superintendent, J. C. Lugar. The Germantown Passenger Railway Company and the Green & Coates Railway Company are leased to the People's Passenger Railway Company.

The People's Traction Company, like the Philadelphia Traction Company, is now engaged in the installation of an extensive electric system. Its power station, which is a handsome brick structure, is now approaching completion, though all the equipment of engines, dynamos, etc., yet remains to be installed. It is located between Delaware Avenue and Beach Street near Fairmount Avenue, and its dimensions are 80 × 150 ft. It is two stories in height, the boilers being located on the second floor.

The arrangements for the receipt of fuel, etc., are very complete. The coal will be taken from directly across the street, where it is received from the railroad tracks, and will be transported direct from the cars by mechanical conveyors. It will be delivered by the conveyors into pockets close to the roof, whence the automatic stokers will receive their supply. The boilers are of the Babcock & Wilcox type, and are twelve in number.

The engine equipment will consist of three Reynolds-Corliss engines of 200 H. P. each. These are of the twin tandem compound condensing type, and will drive each a 2,000 H. P. General Electric generator located between the pairs of cylinders, and whose armature is mounted directly on the engine shaft. The condenser is one of Engineer McIntire's own design, and will be driven by an independent Corliss engine. The iron work of the station was supplied and put in place by the Phoenix Iron Works Company, of Meadville, Pa. The station will have two brick stacks, each 150 ft. in height.

The company intends the immediate equipment of fifty miles of track with electric power, one-half of which will probably be completed next spring, when the start with electric power will be made. The electric rolling stock will consist of 400 cars, the orders for which had not been placed by December 20.

The first lines to be put in operation will be the 4th and 8th Streets division, the Germantown division and the Girard Avenue division.

Track construction is going on rapidly, and on the

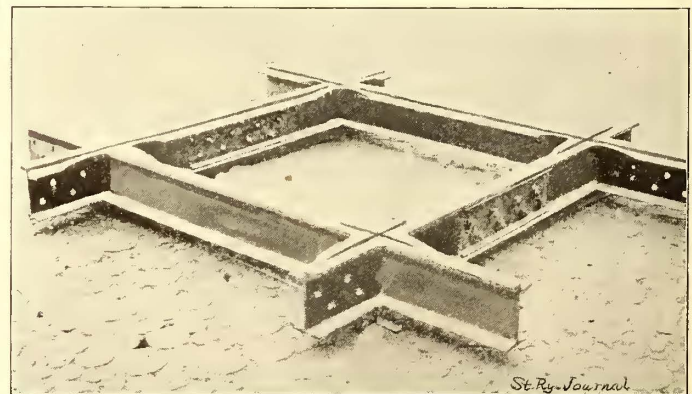


FIG. 14.—CAST STEEL CROSSING—ELECTRIC TRACTION CO., PHILADELPHIA.

Girard Avenue line especially a great deal of activity is being shown. The rail selected is a ninety-three pound, nine inch Johnson girder rail. This is being laid on 5 × 9 in. yellow pine ties located fifteen to every thirty feet of rail. Tie rods are used about every seven and a half feet, and the rails are being bonded with the well known Benedict & Burnham type of bonds. The contractor for the track laying is Charles A. Porter, of Philadelphia.

In the overhead system Morris & Tasker and Walworth tubular poles are being used, and the company is doing its own work in overhead equipment. The feeder system will all be underground, as in the case of the

Philadelphia Traction Company, the feeders being laid in terra cotta ducts lined with cement.

THE ELECTRIC TRACTION COMPANY.

The Electric Traction Company is a corporation recently formed, with the following officers: President, Jeremiah J. Sullivan; vice-president George S. Gandy; secretary Frank Weckerley; treasurer, R. C. Brewster; superintendent, W. N. Janney; electrical engineer, Edward B. Ives. The main office of the company is at 425 Chestnut Street, and the engineer's office is at 11th and Colona Streets. The company also has depots at the latter place and at 2501 Kensington Avenue. It controls the Frankford & Southwark Railway Company, the Philadelphia City Passenger Railway Company, the Citizens' Passenger Railway Company, the Lombard & South Streets Passenger Railway Company, the Lehigh Avenue Passenger Railway Company, and the Second & Third Streets Passenger Railway Company. It also has a controlling interest in the Broad Street omnibus line. Like the other Philadelphia traction companies, it is busily engaged in electric railway construction.

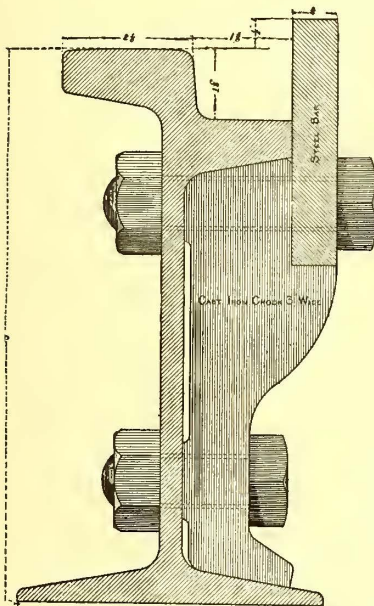


FIG. 15.—CURVE RAIL—ELECTRIC TRACTION CO., PHILADELPHIA.

& Seymour tandem compound engine with cylinder dimensions $16\frac{1}{2}$ and 36×17 ins. stroke, and two Porter-Allen engines, manufactured by the Southwark Foundry & Machine Company, with cylinder dimensions $14\frac{1}{2}$ and 24×24 ins. stroke. Each of these will drive directly a 250 k. w. General Electric generator, the armature shaft of the latter being coupled direct to the engine shaft. The engines will run non-condensing. The boiler equipment will consist of four Babcock & Wilcox boilers of 250 H. P. each, set in two batteries of two each. The piping is so arranged that each engine can be run independently, and each can be cut out of connection with both live and exhaust piping systems. The waste gases from the boilers will be carried through two economizers, by means of mechanical exhaust draft, without being delivered to the stack which will be seventy-five feet in height. The station will be fully equipped with feedwater heaters, etc. The water supply will be from an artesian well.

The station is very compact, having a frontage on Hutchinson Street of sixty-seven feet three and a half inches, and being ninety feet deep. The engine room will occupy a depth of forty-five feet, and the boiler room of the same. It will be of plain brick, with no attempt at ornamentation, and will be absolutely fireproof. The fuel will be dumped from the cars directly in front of the boilers, the cars for this purpose being run on a trestle extending parallel with the boilers, and discharging the fuel into a vault which will have a capacity of one week's supply of fuel. The station is so designed that its capa-

city can be doubled, with very little additional expense, with increase of traffic.

Line.—The line construction of the road differs materially from that adopted by other companies in Philadelphia. Span wire construction will not be used, bracket poles being employed throughout the work. These, instead of being located on the same side of the street, as is usually done, will be set alternately on opposite sides of the street. The claims of advantage made for this construction are that, in the first place, a more symmetrical appearance is secured, and, in the second place, that in case of breakage of the trolley wire the tension will not fold all the brackets of a section to the destruction of the line. The company will use a No. 00 trolley wire. The size adopted by the other Philadelphia companies is the No. 0.

The method of bonding and the provision made for the return circuit differs also in several respects from that employed by the other companies. A bare copper No. 00 wire is used for electrically connecting the rails. This is laced in and out of the adjoining ends outside of the angle bars three times, as in the Philadelphia Traction Company's track, so that the carrying capacity of the bonds at each joint is three times that of a single, No. 00 wire and is equal to that of the rail. This wire is connected to the rails by a special bonding chuck of Stern & Silverman, of Philadelphia, shown in Fig. 16. This chuck, as will be seen from the engraving, is so arranged that

it can be screwed into the rail, making a close electrical contact of bright surfaces. One end of the chuck, which is bored to fit the bond wire, is tapered and slotted. The action of screwing up

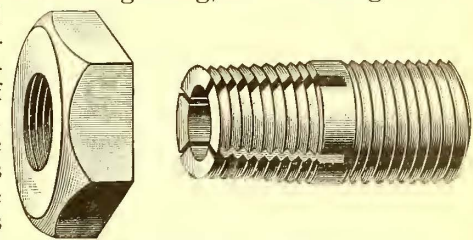


FIG. 16.—BONDING CHUCK—ELECTRIC TRACTION CO., PHILADELPHIA.

the nut, then, is to bind the surfaces closely together, making good electrical contact. After the bonds are in place they are coated with P. & B. compound.

The underground system of feeders in use on the other roads is also employed by the Electric Traction Company, the ducts being of the McDonald and Wyckoff types. The return feeder is connected to the rails at every manhole. The company is making its outgoing circuit of the same resistance as its return circuit, but is not making its largest feeders of greater millage than 650,000. The cables and feed wires were supplied by the J. A. Roebling's Sons Company, and the poles and brackets, which are of wrought iron pipe, by Morris, Tasker & Company, of Philadelphia.

Track.—The track laid by the company includes the use of a ninety pound girder rail of the Pennsylvania Steel Company laid in a similar manner to that of the other companies.

Fig. 14 shows a square crossing of open hearth, cast steel, made in but two pieces, used largely by the Electric Traction Company. This type of crossing was exhibited at the Milwaukee Convention by its makers, the Pennsylvania Steel Company. A section of the nine-inch guard rail made by the same company, and used on the Electric Traction Company's lines, is given in Fig. 15. As will be seen, a three-quarter inch steel bar resting on a three inch cast iron chock, is bolted to the inside of the rail. This construction enables the company to connect the guard rails directly to the straight track without the use of compromise joints. The steel bar used as a guard can, of course, be readily renewed, when worn out, at slight cost.

During the process of track construction the railway company has repaved all the streets occupied by its rails, the same condition for the use of the streets existing in the case of all the companies. The charters of the companies, however, are perpetual, so that it can be seen that they can afford to do this work, which with a limited franchise might not be possible. Within a year's time

Philadelphia will probably be one of the best paved cities in the country.

The track construction on the Tenth & Eleventh Streets line is almost completed and that on the Lehigh Avenue line is almost as far along. The company will require forty cars for the operation of the first mentioned line, and probably fifty for the latter, but the contracts for the cars and for the motor equipment had not been given out at the time of writing.

THE HESTONVILLE, MANTUA & FAIRMOUNT PASSENGER RAILROAD COMPANY.

The work of electrical equipment on the lines of the Hestonville, Mantua & Fairmount Passenger Railroad Company is not so far along as that of the other companies, but is progressing rapidly under the supervision of Chief

Power Station of the Lynn & Boston Railroad Company, at Salem, Mass.

The accompanying illustrations represent the new power station of the Lynn & Boston Railroad Company, at Salem, Mass., and which has recently been put into service with marked success. This is one of three stations belonging to the above road, and together with the other two, supplies power to 130 miles of line. The stations will have a capacity, when fully equipped, of about 10,000 H. P. The power house was designed by and constructed under the direction of J. H. Bickford, consulting and constructing engineer, of Salem, Mass., and is laid out for an ultimate capacity of 3,000 H. P., of compound, condensing engines. At present there are 400 H. P. engines installed and running.

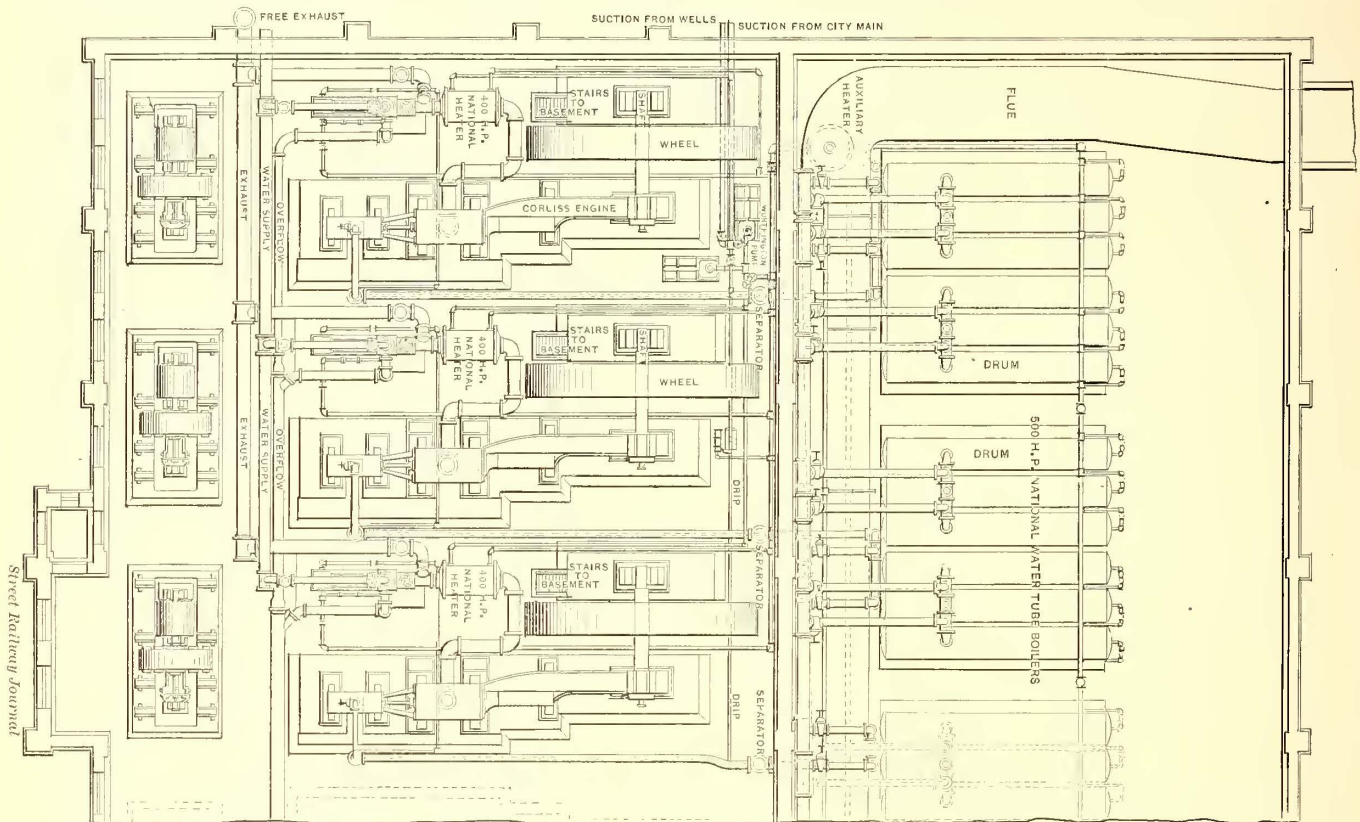


FIG. 1.—PLAN OF COMPLETED PORTION OF SALEM STATION—LYNN & BOSTON RAILROAD CO.

Engineer A. Langstaff Johnston. The officers of the Hestonville, Mantua & Fairmount Passenger Railroad Company are: President, J. Hopkins; vice-president, I. Blum; secretary and treasurer, W. B. Benson. The office of the company is at 4,300 Lancaster Avenue, and it operates twenty miles of track.

Station.—The plans and specifications for the new power house are being completed, and contracts will be awarded and work will be commenced in the early part of 1894. The power house will be a handsome brick and stone structure, and will be located on the Schuylkill River, at the corner of Callowhill and 26th Streets. Water for condensing purposes will be taken from the river, and fuel will be conveyed directly to the station in boats.

The station equipment will probably consist of four 500 H. P., compound, condensing engines belted directly to the generators.

Line.—The track construction adopted is practically the same as that already described in the case of the other companies, consisting of nine inch, ninety pound girder rails laid on 5×7 in. sawed ties placed three feet between centers. The rails will be connected by fishplates with eight seven inch bolts. All feed wires will be run through conduits.

The line, though small compared with the other lines in Philadelphia, is well arranged for operation by electricity, and serves a well populated territory.

It is said the street railway systems at Bridgeport will soon be purchased by a New Haven syndicate.

The engines are the Hamilton-Corliss, made by the Hooven, Owens & Rentschler Company, of Hamilton, O. Each engine is belted direct to an M. P. 300 General Electric generator, which makes 400 revolutions per minute, while the engines run at seventy-two revolutions per minute. The flywheels are twenty-two feet in diameter, giving a belt speed of about 5,000 ft. per minute. Each engine has an independent Deane jet condenser, and is so arranged that the loss of vacuum on one engine does not disturb in the least the others, although all of the condensers take water from one suction pipe. The water for condensing as well as for boilers, is taken from driven wells on the premises. The belts were supplied by Chas. A. Schieren & Co., of New York.

The boiler room has at present 1,000 H. P. of water tube boilers, made by the National Water Tube Boiler Company, of New Brunswick, N. J., while space is left for 1,000 H. P. more to be added as needed. National feedwater heaters, Stratton separators and Worthington pumps are used.

Everything about the station is so arranged that there is very little chance of a shutdown by accident. The steam piping is duplicated throughout, as well as the feedwater piping. There are two sources for water supply as well. In fact, the station can be divided into two separate plants and run simultaneously. Under the engine room is a basement about eight feet in the clear, where are located the condensers, heaters and all the large suction, exhaust and overflow piping; all having been arranged for easy access. Plenty of light is obtained in the

basement by windows, as will be seen by the Fig. 3. A novel feature of the arrangement is that there is not a low pressure drip in the plant, and, consequently, no traps of any kind. The receiver drips are simply a

the condenser pumps, which is passed through the shell of the heater. The result is that, with all pipes and heaters uncovered, the feedwater is brought up to 208 degs. F, with but a very little steam being used to run

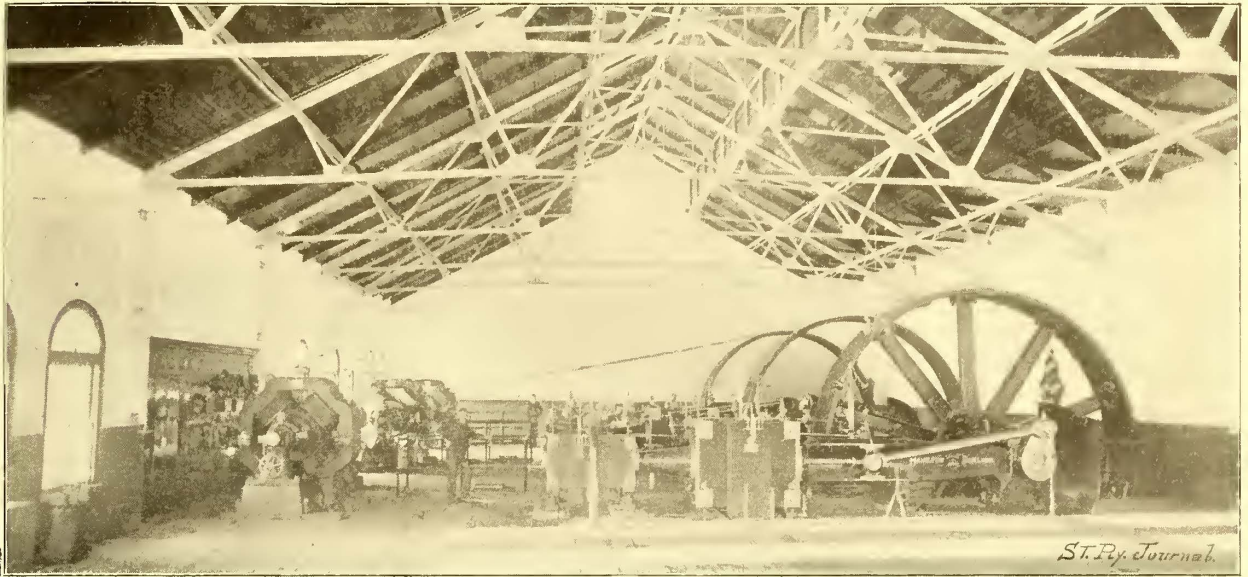


FIG. 2.—INTERIOR OF SALEM POWER STATION—LYNN & BOSTON RAILROAD CO.

by-pass around the low pressure cylinder, arranged in such a way that there is practically no loss of pressure in the receiver. All pipes leading to the condensers from the engines are graded in such a way as to drain all water into the condensing chamber, the heater connections being arranged to admit of doing this. All drips from the steam pipes in the boiler room are returned by gravity direct to the boilers, the main being located sufficiently

the condensers. Fig. 1 shows the general arrangement of the piping in the basement, as well as an outline of the building.

The building itself is of brick, as will be seen from Fig. 3, with a roof supported by iron trusses and covered with slate. The chimney is 160 ft. high, and has a clear diameter inside of eight feet. It will be noticed that the feed wires enter the building through a perforated stone



FIG. 3.—EXTERIOR OF SALEM POWER STATION—LYNN & BOSTON RAILROAD CO.

high for the purpose. The drips from the steam pipes in the basement are all returned by gravity to a tank, and automatically pumped back to the boilers.

A feature of the feedwater system is a large auxiliary heater, through which the feedwater passes after going through the individual heaters. This auxiliary heater is made with a great amount of heating surface, exposing a large body of water to the heat in the exhaust steam from

slab placed in the gable of a bay window on one side, and go directly to the switchboard located immediately back and in the center of one side of the engine room, and can be reached at the back by a door leading from a small entry or vestibule. The entire station has been arranged for permanency and economy, with a minimum amount of repairs, which are generally a large item in many previously constructed stations.

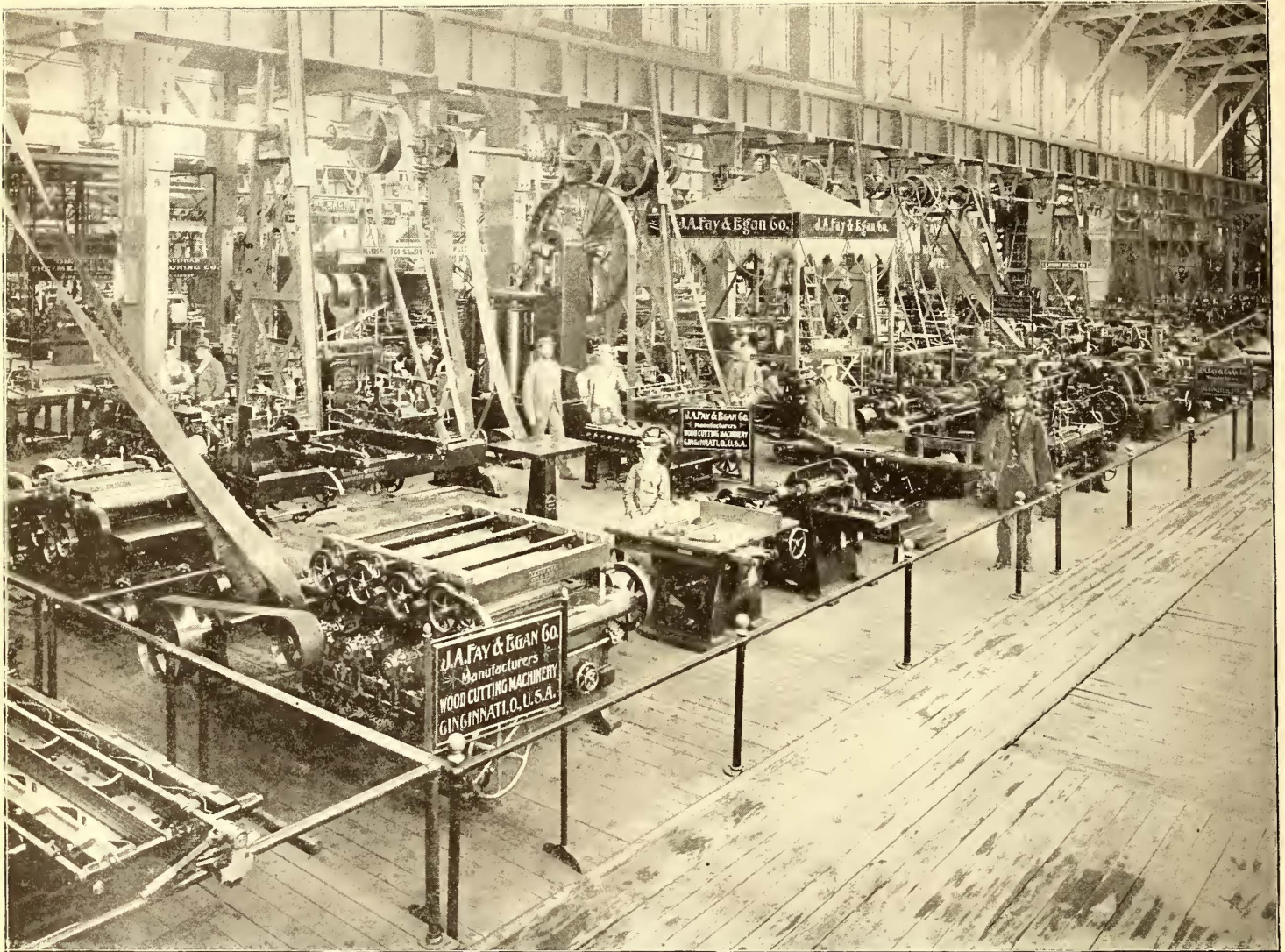
The Cost of Concrete Paving in Washington.

The report of the Commissioners of the District of Columbia for the year ending June 30, 1892, contains some interesting statistics on the cost of the concrete pavements in Washington. The term concrete is applied in that city to all the smooth pavements, whether cold tar distillate, asphalt or asphalt block. On July 1, 1892, the total area of these pavements laid was 2,411,446 sq. yds., divided as follows: Cold tar, 924,028; asphalt, 1,213,996; asphalt block, 271,425. The former cost, between 1886 and 1889, during which latter year its use was discontinued, \$2 per square yard. The asphalt pavements, using Trinidad asphalt, and with a six inch concrete base, have

cost of making repairs has been about three cents per yard. The cost of resurfacing, the Commissioners think, will probably remain constant at \$1.50 per yard.

Exhibit of the J. A. Fay & Egan Company, at the World's Fair.

The J. A. Fay & Egan Company, of Cincinnati, O., made one of the most striking and noticeable exhibits in Machinery Hall for a display of its well known wood working machinery. This company is a recent consolidation of the important businesses of J. A. Fay & Company and the Egan Company, and the machines shown included those



WORLD'S FAIR EXHIBIT OF THE J. A. FAY & EGAN CO.

cost, for many years, \$2.25 per square yard, and \$2 per yard with a four inch concrete of bituminous base, exclusive of grading. Asphalt block pavements have for several years cost \$2 per square yard. All prices are exclusive of grading.

All pavements laid since 1888 have been kept in repair by the original contractors, without cost to the District, for a period of five years. The repairs made after the guaranty period have been made by the District under special contract. Under this contract, ordinary repairs are guaranteed for one year, and are made at the following prices: Asphalt service, \$17 per cubic yard in place; binder, \$7 per cubic yard in place; bituminous base, \$3 per cubic yard in place, and hydraulic cement and concrete, \$5 per cubic yard in place. Resurfacing is guaranteed as new pavement for a period of five years, and all repairs during that time are made at the contractors' expense. The prices are the same as for ordinary repairs, except that the asphalt surface itself is \$1.02 per square yard. Experience has shown that the annual average

by means of which each of these companies has secured its well earned reputation. The space occupied was about 6,000 sq. ft., and forty-six machines altogether were shown, comprising all types of wood working and boring machines, saws, lathes, mortisers, tenoners, grinders, sanders, moulders, etc.

The J. A. Fay & Egan Company claims to be making more than one-half of the wood working machinery being manufactured in this country, and its output consists of over 1,000 different types of machines adapted to every species of wood working. These machines are well known in the wood working shops of street railway companies and car builders.

THE oldest street car driver, in point of service, in this country is said to be John Brynes who lives in Boston, and has driven cars for forty years, traveling in that time a distance equal to twenty-five times around the earth. He is sixty-four and in good health.

The Plant of the Worcester Traction Company.

In the STREET RAILWAY JOURNAL for July, 1893, was described at length the station of the Worcester, Mass., road which was at the time under process of construction. It will be remembered that the road was incorporated as a horse railroad up to about a year ago, under the name of the Worcester Consolidated Street Railway, and that the property was acquired by the Worcester Traction Company, of New Jersey, which has now equipped the road with electricity, and brought it up to the present modern standard.

In the article in question, E. J. Cook, of the Field Engineering Company, gave, in detail, particulars of the steam plant, etc. Since that was written certain small modifications have been made, and we are now in a position to take up the matter again.

The engines employed are of the vertical compound type and were furnished by the Lake Erie Engineering Works. The cylinders are of the four valve type, having two ports for steam and two ports for exhaust. Clearances vary from 2½ or 3 to 7 per cent., according to the diameter of the pistons. The double face slide valves are small, light and four-ported. The governor and steam valves are constructed to carry as far as three-fourths stroke in the first cylinder, permitting the engine to exert more power than any engine with releas-

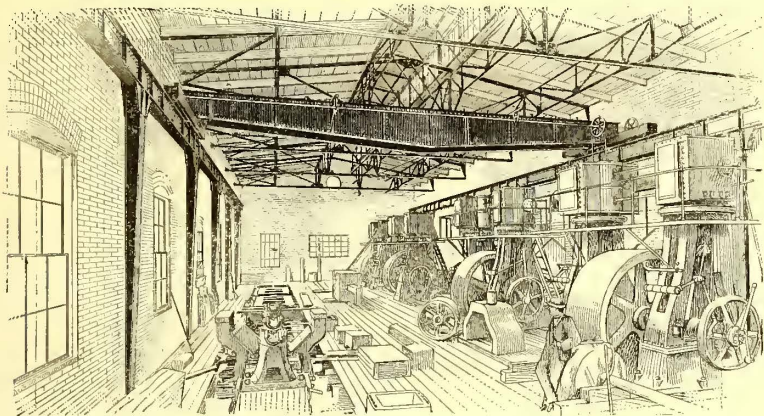


FIG 1.—ENGINE ROOM DURING CONSTRUCTION—WORCESTER.

ing valve gear of the same diameter of cylinder and piston speed. This feature especially qualifies the engine for railway work. The movement of the high pressure admission valve is controlled by a centrifugal shaft governor consisting of two weights, one spring and four pivoted joints. The variation in speed of these engines in regular railway work does not exceed 1½ per cent. between frictional and rated load when running condensing or non-condensing, and not over 2½ per cent. when one-half the rated load of the engine is suddenly thrown off or on. The main bearings are so proportioned that the pressure thereon and the velocity of their rubbing surfaces are uniform, and the service is within the limits of remarkable durability. All bearings and slides are water jacketed and removable, a vital point in engines on electric service. The frames are of the "A" type, double box girder, cast iron. The pistons, piston rod, cross-head, connecting rod, etc., are of the best marine type. The crankshaft is of forged steel, built-up pattern, with counterbalance in one piece.

The economy of these engines is the best obtainable; the cylinder condensation is low, the clearance is small and the steam distribution practically perfect. All steam, exhaust and condenser piping, was furnished by Best, Fox & Company, of Pittsburgh. The valves on the steam piping system are Climax bronze seated gates instead of Chapman, as mentioned in the previous article.

The electrical generating equipment is entirely General Electric, and consists at present of four 300 k. w., multipolar generators, each directly belted to one of the engines. The ultimate capacity of the station, as at pres-

ent laid out, is 1,500 k. w., and space has, therefore, been left for another engine and another 300 k. w. generator. The speed of the dynamo is 400 revolutions per minute. The floor space is controlled by a traveling crane with a travel the full length of the building, thus enabling the

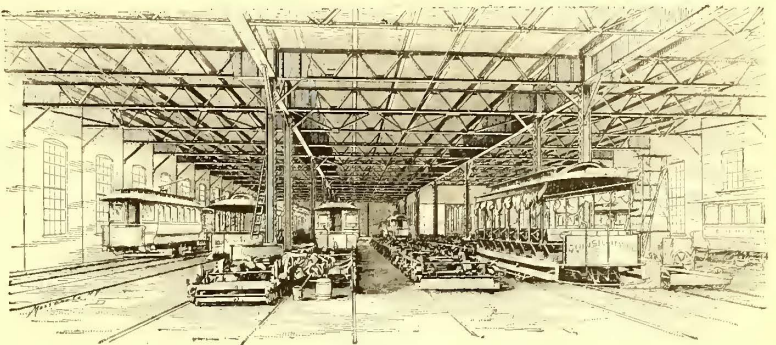


FIG. 2.—FIRST FLOOR OF CAR HOUSE—WORCESTER TRACTION CO.

placing of machinery at the absolute minimum of expense, and in the case of repairs it can be moved cheaply and quickly. It was designed and built by the Berlin Iron Bridge Company, of East Berlin, Conn. The engraving (Fig. 1), shows the engine room while the equipment was being installed.

The switchboard is built up of General Electric standard panels both for generators and feeders; of the latter there are thirteen. The panels are each fitted with an automatic circuit breaker with electrical reset—a new device which has already proved itself invaluable in railway operation.

The rolling stock consists of sixty-three motor cars and the same number of trailers. Twenty-five are twenty-two foot Laclede bodies, ten ten foot bodies of different makers, while the balance are sixteen foot bodies. The twenty-two foot bodies are mounted on Brill Maximum Traction trucks, and the smaller bodies on Brill No. 21 trucks.

Of the car equipments, forty-five are of the latest General Electric type, *i. e.*, two G. E. 800 motors to each car. These have already shown that the excellent qualities claimed for the new motor are by no means exaggerated. The other eighteen motor cars are equipped with Westinghouse motors, eight having two twenty horse power motors per car and ten having each two twenty-five horse power motors. All the General Electric equipments include the type K series parallel controller.

The car house is one of the best in the country. Fig. 2 is an interior view in the first floor, showing the general construction of the building. Fig. 3 is an interior view in the second floor. The entire framework of this build-

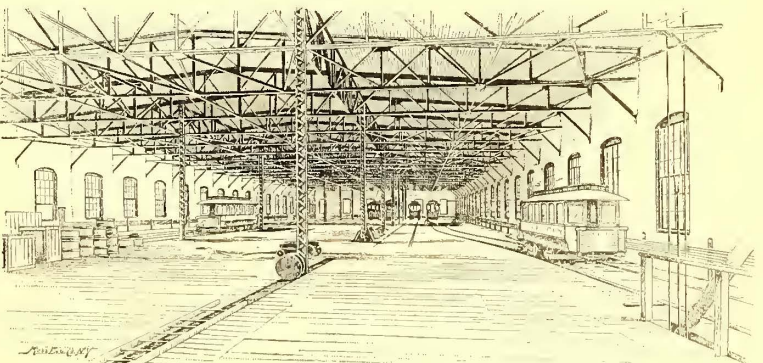


FIG 3.—SECOND FLOOR OF CAR HOUSE—WORCESTER TRACTION CO.

ing is of steel, the second floor and the roof being supported by steel girders, which in turn are supported by columns and girders in the interior of the building. The side walls are of brick, but made very light, the main support being through the steel columns which are bricked into the side walls. Very little woodwork is used about the construction of the building, being used only in the second floor and the roof plank, and here, on account of the heavy quality of the lumber used, the danger from fire is almost

eliminated. It has a storage space for sixty cars on the main floor, and thirty to forty cars up stairs in the paint shop and storage room. It was designed and built by the Berlin Iron Bridge Company, of East Berlin, Conn.

The length of the road is thirty-one miles. Of these, twenty-three are laid with ninety pound Wharton nine inch girder rail spiked directly to the ties, set two feet six inches between centers, four are laid with seventy pound girder rail, and the remaining four miles with fifty pound T rail. The rail bonds are of galvanized iron, set in with channel pins, and the entire system is triple bonded.

The general design of the plant is such that the boilers, engines and dynamos are located in the best position to avoid, as far as possible, loss in transmission of the different forms of energy from the coal to the line. The lighting is both incandescent and arc, in General Electric Company's systems.

The officers of the road are: E. J. Moore, president; Thos. C. Ban, secretary; C. Ford Stevens, treasurer, and J. N. Akarman, general manager.

Lithographed Car Tickets.

Where the practice exists of selling packages of tickets at a reduction on the price of single fares, or where commutation rates are in vogue, the desirability of using neatly engraved or lithographed tickets is a point which is often not carefully considered. Too frequently it is thought that almost any piece of pasteboard with the name of the company painted thereon will answer the purpose, but with a slight or practically no additional original outlay, a ticket can be issued which is both attractive and difficult to counterfeit. In this way, a company will often in a short time, not only save more than the additional cost of tickets by the prevention of the use of bogus tickets, but will keep before its patrons the idea that its policy is a liberal one.

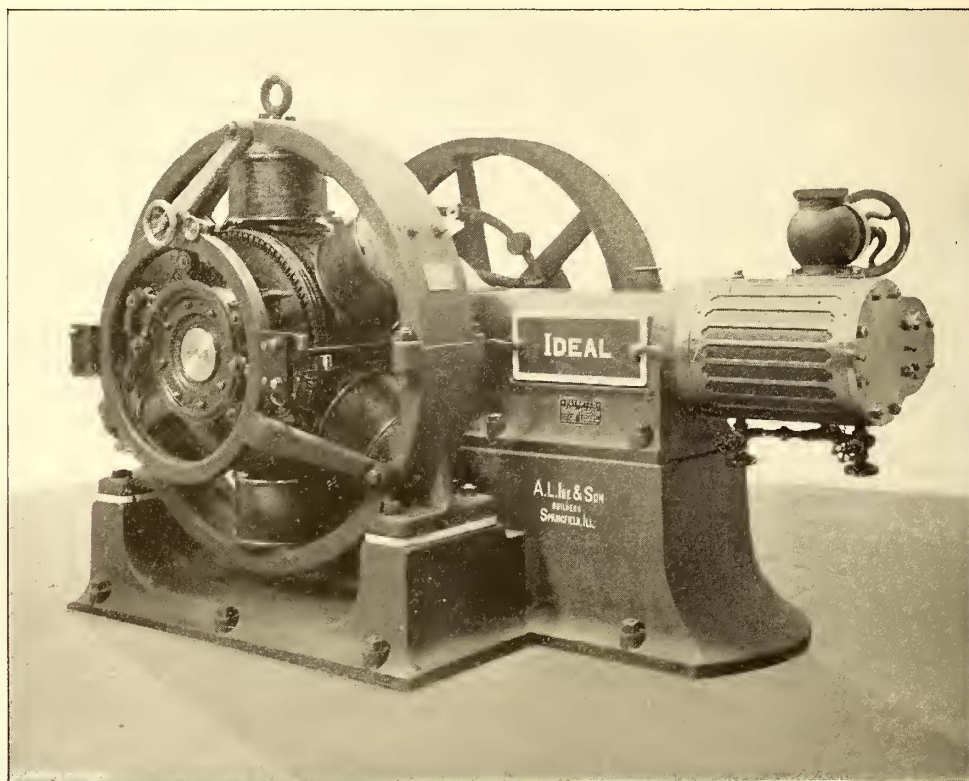
A new company, known as the Lithograph Street Car Ticket Company, has recently been organized in Cleveland for the manufacture of lithographed street car tickets of a high grade, street railway stock certificates, bonds and all kinds of lithograph work. E. Rettberg, who will be at the head of this concern, has had a long experience in this business, and promises the street railway managers a finer line of tickets than has yet been produced. The company will also make a specialty of printing transfer tickets. Its plant will contain the latest improved machinery for this class of work. Some work which this company has performed for the Knoxville (Tenn.) Electric Railway Company and the Citizens' Street Railway Company is of a very high grade.

THE Middletown-Goshen Traction Company, of New York, has recently completed three miles of road, and expects to add about twelve miles as soon as the season for track laying again opens. Electric cars will be run about April 1. The power plant is well under way, and when completed will have a capacity of 300 H. P. M. J. Wightman is the electrical engineer of the road.

PERMISSION to build an electric railway has been given by the Baltimore County Commissioners to the Walbrook, Gwynne Oak & Powhatan Railroad Company, the road must be completed within eighteen months.

New Direct Connected Engine and Generator.

The state of perfection at which the latest types of steam engines have arrived is shown in nothing so clearly as in the increasing demand for automatic types of engines to be direct connected to dynamos. The fluctuations in load, especially in street car service, are so great and so numerous—fluctuations of 25 to 100 per cent. of the entire load occurring almost instantaneously—that it has taxed the inventive genius of our engine builders to the utmost to produce engines that will stand the strain. In the case of belt driven dynamos, a severe short circuit will usually cause the belt to fly off and thus relieve the engine, but a direct connected engine must not only be able to maintain a uniform speed under these sudden changes of load, but it must not fly to pieces if a short



NEW DIRECT CONNECTED ENGINE AND GENERATOR.

circuit brings the engine to a sudden stand still. To meet the demand for direct connected engines and generators, the engine shown in the accompanying cut has been built by A. L. Ide & Son, of Springfield, Ill. The illustration is taken from one of three Ideal engines recently shipped by this firm for use in lighting the new Southern Hotel in St. Louis, Mo. Two of these engines had 14 x 14 cylinders, the third had a 13 x 12 cylinder. All were regulated to run at 275 revolutions. Each of these engines had a General Electric Company's armature keyed on the crankshaft in place of the plain pulley. The construction of the armature and engine is such that no outboard bearing is required. The two 14 x 14 engines are to drive dynamos belted from the governor pulleys in addition to the direct connected armatures.

The points of superiority claimed by the builders of these engines for this form are as follows: They claim that they will not vary over 1 per cent. in speed for a sudden change of 100 per cent. in load. They are perfectly self-contained and balanced. Every engine was adjusted, before leaving the works, to run at its specified speed under full load, and so balanced as to run without shaking with all anchor bolts removed, excellence in workmanship and material, steel and bronze entering into its construction to an unusual extent. The engines are provided with the well known Ideal system of self-oiling, which supplies all the working parts with a constant stream of oil that is used over and over again. There is

positively no oil scattered in any direction. The armatures are therefore entirely free from any danger that could result from a splash of oil.

That these engines are peculiarly adapted to work in places where space is valuable, will be apparent from these dimensions:

The 14 × 14" engines, with armatures attached complete, as shown in the illustration, can be placed in a box 68 ins. high, 81 ins. wide, 10 ft. 3 ins. long, and their rated horse power is 125. The 13 × 12" engine, 100 H. P., can be placed in a box 68 × 74 ins. × 9 ft. 11 ins.

A New Car and Truck.

We illustrate herewith a new car and truck recently built by the Barney & Smith Car Company, of Dayton, O., which is one of a number ordered by the City Railway Company of that place for the Dayton & Soldiers' Home line which it controls. The car shown in Fig. 2 has a sixteen foot body, and is twenty-four feet four inches long over the platforms.

The outside is paneled in red and white with window frames of oak. The hood is the standard semi-circular shape manufactured by the Barney & Smith Company. There are six windows on a side, fitted with Burrows roller shades and glazed with double thick French glass. The inside finish is in quartered oak with oak doors and window sashes. The seats and backs are upholstered with loose cushions, and the car is lighted by a center light consisting of two electric and one oil lamps and with additional electric lamps at either end.

The truck on which this car is mounted, and which is illustrated in a separate engraving, was recently brought out, and is being manufactured by this company. It has been in successful operation for about three months, and promises to be one of the best on the market. The points aimed at in this truck are: Superior riding qualities, eliminating the objectionable end tilting, strength, simplicity and moderate cost. The first is accomplished by

The strength of this truck is principally owing to the fact that the side frames are continuous and straight, which will be appreciated by those acquainted with built-up frames. An examination of the cut will show the simplicity of the frame; the wheel beams are constructed of two steel channel bars placed back to back, with an intervening wood filling one inch thick. This filling is introduced

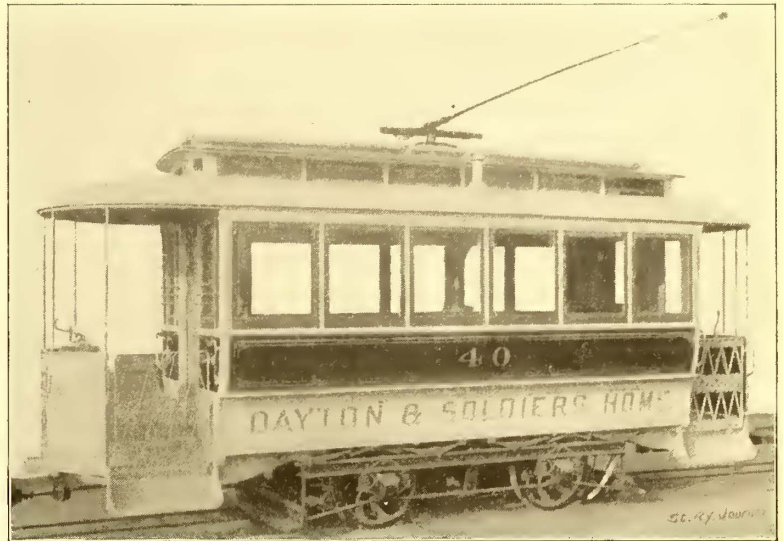


FIG. 2.—CLOSED CAR FOR DAYTON & SOLDIERS' HOME RAILWAY—DAYTON, O

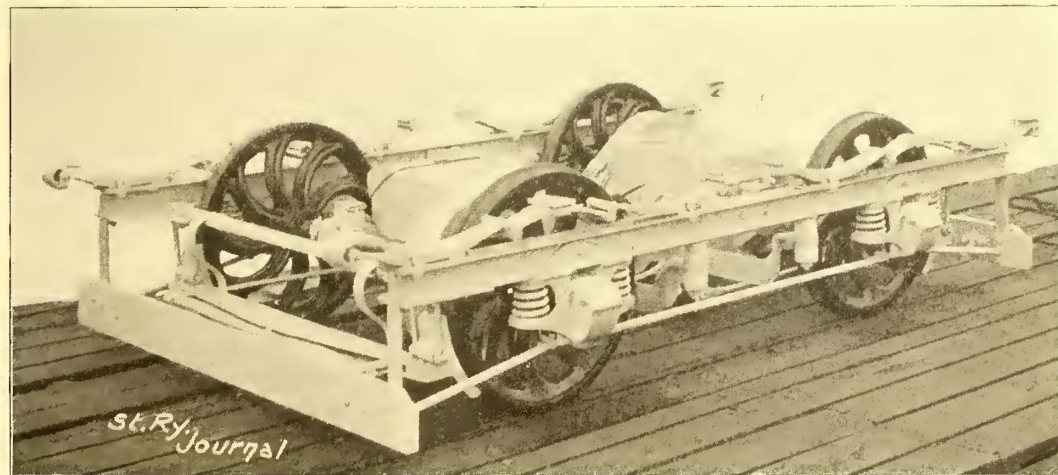


FIG. 1.—NEW TYPE OF TRUCK.

interposing between the car body and the truck side frames, four sets of half elliptic springs, one set of three frames over each journal. These springs are so proportioned and connected that a load applied at any one of the points of support is felt equally by the whole set, and is thus distributed over a considerable distance on both car body and truck frame. In addition to these there are short spiral springs placed between the truck frame and the journal boxes. The object of these is to absorb the shorter vibrations and at the same time protect the truck frames; it is well known that a frame without some cushion between it and the axles is very troublesome to maintain, its different members are continually breaking, and the joints and bolts are nearly always loose.

to deaden the noise, the strength of the frame in no wise depending upon it. The iron end sills of rectangular section, are attached to the side frames by means of strong malleable iron corner plates, which are provided with flanges engaging with the edges of the bars, thus taking all side strains off the bolts. The springs rest in malleable iron sockets, and are securely fastened to the frame with clips and bolts. The pilot brackets, pedestal braces and brake beams are of wrought iron. The manner in which the side beams are constructed makes it possible to use any kind of motor support that might be selected without drilling holes in the iron work.

THE Chesapeake & Ohio Transportation Company has been incorporated at Hagerstown, Md., by C. K. Lord, H. Crawford Black and Alexander Shaw, of Baltimore, Lloyd Lowndes, of Cumberland, and J. Clarence Lane, of Hagerstown. Its capital stock is \$250,000 and its object is to operate canal boats on the Chesapeake & Ohio Canal, by the electric trolley system such as tested on the Erie Canal. The shares

of the company are of \$100 par value each, and they are mostly held by coal mine owners in Western Maryland.

THE Belgium Government has received from the tramway company operating from Ixelles to Boendael, near Brussels, a request for a franchise for a movable sidewalk extending from the entrance of the St. Hubert galleries to the Namour gate. This moving sidewalk will be constructed under a recent patent granted to Mr. Empain.

It is stated that the youngest electrical superintendent in the country is Edmund H. Perry, of Bloomfield, N. J., who is only fifteen years old.

The Medical Side of Street Railway Practice.

PART III.

By GEORGE J. TOBIAS, M. D., CHICAGO, ILL.

In describing railway injuries it will be necessary to make some division of the different forms of wounds, and to classify them in a brief and simple manner so that we may be enabled to intelligently consider appropriate treatment.

For convenience, and for the purpose of a simple classification of railway injuries, we shall consider them under three separate heads:

1. Injuries of the soft parts.
2. Injuries of the bones.
3. Injuries involving both.

Wounds of soft parts may be contused, lacerated, incised or punctured. The two former being most frequently met with in street railway injuries, we shall confine our attention principally to them.

A contused wound (*contundo*, to bruise) is one, that, generally speaking, is produced by injury from a blunt weapon, or collision with some foreign body, without breaking the skin or covering of the injured part. In cases where there is a breach of the surface, in contused wounds, the injury generally extends far beyond the area of the external wound. Subcutaneous contused wounds are very misleading in their general appearance, and are often of grave importance, as the injury is not localized, and its extent cannot be made out by a single inspection of the external parts. Such injuries require the most accurate examinations, and demand the greatest care in treatment.

From a clinical point of view contused and lacerated wounds might well be classed together, the element of contusion considered as a complication of the wound, and the distinction one of degree and not of kind. But in railway injuries we have many contusions to treat where there is no breach of the surface, as contusions of the hip joint, shoulder, knee, or, in fact, any part of the body. Many cases that we examine for alleged injuries are devoid of all objective signs of traumatism, and the only tangible symptom of disorder is pain in the back, which might emanate from other various causes other than injury.

And yet just such cases are brought into court claiming damages for contusion of the back, "concussion of the spine," etc. etc. It can be readily seen that advantage is often taken of the circumstances which connect some dishonest persons with a railway accident in which they were in nowise injured, but are desirous of gaining compensation by fraud. In well marked injuries, which are properly classified as contused wounds, we find swelling and acute inflammation of the part. There is pain and tenderness on touch, loss of function, and usually there is more or less discoloration which soon becomes apparent on account of the delicate subcutaneous tissues which are torn, and the rupture of blood vessels, which give rise to hemorrhage. A simple discoloration caused by diffused blood, is called ecchymosis, but when the hemorrhage is so profuse as to cause a lump or blood tumor, it is named hematoma. The treatment of contusions consists, first, in the relief of the general shock, and second, of the local pain. The injured part should be placed at rest. If voluntary immobilization is not sufficient, place the patient in a recumbent position in bed, and resort to bandages or splints if necessary; at any event secure rest, for in so doing we lessen the local irritation, and hasten the absorption of effused fluids. Hot fomentations are of great value in reducing inflammation or to allay pain. Cold applications are frequently found to be of service; but their use should not be continued for any great length of time, as the vitality of the parts may become depressed.

In mild forms of contusions, evaporating lotions are very useful, such as tincture of arnica, aconite, belladonna, camphor, witch hazel, etc., their efficiency being largely due to the alcohol which they contain. When we find the bruising severe and subcutaneous hemorrhage present, the indications are that some important

blood vessel has been wounded, and it will be proper to make a free incision in order to expose the ruptured vessel and apply a ligature to it.

If there be danger of septic infection, or in cases where contusion is followed by severe inflammatory reaction, it will be necessary to combat the disorder upon general surgical principles, including such constitutional measures as may be required to relieve pain, reduce fever and sustain the strength and vitality of the patient.

A laceration is that form of wound in which the tissues have been forcibly torn or crushed. The surface presents a rough and irregular appearance, giving rise to a gaping and ragged condition of the tissues involved.

In many instances we find severe contusion accompanied by extensive laceration of the soft parts; this condition is, of course, produced by the mingled elements of the injury, the character and cause of such disorder being similar. We have in such cases, not alone the bruising and disorganization of tissues to contend with, but the depressed vitality of the injured part which must take up a new circulation in order to establish resolution, and, therefore, the result of the injury (so far as the treatment is concerned) depends, not alone upon the surgical care of the case, but the susceptibility of the wounded part for prompt healing and repair. In lacerated as well as incised wounds the divided or torn tissues have a tendency to retract, causing more or less gaping, the hemorrhage which follows being the effect of every open wound. Pain is a usual accompaniment, which is due to the disordered condition of the sensory nerves. The amount of pain varies with the nerve supply of the wounded part and the general sensitiveness of the patient. The most painful and sensitive parts of the body are the lips, tongue, nipples and external genitals. The temperament of the individual always modifies the pain. In severe forms of lacerated wounds, the nerve irritation is so great as to mark the immediate effect upon the individual, causing profound general depression. This condition is called "shock." Age, mental conditions and temperament also modify shock.

The degree of shock may be influenced by the physical condition of the patient and the natural powers of resistance. In severe forms the vital forces are so profoundly depressed as to cause, not alone general prostration, but conditions of the most grave importance, which are characterized by such symptoms as feeble pulse, impaired respiration, clammy skin, cold extremities, peculiar shrunken appearance of the features, and loss of consciousness.

Fright often tends to increase the general collapse, and in some cases it has been known to produce great psychical depression which has resulted in "cardiac syncope" and death. A remarkable case of death by mental emotion is related by Lauder Brunton, and is quoted by numerous medical writers.

Thus it will be seen that shock does not necessarily depend upon actual injury, and further, that the mental condition (which is a factor in all cases of shock) is largely responsible for the degree of severity of the depression.

Just how far corporations are liable for the emotions and mental attitudes possessed by their passengers is a question for the courts to decide, but it would seem unreasonable (from a scientific point of view) to expect payment from a railway company for an alleged injury or condition which may have been the result of fright, and where the alleged injury would have made no serious impression upon a well balanced mind. It must be remembered that railway companies do not stand guarded by medical examiners, like life insurance associations, who make it a study to select only healthy people to do business with. The street car company must carry all passengers who behave themselves, whether they are healthy or otherwise. How often have we noticed invalids and pregnant women riding in street cars, who at that very time should have been under the care of a nurse or attendant. How many instances have occurred where actual childbirth has taken place in public conveyances. Such matters as these should be fully considered by courts and juries.

(To be Continued.)

Comments on English Track Construction.

BY ARTHUR HODGES, LATE CHIEF ENGINEER OF THE WEST END RAILWAY, BOSTON, MASS.

I have been much interested in the article on "English Methods of Street Railway Track Construction," which has run through the last three numbers of the STREET RAILWAY JOURNAL.

I intend simply to discuss similar practice in this country and to suggest some objections, which occur to me, to fully carrying out the form of construction described. But, incidentally, I cannot refrain from saying a few words in reference to the false impressions which, judging from this paper, seem to be current in England concerning our practice in track construction.

They are mistaken in thinking that the practice in America has been to multiply the number of parts instead of lessening them. The construction to which the paper refers as "having the rails secured by cotter bolts to pan or metal stringers," and "these again tied by rods which are often cotted to the stringers" is almost unknown in this country. A statement to the contrary gives a very wrong impression to persons not acquainted with our track construction, and although some parts of the paper show that the writers have some knowledge of our tracks, this goes to make one think that it must be very superficial. They say also: "We believe, however, that within the last year or two the girder rail is obtaining more favor, and is being adopted by many companies," etc. The well known facts are that the girder rail has been in use in this country for fourteen or fifteen years, and has been used *extensively* for several years, so that the mileage is now up among the thousands.

In the matter of "points," as the English people term what we call switches, the practice in England seems to be in no manner in advance of American practice. With us the built up switch is found to give the best results, and the movable tongue, which we find to give the best satisfaction, is made from highly tempered crucible steel, forged to the requisite dimensions.

We have long used tie rods which are identical with those described in Part II. Built up switches and crossings are, by no means, new to us, and long strides have lately been made in their improvement. We have been through nearly the same experiences in references to switches for turnouts as are described in this paper, and have arrived at the point from which we started, using movable tongues, and where electric or steam motors are to be used we have for several years used movable tongues on both rails, that is, in both switch and mate, as we call them.

In the matter of heavy "fish joints" with large bolts, we are not behind. We have used one inch bolts for two or three years, and some of our engineers have suggested and advised bolts of larger diameter. Even in the matter of paving, the concrete foundation and the grouting with pitch after the joints have been filled with pea gravel is getting to be a very common practice. The development of the street railway in England, as described in this article, is so nearly coincident with that of our own, that there seems little left to discuss between us other than the foundation or substructure.

The first difficulty which suggests itself in the adoption of the concrete foundation with a six or seven inch rail is the fact that in this country the specifications for paving blocks in the large cities call for a depth of seven or eight inches. As it is necessary to have a bed of from one and a half to two inches, it will at once appear that the English plan for a concrete foundation is impracticable under such conditions. But this can be overcome by the use of a nine or ten inch rail. Such a rail has been used here during the last two years, and the paving laid in connection with it has been placed upon a concrete foundation with a bed of about two inches of gravel, and has been grouted with pitch after the joints had been filled with pea gravel. This class of paving has been used in American cities for three or four years, and is giving good satisfaction.

Another way of obtaining sufficient depth for our paving stones is by the use of chairs spaced as may be specified in the contract for track construction. Such a track was laid in Washington Street, Boston, in the summer of 1892, in which the rail is a girder, with rolled steel chairs electrically welded to its foot. At the joints there are long chairs which admit of deep, heavy fishplates. This track was paved as just described for the nine inch rail, and has been in constant use, under heavy traffic of electric cars, for more than a year, and is in excellent condition. Some idea of the test to which it has been subjected may be obtained from the statement that from 170 to 180 cars pass over it every hour. The tracks above described are placed upon oak or chestnut ties, or ties of vulcanized hard pine.

Owing to the peculiar conditions and disadvantages under which we labor, I am afraid it will not be advisable at present to depend entirely upon concrete for the support of our tracks. Unfortunately our streets are liable to frequent disturbance by some of the many corporations which have franchises permitting them to occupy certain portions of them, and by the city authorities themselves. Such corporations, in making the excavations necessary for repairs or extensions of their underground works, unavoidably undermine the street railway tracks which lie in their way, and frequently the line of their pipes, or other underground construction, coincides with the line of the tracks above it for a long distance. It will be seen, without argument, that the concrete foundation would be utterly destroyed by the excavation in such cases, and this condition of things is so nearly universal as to make it a very serious objection to the form of construction under consideration, and to demand a track which can be suspended, in the event of undermining, and put again in running order with the least possible expense.

In addition to the foregoing objections to the concrete foundation, our climate may well be considered as worthy of a place in the discussion. It is well known that the frost penetrates the ground to a depth varying from two to six feet, and its influence is seriously felt in all work the foundation of which is not carried below the depth to which the frost reaches. How far this would affect the track, in outlying districts, constructed with no other support than concrete, I am not prepared to say, and it may perhaps be a subject for experiment, but there are many localities where the first cost of a concrete foundation would be prohibitive, *i. e.*, where a cheap track must be built—the cheapest possible—or none at all. In many cases a foundation of concrete would certainly double the cost of the track.

The objection to a rail with a groove one inch wide is at once apparent to one familiar with our light carriages. Such a rail is used to some extent in America, notably in Washington and Boston, but great care is needed in the use of light carriages in streets where it is laid. The head of a rail much used in our large cities is much better adapted to our streets. I refer to the semi-grooved rail largely entering into track construction in New York, Buffalo, Boston, etc., and originally known as the "Richards Improved" rail. This rail, while it possesses many of the advantages of the full grooved rail, is without its objections.

In the matter of cable construction I am inclined to think that we have not much to learn, as yet, from our British cousins. The conditions are very different with us from those prevailing in the cities of Great Britain.

One of the principal difficulties which we must guard against here is the danger of the closing of the slot from frost pressure. The argument might be used that with a shallow conduit the tendency to the closing of the slot would be less, and more easily overcome. But we have not arrived at a point where we can use the shallow conduit, and as long as it is deep we must have a yoke of great stiffness. There is no doubt but that it is an advantage to have the rails connected with such a yoke.

THE new electric line between Newton (Mass.) and Mt. Auburn was opened December 13.

THE INTRINSIC VALUE OF STREET RAILWAY INVESTMENTS.*

BY EDWARD E. HIGGINS.

FIRST PAPER.

The rapid increase of street railway mileage during the past five years, the extensive adoption of electricity and the cable in place of horses, and the general reconstruction of roadbed made necessary by change of motive power have made heavy demands upon the speculative and investment capital of the United States. It is probable that not less than \$125,000,000 in cash and in financial and commercial credits have been brought into this field since 1888, this sum representing perhaps 25 per cent. of the total investment to date in American street railways.

There has been a large increase in capital liabilities. It is safe to say that the gross mortgage indebtedness of our street railways is to-day double what it was in 1888; that the capital stock has been increased in an even greater ratio, and that the gross capitalization per mile of track (including the capitalization of "Traction Companies") is so far in excess of that of 1888 that the entire difference cannot be explained on the score of cost of reconstruction and change of motive power. The volume of securities in existence to-day may be considered as representing:

First. The purchase of the old horse railway properties at a large, and in some cases an abnormal advance on their original costs.

Second. The reconstruction and re-equipment of such properties accompanying a change of motive power, at a cost usually in excess of that for which the same or superior work could now be done.

Third. The extension of the reorganized properties into new territory.

Fourth. The development of entirely new properties in unoccupied territory.

Fifth. Construction, promotion, banking and brokerage profits.

The present distribution of the new securities cannot be known with accuracy. It is certain that a very large portion have not yet found the ultimate investor, but are held in more or less speculative channels awaiting favorable markets. Nearly all of the mortgage bonds have been negotiated in the East, although a few issues have been brought out in Chicago, which probably owns also the greater part of its local street railway securities. Two or three of the great Western cities are carrying their own mortgages, but in general the rapid street railway development in the West (which preceded that in the East) has been financed almost exclusively in New York and Boston. The New England clientage of Boston banking houses has, in particular, invested large sums in this field partly by direct purchase of recommended bonds, and partly by the purchase of collateral trust issues secured by underlying street railway bonds. Certain New York and Philadelphia houses, with foreign connections, have secured Scotch, English and German capital for special issues. It is known, however, that a large amount of these bonds are still held by bankers, brokers and syndicates, and are not pressed for sale because of the belief that much higher prices can be realized when the reconstruction period is over and the properties are showing the great increase in net income reasonably to be expected. Little attempt has yet been made to market the new stock issues. Rarely representing actual cash investment, they are held chiefly by syndicates, promoters and traction companies, as a source of future, rather than present profits. It must not be forgotten that recent street railway development has been marvelously rapid. We can look back but five years to the first successful electric road, and it is clearly impossible to find many roads which have been in operation under the new conditions long enough to obtain the full advantage of the change.

Now the vast sums which have been drawn from ordinary investment channels into this field are exciting some uneasiness in conservative financial circles. Will the general confidence in street railway investments be justified by results? Is the rapid development normal? Is it not a repetition on a smaller scale of the steam railway "boom" of 1869-73, and will not disaster come? All these are pertinent questions hardly possible to answer wisely as yet. Overcapitalization of costs is almost universal. It is certain, too, that there has been in some places overcapitalization of earning power, so that reorganization and the scaling down of nominal values will soon be necessary. Elsewhere, however, "syndicates" have often been contented with smaller paper profits, and it is not unreasonable to suppose that such properties, if well managed, will return dividends for years to come. The work of separating the good from the bad—speculative from investment values—is of grave importance. We are in the midst of great—almost fundamental changes, whose effect cannot yet be foretold. We are hampered by the natural unwillingness of street railway managers to furnish full and reliable data on which their properties can be judged. Yet it is not impossible, even now, to lay down certain principles which will serve to determine the limits of success in particular cases, and to establish the broad lines of a "theory of values" in this comparatively unknown financial field. I shall attempt this in the following pages, claiming for my effort nothing more than that it is a careful, conscientious and painstaking endeavor to throw some light upon an exceptionally difficult subject, and knowing well that many of the conclusions which I shall draw may be open to present criticism, or may prove erroneous in future.

GENERAL CONDITIONS.

The municipal transportation industry in the United States is intrinsically profitable—much more so than abroad. This is due primarily to the peculiarities of the American character. Our national passion for "getting there" forced the introduction of street railways long in advance of their adoption in other countries. "Perpetual" franchises, high fares, freedom from burdensome conditions, all were instantly—almost impatiently granted in the eagerness for facilities. To-day, these old time franchises are immensely valuable and almost perfectly protect the interests of their owners. This is the first effect of "American energy." The second is equally characteristic. The average American is careless of small economies. He has no time to "split a nickel;" he despises a penny and, in some parts of the country, will throw it away; he will willingly pay five cents to save three minutes in a half mile ride, and he will doubtless be the same man fifty years hence. Attempts have been made in a few cities to reduce the now almost universal nickel fare. They have rarely succeeded, not always because the reduction could not have been forced, but because no interest could be aroused among the people. It might appear at first that this argument for the investment value of our street railways is flippant or superficial. It is not. It is fundamental. Americans are free riders, and their insatiable craving for more facilities arouses mingled feelings of gratification and anxiety in the minds of street railway managers.

Under the influence of this pressure, and with the realization that cars propelled by animal power but imperfectly fulfil the whole function of a street railway, the cable and electric systems of motive power have come into being. They were first introduced in the belief that the actual reduction in operating expenses would be sufficient to yield satisfactory returns on the additional investment required. This expectation has not been precisely

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realized. Total operating expenses have been somewhat greater than before, instead of less, because the sudden and amazing increase in traffic brought about by greater speed and clean, attractive and easy riding cars has made it necessary to greatly increase the car service. But the operating expenses per car mile and per passenger carried, and the percentage of operating expenses to gross receipts are, in general, sensibly reduced. The intrinsic advantage of steam over animal power is very great. Coal is far cheaper than grain, and the labor required to run a power station less than that of caring for horses, so that in spite of unexpectedly large repair accounts caused by imperfections of early apparatus and severe usage of track, the results of the change have encouraged the belief that the cost of carrying a passenger under the new conditions will be materially less than with horses.

Summarizing the above, it is certain that our street railways, as a whole, have been profitable even when operated by horses, and that the general adoption of electricity and the cable has invariably brought about a substantial increase in gross receipts and almost invariably an even greater proportional increase in net. The real question becomes, therefore, whether or not there has been serious overcapitalization of the permanently safe net earnings. This question can best be answered in an examination of actual statistics, and, as the conditions vary greatly with the scale of operations, and as we cannot here deal with units of less magnitude than the entire street railway systems of the different population centers, I shall continue the discussion under the following groupings:

Class I. Surface railways in American cities and towns of less than 15,000 inhabitants.

Class II. Surface railways in American cities and towns of from 15,000 to 25,000 inhabitants.

Class III. Surface railways in American cities of from 25,000 to 50,000 inhabitants.

Class IV. Surface railways in American cities of from 50,000 to 100,000 inhabitants.

Class V. Surface railways in American cities of from 100,000 to 500,000 inhabitants.

Class VI. Surface and elevated railways in American cities of over 500,000 inhabitants.

Class VII. Interurban electric railways in America.

Class I. Surface Railways in Cities and Towns of Less Than 15,000 Inhabitants.

There are about 500 cities, towns and boroughs in the United States of from 5,000 to 15,000 inhabitants. Of this number over 300 now contain local, or are served by interurban street railways,* about 120 having been invaded since 1890. Many of the smaller places, too, have street railway facilities, although few of less than 5,000 are served by strictly local roads. Late returns show that the motive power on about 25 per cent. of the total mileage is horse, on about 70 per cent. electric, and on the remainder steam and miscellaneous.

Local roads of this class have little general interest, and it would be useless to examine their statistics in detail. There are no comprehensive laws governing their success or failure, everything depending on local conditions and management. Before the era of electricity a large majority of the horse roads were unprofitable to a greater or less extent, the small areas served not permitting lengths of road sufficient to induce traffic. Gross receipts ranged from \$.25 to \$2 per capita per annum, rarely exceeding \$1. Operating expenses, with the closest economy and with minimum expenditures for salaries and maintenance, generally absorbed all, or nearly all the gross receipts, and in the rare instances where net earnings (?) were paid out in interest and dividends it was usually at the real expense of the assets. In many cases such roads actually refused to earn current operating expenses, to say nothing of interest, dividends or proper maintenance charges, and it became an interesting problem to know what to do with them. "Reorganization" was impossible

*In this and subsequent papers the distinction between roads which are purely local in character, not extending outside the limits of single population centers, and interurban roads serving two or more population centers, must be kept clearly in mind. The latter are treated separately as their statistics differ materially from those now under consideration.

without some surplus, or hope of surplus, however small. "Receiverships," without net earnings, would have become unpaid disbursing agencies without funds. Abandonment, though not always easy of accomplishment where franchises are construed as contracts, would have proved in many cases the only resort had not the advent of electricity given to these roads a fictitious value for the purposes of promoters or in consolidations with interurban systems.

The equipment of these small roads by electricity has sometimes—but by no means always improved the financial outlook. Gross receipts have always increased and frequently in a very large ratio—100, 200, even 300 per cent. This is the natural result of radical improvements in service and of the novelty of electric traction. But it has been, and is now difficult to crowd down operating expenses to a point where returns can be regularly made on the necessarily increased capitalization. "Electricians" are costly (sometimes in more ways than one). The fixed expenses of a power station, when distributed over but three, four or five cars, frequently make the cost of motive power excessive; nor can this charge be greatly reduced by hiring power from local lighting stations. In small towns the latter rarely operate more than six to eight hours out of the twenty-four for lighting service. In order to furnish power to an electric railway they must add new engines, boilers, special dynamos and apparatus, and must employ another set of men. The slight saving in general expenses per unit output is more than counterbalanced by the profit necessarily charged by the lighting company. Depreciation of track is greater with electric operation than with horses, and the cost of maintaining the earlier types of electric motors has been disheartening. Nor can we forget that all the items of the profit and loss account are on so small a scale, that a single accident causing loss of life or limb may result in successful damage suits, entirely wiping out a year's net earnings.

The evil of overcapitalization was almost wholly absent in the horse railways of this class, but is decidedly present in their electric successors of to-day, though with a better excuse for being than is always the case with larger systems. In the early days of electric railroading when manufacturing and construction costs were a well guarded mystery, high prices for apparatus and for all kinds of contract work were demanded, particularly when the contractors were obliged to take part payment in bonds. A great majority of the smaller roads could be financed only in this way and were burdened with heavy interest charges hard to meet even at first with road and equipment comparatively new, and presumably in the best condition for profitable operation. Defaults have already occurred, and must be expected henceforth with greater and greater frequency.

While the above discussion applies to the great majority of roads serving less than 15,000 inhabitants, there are many cases which seem to be, and a few which actually are exceptions to the rule. When a population of from 12,000 to 15,000 is scattered along a narrow territory such as a valley or river front, and if there is constant necessity for travel between the different parts of this district, an electric, or even a horse railway will occasionally show true profits on the actual cost of construction. Even so, however, there can be little margin for mistakes of management or for accidents, both of which are a constant menace to net receipts. Again, a "summer road" situated in a small town, but serving a much larger transient population bent on pleasure, is frequently profitable on a moderate scale; but such roads evidently do not properly belong in this class. In still other cases local conditions favor larger gross and net earnings than the average.

I have not thought it wise to incorporate in the Table of Statistics examples of these small properties, because of the impossibility of doing justice to so large a number of roads by the selection of typical cases. The above conclusions are believed to be justified by a careful and patient examination of all available statistics and a somewhat intimate knowledge of the difficulties under which many individual roads are laboring.

Class II. Surface Railways in American Cities and Towns of from 15,000 to 25,000 Inhabitants.

There are ninety-one cities and towns in the United States of from 15,000 to 25,000 inhabitants.* Fifty-seven of these cities are located in the Eastern States, twenty-one in the Central, nine in the Southern, and four in the Western. All but ten have local street railway systems; eight of the ten are connected with larger metropolitan systems, and street railways are projected in the two towns not yet served. The total track mileage exceeds 1,000, of which about 80 per cent. is electric, 16 per cent. horse, and the balance steam and miscellaneous.

Much that has been said about the street railways of Class I is equally true of those now under consideration. The proportion of successes to failures becomes greater, however, as we enlarge the scale of operation, and we find in this class a number of properties which will earn fair returns on a reasonable capitalization. The areas of the cities proper are still too small for large mileage, but the outlying districts have been lately opened up for residence to a surprising extent, so that a service of less than 2,500 inhabitants per mile of road is not unusual. Needless to say that this rapid development is heavily discounting the future, and is frequently an adjunct of real estate speculation. There is no question that the territories affected are being greatly benefited. The census of 1900 will show large additions to urban areas and populations, and many of the systems of this class may eventually become safely profitable. Meanwhile, however, the original security holders will be fortunate if the scaling down of capital liabilities by the reorganization process do not rob them of much of their expected profit.

In the Table of Statistics are given a number of examples of the roads in this class so large as to be fairly representative of all types and conditions developed up to 1892. Many cases are complete, and show the changes made in two years of operation; in others, the returns for 1890 alone are given, later figures not being obtainable. In still others, the statistics of mileage and capitalization for both years are given, but those of operation for 1892 are omitted from lack of full or reliable information.

Of eighteen railways operating by horses in both 1890 and 1892, five only have had a gross passenger income (reported) in either year exceeding \$30,000. Case No. 13 (17,000 population) serves a fashionable winter resort in the South, and its local patronage is greatly increased by the transient. The gross income in 1890 was \$49,000, due to the cause above mentioned and (probably as a consequence) to an exceptionally heavy car service. The cost of the latter was reflected in operating expenses which exceeded the income and left a small deficiency. Cases No. 14 (17,000 population) and 17 (18,000 population) serve two manufacturing cities in an Eastern state; were moderately capitalized in 1890; earned respectively \$36,000 and \$38,000 gross, and \$5,700 net; equivalent to 11 and 6 per cent. upon the respective capital liabilities. Case No. 24 (20,000 population) is perhaps the best horse railway statement in the table. It serves a somewhat important manufacturing city and its suburbs. The capitalization is moderate; there is no floating debt; the car service is good, but not excessive; the passenger income is about \$50,000 gross; \$6,000 per mile of track, \$0.25 per car mile, and \$2.50 per capita; and the net earnings are apparently sufficient to return from 12 to 16 per cent. on the actual investment. This road is now being extended and equipped by electricity, and bonds have been issued conservatively. Case No. 31 (21,000 population) is an excellent statement for so small a road, showing 10 per cent. return on a large capitalization.

But five railways were in operation by electricity both in 1890 and 1892. Case No. 3 (16,000 population) earned \$32,000 gross in 1890, and has presumably earned much more since, as the mileage has been greatly increased and the capital liabilities multiplied by eight. Case No. 4 is unimportant. Case No. 15 (17,000 population) serves a suburb of a large Eastern city; the road is moderately capitalized; the car service is fair; the passenger income is now over \$40,000 gross; \$3,300 per mile of street, \$0.28 per car

mile, and \$2.50 per capita; and the net earnings, though smaller in 1892 than in 1890, were sufficient to return 7 per cent. on the capital liabilities in 1890 and 4.6 per cent. in 1892. Case No. 20 (19,000 population) serves a fashionable coast resort in the East; is heavily capitalized; its passenger income is \$40,000 gross, \$9,400 per mile of street and \$2 per capita; and its net earnings, for practically the first year of complete electric operation, are 8 per cent. on the capital liabilities. Case No. 46 (25,000 population) serves a manufacturing town. It is moderately capitalized; its car service is small; its passenger income has decreased since 1890, although the car miles have increased; the passenger income per capita is but \$1.09; the operating expenses are increasing, and the net earnings, though sufficient to return 11 per cent. in 1890, were in 1892 but 6.5 per cent. on capital liabilities.

There are seven fully reported cases which were in operation by horses in 1890 and by electricity in 1892. It is worth while to examine these in some detail in order to note the effect of the change of motive power upon their success.

Case No. 6 serves a small but prosperous manufacturing town of the East, and was a poor and insignificant property when operated by horses. Its development began in 1891. An extension of about ten miles was built to a lake resort which attracts large numbers of people from all over the country during the summer. The new equipment and construction work are excellent. The population figure (16,000) does not properly represent the actual population served in 1892, because of the new extensions and the heavy transient patronage. The tremendous increase in passenger income from \$12,000 to \$53,000 is, therefore, due less to the introduction of electricity than to the increase of mileage and population served. It is significant, however, that the passenger income per mile of street was \$4,200 in 1892 as against \$3,500 in 1890, a very satisfactory result, and one which shows that the mileage has not been unduly pushed. The fact that the operating expenses have absorbed practically all of the passenger income would be surprising were it not that 1891-92 was the year of reconstruction, and the passenger income is probably less and the operating expenses more proportionately than will be the case in the following year. The capital liabilities given are very small, but have been increased in 1893 to \$550,000, or at the rate of \$25,000 per mile of track, which is overcapitalization of costs to a moderate extent.

Case No. 10 serves a small manufacturing city in the East, of little value as a street railway town, although its passenger income is large for but three miles of track. The net earnings are partly due to the sale of electric power for small factories. The railway, lighting and power accounts are so mixed up that it is impossible to determine the operating expenses of the railway plant alone.

Case No. 12 shows the results of electrical equipment without increase of mileage. The passenger income has increased about 50 per cent., due largely to the fact that the car service has been nearly doubled. The passenger income per car mile is about 25 per cent. less than with horses, and the passenger income per capita has risen from \$0.89 to \$1.27. The net earnings with electric operation show a return of over 6 per cent. on a capitalization of \$12,500 per mile. This return is small for the first year of electric operation, and it is probable that the surplus will be more than wiped out as the maintenance charges increase.

Case No. 28 serves a prosperous manufacturing city. A consolidation of the street railway and electric light companies was made in this city, and the joint enterprise was heavily capitalized, the railway standing at \$67,300 per mile of track. The mileage has been doubled, the car service greatly increased, and the passenger income is nearly quadrupled. The net earnings (due in part to sale of power by contract with the electric light company) were sufficient to show 4.5 per cent. return on the excessive capitalization, but the financial depression of 1893 caused the factories in this town to shut down, and the receipts decreased to such an extent that the road has passed into the hands of a receiver.

*By census of 1890 in all cases.

SERVING FROM 15,000 TO 25,000 POPULATION.

PART II.—STATISTICS OF OPERATION.

Electric, Cable and Steam Railways are given in Italics.

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Table with columns for Case Number, Population, Area, Population (Per Mile Street, Per Square Mile), Year Ending, Car Mileage (Total, Per Capita), Passenger Income (Total, Per Mile Street, Per Car Mile, Per Capita), Operating Expenses (Total, Per Car Mile, % Passenger Income), Net Earnings (Total, Per Car Mile, % Passenger Income, % Cap. Liab.), and Case Number. Rows 1-28 provide detailed data for various street railway cases.

a. Service rapidly deteriorating. b. Operation suspended January 1, 1891, owing to growing deficiencies. c. Plus \$20,546 from sale of current. d. Deficiency. e. Operating expenses due to railway business cannot be separated from total. f. "Operating Expenses" include interest on funded debt. "Net Earnings" are applicable to returns on capital stock. g. Including \$16,090 from sale of current.

TABLE I.—AMERICAN STREET RAILWAY SYSTEMS
PART I.—STATISTICS OF CAPITALIZATION.

SEE "INTRINSIC VALUE OF STREET RAILWAY INVESTMENTS."

Horse Railways are given in Roman figures.

Table with columns: Case Number, Miles of Track (Horse, Electric, Cable, Miscel., Total), Miles of Street, Capital Stock (Total, Per Mile Track, Per Capita), Funded Debt (Total, Per Mile Track, Per Capita), Capital Liabilities (Total, Per Mile Track, Per Capita), Floating Debt (Total, Memo.), Case Number. Rows 29-47.

i. Approximate.

s. Current assets exceed current liabilities.

the totals of net earnings, we cannot but fear that the latter will gradually dwindle to the point of disappearance.

3. Few of the entire number will be able to earn a 5 per cent. dividend. on their capital stock after meeting true operating expenses and fixed charges.

4. None of the securities are worth the consideration as investments of other than local capitalists, who may be able to give personal time and care to the management of the properties.

THE TABLE OF STATISTICS.

The Tables of Statistics which accompany these papers cannot be made complete nor wholly satisfactory. The frequent refusal of street railway managers to furnish information, even for anonymous use, is not unnatural, although it is doubtless a mere matter of time before the recognized right of the public to have knowledge of the profits derived from municipal franchises will be exercised in all our states as it now is in several of the East. The figures given in the table are

obtained chiefly from official sources, and are believed to be as nearly correct as can be expected where such great differences in bookkeeping methods exist. Nearly all of these official returns are given under oath, which does not always prevent, however, careless or intentional misstatements. This can only be detected by most careful inspection and comparisons of balance sheets from year to year, and I have been under the necessity of rejecting many cases otherwise highly interesting. The figures finally admitted to the tables are believed to be reliable, except as to the items of "operating expenses" and "net income." In these, the soundness or honesty of the various methods of distributing expenditures, particularly where "construction accounts" exist, is by no means guaranteed. It may be said in this connection that the uniform system of accounting prescribed for street railways in Massachusetts by the Board of Railroad Commissioners has, for many years past, secured returns whose substantial correctness is hardly open to question. The New York returns also, though less perfect in some details, are nearly as reliable as those of Massachusetts. Those of Maine and Rhode Island are believed to be honest, but, being given in much less detail, discrepancies cannot be so readily detected. The published returns of Pennsylvania are arranged in such a way as to be in the highest degree chaotic, inconsistent and misleading, and those of

SERVING FROM 15,000 TO 25,000 POPULATION. (Continued.)

PART II.—STATISTICS OF OPERATION.

Electric, Cable and Steam Railways are given in Italics.

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Case Number	Population		Area		Year Ending	Car Mileage		Passenger Income				Operating Expenses			Net Earnings				Case Number
	Served	Per Mile Street	Per Square Mile	Total		Per Capita	Total	Per Mile Street	Per Car Mile	Per Capita	Total.	Per Car Mile	% Passenger Income	Total	Per Car Mile	% Passenger Income	% Cap. Liab.		
																		a		b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t
29	21,000	4,200	6-30-1890	351,350	16.7	18,700	3,700	.053	.89	10,670	.030	57.2	8,030	.023	42.7	6.9	29		
30	21,000	2,800	6-30-1890	373,125	17.8	26,713	3,600	.072	1.27	31,837	.085	119.1	8,016	...	30.0	4.8	30		
31	21,000	7,500	6-30-1890	29,045	...	10,300	...	1.38	...	21,766	...	75.2	8,500	...	29.3	10.5	31		
32	21,000	4,700	6-30-1890	292,000	13.9	25,000	5,600	.086	1.20	19,575	.067	78.4	5,575	.019	22.3	5.6	32		
33	21,000	4,000	6-30-1890	17,912	...	3,400	...	.85	...	15,591	...	87.2	2,865	...	16.0	3.5	33
34	21,000	7,000	6-30-1890	216,810	10.3	15,075	5,000	.070	.72	14,775	.068	98.0	1,815	.008	12.0	3.6	34		
35	21,000	4,200	6-30-1890	124,968	6.0	13,769	2,800	.110	.66	10,301	.082	74.6	3,505	.028	25.3	6.7	35		
36	22,000	1,300	6-30-1890	30,399	...	1,800	...	1.38	...	16,936	...	55.6	13,463	...	44.4	3.4	36		
37	22,000	1,600	6-30-1890	86,032	...	6,100	...	3.91	...	37,852	...	44.1	48,200	...	56.0	14.4	37		
38	22,000	11,000	6-30-1890	6,494	...	3,200	...	.30	...	6,477	...	99.8	17	...	.3	...	38
39	22,000	2,800	6-30-1890	238,318	10.8	43,376	5,600	.182	1.97	26,896	.113	61.9	16,669	.070	38.5	8.4	39		
40	22,000	6,700	6-30-1890	16,955	...	5,200	...	.77	...	17,045	...	100.0	499	...	2.9	.6	40
41	23,000	2,900	6-30-1890	18,533	...	2,300	...	.80	...	13,129	...	70.8	5,615	...	30.4	5.4	41
42	23,000	4,800	6-30-1890	24,795	...	5,200	...	1.08	...	24,493	...	98.8	302	...	1.2	.2	42		
43	24,000	5,300	6-30-1890	197,100	8.2	22,577	5,000	.115	.94	18,537	.094	81.9	4,108	.021	18.2	2.2	43		
44	25,000	5,000	9-30-1890	132,322	5.3	34,436	6,900	.261	1.38	31,280	.237	91.0	4,173	.032	12.1	4.0	44		
45	25,000	2,100	6-30-1890	438,000	17.5	44,049	3,700	.101	1.76	38,912	.089	88.4	15,134	.034	34.3	6.5	45		
46	25,000	4,200	9-30-1890	117,450	4.7	30,144	5,000	.258	1.21	19,479	.167	64.8	11,427	.097	37.9	11.4	46		
47	25,000	1,500	6-30-1890	558,450	22.3	74,781	4,500	.134	3.00	55,041	.099	73.5	20,054	.036	26.8	5.7	47		

h. Including \$12,000 from rentals.

k. Operation not commenced.

o. From operation.

New Jersey are even more valueless, though for different reasons. The census investigations in charge of Henry C. Adams, from which many of the 1890 statistics in the present tables are taken, was admirably planned and patiently followed up by detailed correspondence. The results are the most complete of the kind in existence for the one year period covered. It is impossible, however, to be certain that the returns were correct, though as they were in nearly all cases signed by responsible officers of the roads, they are here presumed to be so.

The method of arranging the Table of Statistics is believed to be the best for present purposes. Street railway systems serving population centers of the same size are directly comparable and in practically the same years of operation. In many cases comparisons may be made between the operating year ending in 1890 (which marked the beginning of the recent era of street railway development), and the operating year ending in 1892. It should be noted that these street railway "cases" are frequently combinations of two or more independent companies operating within the same territorial limits. The exact method of making up the tables is described in detail as follows:

Column A. Case numbers. For reference.

Column B. Miles of track operated by horses (or mules), measured as single track including sidings.

Column C. Miles of track operated by electricity, measured as single track including sidings.

Column D. Miles of track operated by cable, measured as single track including sidings.

Column E. Miles of track operated by motive powers (chiefly steam dummies) other than horse, cable and electric, measured as single track including sidings.

Column F. Miles of track operated by all motive powers, measured as single track including sidings.

Column G. Miles of street containing track, equivalent to the miles of single track roadbed (not including sidings) plus the miles of double track roadbed.

Column H. Capital stock, actually issued and outstanding, not including treasury stock.

Column I. Capital stock per mile of track, = $\frac{H}{F}$; results carried to nearest \$100.

Column K. Capital stock per capita population, = $\frac{H}{b}$; results carried to nearest \$0.10.

Column L. Funded debt, actually incurred and on balance sheets;

includes mortgage bonds and (rarely) other secured indebtedness except collateral notes and subsidiary real estate mortgages, which are found in Column R.

Column M. Funded debt per mile of track, $= \frac{L}{F}$; results carried to nearest \$100.

Column N. Funded debt per capita population, $= \frac{L}{b}$; results carried to nearest \$0.10.

Column O. Capital liabilities, $= H + L$.

Column P. Capital liabilities per mile of track, $= \frac{O}{F}$; results carried to nearest \$100.

Column Q. Capital liabilities per capita population, $= \frac{O}{b}$; results carried to nearest \$0.10.

Column R. Floating debt, where marked "net" in Column S, consists of current liabilities in the balance sheet (bills and accounts payable, and miscellaneous items not protected by mortgage), less current assets (cash, bills and accounts receivable and miscellaneous items), the letter "S" signifying that the current assets exceed the current liabilities; when marked "B. P." or "B. A. P." in Column S, consists of bills payable, or bills and accounts payable respectively, without reference to offsets in current assets. Entire absence of figures signifies that the floating debt cannot be ascertained.

Column S. Memoranda concerning floating debt; see column R for explanation.

Column T. Case numbers; identical with column A.

Column a. Case numbers; identical with columns A and T.

Column b. Population served by the various street railway systems numbered; census of 1890 in all cases; suburbs included wherever it is known that they are served.

Column c. Area served in square miles; official census returns not yet issued.

Column d. Population per mile of street $= \frac{b}{G}$; results carried out to nearest 100.

Column e. Population per square mile $= \frac{b}{c}$; results carried out to nearest 100; official figures not yet obtainable.

Column f. Year for which operating report is made.

Column g. Car mileage made during operating year.

Column h. Car mileage per capita population, $= \frac{g}{b}$; results carried out to nearest 0.1; shows comparative service given by different systems, and has a bearing on gross receipts.

Column i. Passenger income for operating year; not including income from any source other than passengers.

Column k. Passenger income per mile of street, $= \frac{i}{G}$; results carried out to nearest \$100.00.

Column l. Passenger income per car mile, $= \frac{i}{g}$; results carried out to nearest \$0.001.

Column m. Passenger income per capita population, $= \frac{i}{b}$; results carried out to nearest \$0.01.

Column n. Operating expenses; includes all charges properly distributed to the four accounts of "General Expenses," "Transportation," "Maintenance of Way and Structures" and "Maintenance of Equipment," together with taxes, state and local.

Column o. Operating expenses per car mile, $= \frac{n}{g}$; results carried out to nearest \$0.001.

Column p. Percentage of operating expenses to passenger income, $= \frac{n}{i}$; results carried out to nearest 0.1 per cent.

Column q. Net earnings; the figures in this column are made up with great care after careful inspection of the respective profit and loss accounts; they represent the difference between passenger income (Column i) and operating expenses (Column n) plus miscellaneous income, such as car advertising, sales of by products, interest and dividends on treasury assets, rentals of track (which might also be credited to maintenance account in operating expenses), etc.; minus miscellaneous disbursements not chargeable to operation, such as interest on floating debt, rentals of track, etc.

Column r. Net earnings per car mile, $= \frac{q}{g}$; results carried out to nearest \$0.001.

Column s. Percentage of net earnings to passenger income, $= \frac{q}{i}$; results carried out to nearest 0.1 per cent.

Column t. Percentage of net earnings to capital liabilities, $= \frac{q}{O}$; results carried out to nearest 0.1 per cent.

Column u. Case numbers; identical with columns A, T, a.

In all the calculations, three significant figures are used where the results are given with three or less significant figures, and four when required by the results.

When the motive power on one half or more of the track mileage is horse, Roman figures are used. When the motive power on more than one half the track mileage is electric, cable or steam, the figures are given in italics.

Curves and Turnouts for Electric Railways.

By F. A. BRYAN.

Electric railroads have been so extended into the suburban districts during the last few years that, in the strict sense of the word, many can no longer be called street railways. In this extension steam road practice has to a certain degree been followed in the construction, but not to the extent that it should be. Too often do builders seem to think simply of getting the rails down irrespective of other factors. The general impression seems to be that because a car can go around a curve within a thirty-five foot radius, it ought easily to travel one with 150 ft. radius. This, of course, is the case, but, can we not, by reducing the curvature to a minimum, reduce the wear and tear, the needed power and the liability of derailment; and, above all, add to the comfort of the passengers, making our road more popular? Is not a sudden shock or jar to a dozen passengers holding to the straps as undesirable as it is on a steam road? The curvature on suburban roads should be of as small a degree as possible, but it is usually made up of fifteen to thirty degree curves, while a maximum on good steam roads in mountain districts is but ten degrees. Such

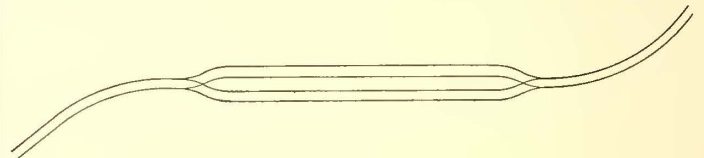


FIG. 1.

curves should always be spiraled, thereby blending insensibly together the tangent at one end and the curve at the other, and thus removing the sudden shock and jerk otherwise felt when a car enters a curve.

For some reason, probably on account of being more familiar with street roads proper, electric railway man-

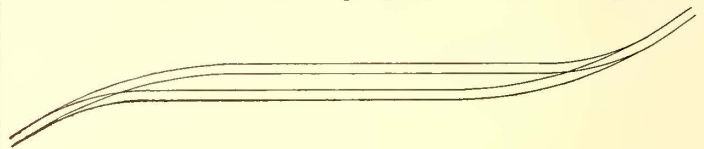


FIG. 2.

agers and engineers seem to entertain the idea that for a single track road, the only desirable passing siding is the standard diamond turnout. Of course, on straight track in streets this is desirable, but in many cases on public roads, where the track is on the company's property, there

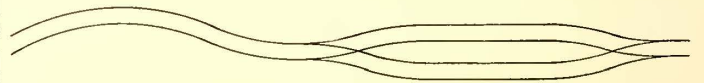


FIG. 3.

is seldom any reason for the use of such a turnout. The writer has several instances in mind where the engineer seems to have taken special pains to have diamond turnouts in locations such as shown in Fig. 1. Why should we not profit by the best steam road practice, and build a passing track similar to that shown in Fig. 2? In the

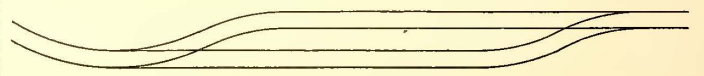


FIG. 4.

former we have six distinct curves, and in the latter but two. Then again, by having the outside track, or one with greater radius, irrespective of whether they pass to right or left, the trolley is not liable to jump at the switch, and we can take the siding at full speed, if desired.

Another instance is at a street corner where we have a reverse curve in order to obtain a greater radius. Here I have seen turnouts located as shown in Fig. 3. Why not use one as shown in Fig. 4, thereby not increasing the curvature any above what we have for single track?

Annual Report of the New York and Brooklyn Bridge Trustees.

The report of the trustees of the New York and Brooklyn Bridge for the year ending December 1, 1893, was submitted last month to the mayors of the cities of New York and Brooklyn. The following is an abstract of the report as relating to the cable railway. The receipts from tolls during the year amount to \$1,252,908.04 divided as follows: Railroad, \$1,167,497.65; carriageways, \$85,410.39. Passengers carried by railroad numbered 42,615,105 and the income derived from this department shows an increase of \$22,501.81 over that of the previous year.

The railroad fare is three cents or ten tickets for twenty-five cents. The travel on the Bridge railway continued to increase until in August last, when for the first time during its operation the travel began to decrease, and has continued to do so up to the present time, but at a diminishing ratio. The number of passengers carried in October was 3,644,053, only 21,037, or about one-half of 1 per cent. greater than the number carried two years before, in October, 1891. The rate of increase and decrease of travel and its fluctuations at different periods of each year, from January 1, 1885, to November 19, 1893, are graphically represented by the diagram on this page, which is a continuation of that printed in the report of 1892. This, it will be noticed, is based upon the average number carried in consecutive periods of four weeks, and exhibits abrupt changes at different seasons, generally the maximum being in May and the minimum in August.

From the opening of the railway to the public use, September 24, 1883, to November 30, 1893, inclusive, a period of ten years and sixty-seven days, 304,875,286 passengers were carried. During any month, the greatest number transported was 4,033,920, in October, 1892, which included the week from the 8th to the 15th of the Columbian festival. The next greatest number was 3,846,493, in May of the current official year, an average of 124,080 per day. In one day of twenty-four hours, the maximum number carried was 223,625, on October 13, 1892, during the Columbian festival; the next greatest number was 166,403, on January 14; and the minimum number during the current official year was 45,280, on August 20.

Since the date of the last report the trains have been run with great regularity and few interruptions. The total time lost by delays, from all causes, was four hours thirty-five and a half minutes, an average of forty-five and a quarter seconds per day of twenty-four hours, or of one minute for 154,668 passengers carried. Of the total time lost by these delays, only 38 per cent. was due to a failure of or a defect in some of the several parts of the cable hauling machinery; the remaining 62 per cent. was due to accidents common in ordinary railroad transportation.

The grip mechanism has been even more reliable and trustworthy during the past year than ever before. Generally, since it was perfected and its operators became accustomed to its application, but little time has been lost in the movement of trains from its failure in any way to perform the service required of it. During the period covered by this report, from such failures altogether there were but seven delays, aggregating one hour and nine minutes, of the total thirty-seven delays from all causes whatever during the 7,300 hours the cable was in active operation.

The railway continues to supply extraordinarily safe transit for its passengers. Referring to this, the following from the preceding report is as true as when then written: "Of the large number carried since its opening to public use, no one in transit has been fatally injured. The principal accidents still are in the form of rear collisions at the stations, caused by an incoming train bringing up against a preceding one not hauled out from the platform in time. As the cars now in use are constructed, when such accidents occur there is little or no damage done to the cars, and the passengers are entirely safe from shock, as well as injury, if they are within the cars and seated."

For switching at the stations the trains hauled by cable, and for hauling the trains over the entire railway generally for the four hours each day, from one to five o'clock A. M., and at other occasional times when from any cause the cable is stopped, locomotives are used, for which until recently there were six, all of one type, each upon two pairs of driving wheels, and weighing when loaded twenty-two tons. These locomotives will haul trains of four cars over the switches and of two cars over the Bridge. They, however, in consequence of the necessarily long wheel base and their lack of steadiness of movement, rapidly wear the rails and flanges when passing the curves of the switches and main tracks. To reduce in some measure this wear, as well as to provide greater facilities for hauling the trains, a locomotive of an entirely different design was recently procured, with the view, if its operation was found satisfactory, to adopt it as a type of the locomotives hereafter to be used. This locomotive was ordered in August and delivered in November last. It has four driving and four truck wheels, one pair of the latter being pivoted to and placed at each end of the locomotive frame. Its weight when loaded is thirty-four and a half tons. A test, preliminary to putting it in regular service, was made, showing that on dry rails and under favorable conditions, it can haul at cable speed (ten and a third miles per hour) a train of four cars partly loaded or a train of three cars fully loaded with passengers; that is, from eighty-five to 100 tons, this being up the steep grades of the Bridge, the maximum of which is 3 3/4 per cent., or 175 ft. to the mile. Its hauling capacity, therefore, is more than one-half greater than that of the locomotives previously in the service here.

It was stated in the report for the year ending December 1, 1891, that measures had been taken to double the facilities of the Bridge railway and in like proportion to lessen the discomfort of travel during the hours when the largest number of passengers are to be transported; general plans therefor were prepared, including a new and enlarged

station in New York and one in Brooklyn, *an extension of the car storage yard from Concord to Tillary Street, a duplication of the cable driving plant, and other additions necessary to render the whole complete and effective. Of these during the year following the report, the elevated structure for the car storage yard was erected and the extension of the power house and boiler house had been previously finished. During the past year, the cable driving machinery, including a duplicate set of steam boilers has been erected. In obedience to the resolutions passed October 13, 1893, all work on the Brooklyn station has been suspended pending certain modifications in the plans.

It may be proper here to say that annoying and disappointing as are these continued delays in the accomplishment of the purpose of the trustees to as speedily as practicable increase the facilities of the railway, and to relieve its passengers from the crowding and disturbance consequent upon its present limited capacity, it is deemed wise to be certain that whatever may be finally done will best serve their purpose to these ends.

In September last, the attention of the trustees having been called to the ease and efficiency with which the Intramural Elevated Railway

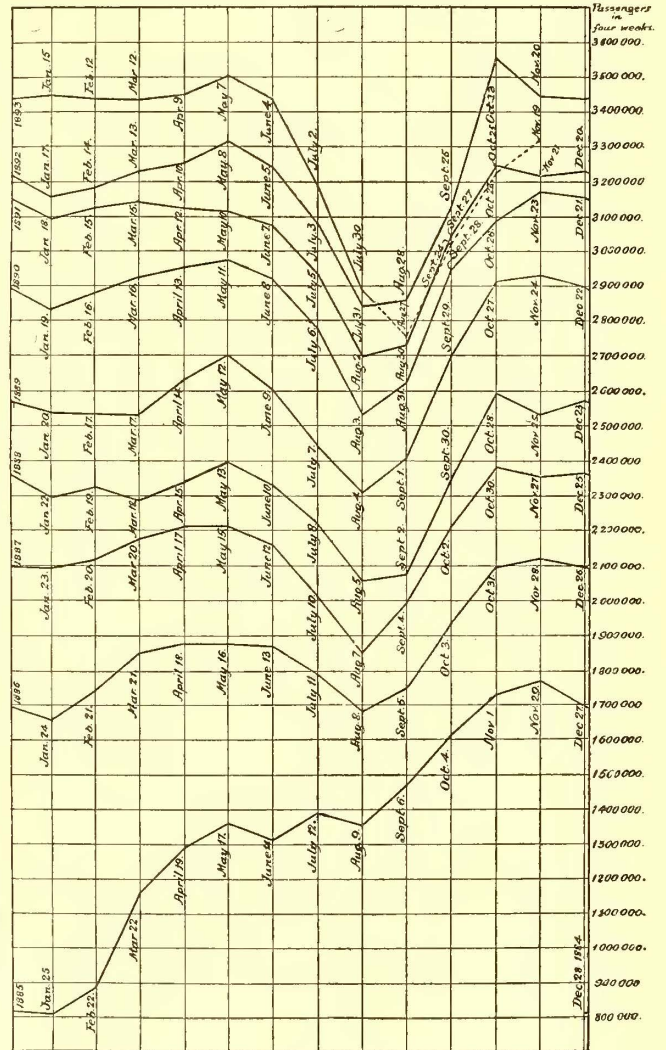


DIAGRAM SHOWING TRAFFIC ON NEW YORK & BROOKLYN BRIDGE CABLE RAILWAY.

on the grounds of the Columbian Exposition, at Chicago, was operated by electric motive power, they directed their engineers to make detailed examination of the same, with a view to determine whether it would be expedient to substitute electric for cable power on the Bridge railway. The report of the engineers has not been formally presented, in consequence of a delay in procuring certain required data as to equipment and cost. It, however, may be here stated that the results of their examination do not, in their opinion, justify at the present time a change, involving necessarily expensive and perhaps doubtful experiment before it will be established that such substitution is safe and economical. Possibly in the future, when the application of electricity to move frequent and heavy trains over steep slopes, under the conditions which govern the operation of the Bridge railway, is elsewhere fully developed, it may be desirable to again consider this matter.

In conclusion, the management desires to again testify to the faithfulness and efficiency with which the several employes have discharged their duties, sometimes at the risk of life and limb, and generally with an earnest desire to fully serve the public to its complete satisfaction and to their best ability.

*These plans were given in the STREET RAILWAY JOURNAL for April, 1893, p. 206 and for May 1893, p. 232.

Annual Report of the West End Street Railway Company.

The annual meeting of the stockholders of the West End Street Railway Company, of Boston, was held November 28. By the vote for directors the next board will be decidedly different from the old one. Six of the old board of fifteen retire. They are Isaac T. Burr, Prentiss Cummings, Joseph S. Fay, Jr., William Powell Mason, Dexter N. Richards and Nathaniel Thayer. The new members of the board are Alfred Bowditch, Francis L. Higginson, William Hooper, B. Rodman Weld and Alfred Winsor, all of Boston, and Samuel Spencer, of Drexel, Morgan & Company, of New York.

The sixth annual report of the company, being that for the twelve months ended September 30, 1893, shows a gain in gross receipts of the usual \$1,000 per day with something to spare, the total gain being \$375,372, of which but \$72,951 was consumed in added expense for operating. The improvement was \$302,421, of which \$180,077 was required for added taxes, interest and rentals, leaving for dividends \$122,344 more than the previous year. The common dividend was reduced from 10 to 8 per cent. in July last, and yet the total dividend payment for the past year is about the same as for the previous year. The balance to surplus account is \$122,414 compared with \$6,358 a year ago. Operating expenses were a trifle under 68 per cent. of gross receipts, against 70.24 per cent. in 1891-92, and 74.47 in 1890-91.

The balance sheet shows current liabilities of \$2,215,010, and offsetting assets of \$1,408,200, leaving \$716,810 to be met by the balance of bond subscription, say, \$500,000, leaving a nominal floating debt. In the liabilities for this reckoning are sundry items accrued, but not due. The track improvement account stands charged in the balance sheet with \$192,190 "to be later written off against earnings." This is the balance of track reconstruction account above what the railroad commissioners permit to charge to construction account. Had this been charged against earnings the past year, the dividends would not have been quite earned. The future will, of course, derive benefit from the track improvements of the past year, and it might be contended that it should share in the expenditure. The reduction in the common dividend last July was a conservative step, as shown by analysis of the annual report. A summary is as follows:

Year Sept. 30.	1892-3.	1891-2	Increase.
Earnings.....	\$6,692,578	\$6,317,205	\$375,372
Expenses.....	4,559,734	4,477,783	72,951
Net.....	\$2,141,843	\$1,839,422	\$302,421
Charges and tax.....	689,778	509,701	180,077
Balance.....	\$1,452,064	\$1,329,720	\$122,344
Dividends.....	1,329,650	1,323,362	6,288
Surplus.....	\$ 122,414	\$ 6,358	\$116,056

ASSETS.

Sept. 30	1893.	1892.
Construction.....	\$6,076,760	\$5,920,585
Real estate.....	7,315,153	7,342,904
General equipment.....	512,614	556,917
Horses, 2,123 in 1893, 3,754 in 1892.	284,482	563,036
Cars, 826 in 1893, 1,226 in 1892.	690,448	919,130
Electric cars, 1,346 in 1893, 1,028 in 1892.....	4,318,988	3,238,227
Electric line equipment.....	1,276,417	973,437
Electric car house and shop equipment.....	166,811	99,989
Power station equipment.....	1,845,853	1,441,041
Malden & Melrose R.R. Co.....	214,519	214,519
Somerville Horse R. R. Co.....	82,353	82,353
Furniture and fixtures.....	19,978	24,778
Stocks and bonds.....	75,100	75,100
Track improvement.....	192,190	.....
Cash.....	738,654	355,052
Material and supplies.....	472,639	554,029
Notes and accounts receivable.....	255,822	289,354
Insurance, present value.....	31,114	12,783
Total assets.....	\$24,569,871	\$22,603,340

LIABILITIES.

Common stock.....	\$9,085,000	\$9,085,000
Preferred stock.....	6,400,000	6,400,000
Funded debt.....	6,690,000	4,265,000
Notes payable.....	1,219,700	1,376,448
Current bills.....	725,526	923,120
Coupon interest uncalled for.....	24,472	22,057
Dividends uncalled for.....	8,925	12,409
Outstanding tickets and checks....	11,520	11,136
Accrued interest and rentals not due	96,866	44,783
Accrued pfd. div. to Sept. 30.....	128,000	128,000
Profit and loss surplus.....	179,861	336,284
Total.....	\$24,569,871	\$22,603,240

The surplus account is credited with \$458,699, of which \$179,861 is carried forward to the new year, and the balance is charged off as follows: Buildings removed and destroyed, \$37,952; loss on decrease of 1,631 horses, \$147,051; old track removed and not replaced, \$27,524; depreciation of equipment, \$66,310. The track mileage September 30 was 268½, and the addition during the year was 8½ miles. The miles fully equipped with electricity were 182½ (an increase during the

year of 34.48 miles), and 25½ miles were partially equipped. The revenue miles were 18,669,809 against 17,498,660 miles the previous year. Number of revenue passengers 133,863,618, against 126,210,781. Of the number of revenue miles run 76.17 per cent. was electric and 23.83 horse, against 48.63 and 51.37 per cent., respectively, last year. Of the passenger receipts 80.33 per cent. was from the electric lines (against 53.39 last year), and 19.67 from horse lines. The average receipts per passenger were 4.943c., an increase of .001c.

The company owns 524 box horse cars, against 702 last year, and 302 open, against 524 last year; 720 box electrics, against 577 last year; and 624 open, against 451 last year; two motor cars; 2,123 horses, against 3,754 last year; 1,657 electric motors, 83 horse snow plows and 84 electric, 372 snow sleds, and 548 miscellaneous vehicles.

During the year twenty persons were killed and 310 injured on the West End road. Of the killed one was a passenger, two were employes and seventeen other persons. Of the injured 169 were passengers, twenty-three employes and 118 others.

Mr. Prentiss Cummings, vice-president, furnishes the following in connection with the report:

At the close of the year five-sixths of all the mileage, namely, 1,325,000 miles per month, was run by the electric system. It is expected that during the coming year that system will be so extended as to cover most of the important lines.

The board of directors has undiminished confidence in the electric system, and the increased riding, wherever it is introduced, proves clearly that the public consider it a great improvement over horse power. This fact and the comparative cheapness of operation, in the opinion of the directors, justify the large expense involved in the introduction of the system.

To meet this expense and fund a floating debt incurred for construction, the company has authorized the issue during the past year of 5 per cent., ten year bonds to the amount of \$3,000,000. All have been sold, and bonds to the amount of \$2,500,000 have been delivered and paid for, and the remaining \$500,000 are by contract to be delivered and paid for on or before January 1, 1894. The loss on horses, real estate and cars involved in the change, to the amount of \$251,313.60, has been charged off during the year either against the surplus or against the earnings, as is detailed more particularly in the auditor's statement hereto annexed. In pursuance of a conservative policy, your directors decided to reduce the semi-annual dividend paid, July 1, from 5 to 4 per cent.

The business of the company has been prosperous during the past year, the average increase of \$1,000 a day over the preceding year being more than maintained. Since August 1, however, the effect of the financial difficulties in which the country has been involved has appeared in the receipts, which since that time have been just about equal to last year.

Mr. Henry M. Whitney who had been president of the company since its organization, resigned September 7, 1893, owing to the pressure of business in large interests wherein he is engaged.

An interesting analysis of the earnings and expenses is appended and throws light upon two items much discussed during the year, snow damages and accident damages:

RECEIPTS.		Increase.
From passengers.....	\$6,616,607	\$378,960
Rent of tracks.....	15,537	2,114
Sales of manure.....	7,809	*5,111
Rent of real estate.....	19,380	*2,129
Advertising.....	31,326	1,936
Miscellaneous income.....	1,917	*399
Totals.....	\$6,692,578	\$375,372
EXPENSES.		
For general expenses.....	\$401,192	\$37,476
Maintenance of track.....	281,015	42,224
Maintenance of buildings.....	66,440	12,890
Maintenance of cars and vehicles....	298,068	78,329
Maintenance of horse equipment....	51,101	*171,308
Maintenance of electric equipment..	343,073	86,151
Road and snow expenses.....	198,247	64,769
Transportation expenses.....	2,691,273	*91,429
Injuries and damages.....	220,322	13,847
Totals.....	\$4,550,734	\$72,951
Net earnings.....	\$2,141,843	\$302,421

A Generous Gift.

The Chicago City Railway Company, to help the Columbian Exposition last summer, subscribed for 10,000 shares of Columbian Exposition stock. The board of directors of the company now proposes to donate these shares to the permanent museum now being established in Chicago, provided such action is approved by the stockholders of the railway company. The next meeting of the stockholders is on January 15, when it is expected that a vote will be passed approving the proposed action.

*Decrease.

Trinidad Pitch.

FROM A REPORT BY CLIFFORD RICHARDSON TO THE COMMISSIONERS OF THE DISTRICT OF COLUMBIA.

(Continued from our last issue.)

LAKE AND LAND PITCH—THEIR PROXIMATE COMPOSITION.

For the purpose of studying the various deposits of pitch, and making a comparison of their properties and value for paving purposes, a large collection of specimens was made from the lake and from the land deposits. These have been carefully examined since my return, and the results are presented here, together with some observations upon commercial specimens collected in this country which have extended over a number of years.

On the lake, specimens were collected at each station on the line of levels, which was run from north to south across it at intervals of 100 ft., and also on an east and west line at intervals of 200 ft., and at the soft and semi-soft spots.

Specimens of land pitch were taken from the several excavations which were visited, from the heaps prepared upon the beach for shipment, and in a few places where the pitch is not worked commercially.

The samples were brought to this country in tin boxes, and although most of them less than a pound in weight, represent, I believe, fairly the deposits from which they were taken. Some of the better class of land pitch deposits had not been opened when I was in Trinidad, but of one or two of these I have since obtained specimens.

When calculated to dry substance the figures become:

	Soft.	Average lake.	Average land.
Inorganic matter.....	38.00	36.56	37.74
Organic matter not bitumen.....	9.64	10.57	10.68
Bitumen.....	52.36	52.87	15.58
	100.00	100.00	100.00

It is apparent, therefore, that in the commercial supply of land pitch which has been carefully selected and from which alteration products and soil have been excluded there is no essential difference in the relative proportions of mineral matter, bitumen and organic matter not bitumen from those in lake pitch. The difference between the two pitches depends, therefore, on some variation in the character of their constituents. The mineral matter and the organic matter not bitumen do not change so as to affect the properties of the pitch, as will be seen when they are described further on. The bitumen in the two pitches must therefore be to some extent unlike, and it is a fact that the original bitumen of the lake pitch has become to a greater or less degree modified in the land deposits. As the soft spots in the lake gradually harden and become like the rest of the surface so this process continues, making the outer portions of the lake harder than the center, and the land deposits harder than any part of the lake. We find evidences of this in the heaps of pitch ready for shipment on the shore. Those of lake pitch rapidly run together and become a homogeneous mass in a short time, while the land pitch, even under the strong tropical sun, still shows the distinct lumps of which it was originally made up, for a longer or shorter time, depending on the quality of the land deposit. With the poorest deposits they remain so loose and friable that it is possible to shovel over such heaps even after weeks.

Their softening and flowing points of the specimens examined reveal the difference, and the results show the greater softness of the lake pitch, and were it not for the difficulty of getting rid of the water in such small samples as were collected of the crude pitch, without losing some of the lighter oils, upon which the flowing point much depends, the relative differences shown in the tables would be greater and more distinctive.

In consequence of this difficulty of removing the water on a small scale from specimens, without decided changes in their character, the comparative study of the bitumen in the two kinds of pitch has been continued with typical specimens of refined pitch, carefully handled on a large scale.

THE DIFFERENCES IN THE CONSTITUENTS OF LAKE AND LAND PITCH.

Refining pitch commercially consists in heating large quantities in stills or boilers to as high a temperature as will drive off the water in the material and melt it without volatilizing the oils to any noticeable degree, the heat being applied, not directly from a fire underneath the vessel, but by conducting the products of combustion around it, beginning at the upper portion of the still. The melted product from which the water has evaporated, the coarser mineral matter subsided, and the lighter organic matter been skimmed is drawn off and is known as refined asphalt, or in Trinidad as *epuré*. It gives the bitumen of the pitch in a more available form for investigation, and where the process has been carefully conducted, in one representing very closely its nature and character as found in the original pitch.

SOFTENING POINT.

As has been said, the differences in the pitch from the lake and from the land deposits are first revealed by the lower softening point of the former. In commercial refined asphalt this difference is readily recognizable. Determinations accumulated during the past three years with different cargoes have furnished the following extremes:

From a commercial point of view it is not quite possible to tell from the softening point alone the origin of refined asphalt, where refining has been carefully conducted. The figures, however, are representative of characteristics which can be made visible by reducing portions of the refined asphalt to an impalpable powder when cold, and then allowing them to stand in a small heap at ordinary temperatures, seventy to eighty degrees. Under these circumstances the lake material will become caked and tough after twenty-four hours, so that the powdery mass can only be separated with the use of some strength. The best land asphalt adheres somewhat, while the poorer qualities remain in their original condition, and in no wise agglomerated.

	Soft.	Flow.
	°F	°F.
Refined lake asphalt.....	180—193	189—210
Refined land asphalt.....	190—237	210—255

If in addition, these preparations are subjected to a temperature approaching or equaling their softening points, they will flow if placed on an incline, and the distance covered may be expressed in percentages of some standard sample, thus giving another expression of the quality of the material.

The softening point of refined asphalts is, of course, modified by the care exercised in refining, and somewhat by the portion of the still from which the sample is drawn when any sedimentation has been allowed or excessive heat applied.

Refined lake asphalt of good quality always softens between 190 degs. F., refined land above that temperature.

CONCLUSIONS IN REGARD TO THE PRESENT POSITION OF THE PITCH INDUSTRY, AND THE RELATIVE VALUE OF LAKE AND LAND PITCH.

In the light of the foregoing investigations and facts the following brief conclusions appear to me to be justified in regard to the present status of the pitch industry:

Land pitch is inferior to lake pitch in cementitious value. Land pitch is better in quality the nearer its source is to the lake. Land pitch can readily be distinguished from lake pitch by certain characteristic differences when examined in the refined state.

Lake pitch is superior for paving purposes, because it contains more bitumen in a viscous or cementitious form and less of the brittle bitumen, which is of smaller value.

The addition of oils to the latter form of bitumen will not produce as desirable cement as that made from lake asphalt. It will not draw out to a long string like lake asphalt cement, but breaks short and is of the same comparative value that cold short is to tough and good iron.

Land pitch requires the addition of more petroleum oil to produce a cement of required consistency than lake pitch.

Land pitch would never be used were lake pitch generally available.

The poorer forms of land pitch are now generally conceded to be unfit for paving, and the question may therefore be asked, where the line or degree is to be drawn as to what is suitable?

The large extent of the lake deposit permits of an unfailling and uniform supply, which can always be depended on and always handled in the same way.

Various deposits of land pitch vary widely and demand great skill in manipulation to produce even the best results attainable with this kind of pitch, although the care used in selection and cutlassing has improved the character of the shipments decidedly.

This element of manipulative skill in handling the materials properly for the production of a good pavement, that is, a thorough understanding of the technique of the industry, in the works and in the street, should, without doubt, have equal consideration with the quality of the materials in use.

A skilled laborer can probably make a better pavement from land pitch than an unskilled one with lake pitch.

With the enormous growth of the industry within a short period of time, the demand for experts has continually exceeded the supply. Every one engaged, from the superintendents and foremen down to laborers, has a decided influence on the character of the finished work. Those who refine and handle the crude asphalt, who make the asphaltic cement and compound the surface mixture, and those who rake and roll the material in the street, according to the degree of their knowledge, experience and skill contribute to the success or failure of the work. The older paving companies certainly control the best labor and brains, having had the longest and most successful experience, and the city of Washington as a pioneer in laying asphalt surfaces has probably at present as able a set of men employed by its contractors as can be found. The character of our street surfaces of all ages attests this fact and it would seem to me to be undesirable, at the height of our success, to enter into any experiments with new and untried conditions and materials.

Should any competitors of the present contractors or methods desire to exhibit their work, there is no reason why they should not be given an opportunity to prove it of superior character, by laying a certain amount at their own expense, where it would be subjected to fair conditions of traffic and wear, in comparison with our own asphalt surfaces.

I should, therefore, in the light of all my experience and knowledge, unless further evidence is adduced or great pecuniary advantages offered, recommend that the District of Columbia provide in its specifications that lake pitch be used in pavements for which it contracts, and that the work shall be done by the most skillful and experienced labor and in the most approved manner.

St. Louis Notes.

Workmen are busy at the works of the Madison Car Company, of Madison, Ill., getting things in shape preparatory to an early resumption of business. This company failed July last.

The Manchester Road Electric Railway Company will begin construction very shortly on the city end of its line. The route within the city lies along Manchester Road from King's Highway to the western city limits. The company is bound by the terms of its ordinance to make a transfer arrangement with one of the city railway systems so as to enable passengers to reach the center, and, in fact, all parts of the city. The road will not be allowed to begin operations until the arrangement is effected. The company must finish the work of construction within two years. The franchise lasts thirty-two years, each of the first five of which the company must pay into the city treasury \$1,000, and on each of the remaining years \$2,000.

The Midland Electric Railway, which is now in operation on Page Avenue, in St. Louis County, is to extend its road further westward a distance of about ten or twelve miles. The extension will be on private property only.

The efforts of the Smoke Abatement Association, have at last been crowned with great success. A bill was passed through the Municipal Assembly several months ago concerning the unlimited abatement of the smoke nuisance. A large number of citizens took the enforcement of the law in their own hands. As a result, three smoke inspectors have been appointed, in keeping with the provisions of the ordinance, who are to thoroughly canvass the city. If any plant emits black or gray smoke the company owning the same will be required to put in a smoke consumer within thirty days after the time the smoke had been declared a nuisance. Smoke consumers are being rapidly installed, and mostly in the largest manufactories.

There have been several libelous articles published recently in local papers concerning G. W. Baumhoff, general manager of the Lindell Railway Company. He has been charged with compelling all employes of the company to join the politico-religious organization, commonly known as the A. P. A., or receive their discharge. We have the most convincing evidence given us personally by Mr. Baumhoff which utterly puts out of the question the existence of such a state of affairs, and a suit for libel has been brought against the guilty parties. From information elicited from employes of the railway company, everything seems to be working harmoniously between the men and their general manager.

The Missouri Railroad Company has just completed a very neat pavilion in Forest Park, at one of its principal entrances. It is built of white stone and Pompeian buff brick, and cost in the neighborhood of \$20,000. The company's Laclède Avenue line now has its western terminus at the pavilion.

The Lindell Railway Company's Compton Heights & Union Depot line commenced operations about the middle of October. The cars are twenty-five in number, forty feet in length, and are each equipped with two twenty-five horse power Westinghouse motors. They were built by the St. Louis Car Company, and are painted a rich red. The new power station of 2,100 H. P. capacity is located at Park and Vista Avenues, where also are located the car sheds. The station was described in the June, 1893, issue of the STREET RAILWAY JOURNAL.

The Union Depot Railroad Company, since its acquisition of the Bellefontaine and Mound City railways, possesses the largest street railway system in St. Louis. There are several extensions being made. Sixty twenty-eight foot cars have been ordered from the St. Louis Car Company for these lines. Each will be mounted on Robinson radial trucks, and will be propelled by two General Electric twenty-five horse power motors. The power plant is being increased 2,000 H. P., and will be divided into two units. The generators were built by the General Electric Company, and are to be each direct coupled to a 1,000 H. P. Southwark Foundry & Machine Com-

pany's Porter-Allen automatic engine. This company is also supplying the engine equipment for the Lindell Railway's plant. The Union Depot management's new transfer arrangements enable a passenger to ride a distance of about fifteen miles for five cents.

The St. Louis County Street Railway Company has decided to extend its line to Ferguson. The new line will be completed before winter has passed over. S. L.

Notes from England.

(By Our London Correspondent.)

Since the last installment of these notes was written, an event has occurred in the British tramway world which may fairly be reckoned as the most important of the year, and indeed of many past years. Messrs. Dick, Kerr & Company, Limited, the engineers and contractors, and the holders of the cable tramway patents for Great Britain, have succeeded in obtaining a lease for twenty-one years on the Edinburgh tramways. It will be remembered that the Edinburgh Corporation bought the lines from the existing company, and asked offers to take them on lease. The success of Messrs. Dick, Kerr & Company is everywhere looked upon as a most significant event in the development of cable traction in this old country. The lessees are to pay 7 per cent. per annum on the purchase price to the Corporation and the latter, after paying interest on the borrowed money, will pocket 4 per cent. per annum. A subsidiary company will work the tramways, and as the capital, which has only to provide cars, horses and tools, will only be £75,000, large dividends are certain, even with horse traction. The Corporation intends almost immediately to set about the building of fourteen miles (seven miles street length) of cable roads, and great success is assured. The lessees will also pay 7 per cent. on the cost of cable construction.

Edinburgh will be the first city here to have a comprehensive system of cable tramways. Things are moving elsewhere also, for in Newcastle-on-Tyne, a syndicate has acquired the control of the local tramway company and is arranging with the Newcastle Corporation for the introduction of the cable system. Things are promising to boom at last. Owing to the Tramways Act little could be done before.

The Thomson-Houston Electric Company is making strong efforts to get the Corporation of Leeds to adopt electric traction. The object lesson of the existing cable road in Edinburgh has converted the people there, and so perhaps will the present electric line in Leeds. The overhead wires are still thought by some a bugbear, but Mr. Graff Baker is trying to enlighten the people as to the benefit of center pole construction.

The Board of Trade has just issued draft regulations for electric tramways, allowing the use of an uninsulated return. Some of these rules are very stringent, and in America would seem grandmotherly. Criticisms have, however, been invited from electrical engineers, and after these have been sent in a working set of regulations will be issued. Tramway companies and electrical engineers will then know exactly what they have to face, and I am strongly convinced that a development is at hand.

Indeed, there is little doubt that great changes are at hand. One hears murmurs from some peculiar people in London against the cable tramway at Brixton, but these are of little consequence. The Board of Trade has itself to thank for the chief cause of complaint, which is the noise caused by the grip cars. The Board refused to allow passengers to be carried on the grip cars, and, consequently, these are of a very light make, with open sides and a flat roof that acts as a sounding board and intensifies tenfold the noise of the wheels on the rails. The evil is easily remedied, and people wherever the cable system has been tried are taking to it hugely.

In the three arbitrations which have taken place—in London, Leeds and Edinburgh—as to the price to be paid under the Tramways Act by corporations buying up tramways, appeals to the courts of law have been intimated by the companies. In each case the arbiter held

that structural value of the tracks, minus depreciations, was what was to be allowed. The companies maintain that rental value ought to be allowed them, and one of them threatens to take the case to the supreme court of appeal, the House of Lords. Should the companies' contention be upheld, purchase will be a very expensive business for corporations, but I am inclined to think the courts will support the view of the arbiters.

That wonderful body, the London County Council, has declined to entertain the notion of buying up the whole of the North Metropolitan Tramway Company's system at present, but will only purchase the nineteen miles which at present fall in under the Tramways Act, leaving the rest to be bought five years hence when it falls in. The County Council has also decided to spend £500 in getting an inquiry carried out by experts as to improving local transit in London, chiefly by means of deep-tunnel electric and cable railways. The Council thinks it can beat private enterprise, because it hopes to persuade Parliament to allow it to put into force the principle of betterment to such an extent to owners of land and houses which are increased in value by the railways will pay most of the cost of construction. Then the Council will be able to give very cheap fares, and the Millennium will be at hand.

Since writing the above, and just before dispatching these notes, I hear of another advance proposed in the way of cable traction. The London Tramways Company intends promoting a bill in the next session of Parliament for the extension of its Brixton cable road three miles further out towards the country. There is no tramway at present on this route, and it is indeed too hilly for a horse line to be easily worked. Should the scheme be carried out, I fancy it ought to be fairly remunerative. The population is not very dense, but it is rapidly increasing, and in the course of a year or two there should be a fairly good traffic. The cable system would show to better advantage if it were extended citywards, but at present there are several obstacles, such as the coming purchase of the existing horse lines, and the attitude of the County Council in seeking to impose restrictions. The three miles (or six, reckoned by single track) will require no new power stations, as the existing one is located so as to be capable of working the extension, and the engines also are ready for the work. The expense will simply be for street work. The chairman of the company is evidently much more enthusiastic about cable traction than he has professed to be at recent meetings of the shareholders. He has expressed there only modified pleasure with the existing cable road, but the action of the directors shows that they know when they have a good thing.

We are promised several additional schemes for underground railways in London. These are to be promoted in the coming session of Parliament, and no doubt the power to be employed will be either the cable or electricity.

Interesting Rail Tests.

In tests conducted at the Watertown arsenal, according to the *Scientific American*, it has been found that old steel rails when submitted to a bending test in which the head of the rail is put in tension and the base in compression, will invariably fracture, making a clean break across the rail, while if the same rail is turned over and the head put in compression it will bend without fracture. Again, if before conducting a test, about one-sixteenth of an inch of metal is planed off the head of the rail, there will be no fracture no matter which part of the rail is in tension. But if, in planing this head, care is not taken to remove one-sixteenth of an inch of metal from the corners as well as the top of the head, the rail will fracture as before. The explanation of the matter is that a thin layer of metal on the head of the rail has been greatly hardened by the contact and pressure of the wheels passing over it, and fractures when put in tension. When once started, the fracture, of course, extends entirely across the rail. If this hard material is removed, the fracture cannot make a start and the head of the rail is as good as the base.

Notes on European Street Railway Practice.

BY G. BRAET, ENGINEER TO THE MINISTER OF THE RAILWAY, POSTAL AND TELEGRAPH DEPARTMENTS, BRUSSELS, BELGIUM.

GAS MOTORS EMPLOYED FOR STREET RAILWAY PURPOSES IN DRESDEN.

We believe that it would be interesting to describe the Lührig system as applied to the operation of street cars by gas in Dresden. The system, as described in the *Moniteur des Chemins de Fer*, operates as follows:

The gas necessary for the operation of the motors, of which there are two for each car, is carried in cylindrical reservoirs 280 millimeters in diameter, and with a capacity of one and a quarter cubic meters, to two and a half cubic meters, where it is stored at a pressure of ninety pounds to the square inch. The storage can take place at any point along the pipe line. Here is established a small station containing a stationary gas motor directly connected to a compressor, which is put in connection with the reservoirs on the car. The consumption of gas by the compressor motor is 8 per cent. of the quantity stored, which is about ten cubic meters per horse power. Naturally, the number of stations for storage varies according to the number of cars in operation. The cost of each of them is from 10,000 to 15,000 francs. The motors for the cars have a power of from fourteen to fifteen horse power, have each two cylinders placed in tandem and disposed lengthwise under the seats. The flywheels are outside of the framework or body of the car behind and along the backs of the seats. The cars are of two types, one for ordinary routes and designed to carry twenty-nine passengers; the other is for steep grades and is designed to carry twenty-two passengers.

The action of the two motors can be either separate or simultaneous. By means of a foot lever, different speeds can be obtained, varying from 150 to 240 revolutions per minute. The first of these speeds is that of the motors turning without load during the stops, it having been found more desirable to have continuous running motors. Stopping and starting are made while the motors are in operation, by means of two hand levers, which throw in and out of contact spur gears by which the power is transmitted. The hand brake permits instant stops to be made. Five reservoirs are carried on the car; four of these are under the platform and one on the roof, where is also located the water reservoir. The pressure of the gas is reduced from thirty to forty millimeters by a Pintsch regulator. The products of combustion pass into an exhaust head, thence into a condenser, by which they pass into the air without noise or odor. The car weighs complete 16,500 lbs. A smaller type has been constructed of 9,900 lbs., useful for steep grades, but only carrying a motor of ten horse power placed under one seat, the reservoirs and exhaust head being located under the seat. The price of the original installation of gas traction, calculated for a line of eight kilometers of single track, is figured at 93,750 francs per kilometer (\$11,500 per mile.)

If the gas manufacturing companies agreed to furnish gas at \$1.15 per 1,000 cu. ft., gas traction should cost about two and a half cents per car mile.

GAS TRACTION ON THE SWISS RAILWAY FROM NEUFCHATEL TO ST. BLAISE.

The system which will probably be installed on the line running from Neufchatel to St. Blaise, will consist of gas motors with double cylinders, and of eight horse power. The motor will be placed on one of the platforms. The car, when ready for operation, will weigh about 13,200 lbs. The speed will be eleven miles per hour. On a grade of 3½ per cent. the car ought, on full charge, to make a speed of about eight miles per hour. This car will be able to draw one trail car having a weight of 8,800 lbs.

The consumption of gas will be, for a trip of 6.2 miles (round trip), 180 cu. ft. per car when the motor car runs

alone, and 250 cu. ft. for a train of one motor car and one trail car.

NOTE ON ALUMINUM HORSE SHOES.

M. Risler recently reported to the National Agricultural Society of France, on some experiments of M. Jaspy, on shoeing horses with aluminum shoes. The principal conclusions arrived at by M. Jaspy are as follows:

A complete set of aluminum shoes for a horse weighs about one-fourth of that of an iron set. Even when the aluminum was alloyed with about 10 per cent. of another metal to give it greater hardness, the complete set of shoes thus made never weighs more than a single hind shoe of the old style.

Horses thus shod immediately notice the difference in the weight. One becomes convinced of this by shoeing with aluminum a horse with sensitive hoofs that usually dislikes to go unshod. In stepping from the forge with this new protection on his hoofs, the horse seems to have the same misgiving as if he were not shod. He hesitates to plant his hoof on the ground, and it is necessary to urge him in order to give him his usual assurance.

In proportion as the hoof grows all the horseshoes spread a little. At the end of thirty or sixty days they are from two to three kilometers wider between the prongs than when they were put in place. This would indicate that the light pressure exerted by the growth of the hoof makes the metal change its shape on account of its malleability. As this material continues to adapt itself to the natural shape of the hoof, advantage may be taken of this fact to prevent much lameness. There being also less jar when the shoe strikes the ground, it follows that aluminum shoes can render useful service in the treatment of diseases of the hoof.

The average life of a shoe made in this metal, and well put on, varies from forty to sixty days, according to the composition adopted and according to the work done by the animal. It does not afford, however, the most desirable reliability, for the least want of care in the manufacture changes completely the hardness of the shoe. In the trials made at Beaucourt, in the works of M. Jaspy, shoes of the following character were made: No. 1, pure aluminum; No. 2, 85 per cent. aluminum and 15 per cent. tin; No. 3, 94 per cent. aluminum, 6 per cent. copper; No. 4, 90 per cent. aluminum, 10 per cent. German silver (33 per cent. nickel alloy).

Shoes cast directly from these various compositions were very brittle. Those experimented with were, therefore, made in the following manner: The different alloys were drawn or rolled into plates three times thicker than necessary for the horse shoes. The shoes were then cut out with a die, then drop forged to give them the proper thickness, shape, etc.

A trial of strength gave the following results: Alloy No. 1 gave 19.79 kilogrammes per square millimeter cross section (21,850 lbs. per square inch); No. 2, 20.30 kilogrammes per square millimeter cross section (28,890 lbs. per square inch); No. 3, 24.50 kilogrammes per square millimeter cross section (34,850 lbs. per square inch); No. 4, 30.80 kilogrammes (43,800 lbs. per square inch). However, a mistake in temperature in annealing or forging them might diminish their strength from 30 to 40 per cent. Once finished, the shoes are not to be heated.

In case the shape of the shoe does not correspond with that of the hoof, it is necessary to reheat it. This reheating requires great care, for if done badly, it will render the shoe either too soft or too brittle. This ought to be done in a special forge, or, when this is not available, on an iron plate heated to a dull red, on which the shoe can be turned from time to time.

The nails ought to fit completely the holes in the shoe. If they have any play the holes will grow larger, and the nails quickly become loose.

M. Jaspy has also noticed in taking off the shoes from horses, that there exists between the aluminum shoe and the hoof a white material attaining sometimes a millimeter ($\frac{1}{32}$ in.) in thickness, and weighing about two grammes and a half per shoe. This material seemed to be more prevalent when the metal was the purest. Having analyzed this material, it was discovered that it was a

salt of aluminum containing about 33 per cent. of organic matter. It remains to be determined whether this salt is produced by the contact of the hoof, by the secretion of the foot or by the manure of the stable. In any case it can be avoided by covering the shoe, when putting it on, with a layer of gutta percha softened in hot water.

In conclusion, according to M. Jaspy, horseshoeing by aluminum is practicable for race horses or fancy horses. It is also useful for the treatment of certain diseases of the hoof, but should be in experienced hands and those knowing how to work the metal.

The alloy of aluminum with German silver, so far as can be seen at present, is preferable. Aluminum shoeing ought to be absolutely rejected for all horses having hard work to do; and it cannot as yet be recommended for hard service, such as exists in the cavalry in time of war.

M. Lavalard, of the Paris Omnibus Company, who has made, on his own account, a number of experiments in this direction condemns the use of aluminum for shoes, on account of its not being economical, owing to its rapid wear and the impossibility of utilizing old shoes.

The question is not yet entirely settled; it is still open, and it is to be hoped that the last word on it has not yet been said, but that better results may be obtained.

HORSE SHOEING WITH BESSEMER STEEL.

Considerable progress seems to have recently been made in the shoeing of horses in France. The Paris Tramway Company has been experimenting for some time with a horseshoe made of Bessemer steel, which is fixed cold in a few moments without the use of a single nail. The "sole" is similar to that of ordinary shoes, but it has at the front a bent arm which extends half way up the front side of the hoof without compressing it. A band of the same (flexible) steel also surrounds the hoof, starting from the two (heel) prongs and reaching to the upper end of the bent arm in front, which latter supports the shoe and consequently prevents it from pressing upon the sides of the hoof in any way. The shoe is provided inside with two small prongs, which penetrate into the horn of the hoof, and prevent the shoe from becoming displaced unless the band has been taken off.

NEW METALLIC PAVEMENT FOR TRAMWAYS.

The Paris Municipal Council has just authorized the test of a new metallic pavement invented by Mr. Perrody, of Lyons.

It is well known that the pavement along the rails wears very rapidly and is soon in ruts, no matter how it is made. The wear and tear of highways in this way is such that the Parisian tramway companies have to pay the city annually some 482,000 francs over and above the expense or track repairs, which amount to about 100,000 francs.

According to *Le Génie Civil*, Mr. Perrody proposes to place on either side of each rail a row of cast iron paving blocks to prevent the occurrence of hollows.

The pavement blocks are 25.0 c. m. (6.35 ins.) long, 17.5 c. m. (4.44 ins.) wide and 15.0 c. m. (3.81 ins.) deep, with rounded cross grooves on the upper and lower surface some three-sixteenths of an inch deep and about an inch "mesh," the edges of the block being also chamfered off. The blocks are hollowed and the hollow is filled with concrete. It is seen from the description that the blocks can be used on both sides and can be turned over when worn out on one face. They are laid alternately lengthwise and crosswise, to break up the continuity of the grooves.

The experiment with this paving is to be made at two points where the traffic of vehicles is particularly active, viz., Boulevard Sébastopol between the streets of Rivoli and of Aubry-le-Boucher, and also on the Rue St. Antoine, in front of the Protestant Church. The section of street experimented upon will be about thirty meters (about ninety-eight feet).

The inventor expects this paving to have almost unlimited durability, and thus make up for its relatively higher cost, which is forty cents per block. He claims that the cross grooving and beveled edge will give a good footing to the horses, and that the blocks will not become polished as they wear.

New Work of the Broadway Cable Company.

The new year will mark several improvements and developments in the service of the Broadway line. In the first place, the original idea of having an auxiliary power house on Front Street to operate the Battery loop, has been abandoned, as the engines of the Houston Street power house have been found to develop sufficient power to operate this section, in addition to that from 35th Street to Bowling Green. When the preparations are all completed the Battery loop will be joined to the main cable, and the whole length operated from the Houston Street station.

The new grips to operate with the automatic tripping device at the power house entrances will be put into use early in the year. This will obviate one of the most fruitful sources of delay due to the failure of the gripmen to throw off at the power houses, and the consequent breaking of the grip and throwing off the cable.

A system of signaling to the power house will probably be soon put into operation over the entire line. This system has been in operation successfully for several months on the stretch of road from 50th to 59th Streets. It consists of signal boxes sunk to the level of the street between the rails at intervals of 500 ft. In order to communicate with the engineer at the power station, it is only necessary to lift the cover and turn a crank like that on a messenger call box. There is a dial underneath which shows the signals, such as "stop," "start," "fire," "block," etc. The engineer reads the signal on a similar dial, and a number designating it is simultaneously struck on a gong. A smaller gong also indicates the location of the box, while a "ticker" records both on a tape. Telephones may also be attached at any of the boxes.

Work was begun December 19 on the Columbus Avenue cable road, one of the new projects of the Metropolitan Traction Company. This line will start at Seventh Avenue, and run through 53d Street under the elevated road to Ninth Avenue, and extend thence north to 110th Street.

There will be a connection through 106th Street to the Amsterdam Avenue line. This will carry people directly to Manhattan Street and Fort Lee Ferry. Continuing from 110th Street and Columbus Avenue, the road will extend through 110 Street, or what is known as Cathedral Parkway, to Lenox Avenue, through Lenox Avenue to the Harlem River. The company has also obtained the right to build the road through Lexington Avenue, connecting with its line on 23d Street, to the Harlem River. A crosstown line will extend through 116th Street.

Vestibules in Cleveland.

At a recent meeting of the Board of Directors, of the Consolidated Street Car Companies, of Cleveland, action was taken towards immediately providing platform screens or vestibules, for all motor cars of the different companies not already so equipped. The Canton platform screen, such as has been in use for some time on one of the cars of the Cedar Street line was adopted as a standard, and all motor cars will be equipped with these screens as soon as possible. The immediate reason for this action was the provision of the Ohio State law, which requires all motor cars to be furnished with vestibules for the protection of motormen.

A Comparison in Mileage and Cars for Two Years.

The subjoined table gives in convenient form the street railway mileage and cars operated by cable, electric and horse power in the different states, for the years ending December 1892 and 1893. The statistics are taken from the directory published in the STREET RAILWAY JOURNAL. The mileage is single track, counting one mile of double track as two of single, and switches as additional length. The number of cars under the heading cable, electric and steam includes trail cars as well as motor cars:

COMPARISON OF THE MILEAGE AND CARS OF STREET RAILWAYS IN THE UNITED STATES FOR THE YEARS ENDING DECEMBER 1892 AND 1893.

Table with columns for States and Territories, Horse, Electric, Cable, Steam, Total (Miles and Cars) for 1893 and 1892. Includes a total row at the bottom.

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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

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Havemeyer Building, 26 Cortlandt St., New York.

ANNOUNCEMENT OF REMOVAL.

THE STREET RAILWAY JOURNAL has outgrown its present quarters and has secured a new home in the Havemeyer Building, which extends from Cortlandt to Dey Street on Church Street. This building is close to the Cortlandt Street station of the Sixth Avenue Elevated Railroad, near to the Hudson ferries and the downtown business center of New York, and we feel confident will prove very convenient and accessible to our subscribers and friends. Our offices are located on the thirteenth floor, and command an extensive view of New York Bay and the North River front. A special reception room, furnished with files of the STREET RAILWAY JOURNAL and other technical papers, will be provided to which all interested are welcome. We extend a cordial invitation to all our friends to call and see us in our new home as often as convenient. Those from out of town will be especially welcome, and we trust that they will make our office their headquarters during any visit to New York.

"American Street Railway Investments," a Supplement of the Street Railway Journal—the announcement of which has been made by private letters and general circulars during the past month—is the most important special work which we have ever undertaken. The plan was first conceived by us nearly two years ago, but for many reasons, chief among which was the intensely narrow market for street railway securities at that time, it was thought best to postpone action. The wisdom of bringing out such a publication at the present time is not, we believe, open to question. During the past two years the street railway industry in this country has pressed forward with leaps and bounds. The great investing public has become favorably disposed toward street railway securities, but is not placing money in this field to any large extent, nor will do so until there is some authoritative source of information concerning individual street railway properties. The great publicity given to steam railway operations in this country, al-

though jealously fought by the managements in years past, is now recognized as of inestimable advantage to their security holders, insuring a wide market for their holdings, not only in direct purchases and sales, but for use as collateral in obtaining loans. If any further proof were needed that greater publicity will directly benefit legitimate street railway enterprises, it is found in the undoubted fact that the street railways in the few Eastern States, which are obliged by law to publish detailed annual reports, are regarded by investors with much greater favor than properties whose reports are published only occasionally if at all. The plan of the supplement is broad and comprehensive. Co-operation is invited from all street railways in this country, but no attempt will be made to obtain or print information from those who do not wish to be represented. It is our profound conviction that the time is ripe to broaden the demand for street railway securities, and that the annual publication of this investors' supplement to the STREET RAILWAY JOURNAL will be followed by perhaps gradual increase in the interest taken in this field by legitimate investors.

The Valuable Financial Articles by Mr. Higgins, which we commence in this issue, will serve in still another way to broaden the market for legitimate street railway investments, since they will contain the most careful exposition yet made of the fundamental principles which should govern investors in their choice of securities. No such comprehensive treatise as this is possible in the steam railway industry, because of the many and complicated influences which affect passenger and freight traffic on widely ramified railroad systems, although the brilliant essays of Charles Francis Adams, Jr., Arthur T. Hadley and A. B. Stickney are well considered attempts in this direction. The broad lines of the street railway industry, on the contrary, are far simpler and will be easily comprehended by investors who will take the trouble to study the conditions. The territories served are, in all cases, strictly limited in extent—competition is far less a menace to prosperity—rate wars are almost unknown—and the gross business done is under the direct daily inspection of thousands of persons more or less interested in results. That there are failures as well as successes in so large a field goes without saying. We learn in Mr. Higgins' first paper that purely local roads in cities and towns of less than 25,000 inhabitants are often unprofitable to a greater or less extent, although even here careful management has brought about a fair proportion of successes. We shall find in subsequent papers that the conditions for operation in larger cities are much more favorable, and the intrinsic value of street railway investments on the whole will be shown to be as great as, if not greater than, that of most of the large classes of investment which receive the attention of capital.

A Concrete Foundation for street railway tracks, following the English practice, has been employed on certain lines in Montreal, as noted under the head of "Correspondence," in another column, and is apparently giving good satisfaction, notwithstanding the fact that it is located in a very cold climate. As was said editorially in our last issue, we should be glad to see the experiment tried extensively in different localities in our own country, as it is possible that in former experiments there were elements of weakness which can now be eliminated, so that when the cost is not prohibitory we might reap the same

advantage from this method of construction as is enjoyed by the operating companies on the other side of the water.

An Instructive and Interesting Report relative to the operation of a street railway system in Pittsburgh, Pa., will be found in another column of this issue, which has been kindly furnished us by the superintendent. As this report includes the operations on both cable and electric lines, it furnishes a good opportunity for comparing the relative earning power of these two methods of traction, especially as they are operated under the same management, although the conditions are not the same. One having time will be able to work out from the report a good deal of data that will show some striking results; for instance, one power may be substituted for the other with the traffic and conditions of the other. We have more inquiries from street railway managers for this class of matter than for any other, and it is gratifying that our efforts to induce street railway companies to make public their records of operation are meeting with such success. As we have repeatedly said, those who expect to get must give, and where local reasons do not exist for withholding annual reports and reports of operations, the publication of the same will result in great benefit to the street railway business at large.

The Past Year was the most generally unsatisfactory from a business and financial standpoint that the country has experienced for at least twenty years. Whatever the causes were which produced the industrial crisis, its effects were felt in every part of the country. The street railway traffic responds promptly to all changes in the public prosperity, and the receipts on most roads have fallen off considerably during the year. But more seriously than in any other line the national trouble is felt in the direction of new enterprises. These depend largely upon borrowed capital for the means of their construction and upon the ability to float securities, and opportunities in this line during the last nine months have been very much restricted. Still, it is probable that street railways, as a whole, have suffered as little loss as any of the large industries, and as in spite of the depression new roads have been built in different parts of the country, many of the street railway supply companies, as will be seen in another column, report a good business, and in several instances an increase of business during the past year over that of 1892. So far as can be now predicated, the street and electric railway construction in 1894 promises to exceed that of any previous year. Cheap money should be followed by a demand for high grade investment securities in which are classed the standard street railway bonds. If the sale of their bonds can be easily effected, there will be nothing to stand in the way of street railway companies pushing forward their electrical equipment, and we anticipate a rapid growth in electric railway mileage in 1894.

The Amount of Annual Dividend Paid by a street railway company is not always a measure of the manager's ability. It is possible to pay out so much in dividends that nothing is left as a reserve fund with which to make extensions or make repairs. A manager who makes dividend paying his sole aim to the neglect of the traffic and failure to keep the equipment up to a proper

standard, may gain the favor of the stockholders for a time, and keep the price of the securities high for a certain period, but in the long run his reputation will suffer, for if the road is in a growing city and it becomes necessary to provide increased trackage and accommodations for increased traffic, the only alternative will be an issue of more stock or an increase of bonded indebtedness, which will displease the original investors, and is not always best or desirable, especially if the first issues were well up to the value of the property. A conservative policy will preferably provide a suitable reserve, which may be estimated by making a careful comparison of the growth of the city and increase of traffic from year to year for a number of preceding years. The principal factors in the problem, which must be carefully studied, include the population of the city for each year, the number of miles of new track laid, number of passengers carried, rides per capita of population, gross receipts, net profits, total car mileage, passengers per car mile, cost per passenger and net profit per passenger. These data should also be compared with like data from as many other cities similarly situated as it is possible to obtain, when it will be easy to judge regarding future growth and the probable outlay that will be required to meet it. There is a science in the street railway business well as in law or medicine, and he is the best manager who works along scientific lines.

A Broad and Liberal Policy on the part of municipal authorities in their treatment of street railway corporations, whether it be in the granting of new franchises or franchises for extensions, will as a general thing, result in a service infinitely more satisfactory to the patrons and property holders than a policy that exacts a compensation for the use of streets, either as a tax on gross receipts, an excessive car license or the paving of the entire street. Transportation systems deal with the lives, customs and living habits of the people, and are more prominent factors in character forming than most people realize. They change tenement house property into business blocks and give increased value to all suburban property, because, by them, laboring men can readily reach the outlying districts, where they can own comfortable homes and live under healthful conditions, comparatively free from the debasing influences of city life. No one who has the good of the common people at heart can advocate the taxing of an industry that is giving value to all property, far in excess of all possible returns that the investors who promoted the enterprise can ever expect to receive. Hence, it is that capital invested in this industry should have liberty to earn the largest possible dividends free from tax upon franchise, dividends, privileges or rights of any kind other than tax upon real estate owned or leased by them, the same as would be required of a private individual. It may be stated as a broad proposition that as burdensome taxes are imposed the service will be crippled to a proportionate extent, and private capital will soon be driven from this field, when the building of street railways must necessarily be relegated to municipal ownership, a policy incompatible with our principles of government. On the other hand, money invested in the transportation lines should be made as secure as possible, so that street railway stocks and bonds would become favorite investments. It is seldom that street railways outside the large cities are built by local

capital, but the securities, sooner or later, find their way to the moneyed centers, and are usually rated, not alone by the amount of business done, as shown by the annual reports, but by the period for which the franchise is granted, the conditions of local taxation and the attitude of the community toward the corporation in which the road is located. If there is a disposition to constantly interfere and change the conditions of the franchise every time the route is to be extended, or a disposition to favor any rival company that may be organized, then investors will decline the securities and invest their money in more stable stocks. There should be no conflicting interests in this matter of transportation. The business from its very nature is of a quasi-public character. The moneyed investor, the patrons, property holders and city authorities should work in harmony, and they will reap no permanent success where any of those interests are ignored. Hence, there should be the largest liberty of action allowed the operating company, which, in return should annually make public all the details of operation, including receipts and expenditures. Much of the so-called dissatisfaction on the part of the taxpayers and labor elements comes from either selfishness or ignorance of the facts in the case, and failure to recognize the benefits which a street railway confers. There are those who seem to think that the street railway business is exceptionally profitable, and that railway corporations exist only for the benefit of the stockholders. This fallacy can best be corrected by means of stated reports and the setting forth of facts, relative to the benefits which the system is conferring on the community in which it exists. These benefits include, not only the increased value to property and the advantage of suburban homes, as noted above, but also by providing ready access to schools, churches and places of amusement, and by giving employment to a large number of men. It is the transportation facilities alone that prevent the cities of our country from becoming like many of the cities of the Old World, where thousands are obliged to live in cellars and garret tenements. Hence, it may be seen that the payment of a few thousand dollars, by a street railway company into a city treasury, is no measure of the benefits which the service confers, but is rather a curtailment of the service to a degree corresponding to the payments made. An acceptable service generally begets a corresponding patronage, so that it is plainly to the interests of every operating company to provide the best possible service, and its efforts to do so should not be crippled by the action of local authorities.

Electric Welding of Rail Joints.

The possibility of employing a continuous rail for street railway purposes, in which we expressed our faith about a year ago, is encouraging, although the experiments in this direction which have been made during the past year at Johnstown, Pa., and on the West End lines, of Boston, Mass., have not until now been entirely satisfactory. In Johnstown about 13,000 ft. of rails, of the Johnson girder type, were electrically welded, and in Boston on a little over six miles of track, constructed with the Providence girder rail, the joints were thus united. The result was a smoother track than it had been possible to obtain by any other means of union. Unfortunately, however, in the Boston experiment, about 10 per cent. of the rails broke, in a few instances at the weld, but generally within a few inches of it, the fractures occurring more frequently in the Providence type of rail than in the ordinary girder rail.

The experiment has proved, beyond question, that a continuous rail, thoroughly protected by the pavement,

shows no ill effects from expansion, either of buckling upwards or curving outwards, but whether the rails broke from contraction or from inherent weakness due to the welding, is yet to be demonstrated. It is claimed by the Johnson Company, by whom the welding has been done, that the breaking is due to the pent up expansion strains until now not properly provided for. In the process of welding in the Boston experiment, only a part of the web of the rail was united, and, in some cases, short fishplates were welded in place.

The experiments will be continued, but hereafter the entire end surfaces, including the head, will be united, and care will be exercised not to injure the fibre of the metal or to restrain the expansion due to the heat. These difficulties being overcome, there is little question of ultimate success. The new form of weld embodying these features has been introduced in the last experiments at Boston, and it seems to have entirely overcome all the first defects. The Johnson Company is now satisfied that the process is a success, and it is its intention to order at once several more welders. The experiments are being watched with a great deal of interest, and great credit is due the Johnson Company for its perseverance in this direction.

Next to the welded joints, the best success has been had on the lines of the West End Company by the employment of deep rails united with the Standard girder joint. These joints, of which about 6,000 have been employed on the lines of this company, are about three feet in length, and, we are informed, have required no attention since they were put in service.

Legal Pointers.

BY WM. M. MCKINNEY.

DRIVER GIVING PASSENGER INCORRECT CHANGE.—The case of *Curtis v. Louisville City Ry. Co.* (23 S. W. Rep. 363) should serve as a warning to companies running bobtail cars, that change done up in packages and given to drivers should be carefully counted. In this case, a passenger handed the driver a fifty-cent piece, and requested change for it. The driver gave him a package of nickels marked "fifty cents." The passenger immediately, and in the presence of the driver, counted the nickels, and they were short five cents. He called the driver's attention to the shortage, and demanded the correct change. The driver, not denying the shortage, refused to give the correct change, saying that he had received it at the company's office for fifty cents, and that if there was a shortage, the company must correct it. He then requested the passenger to put five cents in the box, and when the car reached the next station the office would correct the mistake. The passenger declined to put the five cents in the box, saying that the driver having refused to give him back the correct change had retained the fare, and that he would not pay it again. Thereupon the driver called a policeman and caused him to eject the passenger from the car. In an action against the passenger to recover damages, the court held that the street railway company was liable, saying: "It seems that the fear of the driver that the company would not make good to him the shortage, and that the loss would fall upon him if he made up the shortage, caused him to prefer that the company should make the correction. It admits of no doubt from the evidence that the package contained a shortage of five cents. Now, as said, the appellee's rules were reasonable, and if a passenger refused to comply with them the appellee would have the right to expel him for non-compliance. But the question is, who was authorized to make change on behalf of the appellee, and for its benefit, as well as that of the appellant, retain a nickel by mistake belonging to him, and then compel him to put the fare, another nickel, in the box, because the rule of the company required the appellant to put his fare in the box? Now, the appellant had placed the nickel in the hands of the driver, and he was authorized, under the rules, to put it in the box. He received the half dollar, and retained five cents too much—the amount of the fare—and he would not give it to the appellant, but required him to

pay his fare in addition. The retention of the five cents was, under the circumstances, a payment of the fare which the driver could have put in the box had he desired. But whether he put it in the box or not did not concern the appellant, because he had paid his fare and was entitled to his ride. The mistake as to the amount that was in the package was that of the appellee, and not that of the appellant, and the court adheres to the rule intimated in *Wisey v. R. R. Co.* (83 Ky. 511)—which is sustained by other cases—that if a passenger has paid his fare, and the company fails to furnish him with proper evidence of the fact, he is nevertheless entitled to his ride, because the mistake is that of the company, and the passenger ought not to be prejudiced by it, and that the company is responsible for any damages that the passenger sustains in consequence of being ejected by the company.”

DANGER OF THE TROLLEY SYSTEM. In *Louisville Bagging Manufacturing Company v. Central Passenger R. R. Co.*, the Court of Appeals, of Kentucky, held that the operation of an electric street railway by the overhead wire system is not so dangerous to those who reside or do business on a public street, as to authorize its restraint by injunction. The court said: “The next ground is that operating an electric railway car upon a public street is dangerous to those who reside or do business thereon. Practical application of electricity as a power to drive machinery or move carriages, as also for illuminating purposes, is of recent date, and it is shown the system best adapted for the purpose, if yet discovered, is by no means a perfect one. The evidence of experts and men having actual experience shows that three different systems for moving railway cars by electricity have been tried in this country, viz: The underground conduit system, the storage battery system, and that of the overhead wire; and it fully appears that the two first are as yet so defective or imperfect that, of several hundred electric railways in operation, there are not a dozen to which either system has been applied, all others being run by the overhead wire or trolley system, the same used by the Central Passenger Railway Company. To apply electrical power in that way requires the erection at the edge of the sidewalk, on each side of a street, of tall poles, about 120 ft. apart, and from the tops of opposite poles are stretched across the street sustaining wires, which hold up the electric wire that is thus suspended over the middle of the railway track, and from which, by means of the trolley pole, the electric current is connected with the motor placed under the car. It will thus be seen that the electric wire is not like telegraph, telephone and electric light wires near to buildings, but suspended over the railway track. It further appears that the electric pressure, measured by volts, required to drive a street railway car is not so great as to destroy or seriously injure a person or animal coming in direct contact with it; injury, where it is produced, resulting only where a broken or detached telephone or telegraph wire falls on it. The evidence in this case, which need not be considered in detail, shows that, although new and not fully perfected, the trolley system of operating street railway cars, when properly adjusted and supervised, is not much, if any, more dangerous than horse power, applied in the same way. Moreover, while street railway cars thus operated go at greater speed, are more comfortable, and must in time become a cheaper mode of travel, they can be more easily controlled than horse cars, and do not really more obstruct the streets, or interfere unreasonably with business transacted thereon. It, therefore, seems to us that in view of the benefit and convenience to the public of electric cars thus operated, and the comparatively little inconvenience or danger they are to individuals, it would be going beyond the province of a court, and contrary to the decided weight of judicial authority, to enjoin or limit their use; especially when a party seeking such remedy so signally, as has the plaintiff in this case, fails to show that he has been unreasonably obstructed or hindered in his business, or that his rights have been illegally interfered with. The judgment dissolving the temporary injunction and dismissing the action is affirmed.”

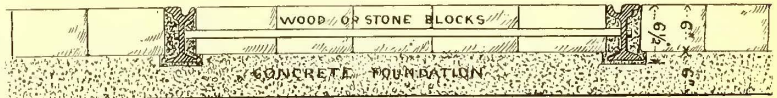
Correspondence.

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.

Montreal Track Construction.

CITY SURVEYOR'S OFFICE, MONTREAL, December, 1893.
EDITORS STREET RAILWAY JOURNAL:

In reply to your letter of November 22, asking me how the English system of construction for electrical service on a concrete foundation has stood the winter in this climate, I beg to inform you that when the Montreal Street Railway Company, last year, began its construction, I advised it to do away with the wooden ties on streets where there was a concrete foundation underneath the pavement. The construction adopted was as follows: The girder rail being six and a half inches deep on wooden paved and stone block streets upon a concrete foundation, we cut out the concrete to the width of



the flange of the rail, about an inch deep, and placed the rails on oak shims and flooded with a cement grout consisting of one part of cement to one of sand, under the flange of the rail; the rails were tied together with iron rods, and each side of the web of the rail was filled with cement grout mortar of one to one to the width of the rail. We then replaced the wooden or stone block and filled up all intersection with a cement grout of one to one as shown.

This mode of construction stood last winter exposed to a temperature of 20 degs. below zero, and the rail neither contracted in winter nor expanded in the heat of summer, nor did the pavement on either side of the rail move. I think this is very satisfactory. We have continued the same system this year, and have laid about forty-two miles of track in the same manner; the durability of this work depends entirely upon the strength of the concrete foundation. The accompanying sketch will illustrate our method.

Yours truly,

PERCIVAL W. ST. GEORGE,
City Surveyor.

A Letter from Mrs. Reckenzaun.

34 HEMBERTON ROAD, STOCKWELL, S. W.,
November 27, 1893.

EDITORS STREET RAILWAY JOURNAL:

Will you allow me a space in the columns of your journal, which has amongst its readers so many of my late husband's friends, to thank them for sending me, in such numbers, letters of sympathy and condolence.

Their number is far too great for me to reply to them individually, and I hope you will give me this opportunity of expressing to them my warmest thanks, and the gratification it is to me to know how universally my husband was beloved and respected. Faithfully yours,

E. RECKENZAUN.

The Fire at the Works of the New Castle Car Manufacturing Company.

NEW CASTLE, PA., December 26, 1893.
EDITORS STREET RAILWAY JOURNAL:

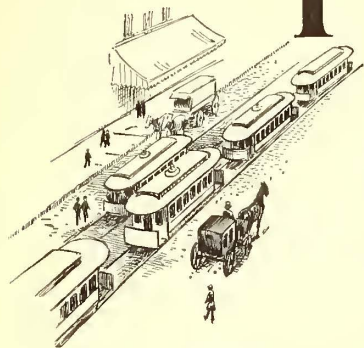
All the papers have been publishing statements that our factory was totally ruined by fire. I write for publication, if you so wish, that our planing mill together with the machinery was destroyed by fire, but the constructing room, painting department, etc., were undamaged.

We expect to rebuild at once and be ready to run in thirty days. We are in the market for a new engine and all necessary wood working machinery.

Yours truly,

THE NEW CASTLE CAR MANUFACTURING COMPANY.

Starting the Cable Cars on Third Avenue, New York.



THE formal opening of the cable service on a portion of the Third Avenue surface road took place on the afternoon of December 4, when ten of the new cable cars were started from the Harlem station at 130th Street, carrying the officers and directors of the Third Avenue Railroad Company and a large number of invited guests, including the city officials, officers of other New York roads and representatives of the daily and technical press. The cars were in

charge of experienced conductors and gripmen in new uniforms of gray material, who had been trained in their duties on the cars of the 125th Street and Tenth Avenue cable lines.

The run was made without a hitch to 6th Street in about an hour, and the avenue for the entire distance presented a holiday appearance, as from many of the principal buildings flags were flying, while the sidewalks, and in some cases the streets even to the line of the track, were thronged with eager sightseers, and from the hundreds of windows of the flats and apartment houses along the route men and women leaned forth to shout their welcome to the handsome new cable cars. At 6th Street the cars were switched to the up track and returned to 65th Street station, where the first car containing the officials of the company was photographed (Fig. 1), when the guests alighted and repaired to the power station, where an elaborate lunch was served, enlivened with music by the military band from the Hebrew Orphan Asylum. After lunch an opportunity was given for all to inspect the driving machinery, some of the auxiliary engines and the overhead electric crane being started up for the pleasure of the company. Two hours were thus spent in social intercourse, and many were the congratulations tendered to the officers of the road and the principal contractors on the completion and success of this important enterprise.

Ten of the cable cars were put in service on December 5, being sandwiched with the horse cars, and the number has been increased from day to day, so that when we go to press forty cars are regularly running, and in a few days more all the horse cars above 6th Street will have been superseded by the cable cars to the number of 180. As soon as the horse cars are out of the way, the ropes will be speeded up to the regulation speed of nine miles per hour, and a headway of three-quarters of a minute will be established. The southern section of the line, from 6th Street to Ann Street near the Post Office, will, it is expected, be in full operation during the present month.

The columns of the STREET RAILWAY JOURNAL during the last three years have contained numerous illustrations and descriptive articles of the progress of the work, the machinery and rolling stock of this interesting line, but in this connection it will not be amiss to give a brief review of the work and note the difficulties that have been encountered, that all may fully appreciate the courage, foresight and patience that have been exercised by the officers of the company in inaugurating and bringing to a successful completion the cable enterprise.

ROLLING STOCK.

That portion of the equipment which will be of most interest to the general public, will, of course, be the cars. These consist of a winter and a summer equipment, and are claimed by the managers of the Third Avenue Company to be as good as money can buy. The cars were built by the Laclede Car Company, of St. Louis, Mo., and

are finished in the highest style of the car builders' art. The bodies of the closed cars are twenty-two feet long and each car is thirty feet long over all, with the hoods supported by means of pipe posts. The interior finish is of mahogany, with ceilings of birdseye maple, and door panels of the same material. The seat cushions are of dark red plush. The Pintsch gas system of lighting is employed, and there are three domes in the ceilings in which are placed handsome four-burner chandeliers enclosed in glass globes and supported by bronze brackets. The cars are so brilliantly lighted that there is no difficulty in reading a paper in any part. Four oil lamps, for emergencies, complete the interior equipment of the car. The deck lights are in two tiers, the lower or stationary portion being of stained glass composed of small triangular pieces set in lead, while the upper or ventilator portion is glazed with delicately colored cathedral glass. There are seven windows of French plate glass on each side, and shutters of mahogany with basswood slats. The exterior of the car is strikingly handsome, the main panels and dashboards being painted in bright red with silver ornaments and gold lettering, while the lower panel is in white. The hand rails and metal trimmings are of bronze, while the iron platform gates are of the folding type, and painted red.

The grips and brakes are operated by straight levers from either end of the car. The life guards consist of V shaped fenders faced with rubber, with a wire screen on both sides of the trucks. The trucks were designed and manufactured by the Baltimore Car Wheel Works, and have the Third Avenue standard, oiltight axle boxes.

The open cars are forty feet over all, with a four foot platform at each end, and have a seating capacity for forty-eight persons. These are mounted on double trucks of the McGuire type. The open car has a center aisle and twenty-four reversible seats, with rattan coverings, of the Hale & Kilburn type. The ceilings are of birdseye maple, and the deck lights are of stained glass, and all the interior mountings are of bronze. The exterior is painted red, with silver ornamentation and gold lettering. In addition to the regular storm curtains, adjustable awnings extend the entire length of the car, which may be let down to shield the passengers from the sun's rays.

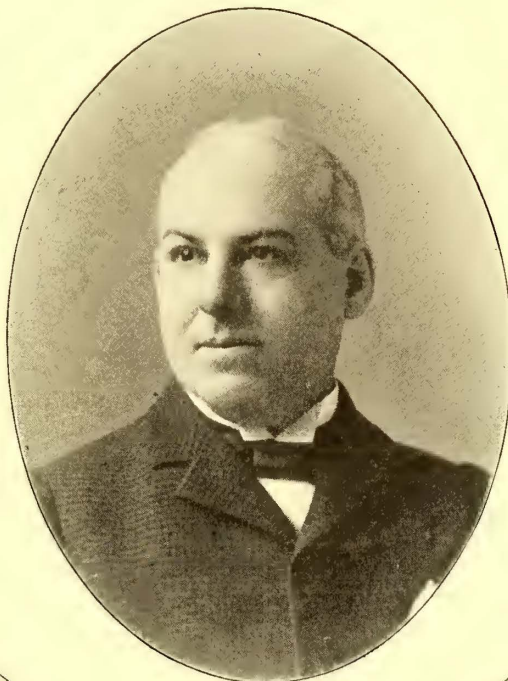
The grips on the closed cars are mounted on the trucks beneath the center of the car, and are connected, by means of rods, with the platform levers (Fig. 2). The grip, which is of the movable lower jaw type, takes the rope on either side, and is of the same pattern as used on the 125th Street and Tenth Avenue line, which was designed by Mr. Robertson, the superintendent, but differs from them by having a triangularly shaped trip on each end in place of the vertical spools formerly employed. It is claimed that a grip with a movable lower jaw is easier on the rope, and in case of a defective rope, is less liable to foul with the grip. It is possible also, when necessary, to lessen the hold on the rope on the curves, since the upper jaw takes the side strain against the curve guard. The new grips are also provided with a tripping device which was designed by the superintendent of the company, and is employed as a protection against cutting the rope. This device consists of a joint or clutch which divides the connecting rod leading from the grip to the lever, and which is operated by means of a lever chain and a depending trip or finger and a connecting chain (Fig. 3). The trip is sprung by coming in contact with a toe or projection coming up through a surface plate beside the slot rail. The toe is supported by a rocking lever placed diagonally under the surface, and provided at its outer end with a projection beside the track rail in position to be depressed by the tongue of the wheel flange, which raises the other end and lifts the operating toe above the surface. In case the gripman fails to release the rope on approaching a crossing or other points where it is necessary to trip the rope, the finger springs the trip which allows the rod to part, when the lower jaw falls by its own weight, releasing its hold on the rope. At the next pick-up it is necessary for the gripman to stop and readjust the trip, which is done through a trap door in the floor. In case the rope has been released by



J. H. ROBERTSON, SUPERINTENDENT.



HENRY HART, VICE-PRESIDENT.



ALBERT J. ELIAS, PRESIDENT.



JOHN BEAVER, TREASURER.



ALFRED LAZARUS, SECRETARY.

Executive Officers of the Third Avenue Railroad Company.

the gripman, the connecting chain is slack and does not operate the joint.

STREET CONSTRUCTION.

The Third Avenue line extends from Ann Street, near the Post Office, along Park Row, the Bowery and Third Avenue to 130th Street, near the Harlem River, a distance of nearly eight miles, and while there are no corners turned there are twenty-eight deflections in the line where it was necessary to employ curve pulleys, the principal one being a compound curve, 500 ft. in length, at Chatham Square, with radii varying from 280 to 500 ft. The lower end of the line terminates in two balloon loops, one beside the main line encircling the Franklin Statue at Printing House Square, and the other at Ann Street, which has a radius of forty-one feet, the entrance and exit radius being fifty-one and forty-one feet, respectively. The rope is carried around the loop by sixty-two horizontal pulleys thirty-three and five-eighths inches in diameter. At the Harlem terminal the loop turns into 129th Street, where it divides into twenty-six parallel tracks which lead over pits in the car barn and emerge at 130 Street, where they converge

most important cable ever built, has many peculiar features. In the first place, it is operated by a duplicate, and in one division by a triplicate set of ropes. The two ropes are so mounted that they can be operated together or singly, and either one may be stopped or started at the will of the engineer. The line is operated in three divisions requiring seven ropes, having an aggregate length of 193,295 ft. The Harlem division extends from 130th Street to the main power station at 65th Street and the ropes on this division are 36,600 ft. in length. The second division extends from 65th Street to 6th Street near the Cooper Union, and on these two divisions the ropes are operated from the 65th Street station, at a speed of nine miles per hour. The City Hall, or southern division, extends from 6th Street to the Post Office terminal. There are three ropes which are operated from the Bayard Street station. Two of them are mounted in the conduit in the ordinary manner, and are run at a speed of seven miles per hour, while the third has a speed of only five miles, but which is taken up south of Bayard Street, on the down trip, and carries the cars down through Chatham Square, Park Row and around the loop, back to the *Times* Building; then one of the fast speed ropes is



W. L. ELKINS, JR.,
PRESIDENT PENNSYLVANIA IRON
WORKS COMPANY.

DESIGNERS AND
BUILDERS OF THE
POWER EQUIPMENT
FOR THE THIRD
AVENUE RAILROAD.



E. A. MOORE,
CONSTRUCTING ENGINEER.



B. W. GRIST,
GENERAL MANAGER.

and return to Third Avenue. The cables do not round the barn loops, but pass around the terminal sheaves in the vault just north of 130th Street, and a Connelly gas motor is employed at this loop for hauling the cars to and from the barn. There are no less than thirty-five separate track crossings on the line, the one at 125th Street being a cable crossing (Fig. 4), and there are eight points where the other roads switch off from the Third Avenue line, and nine crossover switches. The switches are so constructed that the cable cars continue on the main track and ride over the switches, while the horse cars of other lines switch off as required. At the cable crossings where it is necessary to drop the rope, and at the power stations, automatic lifting devices are employed, which bring the rope into position to be taken by the grips. These are also supplemented by hand lifts in the event of the others failing.

The street construction of this, in some respects, the

taken up and employed to 6th Street (Fig. 5). One of the fast ropes down to the terminal vault at the loop, and the slow rope from the *Times* Building up to Bayard Street are carried in a blind conduit outside of the fast ropes.

The object of the slow speed is to avoid slipping the rope on the up grade on Park Row on account of the traffic at that point going slow speed, and also to avoid accidents on the loop. Neither of the ropes, however, is led around the second loop at Printing House Square. This is to be used only in case of a blockade, when the cars will be transferred by horse power.

The conduit on the tangent construction is twenty-four inches deep and fifteen inches wide, while the slot rails are arched and have an unusual spread at the base, the object being to allow the grip jaws to ride well up to the surface of the street, and thus avoid the necessity of a deep conduit which would interfere with a greater num-

ber of gas and water mains. Two styles of yokes are employed, weighing, respectively, 475 lbs. on the tangents and 500 lbs. on the curves. The tangent yokes on that portion of the line constructed by the first contractor rest on concrete piers 12 × 12 ins. and five feet in length, the base extending forty-six inches below the surface of the



R. P. TOMASSECK,
CHIEF ENGINEER.

street; but on the later construction a continuous bed of concrete, six inches in depth, was employed, and in this the yokes rest, being spaced five feet apart. The track rails and slot rails are firmly bolted to the yokes with broken joints, the joints of the track rails being suspended and those of the slot rails supported by the yoke. Both rails are braced at the yokes and intermediately by peculiarly formed steel tie rods with double bolts through



JOHN BROLLES,
ASSISTANT SECRETARY.

the slot rails, the object being to prevent any possibility of the rail tilting. The slot rails are slightly adjustable, a small space between the rail and the base being filled with a bituminous concrete, which can be melted out when it is necessary to open the slot, in case it should be closed by frost pressure or surface traffic. No bolts or nuts were allowed to project into the conduit.

The track rails are of the semi grooved type, weighing eighty pounds per yard, and are seven inches in depth, this

type of rail being required by the Railroad Commissioners of the State. The joints are connected by heavy, six-bolt fishplates, with nut lock washers, and the draining of the rail groove is provided for by the employment of drainage plates connected to the nearest manhole at the foot of each grade. The total weight of the metal per lineal foot of single tangent track on the tangents, is 210 lbs., but on the curves and at the crossovers a much greater weight is employed per foot.

The conduit walls are eight inches in thickness on the sides and ten inches at the bottom, and are composed of concrete made from the best Burnham and Gillham Portland cement, the entire quantity of cement consumed being 46,000 bbls. The details of construction, as followed by the first contractor, included a steam crusher mounted on a car and operated by a portable engine, which was run along ahead of the work on the old tracks, and in which a part of the old paving blocks, which consisted principally of trap rock formation, were crushed, and employed as material for the concrete; a mechanical concrete mixture was also employed. On the later construction, however, the broken stone was purchased and delivered at the cross streets, where the materials were mixed on platforms by hand and delivered to the trench



C. G. BLISS,
MECHANICAL ENGINEER.

by carts and wheelbarrows, when it was tamped in place, wooden forms being provided to shape the conduit, and also for manhole foundations. The pulley vaults are spaced thirty-five feet apart, and are constructed of brick and cement. Where the tracks are close together a single vault connects both conduits, with a manhole between the tracks. The double pulley vaults are five feet two and a half inches deep, four feet wide, and the manhole covers are 2 ft. 6 ins. × 2 ft. 6 ins. Where the tracks are separated, as on a portion of the Bowery between 6th Street and Grand Street, each track is provided with pulley vaults, and the manholes are located outside the rails. The carrying pulleys are sixteen inches in diameter, and are mounted in bracket frames bolted to the yokes. The curve pulleys are thirty-three and five-eighths inches in diameter, and are placed four feet three inches apart, and are of the spiral groove type, similar to those employed on the old lines of the company. These, as well as the deflecting pulleys, are mounted in gimbal bearings, which permit of adjustment in any direction. By means of the spiral groove pulleys, the two ropes are carried around the same curves without interfering with each other. A brick subway, four feet wide and five feet eleven inches in depth, is provided at the inside of the curves, which provides a passageway for the inspection of the curve pulleys. This subway is supported by I beams and T rails, above which the paving and manhole covers are placed. A pipe subway is also located between

the conduits for the entire length of the line, in which the conductors for the electric signals are placed, there being a complete signaling system, with signal boxes located opposite the manhole covers at every second block, which can be opened by keys carried by the conductors, so that communication can be had with the power station, in case it becomes necessary to stop the ropes.

The surface of the street is paved with granite blocks, resting on a concrete foundation, the vertical joints of which, between the rails and track, are grouted with concrete which was applied in a liquid form, while the balance of the surface is grouted with gravel and asphalt cement. Some idea of the excessive street traffic to which the construction is subjected can be formed from the fact that the granite paving on some portions of the Bowery was nearly worn out before the cars were running.

POWER STATIONS.

There are two brick power stations from which the seven ropes are driven; one is located at 65th Street and

roofed over for the protection of the machinery, but will probably be completed in the near future.

The power equipment of the main station consists of thirty-two tubular boilers of 125 H. P. each, arranged in four batteries, two on each side of the passageway, which opens on 65th and 66th Streets. The base of the smoke-stack is located between the two batteries on the east side, and two large iron flues lead into it from the two opposite batteries. The coal bunkers, which have a capacity of 8,000 tons, are located on the floors over the boiler rooms, and the coal is delivered at each furnace door by means of chutes, in which it is automatically weighed. There are four feedwaters of 1,000 H. P. each, and two duplex pumps. The water and steam connections of the four batteries and boilers are so arranged that they can be worked independently or together, so that either battery will supply steam to any of the four engines. The engines are four in number and of 1,500 H. P. each, and are of the Corliss type. Two of these are coupled to the ends of the main shaft by a crank disk,



FIG. 1.—FIRST CABLE CAR RUN ON THIRD AVENUE RAILROAD.

Third Avenue and the other on the west side of the Bowery corner of Bayard Street, and both were designed by Architect Albert Wagner, of New York. The site of the principal station is the rear portion of the old 65th Street depot before it was torn down to make room for the new power. The building is bounded by Second Avenue on the east and by 65th and 66th Streets. The ground plan containing the boiler and engine rooms is 200 × 285 ft., and the smoke stack is 200 ft. high. The engine room is open to the roof, which is of glass, eighty-four feet eight inches above the floor, and is supported by a clear span 137 ft. 10 ins., composed of seven arched steel girders, making what is, doubtless, the largest and brightest cable power station in the world. After the rope is in full operation it is proposed to remove the remaining portion of the old station and extend the new building through to Third Avenue, which will provide car storage, and rooms for repair shops and offices.

The Bayard Street station is designed to be nine stories in height, of brick and granite. The upper floors are designed for business purposes and will be served by six elevators and lighted by electricity. Only one story, however, has as yet been completed, and this has been

and have flywheels twenty-two feet in diameter. The two others are coupled to auxiliary shafts, which are on the same line, in the rear of the main shaft, fifty-six feet distant, to which the power of each is transmitted by means of twenty-two cotton ropes working over a pair of grooved pulleys twenty-two feet in diameter.

The main shaft is 154 ft. in length and twenty inches in diameter in swell, with bearings 18 × 30 ins., and is divided by five plate couplings. There are four nine-foot rope pinions mounted loose on the main shaft, each having twenty-two grooves, and these are provided with plate clutches of the Walker type by means of which they are coupled to the main shaft, the clutches being operated by means of a lever provided with a hand wheel and operated by a rack and pinion. The power is transmitted from the pinions by means of cotton ropes to corresponding pulleys thirty-two feet in diameter, each mounted on the same shaft with the first winding drum in each pair, the shaft being fifty feet distant from the main shaft, and which is coupled to the shaft of the second drum by a train of cut gear, so that both winding drums are driven. The winding drums are fifteen feet in diameter, mounted overhanging, and have solid, removable rims, so that,

with the engines running at seventy-five revolutions, the cables are driven at a speed of nine miles an hour. The tension runs are 255 ft. in length, and, being located between the winding drums and the street, the rope, after being led over the sheave of the tension carriage, returns to a twenty foot stationary sheave located in front of the winders, from which it is led out to the main vault. In addition to the power described, there is a pair of small vertical engines for driving each of the four pairs of winding drums at slow speed for rope inspection or when it is necessary to turn down the grooves. These are located in front of the drums, on each side of the building, and communicate their power by a train of gears meshing with the coupling gears.

All the bearings for the winding machinery rest on heavy cast iron bed frames, which in turn are securely anchored to the foundations which, as well as the foundations for the engines, are built of brick laid in the best Portland cement. The engine room is provided with the traveling electric

OBSTRUCTIONS MET WITH.

The work, as a whole, challenges the admiration of engineers and mechanics, and is a monument to the skill, ingenuity and courage of nearly all who have had a hand



FIG. 3.—GRIP TRIPS, OPEN AND CLOSED—THIRD AVENUE RAILROAD.

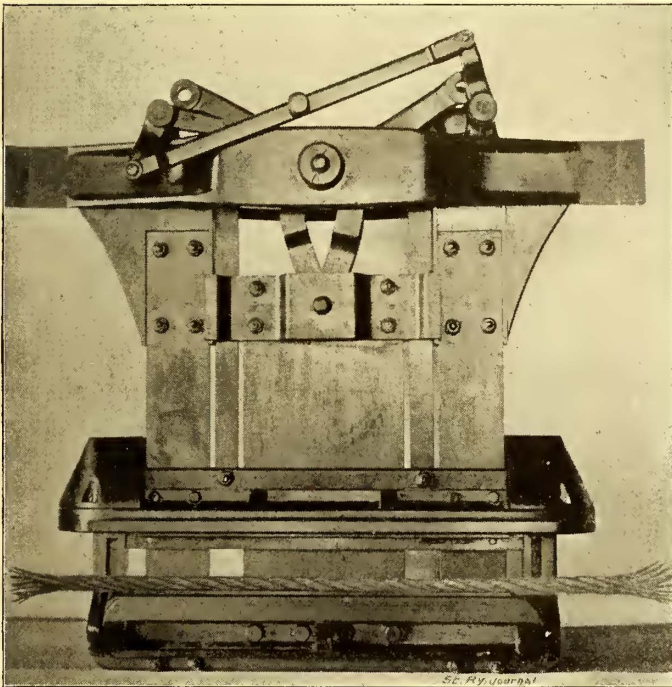


FIG. 2.—GRIP EMPLOYED ON THIRD AVENUE RAILROAD.

crane built by Wm. Sellers & Company, 134 ft. 9 ins. in length, and of thirty tons capacity. The crane, as well as the lighting circuit is supplied with current from an isolated plant.

The power equipment of the Bayard Street station consists of sixteen boilers and two engines, and winding drums for three ropes, like parts in each case being duplicates of those employed in the 65th Street station, and described above.

The tension runs, however, are located between the winders, thus avoiding the necessity of an extra guide pulley, which is employed in the other stations. The engines and winding machinery are located on the west side of the basement, which is thirty-six feet below the surface of the street, and the coal bunkers and tension run are on the west side of the same floor. The boilers, however, are located on the first floor on the Elizabeth Street side, and a portion of this floor will be occupied as the repair shop. The engine equipment of both stations aggregates 9,000 H. P.

in its construction, but that portion of the work which has most taxed the ingenuity of the superintendent, engineers and contractors, but which does not show on the surface, has been the removing of the substructures in the street, renewing foundations to a number of elevated railway posts, and excavating for power house foundations in treacherous quicksand formation, also the placing of temporary tracks and providing for street traffic and the traffic on their car lines.

Although the conduit, as before noted, is only twenty-four inches deep, it was necessary to excavate for the entire width of both tracks, in most cases to a depth of forty-one inches, and at pulley vaults, which are five feet ten inches deep, a still deeper excavation was necessary. The pulley vaults are spaced thirty-five feet apart, with a manhole between the tracks where the tracks run near together, but where the tracks are spread to a considerable distance, manholes are provided for each track. The pulley vaults are drained by eight inch pipes, and are trapped where connections are made with the sewer. On some parts of the line both tracks were constructed at the same time, all the dirt from the excavation being carted into the side streets. In some sections it was necessary to blast a channel through solid rock. Besides the cross mains of gas and water pipes frequently met with, there were encountered at the curve on the Bowery, near 5th Street, a nest of five large gas and water mains, which crossed the line diagonally and continued parallel to it for several hundred feet. These all had to be lowered, the gas mains renewed and the water mains placed in a brick subway with I beam support, and of sufficient size

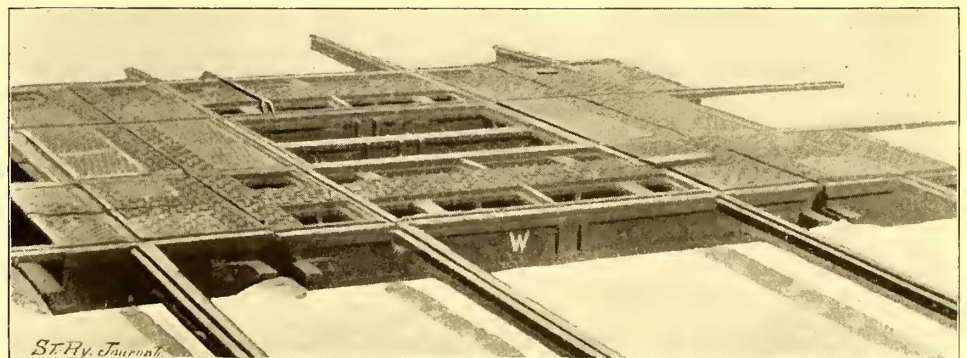


FIG. 4.—125TH STREET CABLE CROSSING.

to allow of access to the mains for the entire distance. Below this point, on the Bowery, a large number of sewer manholes, which are about 125 ft. apart, and which came directly in the line of the west track, had to be changed. This work consists in removing the brickwork of the old shaft down to the line of the sewer, a distance of about twelve feet, and building arched transverse chambers of brick of sufficient length to bring the manhole outside of the tracks, and then rebuilding the shaft, it being necessary

to shore up the sides of the excavation as the formation for most of the way was sand. The terminal and interior vaults are five in number, and each required special construction. The vault for the northern terminal at 130th Street, is sunk below the level of high water in the Harlem River, and is divided by a large sewer which had to be preserved intact. The pulley vault in front of the 65th Street station is 146×60 ft. and 20 ft. in depth, and in it are mounted eight fifteen foot deflecting sheaves. There are also two secondary vaults near by for the elevating sheaves. In excavating for this vault a thirty inch water main was encountered, which it was necessary to sink twelve feet below its original level for a distance of 450 ft., and enclose it in a special tunnel, so that it can be inspected. New brick foundations to the

This excavation, which was in quicksand, was made to the depth of forty-two feet, and, being below the water line, it was necessary to pump out the seepage water and shore up the banks with heavy timbers to protect the walls of neighboring buildings and the lines of the neighboring streets.

Novel methods were adopted by the contractors for conducting the work on lower Park Row, in order to interfere as little as possible with the street traffic. This street is comparatively narrow from Chatham Square to the Bridge terminal, and is traveled by numerous lines of street cars and numberless trucks and wagons. An attempt was made to divert the traffic into Centre Street, but this street soon became congested, and frequent blockades occurred, so that the traffic returned to Park

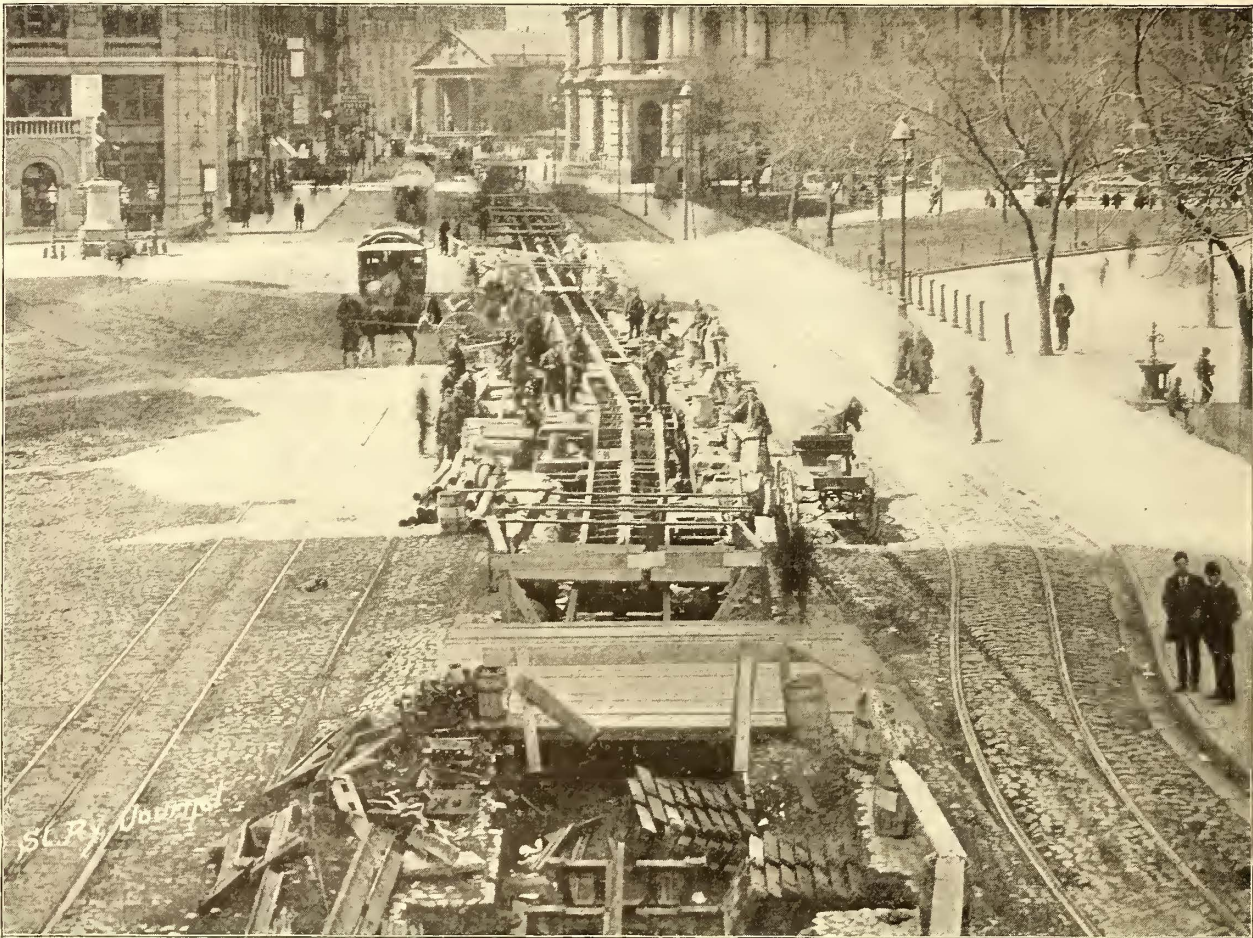


FIG 5.—CABLE CONSTRUCTION—THIRD AVENUE RAILROAD, NEAR CITY HALL AND POST OFFICE.

depth of twenty-four feet had to be placed under six of the elevated posts, and on the west side these foundations are arched over a trunk sewer. It was also necessary to construct a special sewer along 65th Street, for a distance of about two blocks, in order to provide drainage for the vault. In excavating for the 6th Street pit, where are located the terminal sheaves, between the two lower sections, three of the foundations of elevated posts were increased to a depth of fourteen feet, it being necessary, of course, to shore up the structure while the new foundations were being placed.

In excavating for the pit or vault on the Bowery, in front of the Bayard Street station, five sixteen inch, two twelve inch and one eight inch gas mains were encountered, also a twenty inch water main, an electric subway, several six inch pneumatic tubes and a large sewer, all of which had to be changed without interfering with the gas or water service in the neighboring buildings. Besides this, the foundations of three of the elevated posts were renewed with brick to the depth of forty-five feet, the foundation being ten feet below water line, the formation being quicksand. The excavation for the Bayard Street station, however, was one of the most interesting and most expensive features of the entire cable construction.

Row, which necessitated the bridging over of the trench with planking, on which new tracks were placed, while the excavation and placing of the yokes and concrete was carried on underneath the temporary bridge which was only a few inches above the street level. The same method was adopted in constructing the loop and the terminal pit near the Post Office, and in the case of the pit, air for the support of the workmen was forced into the excavation by means of fan blowers operated by hand power. These efforts of the contractors to prevent the blockade of street traffic are commendable, and the methods adopted reflect credit upon the engineers in charge of the work.

HISTORY.

On July 3, 1853, the first horse car was run on the Third Avenue Railroad. This road then consisted of a double track line extending from 23d and Chatham Streets, opposite Tryon Row, north as far as 61st Street. Shortly after this date, the road was extended to 86th Street, and on July 4, 1859, it was extended as a double track to 69th Street, and a single track line opened through to Harlem. A second track was, however, soon after laid on the Harlem section. At the time of the ex-

tension of the line there were very few buildings above 61st Street. The 125th Street branch was opened on October 15, 1870, and was operated by one horse cars, and on August 31, 1885, the Tenth Avenue cable line was opened to the public, and afterwards, December 1, 1886, cable power superseded the horses on the 125th Street line.

As early as September 12, 1887, two years after the completion of the cable construction on 125th Street and Tenth Avenue, the directors of the Third Avenue Railroad Company decided to cable the main line. The credit for bringing about this action is largely due to the late Lewis Lyon, then president of the company, who was

mitted, made a tour of the principal cable cities for the purpose of selecting the best methods of construction. After much deliberation the American or duplicate system, which is practically the same as that employed on the 125th Street and Tenth Avenue lines, was decided upon, and a number of manufacturers of engines and machinery were invited to submit for approval plans and specifications for the full equipment of the two power stations. Finally, in October, 1890, contracts were placed with Wm. Wharton, Jr., & Company, Philadelphia, for the entire construction of the line outside the power stations, including the ropes, for the sum of \$1,600,000 or about \$100,000 per mile of single track. The contract was also

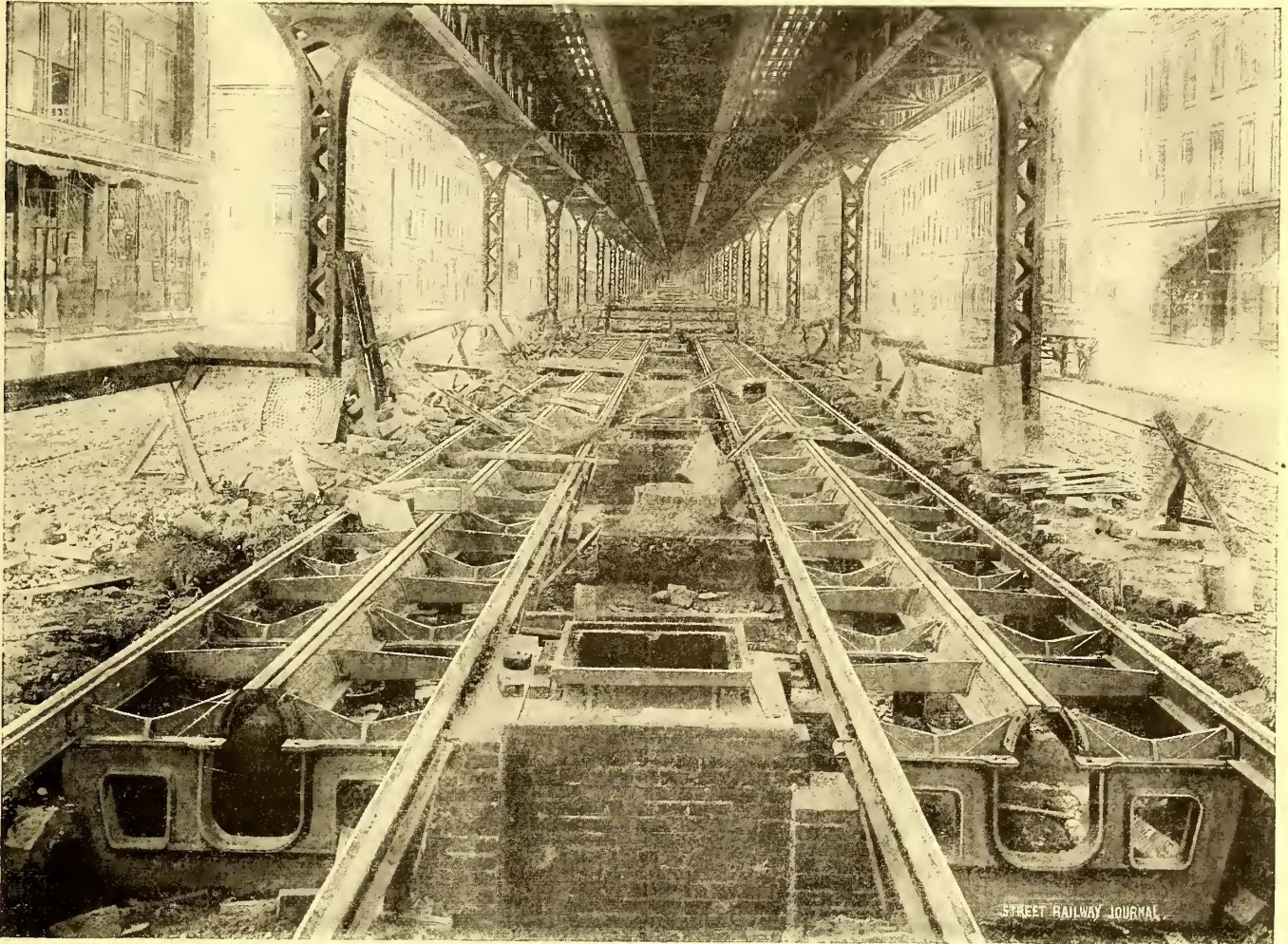


FIG. 6.—VIEW OF THIRD AVENUE CONDUIT AT 100TH STREET DURING COURSE OF CONSTRUCTION.

an enthusiastic believer in cable traction. Steps were at once taken to get the consent of the property owners along the route, and no opposition was met with on the part of the property holders to the enterprise. The company, claiming that its franchise allowed of the employment of mechanical traction, did not make application to the Board of Aldermen for permission to install the cable system, but did apply to the State Railway Commissioners and to the Street Commissioner of the city, for permission to tear up the streets and proceed with the construction. The consent of the Railroad Commissioners was obtained on October 2, 1889, but the Street Commissioner refused the application, when a mandamus was asked for from one of the city courts compelling the commissioner to accede to the request. The court having rendered an adverse decision, the case was taken to the Court of Appeals, at Albany, and on June 17, 1890, a decision was rendered in favor of the company, and soon after an order issued requiring the commissioner to grant the necessary permit, which he did on June 24, 1890. Following this action a chief engineer was engaged and the preliminary work was begun. Before any of the contracts were let, however, the president of the road, in company with a number of directors composing an inspection com-

mitted with the Pennsylvania Iron Works Company, of Philadelphia, for the complete equipment of the power stations after designs made by the manager of the contracting company. The actual work of reconstruction began about 4 P. M., on March 30, 1891, when the first paving block was removed from its bed near the intersection of 124th Street and Third Avenue, and this block has been carefully preserved as a memento of the occasion. The work was pushed vigorously from this time to December, 1891, about five and a half miles of regular construction being completed, when the contractors for certain reasons abandoned the contract, after which the work was divided up, and separate contracts were made for the iron and steel, excavating, castings, etc. The street construction was undertaken by Thomas E. Crimmins, for a percentage on the actual expenditures. Work was renewed by the new contractor in February, 1892, and pushed to a successful completion, as noted above, but the cost per mile has doubtless exceeded the original estimate to a considerable extent.

The official staff of the Third Avenue Railroad Company, whose portraits are given in this connection, from photographs taken especially for the STREET RAILWAY JOURNAL by Ehrlich, of New York, is composed as fol-

lows: Albert J. Elias, president; Henry Hart, vice-president; Alfred Lazarus, secretary; John Beaver, treasurer; John H. Robertson, superintendent; Edward Lauterbach, attorney, with R. P. Tomasseck as chief engineer of construction; C. G. Bliss, mechanical engineer, and John Brolles, assistant secretary.

The board of directors is composed as follows: Henry Hart, William Remsen, Silvanus S. Riker, Robert George Remsen, Robert W. Tailer, John E. Parsons, Edward Lauterbach, Albert S. Rosenbaum, Simon M. Ehrlich, Abraham Ayres, William H. Webb, Emanuel Lehmann and Albert J. Elias.

Mr. Elias succeeded to the presidency after the death of Mr. Lewis Lyon, October 29, 1891, under whose administration the cable scheme was inaugurated. Having previously held the office of vice-president, Mr. Elias was already familiar with the details of the business, and has been the mainspring of the executive organization which has brought the enterprise so near to a successful completion.

To the vice-president, Henry Hart, however, is due the principal credit for having backed the undertaking with the funds with which the expenses of the reconstruction have been met, and, although the cost has largely exceeded the original estimates, his faith in the ultimate success of the line as a business venture has emboldened him to invest his money freely, and thus prominently identify himself with the history of the road.

The secretary and treasurer, Messrs. Lazarus and Beaver, although they have been excessively burdened by the increased labors and responsibilities incident to the reconstruction of the line, have zealously and ably performed the duties, and justly take great pride in their share of the work. Both these gentlemen have long been identified with the affairs of the Third Avenue Railroad Company, the former having served in the present capacity since 1884, and the latter since 1864, at which time he was appointed a receiver, and served in that capacity until 1884 when he was appointed to the position of treasurer which he now holds.

Upon the superintendent, John H. Robertson, has rested the principal burden of personal responsibility for the success of the enterprise. His duties have included, not only the details of keeping the line in operation under the most unfavorable circumstances, but also the details of reconstruction, as he has served virtually as consulting engineer, and necessarily passed upon all the designs, including the plans for the power houses and their equipment, the cars, grips and street construction. He also originated many of the devices employed for facilitating the labors of construction, and patented a number of the safety devices adopted by the company, including the grip trips, tilting sheaves and car trucks. When the multitudinous duties he has been called upon to perform are considered, it is a wonder he has held up so well; nor could he had it not been for his vigorous constitution and the confidence and support freely accorded him and his superior officers, and by the fidelity of his assistants and employes. Mr. Robertson has been identified with the Third Avenue Railroad Company since 1867, and was made master mechanic and superintendent of the repair shop in 1874, and seven years later assumed the position of superintendent of the entire system. He is regarded by all who know him as one of the best all around railroad men in the country, and his many friends hope that on the completion of the cable lines his duties may be less arduous, and that he may long continue in the supervision of the operating affairs of the company as a reward to his devotion and loyalty during the trying period now, fortunately, nearly closed.

We have spoken above of the difficulties encountered in the early history of the cable scheme, in obtaining consent from the city authorities to substitute mechanical traction on the Third Avenue line. The details included suits in a number of courts, and finally the Court of Appeals, the outcome of which reflects great credit upon the legal ability and perseverance of Edward Lauterbach, counsel for the company. Many other legal problems have also been encountered as the work has progressed, all

of which have been ably solved by the counsellor, who is also a member of the board of directors. The chief engineer, R. P. Tomasseck, succeeded to the position in August last, on the resignation of A. H. Lighthall, the former incumbent. Mr. Tomasseck had previously held the position of first assistant engineer and chief of the drafting room and hence was familiar with all the details of construction. He has ably performed the work of redesigning and constructing some of the principal crossings and cross-overs.

C. G. Bliss has charge of the three power stations from which the cable lines are operated, and has also assisted in placing the machinery in the new plants. He has had considerable experience in cable railway work, having previously been employed on the lines of the West Chicago Railway Company and those of the Cleveland City Cable Railway.

PRINCIPAL CONTRACTORS.

As noted above, Thomas E. Crimmins succeeded Wm. Wharton, Jr. & Company, as contractor for the street construction, and under his supervision the work has been successfully prosecuted, notwithstanding the unforeseen difficulties met with. Great credit is due to the contractor for the methods employed, which resulted in little obstruction to public traffic.

The Pennsylvania Iron Works Company, of which W. L. Elkins, Jr., is president and B. W. Grist, general manager, were the contractors for the entire power equipment of both stations. The original designs were produced by Mr. Grist, and the machinery has been erected by E. A. Moore, constructing superintendent of the company. The successful completion and operation of these enormous plants reflect great credit upon the builders, and will stand as a monument to the genius and energy of the individuals composing the company. (See portraits on another page.)

The Jonson Engineering & Foundry Company, of New York, has also done a large amount of work in connection with the street construction and in designing and building some of the operating mechanism. Following the failure of the first contractors, a number of the large sections of the unfinished work were awarded to this firm, and all the special and difficult work, including the double cable crossing at 125th Street (Fig. 4) with the accompanying rope release and pick-up mechanism and the large summit and depression sheaves; also the 6th Street vault work and a number of street railway crossings on the Bowery. The works which are located at 118th Street and Harlem River, are virtually the repair shops of the Third Avenue Railway Company, and to them come a great deal of the detail work, such as building and repair of grips, manufacture of the grip trips above described, fitting pulley frames, bearings and brackets and an endless amount of small work. This firm were the principal contractors for the construction of the Tenth Avenue cable line, and sole contractors for the 125th Street cable road, which they built within eight months. The entire period during which they have been patronized by the Third Avenue Railway is an evidence of the confidence that the excellence of the work has inspired.

The cars were built by the Laclede Car Company, of St. Louis.

Albert Wagner, of New York, was architect of the buildings for the power stations.

The buildings were erected by Isaac A. Hopper, contractor and builder, of New York.

The excavation for the power stations was conducted by the contracting firm of D. E. Genovese & Towle, of New York, in connection with which the work of shoring up the banks and the walls of the old 65th Street station was done by T. P. Galligan & Son.

The ropes were all purchased from the John A. Roebling's Sons Company, of Trenton, N. J.

It is reported that a bill will be shortly introduced in the Maryland Legislature, for the protection of motormen and gripmen on rapid transit cars from the inclement winter weather, by compelling the adoption of vestibules.

The "Imperial" Steel Truck.

The accompanying engravings show a new steel truck, the "Imperial," recently put upon the market by the Fulton Truck & Foundry Company, of Cleveland, the new name of the Fulton Foundry Company, of that city.

In bringing before the street railway managers this new truck, the company does not wish to convey the idea that it has discontinued the manufacture of its wooden truck. The managers of the company still believe in the merits of their wooden truck, and are ready to fill orders for it when their customers so desire, but the manufacture of the steel trucks is done with a view to putting the company in a position to furnish its customers anything they may desire. The success with which the company has met in truck building has been very encouraging, and has driven its owners to the necessity of erecting one of the largest factories for this purpose in the country.

The "Imperial" trucks are designed by W. E. Haycox, who has had thirteen years' practical experience in street railway work, and who thoroughly understands the requirements of street railway companies. The single steel truck "Imperial," it is claimed, has many advantages over trucks of other makes, a few of which advantages are herewith presented the readers of the STREET RAILWAY JOURNAL. The main frame is made of cast steel in the form of an I beam and extends from end to end and around on the cross section about ten inches, and the two frames are joined together with a rolled steel I beam and fishplates similar to those used in track construction, thereby making a very rigid frame and with no joints at the corners, thus preventing the truck from getting out of line. The pockets to receive the springs are cast on to the frame, and also the lugs for the under truss, therefore

been used, which prevents any oscillation even where thirty-two foot cars are used.

These trucks are also equipped with the company's new life guard, which is constructed of gas pipe running as near to the rail as is practical, and having a brace in the center as a support, running from the cross section of the truck to the center of the frame of the life guard. This frame is covered with a wire netting, and is so designed as to pick up any obstruction rather than run over it. The company believes that this style of life guard is as

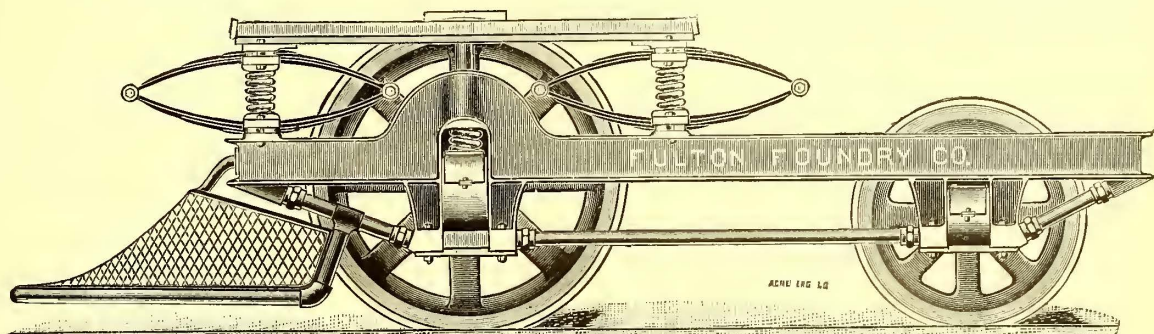


FIG. 2.—DOUBLE "IMPERIAL" STEEL TRUCK.

near perfect as a life saving device as anything can be made. At the same time, it does not require any attention or sufficient presence of mind on the part of the motorneer to operate a life saving device. It is also said to be lighter than any life guard which has yet been put on the market. This truck is equipped with an equalizing brake which is very powerful, and does not require any adjustment as the brake shoes become worn. The subsills are made of channel iron, and the spring connections are riveted on to the same, and after this is done a piece of hard wood is used to fill out the channel iron to receive the car body, thereby giving a support to the car sill the entire length of the truck. There is also a perfect oiltight and dustproof box, and a three and a half inch journal is used as a standard, unless otherwise specified.

The trucks are also equipped with the company's patent double tread wheel, with an independent brake rim, if so desired. These wheels are coming into general use very rapidly and proving the theory that the brake

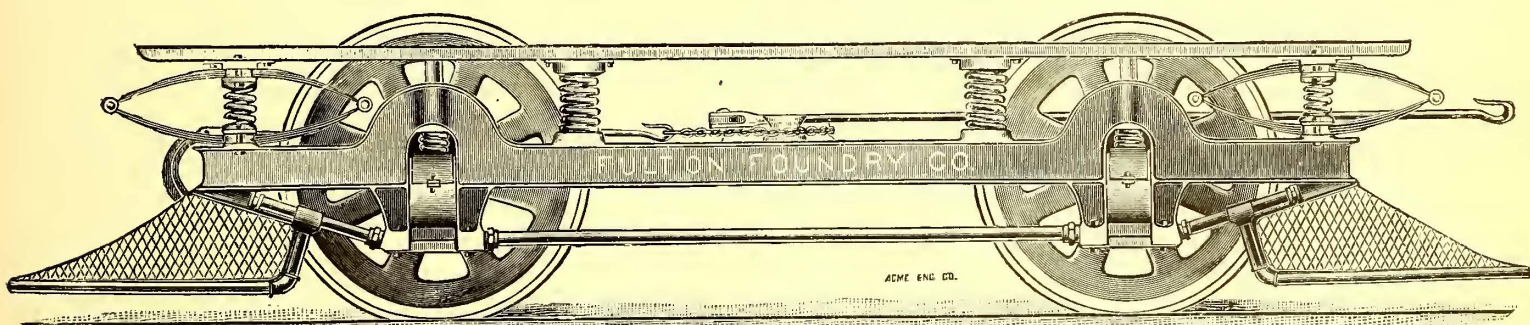


FIG. 1—SINGLE "IMPERIAL" STEEL TRUCK

requiring no bolts or rivets to fasten them to the main frame. The spring over the journal box is kept in position by the pockets in the journal box and in the main frame, and needs no other fastenings. On the end of the truck is a new combination coil and elliptic spring. The great advantage gained by this construction is that it prevents the elliptic spring from breaking should too heavy a strain be brought upon it. The coil spring will bear the greater portion of the strain when the elliptic spring is compressed past its normal position, and assists the elliptic in resuming its proper position. The company has a steady pin running from the subsill through the main frame over the journal box, which prevents the oscillation of the car and keeps the springs in perfect line. The success had with former Fulton Foundry trucks has been due in large part to the fact that this steady pin has

shoe takes from the life of an ordinary wheel from 60 to 75 per cent. Therefore, by placing the brake shoe on an independent rim, it is thought this 60 or 75 per cent. additional life will be gained in addition to having a clean braking surface the year round.

Fig. 2 shows the double steel truck "Imperial," which possesses all the good qualities of the single truck. The main frame is made in the same manner, but is made to use a large driving wheel and small trailers. Four patent combination coil and elliptic springs are employed on the double truck, and the weight of the car body is equally distributed over the driving wheels. The steady pin is connected to the subsill and a king bolt driven directly over the axles of the driving wheels, thereby giving the maximum traction to the drivers. This truck is also equipped with the patent life guard, the same as

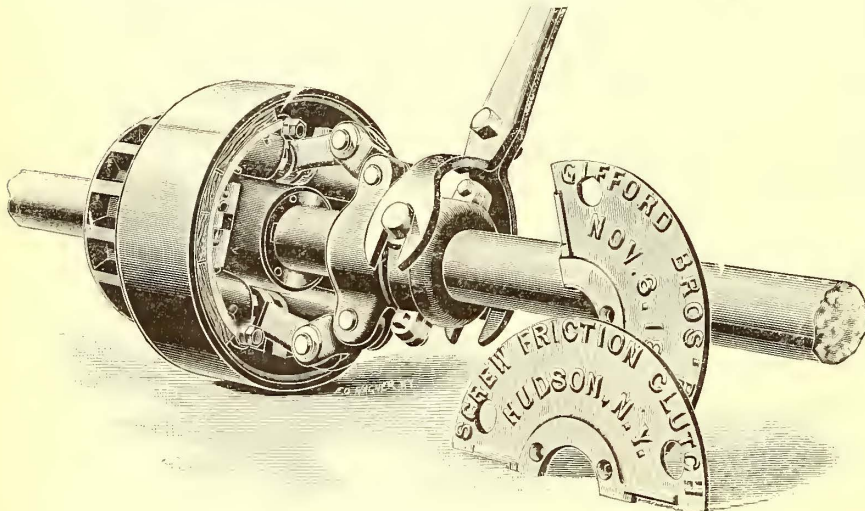
used on the single truck. Another great advantage claimed for the use of these trucks is the convenience of removing wheels and axles when necessary to do so for repairs. The removal of one bolt in the jaw of the main frame and the loosening of another on either side of the truck is all that is necessary to remove the wheels and axles. There are very few bolts employed in the construction of these trucks and those are equipped with lock washers.

The company invites correspondence from the street railway managers, and writes us that it is ready to fill orders promptly, and will guarantee the material and workmanship to be second to none in the country.

Patent Screw Friction Clutch.

Power users will be interested in the accompanying engraving which shows a patent screw friction clutch, manufactured by Gifford Brothers, of Hudson, N. Y., and which has given excellent results in practice.

The power of a screw is employed for creating pressure and this, together with the powerful leverage used to rotate the screw, enables it to weld, so to speak, the face of the driving segments to the interior face of the driven drum. The screw and lever arm are in one piece and, with their nuts, are of aluminum bronze. Wooden lags of hard maple are employed to obtain the best frictional results. It is said that the wear on them is practically imperceptible, and, granting that they might wear, they can be replaced easily and at very slight expense.



SCREW FRICTION CLUTCH.

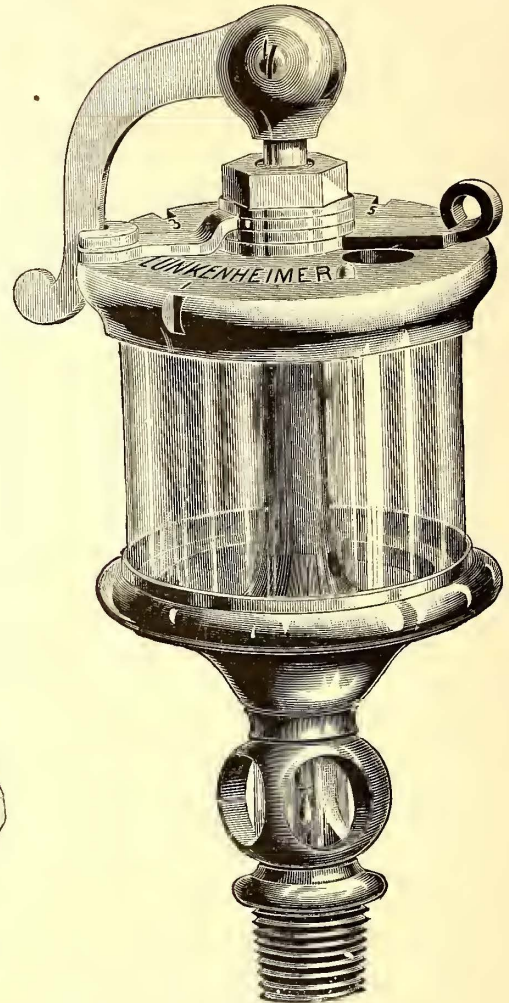
The clutch is compact and requires but little space on the shaft, and the adjustment, when necessary, is readily made. The manufacturers have contracted with the Suburban Electric Company, Elizabeth, N. J., for the installation of countershafting, clutch pulleys, quills, cut-off couplings, etc., in its model electric light and power plant now being constructed.

NEXT spring the Brussels Tramway Company will make an experiment with electric traction on the Uccle line, on the North and South Brussels line. The trolley system will be used. The management of the Suburban Petite-Espinette Railway is completing at its stables, at Cureghem (Brussels), the construction of an electric power house for introducing the same system (trolley) on its lines, about 6.5 miles in length. Certain grades on this line are as high as 6.3 per cent. The first tests will occur shortly.

MILAN, one of the first cities of Europe to install a large central station for lighting purposes, incorporated on November 1, 1893, a double track trolley electric road. This line is nearly two miles in length. The motors are of the General Electric W. P. type. Half of the engine equipment was built by the Armington & Sims Company, and the other half was of Italian make.

New Glass Oil Cup for Dynamos and General Engine Bearings.

The accompanying engraving shows the new Lunkenheimer "Crown" index, sight feed, glass oil cup, manufactured by the Lunkenheimer Company, of Cincinnati. This cup is provided with an "index" device for regulating the flow of oil, and an indicator arm turning on the lid to mark the notch, giving the desired feed. When desired, the feed can be instantly turned off and on again by replacing the index lever in the notch of the indicator



NEW GLASS OIL CUP.

arm. When the index arm is closed the lever can be left to stand up out of the notch, thus acting as an indicator to show from a distance that the feed is shut off.

It is often the case that a number of cups require different feeds, especially before starting the engine, when an extra amount of oil is wanted. This can easily be accomplished with the "Crown" without losing the original feed, by simply moving the indicator arm a few notches to the right, and when the established feed is again required it is only necessary to replace it in the index slide which marks the established feed. These cups are all made of cast brass, handsomely finished and are heavy and durable. The oil will not leak out between the brass and the glass parts, as is the case with all ordinary spun brass cups. Wherever the "Crown" has been put in use it is giving the very best of satisfaction. They are made in eight sizes, holding all the way from five-eighths to eighteen ounces of oil.

Besides the "Crown," this company makes seven other styles for various purposes.

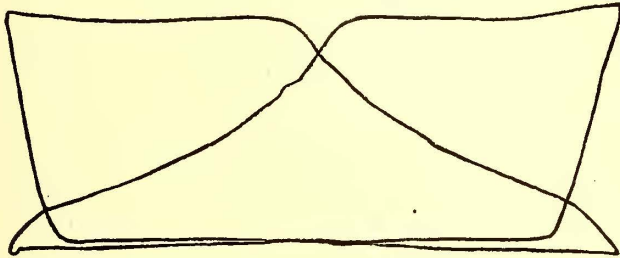
THE size of the electric generators to be supplied by the Westinghouse Electric Manufacturing Company to the Niagara Falls Power Company, it is said, is 5,000 H. P. each.

Triple Expansion Engines in Central Stations.

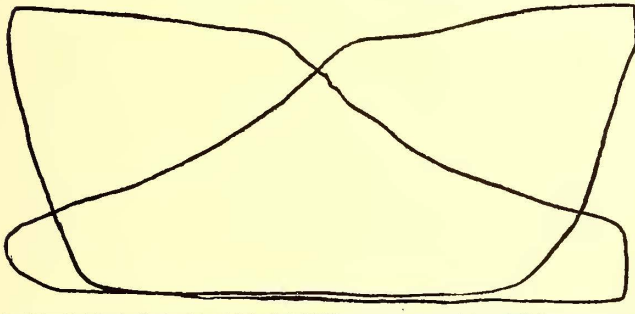
Of the many problems of interest to the central station managers, one of the most important is, how far they can go in the direction of multicylinder engines, and by so doing effect a saving in fuel commensurate with the greater cost of installing this class of engines.

An increase in the number of cylinders narrows the limits of economical working, and the more variable the load, the less is the saving which can be effected by their use. The question is: When do they pay? In the largest cities, in stations for incandescent lighting, it has been found that triple expansion engines are perfectly feasible and effect a large saving. This work, of course, is of a very favorable nature, enabling the units to be always kept well loaded. In smaller cities, however, and where

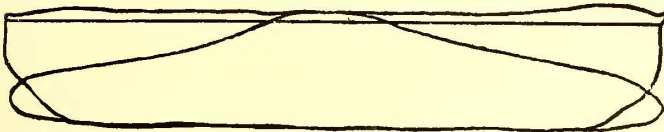
14½ ins.; M. E. P. = 55.53; 60 spring.



23 ins.; M. E. P. = 27.6; 24 spring.



26 ins.; M. E. P. = 9.56 (each); 16 spring.



Initial Pressure, 139 lbs.; Revolutions, 139; Horse Power, 518.69.

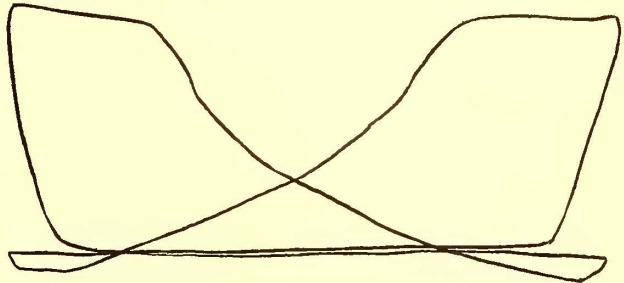
FIG. 1.—MAXIMUM STATION LOAD—INDICATOR CARD FROM TRIPLE EXPANSION ENGINE.

the work is of a varied kind, such as arc, incandescent and motor work in combination, there has not been much done in this line, and it has been considered by most engineers that the efficacy of using triple expansion engines as a means of saving coal is somewhat problematical on account of the variations in the load.

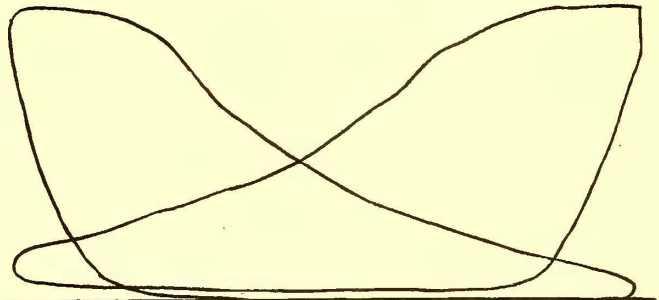
We illustrate herewith some indicator cards taken from a triple expansion engine in the station of the Elmira Illuminating Company, of Elmira, N. Y., which has shown very good results in the line of fuel economy. This station was described in a recent issue. The engine was built by McIntosh, Seymour & Company, of Auburn, N. Y., and is of the vertical, four cylinder, triple expansion type, of a nominal capacity of 500 H. P. In this station the day load consists of motor and electric railroad circuits only, which are run from separate, horizontal, compound engines. The 500 H. P., triple expansion engine is started when the lighting comes on, and runs until midnight. From midnight until morning a smaller horizontal, triple expansion engine carries the lighter load, which is nearly constant, consisting largely of arc lights. The cards taken from the large engine show the minimum and maximum loads

under which it runs, the light cards giving the Sunday evening load, when lightest, and the heavy cards being taken slightly before six o'clock, when both store and house lights are on, and the load is heaviest. It can be readily seen that in both of these extreme cases the engine is working under favorable conditions as regards economy of fuel. The lateness of the cut-offs which occur in triple expansion engines impose a very difficult duty on the governor, much more so than is common in single cylinder and compound engines, by reason of the greater range through which it has to act. Upon this engine, at full cut-off, which is at eight-tenths, the speed falls off only about 2 per cent. from no load and condensing, which is a remarkable result. It will be noted that by having the cut-off valves operated by the governor the receiver pressures and the drop of temperature in the cyl-

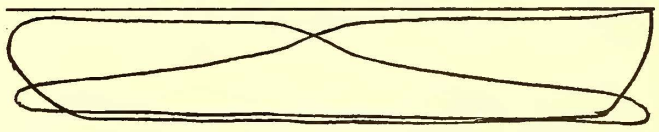
14½ ins.; M. E. P. = 33.46; 60 spring.



23 ins.; M. E. P. = 20.64; 24 spring.



26 ins.; M. E. P. = 7.00 (each); 16 spring.



Initial Pressure, 137 lbs.; Revolutions, 140; Horse Power, 374.62.

FIG. 2.—MINIMUM STATION LOAD—INDICATOR CARD FROM TRIPLE EXPANSION ENGINE.

inders is kept practically constant, and the economy of the engine is always the best obtainable for the conditions under which it is running, without any hand adjustment of the valves being required.

As to practical results, comparing the percentage of the coal bill to the gross receipts of the company from business shows a saving in fuel of 61 per cent. as compared with results obtained in the old station, comparison being made between the results obtained during the months of November this year and last, which should give as fair a test as is possible.

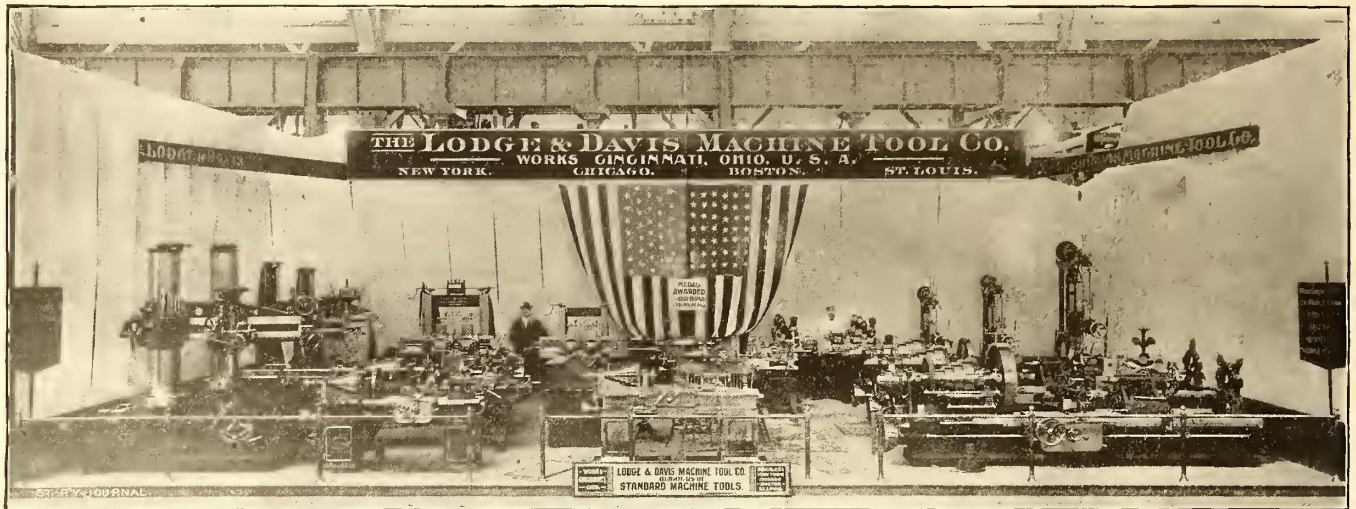
MESSRS. AHEARN & SOPER, of Ottawa, have recently supplied the Canadian Government with three electric mail cars for use in Ottawa. The car bodies were manufactured by the Ottawa Car Manufacturing Company, are mounted on Brill trucks and are equipped with thirty horse power Westinghouse motors. Doors are provided in the sides for loading and unloading the mails, and the interior is arranged to afford every convenience for handling the mails.

The Lodge & Davis Machine Tool Company's World's Fair Exhibit.

The Lodge & Davis Machine Tool Company, of Cincinnati, O., made a most interesting exhibit at the World's Fair. A good idea of the appliances shown is given by

A New Departure For a Long Established Company.

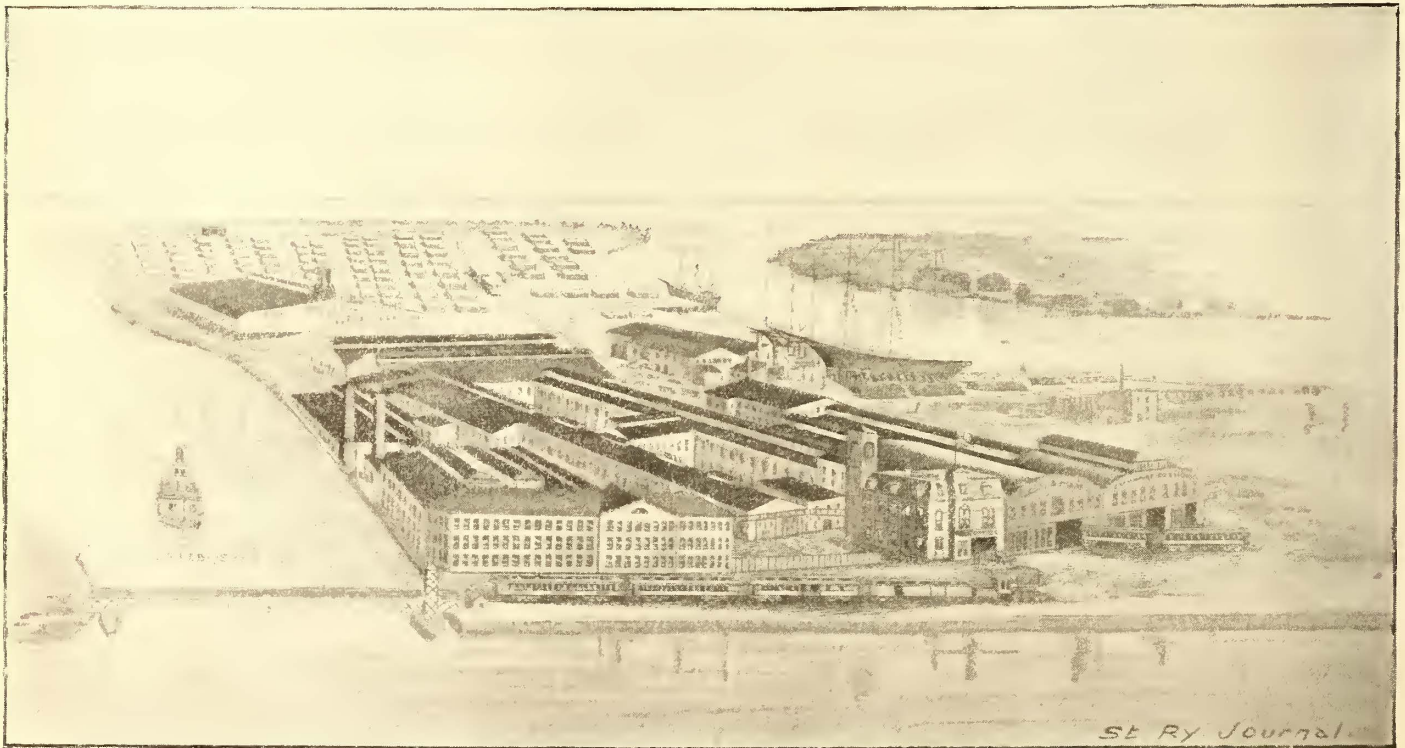
The Jackson & Sharp Company, of Wilmington, Del., who for the past thirty years has been renowned as a manufacturer of railroad cars, is about to start actively



THE LODGE & DAVIS MACHINE TOOL CO.'S WORLD'S FAIR EXHIBIT.

the engraving on this page. The exhibit was made up of some twenty-five engine lathes, planers, drill presses, screw machines, milling machines, turret lathes, etc. An interesting feature was the operation of a large radial drill and an improved tool room lathe, both of the Lodge & Davis manufacture, by direct connected electric motors.

in the building of street railway cars of all patterns. This is not an entirely new step, for many years ago, when the street railway industry was still in its infancy, this company built a large number of the old fashioned, small, light cars, many of which are still in service. The great advance in steam railway construction led the company,



WORKS OF THE JACKSON & SHARP CO.

One of the finest pieces of work in Machinery Hall was one of the company's tool room lathes, entirely finished in gold and silver plate. This lathe cost some \$3,000 and took six months to complete. The company's exhibit was in charge of some of its most capable and experienced men, including the company's foreign representative, who is conversant in nine different languages.

As a proof of the excellence of the exhibit, the company received the highest award for the finest exhibit of machine tools in Machinery Hall.

shortly after, to turn its attention entirely to this line which it has followed exclusively until just recently, when the growing market and demand for street railway cars of superior workmanship and finish has led it to enter the field again.

This firm was started in the business of car building in a small way by Job H. Jackson and Jacob F. Sharp, in 1863. Owing to honest dealing and industry the business has increased to its present dimensions.

Our illustration shows a view of the company's pres-

ent works, situated at the junction of Brandywine Creek and the Christiana River. These works cover twelve acres of ground, and have all facilities for turning out work up to the company's acknowledged standard. The company's lumber yard has a capacity of 7,000,000 ft., and its sheds, of 2,000,000 ft. more. The erecting and paint shops have a capacity of 75 steam, or perhaps 250 street, cars, and the storage rooms, of 75 to 100 more, so that large orders may be easily handled without delay.

Handsome Cars.

The two cars, engravings of which accompany this article, represent two types, opened and closed, manufactured by the New Castle Car Manufacturing Company,

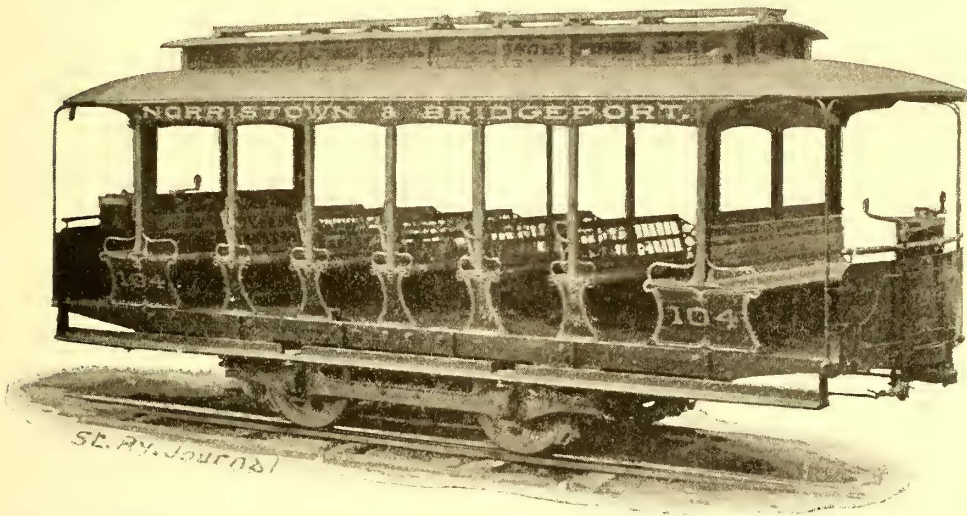


FIG. 1.—OPEN CAR FOR THE NORRISTOWN & BRIDGEPORT RAILWAY.

of New Castle, Pa. The former contains nine benches and was built for the Norristown & Bridgeport Railway. The latter, which is shown without supporting truck, is of the vestibule type and is part of an order filled by this company for the Bridgeport, Bellaire & Martin's Ferry Railway, which was described in a recent issue of the STREET RAILWAY JOURNAL. The managers of this company recently had a fire at their works which destroyed the planing mill. This accident was exaggerated by a number of the daily papers, which reported that the entire works of the New Castle Company had been burned to

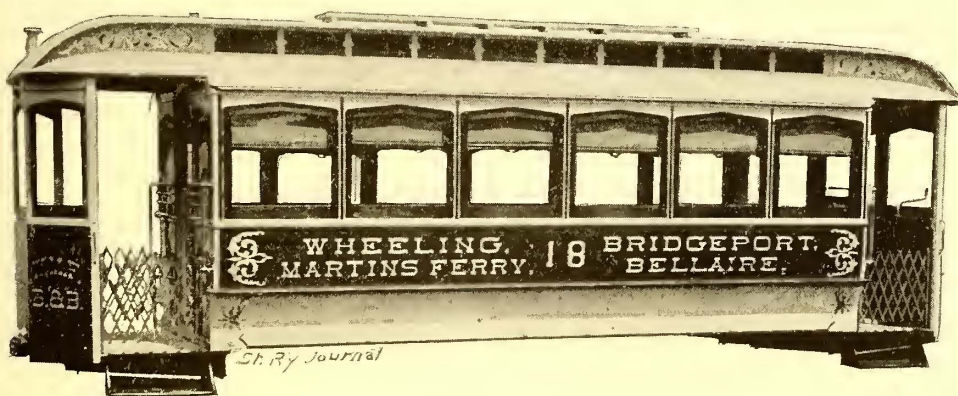


FIG. 2.—CLOSED CAR FOR THE BRIDGEPORT & BELLAIRE RAILWAY.

the ground. The company, as mentioned elsewhere in this issue, will rebuild at once and be ready to run its mill about the latter part of January.

THE Milwaukee Electric Railway was formally turned over to the control of the Milwaukee Street Railway Company, on December 1, having been purchased by the latter company, as we have before noted. A part of the road has been abandoned, and the cars are being operated from the central power station, and the old station is being utilized for lighting purposes.

The Pfingst Fender.

We show herewith two views of one of the cars of the Brooklyn City Railroad, showing the application of the Pfingst fender recently adopted by that road for all its lines. Of the two cuts, Fig. 1 shows the front platform with the fender extended for use, and Fig. 2 the rear platform with the fender pushed back under the car out of the way.

This fender, which was illustrated and described in the STREET RAILWAY JOURNAL for May, 1893, is the invention of Louis Pfingst, late master mechanic of the West End Street Railway Company, of Boston. The fender itself is in the form of a table or platform of wrought iron, with a floor of latticed strips. This table is mounted

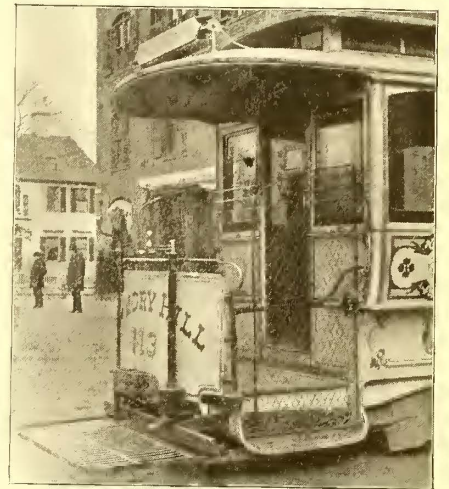


FIG. 1.—PFINGST FENDER READY FOR USE.

under the car, so that it may be extended parallel to the ground or pushed back under the car when not in use. It may also be used when a trail car is used, making it perfectly safe to pass from one car to the other. In action the fender strikes an object below its center of gravity, causing it to fall upon the platform. It is also high

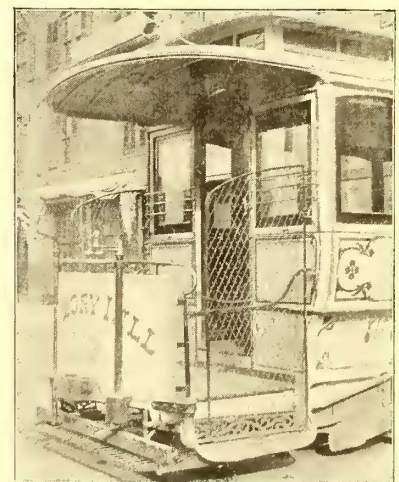


FIG. 2.—PFINGST FENDER PUSHED UNDER PLATFORM

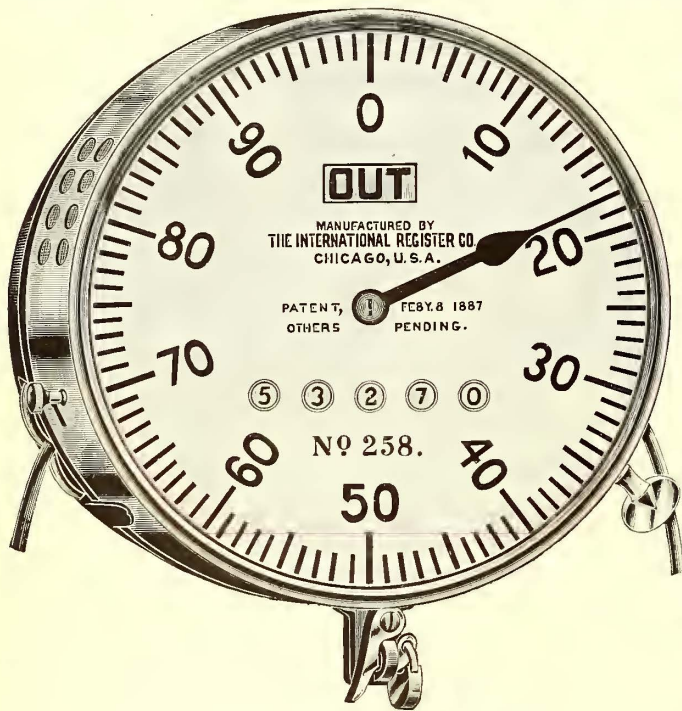
enough from the ground to clear all fixed obstructions that cause derailment. This fender can be applied to any car without interfering with the drawbar, brake, attachments, controller spindle, etc. It has also been adopted by the West End Street Railway Company, of Boston.

THE Street Car Brotherhood, of Indianapolis, an organization of the street railway employes of that city, has disbanded. At one time the Brotherhood was in a very flourishing condition and successfully engineered several strikes against the company.

"The Aluminum" Stationary Register.

"The Aluminum" is the name given the new stationary fare register illustrated below and manufactured by the International Register Company, 300 Dearborn Street, Chicago, which has just placed it on the market. There are a good many new and novel features in this register which ought to recommend it to the practical street railway man. In the building of this machine it has been the aim of the manufacturer to produce a register that is simple, strong, durable and accurate, as well as one of tasty and artistic design. How well the company has succeeded in its efforts is best determined by an examination of the machine. The register is of the double clock-face design, having a tally or permanent register with a capacity of 100,000 fares, and a trip register, indicated by the pointer, which is capable of being returned to zero.

In the construction of the tally or permanent register, the manufacturer claims to have evolved an entirely new idea. It is made entirely of cut gears, without any



AN ALUMINUM STATIONARY REGISTER.

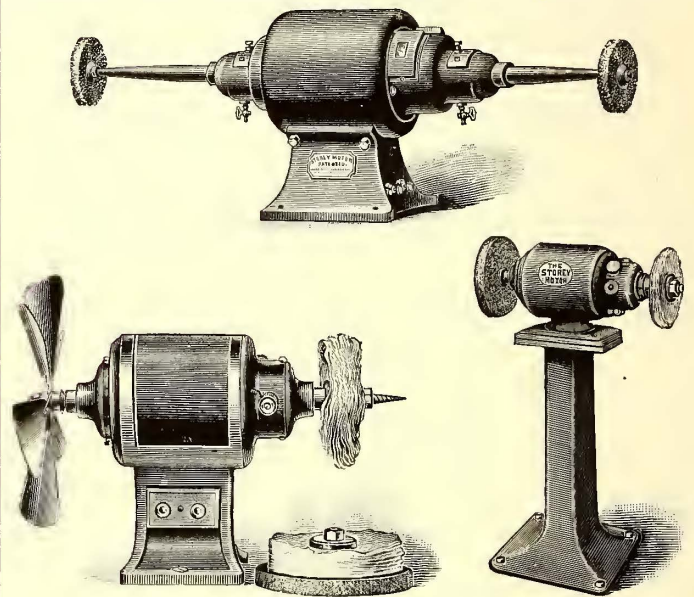
springs or pawls whatever, and is, therefore, not liable to get out of order. It cannot possibly be moved (backward or forward), except by pulling the cord and actuating the entire mechanism. This, as will be seen, is a very valuable feature. It will effectually prevent any tampering with the total record, even though the glass should be broken. The makers go so far as to claim that the total record cannot be changed, even though the case, glass, dials and all are removed, except by pulling the cord as described.

To overcome the inevitable result of cracking and peeling of enameled dials, pure aluminum is used for dials throughout this register, and the satin finished surface presents a strikingly handsome appearance. The advantage in using this material is that it will always retain its color and lustre, making the register look new at all times. Another very valuable feature in this device is the length of the stroke, which is seven and a half inches. The object of this is to overcome the practice of ringing up a number of fares in such quick succession as to make it almost impossible to count the vibrations of the bell. With a long and easy stroke the conductor is obliged to ring each fare distinctly. It will also prevent passengers from ringing up fares when meaning to signal the conductor, as the register will not operate with a short quick jerk. The register is of the standard twelve inch size, and is finished in full nickel, presenting a remarkably fine appearance. It is operated either with cords and pulleys, or by a rod running lengthwise of the car.

The Storey Electric Lathes and Motors.

One of the most interesting developments in the electrical field is the increasing use of small, isolated, self contained motors which can be run directly from the lighting circuits, and are adaptable to a multiplicity of uses in shops, factories, hotels, etc. Among the handiest and most adaptable of these machines are the motors and lathes manufactured by the Storey Motor & Tool Company, of 120 Liberty Street, New York. This company makes a line of standard slow speed motors, ranging in size from $\frac{1}{4}$ H. P. to 100 H. P., which are adapted to run any kind of machines or machine tools, either by direct connection, or belts or gears; and also a line of six sizes of electric grinding and buffing lathes which are rapidly coming into use and giving great satisfaction wherever operated. Our illustrations show views of several of these machines.

These motors, as may be seen, are entirely self contained, the armatures, coils, brushes, etc., being covered and enclosed by the field magnet case which protects them from injury, dust, dirt and dampness. The motor is a plain cylindrical machine having end projections for the boxes and commutator. The field magnets present



TYPES OF STOREY MOTORS.

four poles so arranged that while the center of the machine is of one polarity the ends are of the opposite, and as this is a four pole machine it has eight distinct magnetic circuits, thus giving magnetic circuits of very low resistance and, therefore, maximum efficiency for a minimum quantity of wire. The coils are held in position by the pole pieces. The armature is of the drum type toothed. The end caps act as supports for the bearings, and also serve as oil reservoirs. The bearings are either self oiling or graphite, and so constructed as to work perfectly in any position. From this description it may be seen that this motor, by reason of its dust and damp-proof construction, is capable of many uses from which other motors are debarred, such as in breweries, mines, basements, sugar houses, and for blowers, ventilating fans, in wood working shops, etc. The brushes last indefinitely, and can be changed in a moment by anyone.

The double end buffing lathe has given great satisfaction in a number of the larger hotels in New York where they have been used for cleaning silver and plated ware, knives, etc. All who have used this machine speak of the finish given to the articles cleaned as being fully equal to that of new work, and a vast improvement on hand work. The feature of attaching the buffing or grinding wheels directly to the armature shaft is a good one in that it saves the space occupied by countershafts, belting, etc. A portable motor is being furnished by this company, to which a flexible shaft, with a buff at the end, is attached for polishing brass fittings around the engine room or other places where current is accessible.

The Works of the J. W. Fowler Car Company.

The new factory which has been erected by the J. W. Fowler Car Company, at Elizabethport, N. J., presented a scene of much activity on the occasion of a recent visit of a representative of the STREET RAILWAY JOURNAL.

These works, which, it is well known, have been built during the last year, are equipped with the latest and most approved appliances for the manufacture of street railway cars and all necessary parts for the complete rolling stock of a street railway company, including in this category snow plows and snow sweepers, as well as every variety of passenger car. The works were erected under the supervision of, and are operated and managed by, persons of long experience in just this class of work, and represent the most approved ideas for securing the best of work, together with the greatest facilities for manufacture.

The factory comprises eleven brick buildings, with a total of 100,000 sq. ft. of floor space. The buildings are arranged somewhat in the form of the letter U, a covered passageway being provided between two wings, as shown in the engraving on this page. The arrangement is such that the movement of the material used in the construction of the cars is constantly in one direction, reducing to the minimum all necessary transportation, the receipt of lumber being at the north-western end of the works, and the shipment of the cars at the eastern end, as shown.

Following the raw material as it is handled at this factory, we enter, first, the kiln-dry rooms. These are two in number, with concrete floors, and have a total capacity of 60,000 ft. of lumber each. The process of drying and seasoning is aided by a draft of hot air supplied by a Sturtevant blower fan which keeps a continuous current of hot air passing through the rooms. Adjoining the kiln-dry rooms is a lumber shed, with a capacity of 500,000 ft. of kiln-dried lumber, and opening into this is a third build-

ing containing, on the ground floor, the mill, and on the second floor, the cabinet shop. Both of these are furnished with a great variety of woodworking machinery, of the latest pattern, necessary for performing the varied work pertaining to the manufacture of street cars.

Continuing in the direction which the material takes,

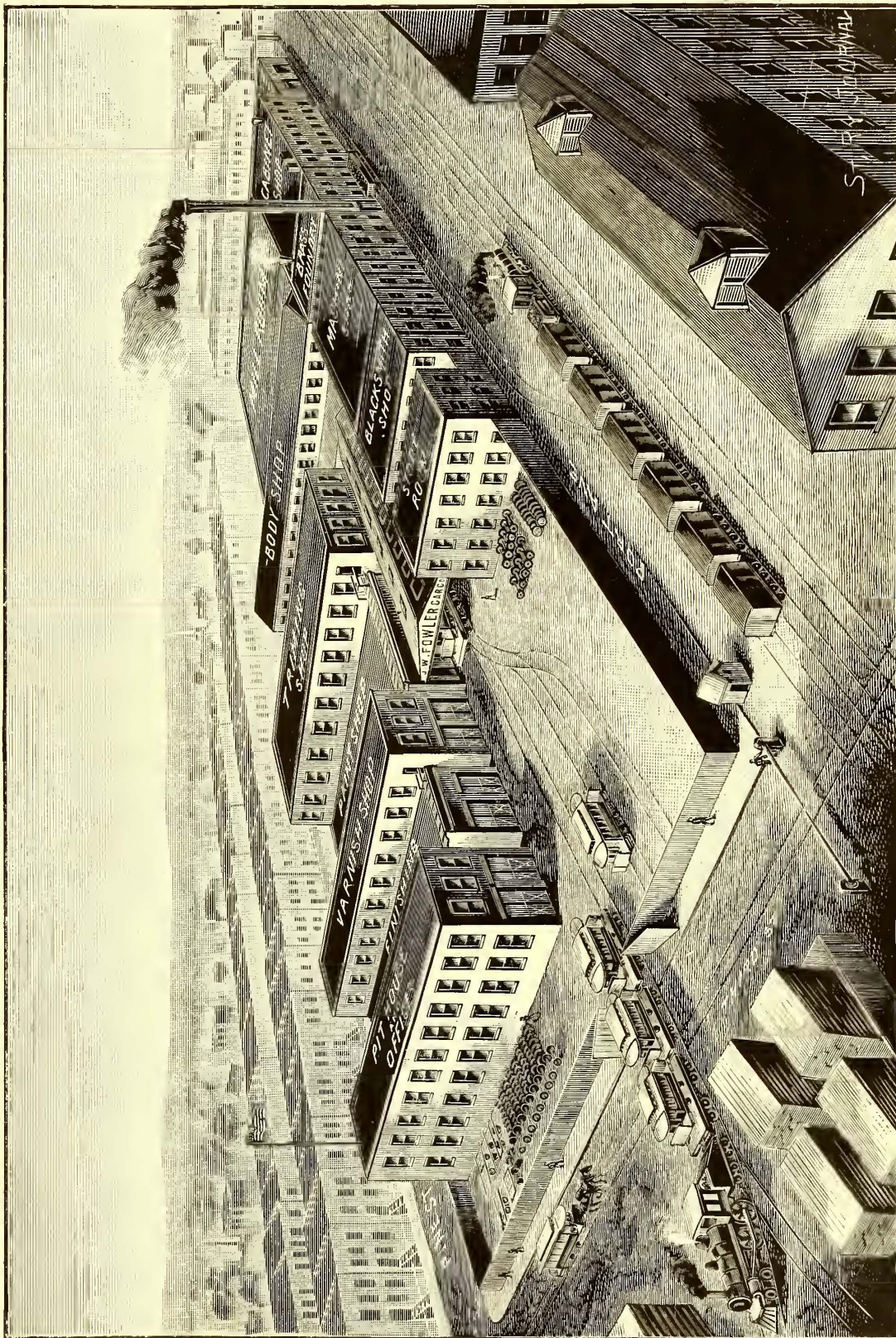


FIG. 1.—THE WORKS OF THE J. W. FOWLER CAR CO.

the visitor next enters the body shop, where the different parts, when finished in the mill and cabinet shop, are taken to be fitted together. A spur from the railroad tracks enters into this room through the covered passageway already mentioned, which is thirty-two feet wide and is lighted by skylights. This enables the company to load the bodies of the cars and the trucks directly on to the platform cars for shipment.

On each side of this passageway are located the rest

of the buildings comprising the factory of the J. W. Fowler Car Company. The order of their arrangement can be seen from the engraving. Each building is two stories in height and entirely distinct from those on each side, though connected by passageways on each floor, so that easy access is allowed from one to the other. These dif-

ferent shops include the body room, trimming room, varnish shop, machine shop, brass foundry, engine room, register and stove departments, etc. Particular attention is paid by the J. W. Fowler Car Company to the manufacture of snow sweepers and snow plows. We present, in Figs. 2 and 3, engravings of two of the many sweepers built by the company this season for service during the winter on different roads. One is a sweeper manufactured for the Scranton Traction Company of Scranton, Pa., and the other one for the Atlantic Avenue Railway Company of Brooklyn, N. Y.

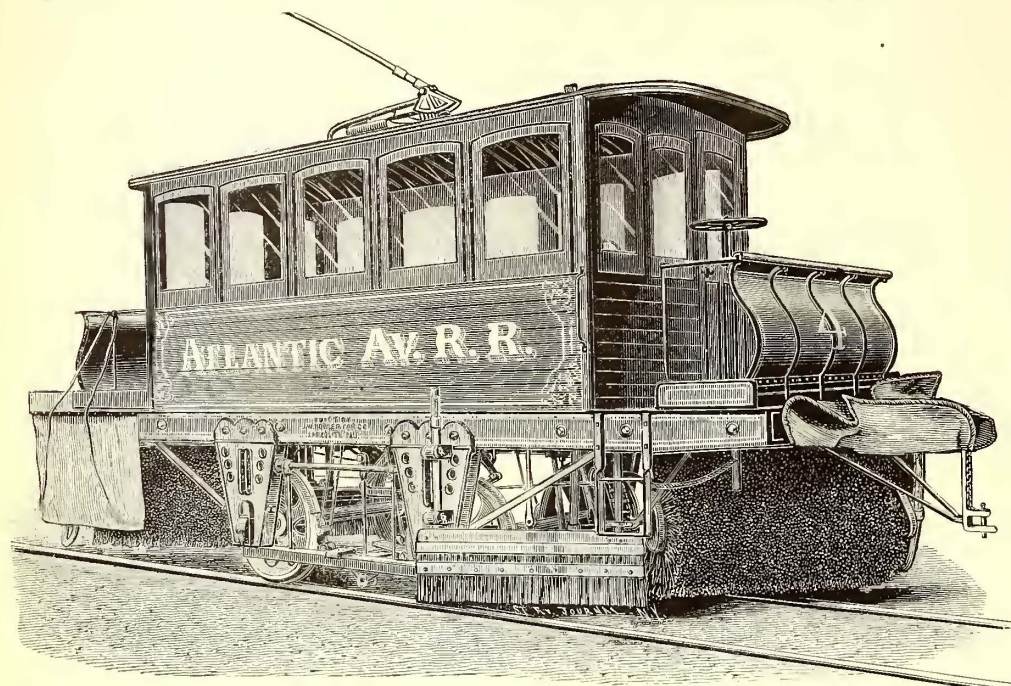


FIG. 2.—ELECTRIC SNOW SWEEPER BUILT FOR THE ATLANTIC AVENUE RAILWAY CO., BY THE J. W. FOWLER CAR CO.

The Scranton sweeper is built with a heavy oak frame, and, as will be seen, has a cab extending its entire length, effectually protecting the operators, motors, wires, switches, etc., from the weather. The cab of the Atlantic Avenue sweeper is much shorter, the motorman standing on the outside. The cabs are furnished with windows at the sides and ends, affording plenty of light and permitting inspection of the street and roadway by the operators. Doors are located at each end of the cab. To permit of easy access to the motors and brooms, one-half of one side of the cab is made detachable. This side can be removed in a short space of time, and can be put in place again just as rapidly.

The revolving brooms, which are of rattan, are thirty-seven inches in diameter and are driven by special motors, so that their speed is entirely independent of the speed of the sweeper. In this way, in case a heavy drift is encountered, the brooms can be operated at full speed, while the sweeper advances slowly. Connection between the broom shaft and motor shafts is made by sprocket chains manufactured by the Link Belt Engineer-

ing Company, of Philadelphia. In addition to the revolving brooms, the mould boards of the sweeper are also equipped with rattan brooms to clear the tracks of snow. The motors employed are of the Westinghouse type, but any type of motor can be used. Every part of the sweeper is made with special care to provide sufficient strength for the necessarily arduous work imposed upon a sweeper, and extra strong knuckle joint brakes form part of the equipment. Turning from these necessary parts of the storm equipment of a street railway, the reader can see in Fig. 4 a specimen of one of the passenger cars manufactured at these works. The car shown was the first car turned out from the works, and is a production of which the managers of the J. W. Fowler Car Company are deservedly proud. It was built for the Lake Roland Elevated Railroad Company, of Baltimore, Md. In point of finish and general tastefulness of design the car leaves nothing to be desired, while in regard to durability and comfort, neither the most captious street railway company on the one hand, nor the passengers on the other, could have ground for dissatisfaction. The bodies of these cars are eighteen feet in length and provided with six high windows on each side. The platforms are four feet wide, furnished with steel steps and folding gates. The roof is of the Monitor type with bonnets supported by posts from the dashes. The inside finish of the car is of solid mahogany with bronze trimmings throughout. Veneer seats are used, and seats and backs are covered with Wilton carpet. The windows are curtained with Burrowes roller

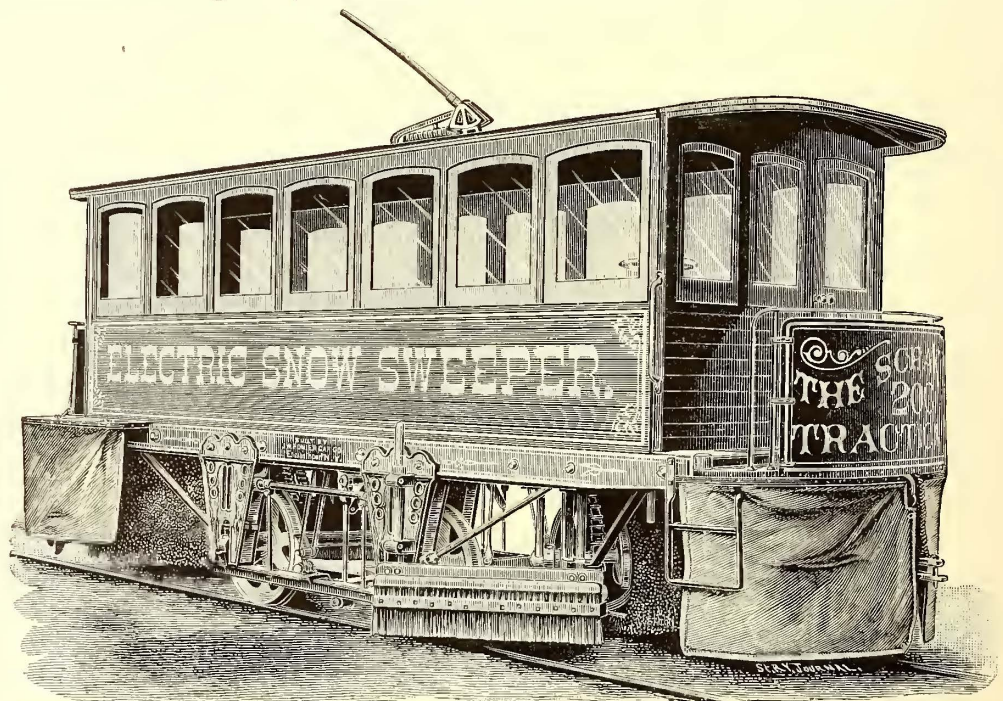


FIG. 3.—ELECTRIC SNOW SWEEPER BUILT FOR THE SCRANTON TRACTION CO., BY THE J. W. FOWLER CAR CO.

shades and each end of the car is furnished with beveled glass mirrors. The ceiling is of quartered oak veneer, handsomely decorated. Illumination is provided by center lamps. DeWitt sand boxes and steel foot gongs are used. The doors are double and self-acting, providing easy ingress and egress. The drawbars are of the

The doors are double and self-acting, providing easy ingress and egress. The drawbars are of the

radiating type and provided with draw and recoil springs.

The personnel of the J. W. Fowler Car Company is a strong one, and includes the following well known names: President, John W. Fowler; treasurer, John W. Cooper;

Fowler was previous to this time, and had been for a number of years, in the mechanical department of the Brooklyn City Railway Company. The success from the start achieved by this register led to an extension of the



J. W. FOWLER,
PRESIDENT J. W. FOWLER CAR CO.



J. W. COOPER,
TREASURER J. W. FOWLER CAR CO.

secretary, R. C. Swan; superintendent of construction, John Hutton; superintendent of supply department, John England; superintendent of machine department, James Grady. In the sales department of the company is George S. Whipp.

The president of the company, John W. Fowler, whose portrait we present on this page, is well known in

manufacturing business of the firm with which Mr. Fowler was then connected, to other street railway appliances, and on December 1, 1883, the firm was merged into the Lewis & Fowler Manufacturing Company, Mr. Fowler being elected president of the company. The business of the company was continued at the same place, No. 8 Columbia Heights, Brooklyn, until April, 1886, when owing to the large increase of business, the factory was moved to larger quarters on Walworth Street, where Mr. Fowler remained president and manager until November, 1892, when he resigned his position and sold out his interest in the company, having served nine consecutive years as its president. In March, 1893, the J. W. Fowler Car Company was organized. Work was immediately commenced on the Elizabethport factory of the new company, which was put in operation September 6, 1893.

Mr. Fowler was born on Long Island, in 1848, and is now a resident of Brooklyn. He is also the owner of a beautiful country residence at Northport, L. I.

Mr. Fowler is ably assisted in his present work by John W. Cooper, treasurer of the company, and a life long friend of Mr. Fowler. Mr. Cooper was born in the City of Brook-

lyn in 1845. At the age of fourteen years, he entered upon his business career, which has so far been a very satisfactory one, both to himself and to his immediate social and business acquaintances.

His first employers were Metcalf & Duncan, ship-brokers, whose office was at 23 South Street. A more promising position was offered him by Davis, Morris & Company, drug brokers, then at 87 Wall Street, but now (under the firm name of Davis, Wolt & Company) 58 Pine

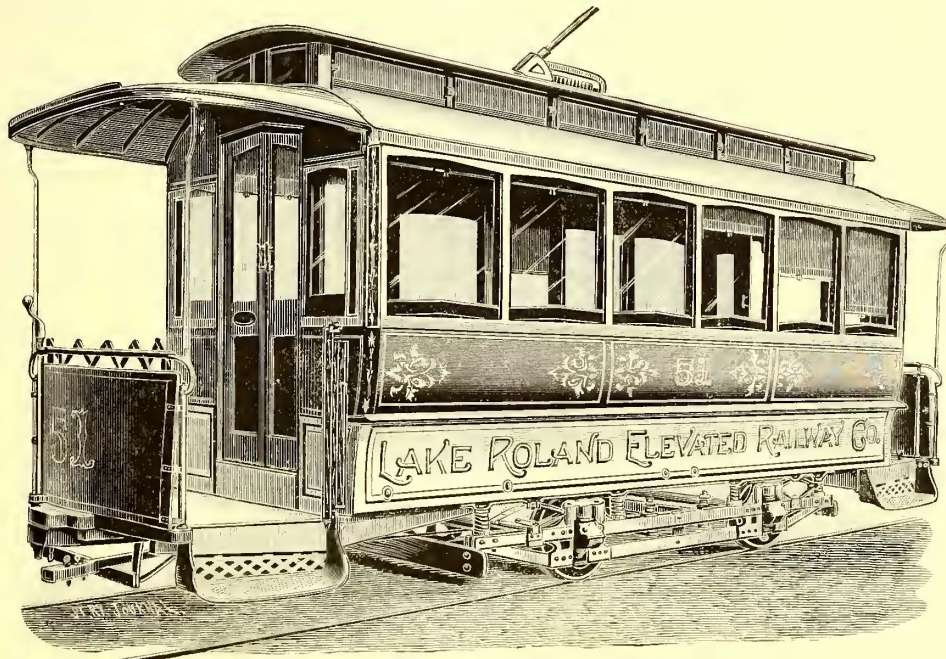


FIG. 4.—FIRST CAR OF THE J. W. FOWLER CAR CO.

the street railway fraternity. The development of a high standard of street car construction is due in large measure to Mr. Fowler, who has always insisted that the products of his works should be of the best, both in material and workmanship.

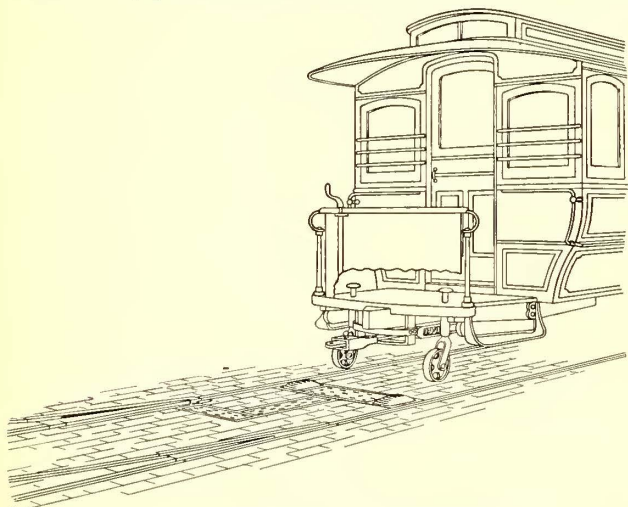
Mr. Fowler started in the manufacture of street railway appliances in 1877, when the first car register of the firm of Lewis & Fowler, which has since become so well and popularly known, was put upon the market. Mr.

Street. Finally, he became connected with Mr. Thompson in the South American trade, where he engaged his time as chief clerk and confidential man for six years. He was with Mr. Thompson for eight years, the last two of which he had a special interest in the business welfare of this house. About 1870, Mr. Cooper established himself at No. 259 Front Street, but has since removed his office and warerooms, to Nos. 36 and 38 Dover Street.

A Pressure Plate Switch.

The plate switch manufactured by the Pressure Plate Switch Company, of Brooklyn, N. Y., illustrated in our last issue has been giving good results in Syracuse and elsewhere where tried. We present herewith another view of the device showing the latest form in use by the manufacturers. This switch, as will be remembered, is operated by rollers mounted underneath the front platform of the car. These rollers are normally held about seven inches above the roadway, by springs placed inside the sleeves of the supports. The pressure plates, by which the switch is operated, are placed in the roadway some five feet or more in front of the switch, so the motorman can see the operation of the switch before the car passes over it. The plates themselves are slightly convex with a corrugated surface.

When it is desired to operate the switch, the motorman presses down one of the foot plates, which brings the roller into contact with the plate. These rollers and the rods holding them can be used with any style of fender. The People's Railway Company, of Syracuse, has recently put in one of these switches at the corner of



A PRESSURE PLATE SWITCH.

Court and Salina Streets, and the company's electrical engineer, H. S. Newton, reports that it has worked in a most satisfactory manner and is a great convenience to the motorman, the tongue moving freely on the application of a light pressure.

A New Fender.

The Euphrat life saving car fender is about to be placed on the market, a company having been organized recently, under the laws of Montana, bearing that name. This fender is the invention of Theophile Euphrat, of Darien, Conn. It is carried under the platforms of the car, out of the way of possible damage from collisions, etc., and consists of a scoop running close to the ground.

There are two styles of this fender; in one, the lower part is down all the time, clearing the ground by about three inches. When an object strikes the fender it springs down and almost touches the pavement, the weight being carried on small wheels or rollers. This gives the effect of a fender running very close to the pavement, without striking when the car rocks.

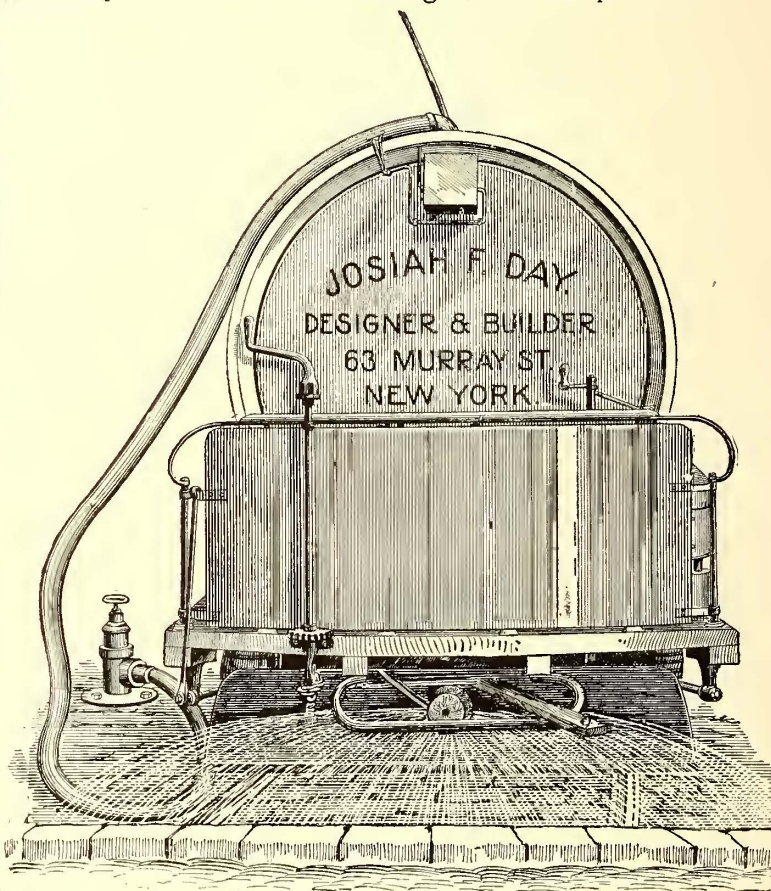
The other style is hinged at the back, and the lower half is carried in a raised position close under the plat-

form. This is let down for use either by a treadle within reach of the motorman or by the person or object striking a strip connected with the releasing mechanism and running around the lower edge of the dash. The main office of the company will be at 45 Broadway, New York City, and it has a representative traveling through the West, bringing this fender to the attention of street railway managers.

Electric and Cable Car Street Sprinkler.

We present herewith an engraving showing view of an electric car sprinkler manufactured by Josiah F. Day, of New York, in connection with the Miller-Knobloch Wagon Company, and claimed to be the only downward spray sprinkler made for electric and cable railways.

This sprinkler is adjusted to spread water from eight to twenty-five feet, and the output is under perfect control, spreading the same amount when running fifteen miles per hour as when running four miles per hour.



ELECTRIC AND CABLE CAR STREET SPRINKLER.

Water can be thrown to the center of a double track, and outside to the curb from eighteen to twenty feet. The tanks hold from 2,000 to 2,500 gals., and when spreading from eight to nine feet will be fifty to sixty minutes in emptying, laying the dust completely. For electric roads the sprinkler is of great value, keeping, as it does, the dust out of the machinery, the rails clean and wet, thus improving traction, and reducing the resistance of the return circuit.

The sprinkler shown is equipped with motors and trolley. A car sprinkler adapted to cable railways is also manufactured by Mr. Day.

Removal of the Offices of the Metropolitan Traction Company.

The main executive offices of the Broadway Cable Road have been removed from the uptown station at 51st Street and Seventh Avenue to the cable road building and station at Houston Street and Broadway.

Death of William Richardson.

We are pained to record the death, on December 31, of William Richardson, late president of the Atlantic Avenue Railway Company, of Brooklyn, N. Y. Mr. Richardson has not only been prominently identified with the street railway interests of New York and Brooklyn for the last thirty years, but he has taken a leading part in the meetings of the American Street Railway Association and of the New York State Street Railway Association, of which he was a regular attendant. His death occurred at his home, No. 125 South Oxford Street, Brooklyn. He had been ill for a week and suffered from pneumonia and heart trouble, following congestion of the brain and diabetes.

Mr. Richardson was born at Berkhamstead, Hertfordshire, England, on December 8, 1822, and, consequently,



THE LATE WM. RICHARDSON.

at the time of his death was seventy-one years of age. When twelve years old he came, with his father, to this country, and the family settled at Gambier, O. When the Republican party was formed he joined it and became a member of its first State Committee. In 1857 he was elected clerk of the Assembly, and he served in 1858, 1859 and 1860. In 1861 President Lincoln appointed him an additional paymaster in the army. After the war he came to New York, and was made superintendent of the Dry Dock, East Broadway & Battery Railroad Company. In three weeks he became a director and president. This position he held for two and a half years, during which time the income of the road increased from \$600 to over \$2,000 a day.

In 1867 he resigned, and leased the Brooklyn & Jamaica Railroad for forty years. In 1872 a mortgage upon the property of the company was foreclosed, and Mr. Richardson bought the property. He then organized the Atlantic Avenue Company and became its president. He gradually extended its lines and built up the property until it was sold for a large sum to the Brooklyn Traction Company last year.

During Mr. Richardson's presidency his road had its share of labor troubles, and at one time the road was tied up for six days. But he successfully managed the affairs

of the company and did not accede to the demands of the men.

Mr. Richardson was popularly known as the "Deacon," but as a matter of fact had never held that office in any church. He married in 1844, and had already made preparations to celebrate his golden wedding next September. He had seven children, of whom three sons and a daughter survive. Wm. J. Richardson, secretary of the American Street Railway Association, is a son.

\$50,000 For the Best Street Car Motor.

The Metropolitan Traction Company sent a letter to the Board of Railroad Commissioners last month offering a prize of \$50,000 for the invention of a system of street railroad propulsion superior to the cable and the trolley. In this letter the officers of the company say:

"On streets where the lines are straight and the business is heavy, the cable system is the most economical yet invented. For general use in a city, winding about through the streets following the routes of travel which the public wish to pursue, it is impracticable. You require straight routes for cable roads. We have, in addition to the lines upon which the cable will be laid, over eighty miles of street railroads now operated with horses all below the Central Park. It is to these lines in particular that we now desire to direct your attention.

"Up to the present time the only system whose practicability has been demonstrated is the overhead trolley. We are well aware, however, that its application in the streets of New York would not meet with the approval of the community. What we most desire now is to hasten the development and perfection of a better system. We therefore submit the following proposition:

"*First*.—We will set aside the sum of \$50,000 to be awarded as a prize to any person who shall, before March 1, 1894, submit to your honorable Board an actual working system of motive power for street railway cars demonstrated to be superior or equal to the overhead trolley.

"*Second*.—The qualities necessary to meet this requirement shall be left to your decision; but with the present state of the art, a system to win the award must necessarily approximate the trolley as a standard of economy in operation, but should be without the features objectionable to the public that are in it.

"*Third*.—We shall exact no rights in the invention in return for the \$50,000, and shall have nothing whatever to do with the making of the award further than to pay any expenses which your honorable Board may deem it necessary or wise to incur, either in the employment of experts, the giving of hearings, or the conduct of experiments—this in order that no effort may be spared to achieve the desired result."

The reply of the Railroad Commissioners is dated December 11. They say they cannot act as arbiters upon the merits of inventions. Competitive efforts should be addressed to railroad companies, and not to officials who try to hold railroads to a proper discharge of duty.

"Your effort is prompted," the letter concludes, "by considerations of such public importance, and your spirit in making it is at once so practical and munificent, that its failure or abandonment would be greatly regretted by all who are interested in solving the problem of rapid transit in New York City. If, therefore, the Board can co-operate with your company within practicable lines such as have been set forth in part, it will do so."

Quick Construction of a Sweeper.

The J. W. Fowler Car Company recently built a snow sweeper for the Meriden Horse Railroad Company, of Meriden, Conn., completing the order and shipping the sweeper within fifty-two and a half hours after receiving the order. This company since commencing work at its new factory, September 6, has built an average of more than one sweeper a week, besides carrying on a large amount of car construction. The sweepers have gone to the Baltimore Traction Company, Scranton Traction Company, Hartford & Wethersfield Railway Company and the Atlantic Avenue Railroad Company, as well as other purchasers.

Change in the New York Offices of the General Electric Company.

It is reported that at a meeting of the executive committee of the General Electric Company, held December 29, it was voted to remove the executive and engineering offices of the company from New York to Schenectady, N. Y. The change will be made, it is said, February 1.

THE electric railway at Remscheid, Germany, which we described in our December issue, was installed by the Union Electricitäts Gesellschaft, of Berlin, and not by the Allgemeine Electricitäts Gesellschaft of that city.

The Requirements of Safety Appliances For Street Railways.

BY R. A. CRAWFORD.

The frequency of accidents from rapid transit street railways, and an earnest desire for their abatement by the mutual interests of the public and railway companies, has created a demand for safety contrivances that American ingenuity has responded to; in fact, railway

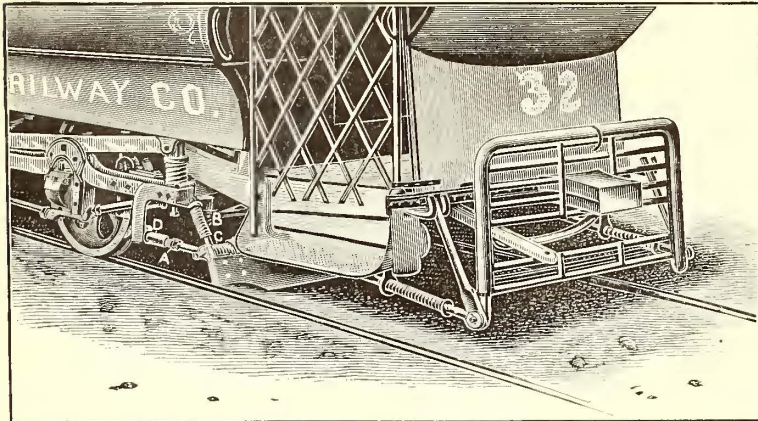


FIG. 1.—CAR WITH FENDER RAISED

officials have been overwhelmed by numerous divergent schemes which have been of educational advantage, if not always of practical utility.

Inventors and railway men coincide in working upon two standard ideas for a safety device, viz.: First, a wheel guard fender board placed in front of the wheels underneath the car; second, a projecting platform fender in front of the car.

Regarding the first standard idea, the present type of rigid fender boards now in use is crude and inflexible, affording no protection whatever, owing to the imperative height carried to avoid irregularities of the roadbed. Even at the present unsafe height of four and a half, five and six inches, they are continually being destroyed or having their ends broken by unevenness of road, sunken rails, plunging of truck and immovable obstructions.

Railway men demand a safety appliance possessing all of the following qualifications: Lightness, neatness, simplicity, safety, durability, and to be at the same time inexpensive, automatic, yielding, needing no attention, capable of being carried exceedingly close to and conforming with the roadbed, capable of passing over immovable obstructions and unevenness of road, quickly removable and adaptable to any car. A wheel guard fender board to meet the foregoing specifications

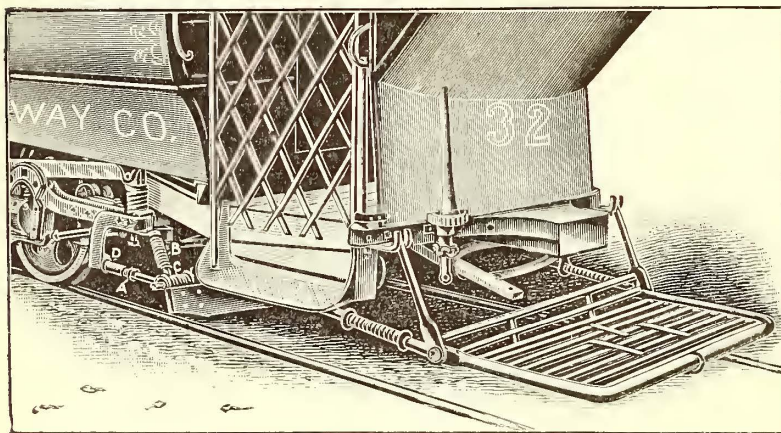


FIG. 2.—CAR WITH FENDER LOWERED.

must be held in place by three types of springs, each having different degrees of strength. There should also be three movements to the fender board, downward, a turning under and upward. In this way, when in contact with a movable object, the minimum power spring yields to its limiting check and allows the fender board to go downward, causing it to rub the ground. Then the next powerful spring resists, and the object is pushed ahead or aside by the car in motion.

When an immovable object strikes the fender board, the minimum power (C) yields to the limiting check, and the fender board is on the ground. Then as the obstacle does not move, the next two springs (A and B) yield and the fender board turns under, then upward and passes over the obstruction. Then the three springs return the fender board to its normal position. This method permits of a very simple form of con-

struction, adaptable to any car and carrying a fender board exceedingly close to the roadbed.

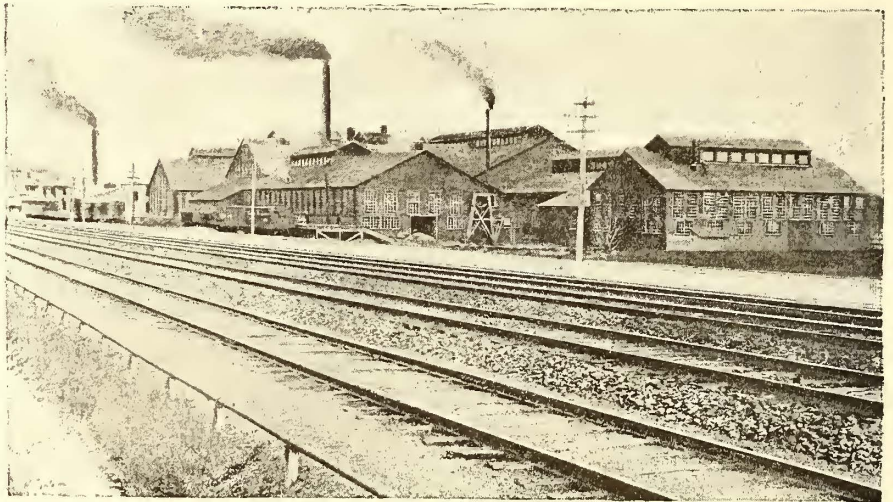
Statistics show that people are seldom seriously injured by the blow of the car, but are crushed and killed by getting under the wheels, motors or high rigid fenders, and as accidents often occur by persons falling from the rear platform and getting under the wheels of the rail car, the value of a wheel guard fender such as described is very evident.

Regarding the second idea of a projecting platform fender, many railway managers assert that a majority of inventors have been working more to secure public approval, than from a practicable conception of what is needed.

The materials of such a fender should be as nearly indestructible as possible to avoid expensive repairs. For this reason pneumatic tubes, many forms of rubber, ropes, canvass and such substances, being destructible by weather, exposure and friction with the roadbed, etc., are objectionable. We should have, therefore, a projecting platform fender constructed entirely of iron or steel. This should be automatic and have a backward, down yielding movement to the roadbed, which action in contact with a person would lessen the impact and cause the one struck to fall into the fender, instead of throwing him forward, as with a rigid device.

A projecting platform fender should be constructed so as to fold up over the drawbar and bumper, and not interfere with the radiating action of the drawbar when coupled to another car, and in going around curves the fender should be entirely automatic and independent of the motorman, who has sufficient duties to perform without the additional one of caring for a fender; besides, accidents are not anticipated soon enough for any motorman to operate a fender and stop the car simultaneously.

As either of these described safety appliances is adaptable



THE WORKS OF THE C. & C. ELECTRIC CO.

to any car on any street railway, the manager's preference and practical knowledge of the cause of accidents must govern his decision in adopting either one or both devices for a car.

The Works of the C. & C. Electric Company.

The C. & C. Electric Company, whose small electric motors for miscellaneous stationary work are well known, has recently been reorganized, and has secured large works, at Garwood, N. J. The company's object in taking these works is to extend its business to include a line of direct connected and multipolar generators, and, probably, also, of street railway apparatus. A general idea of the extent of the works will be obtained from the cut herewith.

The office seen at the extreme left of the buildings, and which is only 150 ft. from the railroad station, is an attractive, light building, two stories high and separated from the buildings comprising the works. Upon the ground floor are the offices of the chief engineer and assistants, cost and accounting departments and purchasing agent, while upon the second is a large and light draughting room with necessary blue print and photographic rooms.

The buildings comprising the works are generally upon the plan of a letter "E," in which the main stem comprises a building, 500 ft. X 80 ft., in which are located the main machine shop, the light machine shop, the winding shop and the erecting and assembling shop. A ten ton electric traveling crane of an approved make operates in this building, in which the various tools and processes are so arranged that from the time the raw materials are delivered under the crane, until the finished dynamo or motor is delivered into the testing room, the work never takes a backward movement.

The three buildings which form the lines at right angles to the main building, are used for the following purposes: One building, 72 X 110 ft., for stock room of raw material, one building, 72 X 110 ft.,

for light winding and testing room, and one building, 50 × 96 ft., for storage and shipping.

In addition to these buildings there is a boiler room containing three boilers with a capacity of 300 H. P. complete, with steam pumps, etc., an engine room with an engine of 150 H. P., with feedwater heater, etc., to be shortly supplemented by a second engine direct connected to multipolar dynamos of 150 H. P. capacity; a pattern shop, 30 × 48 ft., blacksmith shop, 30 × 48 ft., a polishing shop, 25 × 50 ft., and a lavatory of ample size to accommodate 500 hands. Side tracks are so arranged that cars containing raw materials can be set in, and those containing shipments taken out independently, while an industrial railroad runs into all departments to enable the expeditious handling of light materials, without interfering with the use of the crane for the transfer of heavy materials. The arrangement of the buildings permits of the location of the superintendent's office in a position to command the workmen in all departments. Capacious drying ovens are provided for properly drying such articles as require this process to insure high insulation.

All of the shafting and machinery is driven by motors which are supplied with current from dynamos in the engine room. Much care has been exercised in the grouping of tools and machinery, in order to show the great advantages to be gained from electrical power transmission, with a maximum efficiency with minimum investment. To this end, such large tools as are in constant use, are supplied with individual motors of sufficient capacity to operate them, while the smaller tools which require a varying amount of power, are grouped together upon short lengths of line shafting with a motor sufficiently large to meet all requirements made upon it, but without the heavy investment in motors necessary if individual motors were provided for each tool, with a sufficient capacity to operate each one at full load. A casual inspection of this feature of these works, shows that the company has taken advantage of the experience gained in the past, in the numerous applications of its motors to driving all classes of machinery.

These works have a floor surface of about 62,000 sq. ft., and throughout show a careful consideration of the advantages to be gained by concentration of departments, and at the same time an arrangement permitting of growth of these departments without interfering with the most economical conduct of the work. The company is to be congratulated upon its new works, and a prosperity that warrants its moving into them.

Prize Tickets.

The Oakland Consolidated Street Railway Company, of Oakland, Cal., issued some time ago a circular containing the offer given below. The secretary of the road writes us that the plan was very popular, and that the traffic soon increased 15 per cent. and at the time of writing was still constantly increasing:

"To encourage school children, young ladies and enterprising young men, the Oakland Consolidated Street Railway Company will, on and after November 1, 1893, issue prize tickets to patrons of its roads. Each passenger when he or she pays a fare will receive from the conductor a prize ticket duly canceled with the bell punch, in his or her presence. The passenger should, in all cases, accept this ticket, and if he or she does not wish to use it, should give it to some friend who intends to compete for a prize. The prizes will be awarded every two months. The first award will be made January 2, 1894. There will be ten prizes in all, as follows:

"First prize \$60, second prize \$40, third prize \$30, fourth prize \$20, fifth prize, \$15, sixth prize \$10, seventh prize \$9, eighth prize \$7, ninth prize, \$5, tenth prize, \$4, in all \$200 in coin.

"The first prize will be given to the person collecting the largest number of canceled tickets; the second prize to the person collecting the next largest number, and so on through the list. The awards will be made by a committee consisting of representatives from the *Times*, *Tribune* and *Enquirer*.

"Organize districts, see all your friends, ask them to ride on the Oakland Consolidated Street Railway Company's cars and to save the prize tickets which they receive. Persons feeling that they cannot accomplish this work alone, may associate two or more of their friends with them and form a club, and increase their chances for winning a prize. The conductors on the cars will not be allowed to compete; neither will they be permitted to solicit them for their friends, so that everybody will have a clear field.

"Instructions to competitors.—As fast as the tickets are collected, put them up in packages of 100, and lay them away. On or before ten o'clock P. M., January 1, 1894, make one package of all the tickets, and place in this package a card with name, address and the number of tickets. Take or send the package to the secretary of the Oakland Consolidated Street Railway Company, at 47th and Grove Streets, Oakland. Be careful to correctly count the tickets as an error might result in the loss of a prize."

A. K. GRIM, Secretary.

A Neat Paper Weight.

The Electric Railway Equipment Company, of Cincinnati, O., has sent us with its "compliments of the season," one of the products of its foundry in the shape of a souvenir paper weight, which is extremely tasteful in design and which has already proved itself very useful.

**Report of Citizens' Traction Company,
Pittsburgh, Pa.,**

FOR YEAR ENDING OCTOBER 31ST, 1893.

PASSENGERS, TRIPS AND MILES.

Total number of passengers in cable cars.....	12,999,478
" " " electric cars.....	1,848,373
Total.....	14,847,851
Total trips run by cable cars.....	241,605
" " " electric cars.....	75,366
Total.....	316,971
Total miles run by cable cars.....	2,037,262
" " " electric cars.....	459,223
Total.....	2,496,485

EARNINGS AND EXPENSES.

Total receipts from cable cars.....	\$627,558.27
" " " electric cars.....	80,437.07
Total earnings from cars.....	\$707,995.34
Total operating expenses of cable cars.....	\$332,644.48
" " " electric cars.....	57,189.33
Total expense of operating.....	\$389,833.81

Note:—In operating expenses, all expense is included except interest, taxes, damages and dividends.

PER CENT OF RECEIPTS FOR OPERATING..

Cable cars.....	53. per cent.
Electric cars.....	71.1 " "

Average..... 55.1 per cent.

DAILY EXPENSE OF OPERATING CABLE POWER HOUSE, 725 H. P.

Oil, Grease and Waste.....	\$2.31
Fuel.....	28.74
Water.....	3.60
Labor.....	27.16
Total.....	\$61.81

Cost per H. P., 20 hours..... 8.5 cents.

Cost per H. P., 1 hour..... .42 cent.

DAILY EXPENSE OF OPERATING ELECTRIC POWER HOUSE 22 HOURS PER DAY, AND 216 H. P.

Oil, Grease and Waste.....	\$.56
Fuel.....	9.47
Water.....	.98
Labor.....	8.96
Total.....	\$19.97

Cost per H. P., per day..... 9.20 cents.

Cost per H. P., per day..... .41 cent.

DETAIL OF COST OF MOTIVE POWER PER CAR MILE.

Coal.....	.8.45 lbs. Cable.	Cost.	.51 cent.
Oil, Waste and Water...	" "	" "	.10 cent.
Labor.....	" "	" "	.49 cent.

Total cost..... 1.10 cents.

Coal.....	11.36 lbs. Electric,	Cost.	.80 cent.
Oil, Waste and Water..	" "	" "	.10 cent.
Labor.....	" "	" "	.70 cent.

Total cost..... 1.60 cents.

CABLE ROAD.

Miles run 2,037,262	
Receipts per mile.....	30.80 cents.
Expenses per mile.....	16.33 cents.

Profit per mile..... 14.47 cents.

Profit for the year..... \$294,913.79

ELECTRIC ROAD.

Miles run 459,223.	
Receipts per mile.....	17.51 cents.
Expense per mile.....	12.45 cents.

Profit per mile..... 5.06 cents.

Profit for the year..... \$23,247.74

TAXES PAID.

State.....	\$32,471.31
County.....	53.10
City.....	7,192.88

Total..... \$39,717.29

Increase over last year..... \$14,497.82

Paid on account of accidents and damage..... \$ 3,644.45

Repairs to cable cars, .75 cent per mile run.

Repairs to electric cars .35 cent per mile run.

Legal.

STREET RAILWAY SERVICE—INJURY TO PASSENGER—CONTRIBUTORY NEGLIGENCE—QUESTION FOR JURY—NOTE.

1. Where a passenger was injured by being thrown from defendant's car by a sudden jerk of the car, while preparing to get off (while car is in motion), after having given conductor a signal to stop, the question of plaintiff's contributory negligence is for the jury to determine.

2. In the absence of evidence to show, or tending to show, the cause of the injury to the passenger, and no affirmative testimony that the company neglected any duty to the plaintiff, *held*, that the submission of the question of defendant's negligence to the jury was erroneous. Judgment for plaintiff reversed.

Bradley v. Ft. Wayne, etc., St. Ry., Mich. S. C., December 22, 1892.

Note: Preparation to alight while car is in motion has been a fruitful cause of injury and subsequent litigation. It is the duty of the company's servants in charge of a car to stop it at street crossings or other regular stopping places, when so requested, to permit passengers to leave the car, and those who wish to alight have the right to rely upon the performance of that duty. And while a passenger has a right to remain in his seat until the car comes to a full stop, it is generally a mutual saving of time to both carrier and passenger for the passenger to leave his or her seat and make preparation to alight while the car is still in motion. Hence custom, supported by numerous decisions, uphold the rule that, when a passenger has signaled the conductor to stop the car, it is not negligence *per se* to proceed to the rear platform (or side of an open car) while the car is slowing up, and wait there until he can safely alight. But in doing so he assumes the risk of all the ordinary movements of such a car properly managed, but if, while proceeding to the rear platform or footboard, or while waiting there to alight, he is thrown to the ground and injured, by a sudden jerk of the car caused by the negligence of the company's servants, the fact that he left his seat while the car was in motion, and prepared to alight will not defeat a recovery. See, *Medler v. St. Ry. Co.*, 12 N. Y. Supp. 930; *Ganley v. St. Ry. Co.*, 7 N. Y. Supp. 854; *Bowie v. St. Ry. Co.*, 10 So. Rep. 574; *Nichols v. St. Ry. Co.*, 38 N. Y. 131; *St. Ry. Co. v. Findley*, 76 Ga. 311; *Harmon v. St. Ry. Co.*, 17 Wash. Law. Rep. 426; *St. Ry. Co. v. Calderwood*, 89 Ala. 247; *Ridenour v. St. Ry. Co.*, 102 Mo. 270 and 14 So. W. Rep. 760.

It has been regarded as a reasonable safeguard against accidents to forbid departure from a car while it is in motion, but a passenger does not violate this regulation or necessarily preclude a recovery against the company for the latter's negligence, by walking while the car is in motion, toward the rear end (or side) for the purpose of descending to the lower platform of a double decked car. See *St. Ry. Co. v. Leonhart*, 66 Md. 70; or 5 Alt. Rep. 346. See also, *Booth's Law of Street Railways*, 470.

STREET RAILWAY COMPANIES—LIABILITY FOR INJURY TO PEDESTRIANS—SWUNG AROUND A CORNER.

This action was brought to recover damages from the defendant company for personal injuries. The testimony showed that plaintiff was standing near the side of the track, waiting for a car to go by. She testified that she saw the car; that she was looking north at some teams, while the car was coming from the south; that she saw the front of the car go by her, and thought she was far enough from the track to be safe, but was struck by the rear end of the car as it was swung around the corner at a turn.

Held, that in the absence of any claim or proof of defect in the car or its equipment or in the track, or of testimony of anything unusual or improper in the management of the car, that there was no evidence of negligence on the part of defendant, no recovery could be had.

Widmer v. West End Street Railway Co., Mass. S. J. C., January 6, 1893.

Rapid Transit Plans in New York.

The Rapid Transit Commissioners have at last decided upon a plan upon which to invite bids. The new plan provides for a West Side line, beginning at the Battery and running up West Street, West 11th Street, Seventh Avenue, Broadway, the Boulevard, Eleventh Avenue and Kingsbridge Road to the city line. The East Side line has two branches, one starting from the Battery and running up South, James, Centre and Marion Streets, Lafayette Place and Fourth Avenue, and the other starting from the City Hall and running up Centre, Canal and Wooster Streets and University Place to 14th Street. A connecting line is also provided through 14th Street from Fourth to Seventh Avenues.

These lines must all be operated by electricity or some power not requiring combustion on the road, and must be independent of the Manhattan Elevated Railway.

Interesting Legal Decision in Cleveland, O.

An interesting case was recently decided against the Brooklyn Street Railroad Company and the New York, Chicago & St. Louis Railroad Company, joint defendants, in favor of the estate of Isabella Mooney, deceased, in the Ohio Court of Common Pleas. It was charged that the plaintiff came to her death through a complication of diseases induced by nervous shock caused by a collision between a train of the former and a locomotive of the latter company, on September 6 last.

The damages claimed were \$10,000, the maximum amount claimable, but the Ohio State law provides that in case of death from such a cause, the corporation or person causing the same is liable for the actual pecuniary loss sustained by the survivors of the deceased up to a maximum amount of \$10,000. In this case the deceased left three sons, all of age, and the question of the pecuniary loss to these sons, aside from all feeling of sentiment, was charged minutely to the jury. The verdict was for only \$400 each against the companies. The case has been taken to the Circuit Court on errors.

Automatic Cable Signaling Device.

A method of automatically signaling the power station in a cable system, in case the grip of the car cannot be unfastened from the cable, has recently been patented by J. Sachs, of New York. The system consists of a number of small and simple electric signal boxes located in the cable conduit at every wheel pit. The hook or arm that actuates the signal projects into the conduit. On the grip of the car and below the slot is an arm or projection which, although normally in such position as to be safe from and not strike the arm of the signal box, its position can be immediately changed by pulling a suitable lever, at either end of the car. In this way a moving car will strike the signal arm and move it, thereby actuating the signal box and transmitting the signal to the station. If the gripman notices that his car is unmanageable, he simply pulls this hook or lever on the platform of the car, and thereby operates the next signal box in the conduit. By always setting the lever on stopping the car, the signal will be transmitted automatically if the grip should become caught in a strand of the cable.

Rapid Transit Wins in Cincinnati.

The Cincinnati Street Railway Company, after a long fight, was recently granted, by the Board of Administration, the franchises desired for its proposed extensions, and the right to equip its lines electrically.

The franchises granted provide that all old tracks where electric motor cars are to be used be replaced by girder rails of satisfactory weight and pattern, and all pavements disturbed in construction be replaced to the satisfaction of the Board of Administration. The company is also obliged to use iron poles throughout, and no wires to be less than twenty feet above the street, except where required by overhead bridges, etc. The Board of Administration reserves the right to require, when it may be deemed expedient, all feeder wires and mains, except the necessary connecting and supply wires, to be placed in suitable underground conduits. This is to be done as soon as a successful underground system is in operation in any city of the United States.

The company is also required to maintain in good order all streets and pavements disturbed in construction for a period of two years, and also to make good all damage to pavements caused by the yielding of its tracks. Open cars must be run in summer and closed cars heated in winter. Cars shall leave the starting points of all lines up to 12:30 A. M. A full system of transfers on a five cent fare is also provided for.

As to license fees, the company must pay to the city a license fee of \$4 per foot length of body, inside measurement, on each car per year, account to be kept and submitted of all extra cars in emergency service, and also the sum of 5 per cent. on the entire gross earnings of all lines owned and operated. All the extensions authorized must be commenced within three months and completed and in operation within one year from the date of the granting of the franchises.

The franchises granted expire with the existing franchises of the lines to be extended, and as the shortest of these has eighteen years to run, the new franchises are practically for eighteen years from date,

A RETROSPECT OF THE PAST YEAR'S BUSINESS: THE PROSPECTS FOR 1894.

The past year has been one of great activity in street railway construction. During the first six months all the manufacturers of street railway supplies had their facilities taxed to the uttermost to supply the large demand made upon them, and though the last six months have been a period of general depression throughout the business world, the demand for equipment does not seem to have slackened to a very large extent. To lay before our readers what was thought of the past year's business, and what is expected in 1894 by the dealers in street railway appliances, we addressed a circular letter to the prominent manufacturers, asking for an opinion on this subject for publication. The following are some of the replies received:

AMERICAN CAR COMPANY.

ST. LOUIS, MO., December 14, 1893.

GENTLEMEN:—We have no reason to complain of the past year, having built in the neighborhood of 1,000 cars, and increased our capacity so as to largely exceed that output during the year 1894. We have no reason to believe these expectations will not be fulfilled.

Respectfully,
AMERICAN CAR COMPANY.
E. ALEXANDER, Secretary.

SAMSON CORDAGE WORKS.

BOSTON, MASS., December 14, 1893.

GENTLEMEN:—We are increasing our sales of trolley cord considerably, sending our special Samson Spot cord for this purpose largely. We look for an increased business in this line next year.

Yours very truly,
HERBERT G. PRATT.

THE LUNKENHEIMER COMPANY.

CINCINNATI, O., December 16, 1893.

GENTLEMEN:—The volume of our business for this year compares very well with last year, taking all things into consideration, and has only fallen behind about 15 per cent. in sales for the entire year. Collections have been very good with us for the last sixty days, and trade has opened up somewhat, and we expect very large sales for 1894. We hope we shall not be disappointed.

Yours truly,
THE LUNKENHEIMER COMPANY.

PRATT & WHITNEY COMPANY.

HARTFORD, CONN., December 14, 1893.

GENTLEMEN:—The volume of our business for 1893 up to July 1 was 15 per cent. greater than for the same period in 1892, but since that date it has fallen off so much that the business for the year is 20 per cent. less than for 1892. We have known times when business was very much lighter than now, and do not look for an important increase in business before 1895, unless we shall be fortunate enough to obtain some contracts of a special character, which we hope to do.

The milling, drilling, brass finishing, automatic screw making and automatic weighing machines exhibited at the Columbian Exposition attracted universal attention, and the exhibition has already resulted in some business.

Very truly yours,
PRATT & WHITNEY COMPANY.
R. F. BLODGETT, Secretary.

THE WADDELL-ENTZ COMPANY.

NEW YORK, December 13, 1893.

GENTLEMEN:—Our batteries during the last year have been giving good satisfaction where used, and have proved their desirability for street railway service. The most extensive plant of this kind which we have installed is that on the Second Avenue line in New York City, familiar to your readers through the able description published in the December number of the STREET RAILWAY JOURNAL. You will be interested to learn that this battery has been adopted for traction purposes by the Accumulatoren Fabrik Aktiengesellschaft for introduction in Switzerland, Austria and Germany.

The showing made on Second Avenue has attracted careful attention of the street railway men from all parts of the world, and the outlook for the season of 1894 is very promising.

Yours very truly,
THE WADDELL-ENTZ COMPANY,
J. A. MACHADO, Secretary.

THE DORNER & DUTTON MANUFACTURING COMPANY.

CLEVELAND, O., December 19, 1893.

GENTLEMEN:—In reference to comparison of business done this year with last year, we find that in most of our branches, we have done a greater business than we did in 1892. We have considerably increased our plant this year, and anticipate a much larger trade next year, especially in the truck line.

Very truly yours,
THE DORNER & DUTTON MANUFACTURING COMPANY,
W. A. DUTTON.

WM. B. MERRILL & COMPANY,

SOLE MANUFACTURERS OF

THE TRIPP METALLIC PACKING COMPANY.

BOSTON, MASS., December 15, 1893.

GENTLEMEN:—Our business for 1893 has shown an increase over any previous year, far ahead of anything we had anticipated. A generous share of our orders is for packings required for engines designed for street railway service.

Yours very truly,
WM. B. MERRILL & COMPANY.

H. J. WIGHTMAN & COMPANY.

SCRANTON, PA., December 20, 1893.

GENTLEMEN:—As for the outlook the coming year, while perhaps not as promising as the opening of the present year, we think there is every reason for looking for a continuation of the improvement in the business outlook, which has certainly commenced.

Yours very truly,
H. J. WIGHTMAN & COMPANY,
H. J. WIGHTMAN.

J. M. JONES' SONS.

TROY, N. Y. December 30, 1893.

GENTLEMEN:—We are well satisfied with the amount of business done in the past year, and look forward to 1894 as being a good year.

Yours truly,
J. M. JONES' SONS.

IMPERIAL PINE PRODUCT COMPANY.

NEW YORK, December 20, 1893.

GENTLEMEN:—Our "Imperial Cable Coating" is growing in favor, and is being widely adopted. It seems to really fill a long felt want for a perfect and satisfactory coating for cables for railroads and for collieries.

Yours very truly,
C. W. KIRBY, JR., Treasurer.

BROWN & SHARPE MANUFACTURING COMPANY.

PROVIDENCE, R. I., December 15, 1893.

GENTLEMEN:—We find that for the first six months of this year our business, in comparison with that of 1892, was considerably larger, as shown by the amount of sales. During August the demand for machine tools almost ceased, but during October and November the sales were greater than anticipated, so that the total for the first eleven months of the year was but slightly below that for the same part of 1892. We anticipate a gradual revival of business, and, on the whole, satisfactory results before the end of 1894.

Yours truly,
BROWN & SHARPE MANUFACTURING COMPANY.

PHILADELPHIA ENGINEERING WORKS, LTD.

PHILADELPHIA, PA., December 21, 1893.

DEAR SIR:—We have just completed a 22 X 48 in. Corliss engine at the works of the Delaware County Construction Company, this engine being used for driving electric railway generators. Also a 1,000 H. P. cross compound, condensing engine for the Hudson Electric Light Company, Hoboken, N. J., this engine being used for railway work. During the first months of this year, we were fortunate enough to secure sufficient orders to keep us busy night and day until June. Since then orders have been falling off very markedly, this being due to the general depression in business throughout the country.

At the present time we have quite a number of inquiries, and from appearances we have every reason to believe that our business next year will increase in volume at low prices.

During the last few months we have made quite a number of improvements in our shop tools and fixtures, by means of which we hope to more efficiently and economically produce our machinery.

Yours truly,
PHILADELPHIA ENGINEERING WORKS, LTD.,
VICTOR O. STROTEL, Secretary and Treasurer.

HILLES & JONES COMPANY.

WILMINGTON, DEL., December 14, 1893.

GENTLEMEN:—As you are aware, business in our special line of building machine tools is extremely quiet, and it is not worth while to explain what we think is the cause, further than to say that it is fear of tariff reductions which the present Congress seems determined to enforce.

Yours truly,

HILLES & JONES COMPANY.

L. P. & D. TRANSMITTER COMPANY.

MONTPELIER, VT., December 13, 1893.

GENTLEMEN:—Notwithstanding the very bad year for business, the demand for our transmitters has exceeded 1892 thus far by 25 per cent. The great trouble has been in getting paid for machinery sold. As for the other branches of our business, they have been practically dead this year.

Yours truly,

L. P. & D. TRANSMITTER COMPANY.

HINE & ROBERTSON.

NEW YORK, December 14, 1893.

GENTLEMEN:—Had the depression in business not occurred, we have every reason to believe our business this year would have far exceeded that of last year. We do very little with street railways, because contracts for the plants are let to certain contractors. We cultivate their acquaintance, and in that way get what business we have in that particular line.

Wishing you continued success, we remain,

Yours very truly,

HINE & ROBERTSON.

HARRINGTON, ROBINSON & COMPANY.

BOSTON, MASS., December 16, 1893.

GENTLEMEN:—Our business of the first half of 1893 was very satisfactory. It is perhaps needless to add however, that the last half has been decidedly the reverse. We think, however, taking the year as a whole, the amount of business done will not be far behind that of the year 1892.

It seems to us that the present outlook for business in 1894, is very good, but we would be chary of positively assuring ourselves of this result.

Very truly,

HARRINGTON, ROBINSON & COMPANY.

MILLERS FALLS COMPANY.

NEW YORK, December 14, 1893.

GENTLEMEN:—Our business for the eleven months of 1893 fell short 2 per cent. from last year, but was larger than in any former year. The home trade fell off very much, but export demand increased in about the same ratio. We are always bringing out new tools, and have added such new machinery as was needed for the new goods.

For some reason the track drills, which we advertised in your paper are having a good run, regardless of the hard times. In regard to the future we have not very high hopes. We would sooner risk the old time policy of government.

Truly yours,

MILLERS FALLS COMPANY,

H. L. PRATT, President.

CROCKER-WHEELER COMPANY.

NEW YORK, December 11, 1893.

GENTLEMEN:—We have not as yet extended the manufacture of our special types of apparatus into the direct street railway line, our apparatus being supplied with power, in many instances, however, throughout the country, from street railway circuits. We are however, at this time just commencing the manufacture of the larger dynamos, using the Bradley type of bar wound armature construction, the patents on which type are solely owned by this company. The peculiar non-burn-out type of these armatures, we are very sure, will readily commend them to railway managers, and we shall therefore hope a year hence to be able to report to you a considerable output of this type of machine.

Yours very truly,

CROCKER-WHEELER ELECTRIC COMPANY.

H. L. LUFKIN, Manager.

THE BALL & WOOD COMPANY.

NEW YORK, December 15, 1893.

DEAR SIR:—The business conditions which have existed for the past six months have so affected every branch of industry that few establishments, if any, we think, will be able to report any increase over 1892. While we are no exception to this rule, yet orders have been received which have kept our factory busy, and rendered unnecessary either the shutting down of the works, the discharge of our men, or the reduction of wages.

As regards the outlook for 1894, with the Silver and Tariff questions settled, we see no reason why, with the opening of spring, conditions should not be favorable to active business in all directions. As long, however, as either of these questions remains in abeyance and the subject of Congressional action we believe, by just so long, we can expect lack of confidence and a continuance of existing depression.

Yours truly,

THE BALL & WOOD COMPANY,

THOS. C. WOOD, President.

WILLIAM WHARTON JR. & COMPANY, INCORPORATED.

PHILADELPHIA, PA., December 13, 1893.

GENTLEMEN:—During 1893, we have been extremely busy in all our departments, many of them running double turn the entire year, the demand for our "Integral" special work being constantly increasing and taxing our efforts to keep up with it. The closing year will show an output nearly 100 per cent. greater than any prior year, and the only disagreeable factor is that prices have been cut to such low figures that the profits of the business are not such as are warranted by its intricacies and destruction of brain tissue. In regard to the prospect for business during 1894, we do not care to express an opinion.

Yours truly,

WM. WHARTON JR. & COMPANY, INCORPORATED.

JAMES A. TRIMBLE.

NEW YORK, December 15, 1893.

GENTLEMEN:—My business during the year 1893 has been a gain on the previous one, notwithstanding the fact that it was somewhat retarded by building an addition to my factory of two extra stories, which now gives a capacity of twenty-five to thirty cars per month. I am now finishing some cars for Steinway Railway Company, of Long Island, also a lot of work for Brooklyn, Jersey City and others, and am in good shape for next year's trade. I do not pretend to compete against cheap builders, as I only do a high grade of work, as proved by the continuance of my customers during the past fifteen years.

Respectfully yours,

JAMES A. TRIMBLE.

ROBINSON ELECTRIC TRUCK & SUPPLY COMPANY.

BOSTON, MASS., December 19, 1893.

DEAR SIR:—Our business during the last year has been considerably larger than ever before, and the prospects for 1894 are excellent.

One significant fact shows the estimation in which the Robinson radial truck is held by users, and that is, that we have repeatedly received second, third, fourth, and even fifth and sixth, orders from the same companies for these trucks, together with endorsements of the highest character as to efficiency, economy in power and maintenance and satisfaction given.

Yours very truly,

ROBINSON ELECTRIC TRUCK & SUPPLY COMPANY,
WM. ROBINSON, General Manager.

ELI B. HALLOWELL & COMPANY.

PHILADELPHIA, PA., December 15, 1893.

GENTLEMEN:—Our business for this year, as compared with last, has been more satisfactory, inasmuch that, while the volume has not been as large, the net results are about equal. We don't look for any boom next year, but still think that a fair amount of trade will be done. The most promising outlook to us is in the electric railroad line. We hear of new roads almost every day. As a matter of course a great many will not be built, but there will be enough done to keep a good many busy. We have made arrangements to handle a good many octagon poles and also sawn ties, and will be pleased to name prices at any time. Wishing you a prosperous new year, we are,

Yours very truly,

ELI B. HALLOWELL & COMPANY.

THE ELECTRIC RAILWAY EQUIPMENT COMPANY.

CINCINNATI, O., December 19, 1893.

GENTLEMEN:—During the last year we have enjoyed a fair run of business, considering the dullness and stringency of the times. Our sales for November and December show that quite a revival has taken place in the electric equipment of roads. We have this year brought out quite a number of novelties for use in overhead construction, and have enjoyed an exceptionally large sale of our patent joint, wrought iron and steel, tubular poles, having received orders for nearly 6,000 within the last four weeks.

The outlook for the coming season looks as if there would be a considerable amount of business, if nothing happens to upset the financial condition of the country, and we look for large business next year if things continue to improve as they seem to have done the last month or two.

Yours respectfully,

THE ELECTRIC RAILWAY EQUIPMENT COMPANY.

GRAHAM EQUIPMENT COMPANY.

BOSTON, MASS., December 15, 1893.

GENTLEMEN:—We have met with unexpected success in our business during the year drawing to a close. We have trucks running today and giving satisfaction in Milwaukee, Pittsburgh, Philadelphia, Providence, South Braintree, Bath, New Haven and Hazleton, Pa., and we have orders ahead for spring delivery. We have opened an office and established a plant in the city of Philadelphia so that we can give our customers prompt delivery in Southern and Southeastern States. At the same time we are in a central point, and quite able to compete with any truck makers in that section. We are arranging for an entire new plant in Boston. The plans are all ready, and special machinery is being designed. Taking everything into consideration, we anticipate a heavy business in 1894, and we are getting ready for it. If the volume of business is equal to our expectation, we feel confident of our ability to satisfy all our customers.

Respectfully,

GRAHAM EQUIPMENT COMPANY.

HEINE SAFETY BOILER COMPANY.

St. Louis, Mo., December 11, 1893.

GENTLEMEN:—We are glad to be able to state that business is rapidly reviving with us, and we have very little complaint to offer in that respect. We are encouraged to believe that the business of 1894 will go far to make up for the shortage which everyone has experienced in the 1893 business.

HEINE SAFETY BOILER COMPANY,
S. D. MERTON, Secretary.

THE DELAWARE HARD FIBRE COMPANY.

WILMINGTON, DEL., December 13, 1893.

GENTLEMEN:—The only item of interest which we can report just now is that we have opened a store at 15 Long Lane, London, E. C., where we have shipped a large stock of our product, and from which all of our European business will hereafter be conducted.

DELAWARE HARD FIBRE COMPANY,
C. G. RUPERT, Manager.

WADHAMS OIL & GREASE COMPANY.

MILWAUKEE, December 16, 1893.

GENTLEMEN:—The first four months of this year were marked with the most satisfactory business ever done by this company in the same period of time. The general depression during the summer and fall was very noticeable in our line of trade, and on the whole our business will probably fall short of that of last year by about 15 per cent. In some special lines, such as Wadhams graphite curve grease and Badger motor lubricants, our sales ran far in advance of 1892.

We look forward to a good, healthy state of affairs for the new year. Collections are decidedly improved, and a much easier feeling seems to prevail. Wishing you the compliments of the season, we remain,

Yours truly,
WADHAMS OIL & GREASE COMPANY.

CENTRAL ELECTRIC HEATING COMPANY.

NEW YORK, December 19, 1893.

GENTLEMEN:—So far as the railway department of the Central Electric Heating Railway Company's business is concerned, the year just drawing to a close has been a most successful one.

This company has now acquired all of the most valuable patents on electric heating, and after many careful tests of heaters in actual use, has decided on a form which is believed to be both economical and efficient in use for street railway purposes, and it has so proved itself in the fact that it has been adopted on a very large number of street railways throughout the country. The outlook for business for 1894 is most encouraging, and we predict that there will be hardly an electric car in the United States but will be equipped with electric heaters.

Yours very truly,
CENTRAL ELECTRIC HEATING COMPANY,
Per EDW. B. WYMAN.

SHEPPARD MANUFACTURING COMPANY.

LOUISVILLE, KY., December 16, 1893.

DEAR SIR:—Any information we may be able to give you in regard to our business for 1893 must necessarily be meagre, as our company is new, we having incorporated on the 4th of March last. We can say, however, that in spite of the unfavorable conditions of the finances of the country, and the difficulties attending the introduction of a new article on the market, our business has been excellent, having very materially exceeded our expectations.

We regard the prospects for the coming year as most flattering, and feel confident that we shall reap our full share of the harvest that must inevitably follow the reaction in the business interests of the country. We shall issue a new catalogue early in the coming year.

Very respectfully,
SHEPPARD MANUFACTURING COMPANY,
A. B. DUPONT, President.

J. H. McEWEN MANUFACTURING COMPANY.

RIDGWAY, Pa., December 14, 1893.

GENTLEMEN:—Business during the last year has been a surprise to us. We have had a remarkable sale of our engines, furnishing quite a number for street railway work, etc. We are now well established in our new works, having just completed the same. The buildings are of steel. The main building is 120 x 260 ft.; galleries on the sides, each 30 x 160 ft. We have a twenty ton Morgan electric crane in our machine shop, which covers a floor space of 60 x 170 ft., and have hydraulic cranes in the foundry. In fact, we believe we have one of the most complete plants in the country. It looked at one time as though business was going to be dull with us, and in July we reduced the hours of our men to eight hours per day, but at the end of fifteen days we put the men back to full time again, and are now running full force.

Inquiries are such that we are led to believe that business will continue to be good for some time to come.

Yours truly,
J. H. McEWEN MANUFACTURING COMPANY,
Per J. H. M.

THE PELTON WATER WHEEL COMPANY.

SAN FRANCISCO, CAL., December 19, 1893.

GENTLEMEN:—Our business up to July was of large volume, and every way up to expectations. It has, however, been much restricted by the general financial distress, more especially as we were so closely connected with mining interests that have suffered so much from depreciation in silver.

Business has, however, improved much during the past month, and there are indications of increased activity the coming year.

Yours very truly,
THE PELTON WATER WHEEL COMPANY.

SHAWMUT FUSE WIRE COMPANY.

BOSTON, MASS., December 20, 1893.

DEAR SIR:—We are pleased to say that any note from us on the condition of business must be one of cheerfulness and encouragement. The volume of our business in 1893 has been more than twice what it was in 1892, and the "signs of the times" give no evidence of a decrease in the growth. If the demand for fuse wire is any criterion of the loads on cars and circuits there cannot be serious anxiety in the minds of the electric companies.

Yours very truly,
SHAWMUT FUSE WIRE COMPANY,
J. MCK. FERRIDAY, Assistant Treasurer.

REED & MCKIBBIN.

NEW YORK, December 14, 1893.

GENTLEMEN:—The last year was the busiest year we have had, and the most successful. We have completed contracts for street railway construction in the following cities: Brooklyn, N. Y.; Paterson, N. J., four contracts; Easton, Pa., two contracts; Norwalk, Conn., contract for entire construction and equipment.

We have contracts now on hand for the entire construction and equipment of the Lock City Electric Railway, Lockport, N. Y., and the Colonial City Electric Railway, Kingston, N. Y.

On account of our constant increase of business, we have been obliged to lease a larger suite of offices in the Union Trust Building, No. 80 Broadway, near the corner of Wall Street, where we will be located after the first of January.

Yours very truly,
REED & MCKIBBIN.

THE ELLIOTT-LINCOLN ELECTRIC COMPANY.

CLEVELAND, O., December 16, 1893.

GENTLEMEN:—Our business this winter has been very satisfactory in volume. Notwithstanding the fact that we are comparatively new in the field, our apparatus is meeting with a great deal of favor. We have several lighting machines operated by gas engines for private plants, which are doing excellent work. We believe that there are in this direction, prospects for a large increase in our business.

While collections have been hard during the summer and fall, we believe that business will be better soon after the first of the year, and are confidently looking forward to doing a very much increased business next spring. Our quarters will be changed so that our facilities for turning out work will be more than doubled.

Yours truly,
THE ELLIOTT-LINCOLN ELECTRIC COMPANY,
J. C. LINCOLN.

THE LANE & BODLEY COMPANY.

CINCINNATI, December 14, 1893.

GENTLEMEN:—We think that there is a favorable outlook for 1894 in the street railway business. We have been preparing this year a new line of engine patterns with stiffer frames for electric railway service. Quite a number of these patterns are in use and realizing our expectations. The volume of business this year has been considerably less than last.

There seems to be some hesitation at present among buyers as to the future drift of the best engineering practice in the matter of direct and belted driving of generators and in size of units. It is the Lane & Bodley Company's opinion that this will probably work itself out differently in different cities, and that the general conclusion will be favorable to the belt driven generator and horizontal releasing valve gear engine, to be compounded wherever condensing is possible.

Yours truly,
LANE & BODLEY COMPANY.

WM. P. CRAIG.

EAST ORANGE, N. J., December 14, 1893.

DEAR SIR:—The past season has not been a profitable one for me, but have held my end up, and have no fault to find. I completed the Newark end of the consolidated road running to Jersey City last week, and it is partly in operation now, and probably will be running regularly by January 1, 1894. I am now rebuilding the Suburban road in Orange; the trolley will be buzzing over that road between South Orange, Bloomfield, Montclair, Eagle Rock, East Orange and elsewhere by early spring. My little road in Palatka, Fla., is booming, and if any of your representatives give us a call during the winter, they will find the writer on hand to treat them in good Southern style. There is one thing that cannot be said of us down there, that we have not plenty of sand.

Yours truly,
WM. P. CRAIG.

THE PHOENIX IRON WORKS COMPANY.

CLEVELAND, O., December 18, 1893.

GENTLEMEN:—We wish to say that our business is very good at present and that the outlook for 1894 is very encouraging indeed, unusually so, we think. Among the contracts we have just closed are the following important ones: Two fifteen ton hand power cranes for the St. Louis Water Works, of St. Louis, Mo., and seven large steam cranes for Akron Steam Forge Company, of Elwood, Ind. Street railway managers have found out that their power stations are not complete without a traveling crane, which accounts for the increasing demand. Our traveler, for which a patent has been applied for, has shown its superiority over other cranes for power house work.

Very truly yours,

THE PHOENIX IRON WORKS COMPANY,
L. C. SHIPHERD, Secretary and Treasurer.

WOODBIDGE & TURNER ENGINEERING COMPANY.

NEW YORK, December 22, 1893.

GENTLEMEN:—Our business in electric street railway construction for the season now drawing to a close has been large and very satisfactory to us. Among our larger contracts may be mentioned the overhead line construction for all the Providence street railways, line construction for the Union Railroad, of Chester, the track and line construction for the Brigantine Transit Company, Brigantine, N. J., and the track and line construction for the Chester, Darby & Philadelphia Railway. We are prepared to handle an increasing amount of business the coming year, and expect to do so if the financial skies will but brighten with the coming of the spring.

Yours truly,

WOODBIDGE & TURNER ENGINEERING COMPANY,
WM. S. TURNER, President.

THE NEW HAVEN CAR REGISTER COMPANY.

NEW HAVEN, Conn., December 28, 1893.

GENTLEMEN:—The growth and advancement of our business during the past year has been very gratifying, and the fact of our receiving the highest and only medal and diploma awarded on stationary fare registers at the World's Fair is, of course, very satisfactory and a great advertisement for us. Our registers are constantly becoming more widely known and appreciated, and we have recently completed large orders for export, and closed contracts with some of the largest street railway syndicates in the world, and we expect the coming year to do a largely increased business, not only at home but abroad, in all countries in which street railways exist.

Very truly yours,

THE NEW HAVEN CAR REGISTER COMPANY,
JOHN S. BRADLEY, Secretary.

THE BILLINGS & SPENCER COMPANY.

HARTFORD, CONN., December 15, 1893.

GENTLEMEN:—The principal dealings we have with the street railway trade are confined to the sales of our drop forged, pure copper commutator bars, and up to August 1, we were filling large and frequent orders from the street railways for this material. The subsequent falling off we suppose has been entirely due to the general financial stringency. We have lately received some very large orders for these goods, mostly from manufacturers of street railway motors, which make us hope for a return to a more healthy state of affairs than has been prevailing for the past two months.

We believe that the country still lives, and have increased our facilities by new buildings and new machinery, with the expectation of better times. We have a first class article in our patent commutator bars and never lose a customer who has given them a trial.

Yours respectfully,

THE BILLINGS & SPENCER COMPANY,
F. C. BILLINGS, Superintendent.

THE C & C ELECTRIC COMPANY.

NEW YORK, December 13, 1893.

GENTLEMEN:—Our company has recently been reorganized with a view of extending our business, and we have secured large works, which we at present are having fitted up for our use, at Garwood, N. J., and into which we expect to move during February and March. Our object in taking these works is to extend our business into a line of apparatus, from which, on account of our cramped quarters at present, we have been prevented manufacturing. We contemplate making a line of direct connected and belted multipolar generators, and hope in the near future to undertake the manufacture of street railway apparatus; this latter plan, however, is one depending upon the course of business within the next six months.

In regard to the amount of business, we can only say that, as you will know, business has been very much restricted within the last six months, although we feel that we have certainly held our own in comparison with the previous year's record, and that in the spring, with our largely increased facilities, we will do a much larger business than formerly.

Very truly yours,

THE C & C ELECTRIC COMPANY,
A. MITCHELL HALL, General Manager.

THE JEFFREY MANUFACTURING COMPANY.

COLUMBUS, O., December 18, 1893.

DEAR SIR:—Referring to our business with the street railway people, I would state that while we do not deal directly, to any great extent, with the street railroad companies, we sell largely to the manufacturers of motors, cars and such, material used by the railroad companies. Our sale of drive chain for this class of work has been very good in the past year, notwithstanding the stringency, and it is safe to say that our sales have exceeded those of the previous year by at least 25 per cent. We believe this is due entirely to the high class of drive chain that we manufacture. We do not hesitate to claim that our steel drive chains are superior to any made, while our standard line of malleable chains is equal to any for the transmission of power for general elevating and conveying work.

Yours respectfully,

C. W. MILLER, Secretary.

THE LITHOGRAPH STREET CAR TICKET COMPANY.

CLEVELAND, O., December 16, 1893.

GENTLEMEN:—Though we have just got our business fairly established, having only been operating since September 1, we have in this short time received many orders from the street railway companies in the United States both for lithographed, printed, aluminum and rubber tickets. Making a specialty of this class of business, as we do, our facilities are such that we can produce the very best class of work in any quantity at the lowest prices. The coming year will see our company an incorporated one, and our whole attention will be given to the street railway trade of making tickets, bonds, stock certificates, commercial and color work. If the past four months is any criterion to go by the coming year will certainly be a good one. We are always glad to give any information in regard to the way we run tickets and keep them from being counterfeited.

Yours very truly,

THE LITHOGRAPH STREET CAR TICKET COMPANY,
E. RETTBERG, Secretary.

YOUNG LOCK NUT COMPANY.

DECEMBER 18, 1893.

GENTLEMEN:—Although our company, organized only last spring, started in the face of unusual business depression to introduce a nut lock opposed in every way to the old idea of a spring washer, still it has reason to feel more than satisfied with the result of its six months' work. Endorsed by some of the ablest engineers in the United States, such as Col. H. G. Prout, of the *Railroad Gazette*, A. M. Wellington, C. E., of the *Engineering News* and M. N. Forney, C. E., of the *Engineering Journal*, as well as men more closely identified with active railway construction, the Young lock nut has proved itself by actual test in every way worthy of the favorable comments it has received. Devoid of all the weak and injurious features of the spring washers, and depending on a never failing natural law for its efficiency, the Young lock nut has proved that it cannot be overlooked by any railroad which has the economical maintenance of its system at heart. Not only with the steam railroads but even more so, if possible, with street railways has this lock proved its efficiency and economy. It has been adopted by some of the best railways, both steam and electric, in the country, and is the only one used by the Manhattan Elevated Railway Company, of New York. The future success of the company, we believe, seems only limited by the requirements of the country.

Yours truly,

YOUNG LOCK NUT COMPANY.

RELIABLE MANUFACTURING COMPANY.

BOSTON, MASS., December 23, 1893.

GENTLEMEN:—The Reliable Manufacturing Company, of Boston, has just completed a contract with the Brooklyn Heights Railroad Company, Brooklyn, N. Y., for the equipment of 210 cars with the Reliable sand boxes. This street railway company has now 500 cars all equipped, and with the sand box, and this last order makes 710 cars on this road equipped with the Reliable sand box. This, we think, is an excellent testimonial to the superiority of this box over all others, together with the fact that several hundred other street railways are using this sand box with satisfaction.

This company increased its business 50 per cent. during the year of 1893, and with the contracts now on hand, and others about to be closed has bright prospects for the future. The business outlook for the year 1894 warrants the belief that this year's business will be 50 per cent. more than 1893.

During the year the company has manufactured several new appliances for electric street cars, the principal one being the Cochrane electric heater, for which a patent has been granted. We are now busy receiving and filling orders for this heater which gives satisfaction wherever used, because it heats the cars, pleases the passengers and makes money for the stockholders.

The trolley wheels manufactured by this company are having a large sale, as well as the trolley heads made both in malleable iron and brass. The Collett ratchet brake handle is one of the appliances that always find a ready sale the year round.

Yours truly,

RELIABLE MANUFACTURING COMPANY.

J. G. BRILL COMPANY.

PHILADELPHIA, PA., December 15, 1893.

DEAR SIR:—This year, closing with us December 31, has been a remarkably busy one. We will have furnished by that time about 1,400 cars and 2,500 trucks. From a street car building standpoint, the work this year has been good in some ways, orders of considerable magnitude having been placed, but the business has been most troublesome in its financial aspect from the fact that new enterprises in street railways are invariably carried out on proceeds of bond sales, and since July 1, 1893, such sales have ceased practically. In our opinion, the outlook for 1894, excepting for the uncertainty as to the money condition of the country, is fairly promising. There are, as you know, a great many projected roads in the country, the construction of which is dependent upon the money market. These particular roads are, of course, at the present time held back, but when affairs brighten up there will be a good deal of work to be scrambled for by the lusty and already overgrown fraternity of car builders.

Yours very truly,
J. G. BRILL COMPANY.

FROST VENEER SEATING COMPANY.

NEW YORK, December 20, 1893.

DEAR SIR:—We are pleased to say that we have exceeded our last year's trade by about 15 per cent. This, in times such as we are now passing through, we think flattering. This excessive business we attribute largely to the change of the street car system from the old time horse power to electric and cable cars.

The history of our business shows a steady growth, and we feel absolute faith in our ability to make 1894 show better than the year just closing. Should there be a recovery from the present depression, we shall make 1894 the best year in our history. We are now having a large export trade, which comes in very good during these dull times. Our factories—East and West—are in a position to turn out work better and faster than heretofore, with our increased facilities. The opening of the spring we fix as about the earliest time that we shall really see a bright outlook for the country, and also as the time for still greater changes in the street car system.

Very respectfully,
FROST VENEER SEATING COMPANY.
W. P. SEGUINE, Manager Railroad Department.

E. F. DEWITT & COMPANY.

LANSINGBURGH, N. Y., December, 23, 1893.

GENTLEMEN:—We take pleasure in reporting that we have met with great success during the past year in the introduction of our sand box for street car service. The principles of this box are well known to your readers through illustrations and articles which you have published concerning it. It is only about a year since the principle of the box was devised, and the patent which covers the box was only ten months old on December 7, 1893. From this it will be readily seen that, considering the short time the box has been on the market, its success has been remarkable. We have had orders from street railway companies in the following cities; Burlington, Vt.; Syracuse, N. Y.; Gloversville, N. Y.; New Haven Conn. (the Street Railway Company); New York (Broadway Cable Railway); Steinway, New York; Bangor, Pa., and Baltimore (the Lake Roland Elevated Railway). In addition to these the sand box is in use on a number of other roads from which orders are expected soon. On the Gloversville Railway the cars run over a four mile grade, giving a good opportunity for a thorough testing of the box, and the satisfaction given on this road is a good evidence of the success attained by it.

Yours truly,
E. F. DEWITT & COMPANY.

THE COMPLETE ELECTRIC CONSTRUCTION COMPANY.

NEW YORK, December 16, 1893.

GENTLEMEN:—We take pleasure in availing ourselves of the opportunity which you extend to us in furnishing you data relating to our business. We are prepared, and have been for the past five years, to take contracts to build and equip complete both electric and steam railroads; also, the complete construction and equipment of electric light plants.

Our last year's business consisted of the following electric railroads: St. Clair Street line, Cleveland, O., six miles double track, ninety pound girder rail, with overhead construction complete; Norristown Passenger Railway, Norristown, Pa., four miles single track and turnouts, including roadbed, overhead construction, power house and plant complete; Mobile & Spring Hill Railroad, Mobile, Ala., seven miles single track, including entire equipment, except the steam plant; Camden, Gloucester & Woodbury Railway, New Jersey, five miles double track and five miles single track, overhead construction, car equipments, motors, generators and engines all complete, besides two electric light plants and several isolated plants in large buildings.

Our gross business of last year amounted to \$925,000. The outlook for business in 1894, we think, far exceeds our business of 1893. We have estimates in now for 1894 business aggregating some \$310,000, and are estimating every day on new contracts. We believe that the year 1894 will be a "banner" year, especially for the electric railroad construction.

Very respectfully,
THE COMPLETE ELECTRIC CONSTRUCTION COMPANY,
JOHN A. SEELY, General Manager.

PEPPER & REGISTER.

PHILADELPHIA, PA., December 19, 1893.

DEAR SIR:—In relation to the amount of work which we have under way, we would state that at the present time we have the contract for the overhead construction work of the Philadelphia Traction Company, which amounts to over 136 miles, and we have just closed the contract for the Electric Traction Company, of Philadelphia, whose line is about 12½ miles in length. This will give us a large amount of work in our own city which will not be completed for a couple of years to come. We are also glad to announce that we have quite a nice contract in Lynchburgh, Va., the building of an electric railway there, including laying of tracks, paving streets, steam plant and overhead construction.

We have recently, in connection with our business, taken the agency for the J. H. McEwen Manufacturing Company, of Ridgway, Pa., manufacturers of high grade automatic engines, and we are pushing the sale of the engine in this locality.

We regard the outlook as very favorable in the street railway line, as idle capital in this locality is seeking investment now while material and labor are cheap.

Very truly yours,
PEPPER & REGISTER.

THE KEASBEY & MATTISON COMPANY.

54 WARREN STREET, NEW YORK, December 13, 1893.

GENTLEMEN:—Each year since we started the manufacture of Magnesia coverings we have increased our plant, and have made a larger stock during the past summer and fall than the year before. This year the plant and store are, as usual, increased, and very much increased. We have never shipped from our factory as much covering as we are shipping at this time. Our output was never as large. This, considering the alleged dullness of times, we think, is a pretty good showing. During the summer and fall, we have performed work at the following railway stations: Brooklyn Heights Railroad Company; 52d Street station, South Brooklyn; Kent Avenue station, Brooklyn; Ridgewood Station; Smith and 9th Streets station, Brooklyn. Broadway cable road; Houston Street station; 51st Street station. Third Avenue cable road; Bayard Street Station; 65th Street station. Utica Belt Line road, Utica, N. Y. Olean Street Railway, Olean, N. Y. Buffalo Street Railway, Buffalo, N. Y. Consulting engineers, architects and business men generally throughout the state, have been giving us more trade direct, that is, without an investigation, than ever before, showing that "Magnesia" has made such a name for itself that comparisons are odious.

Yours very truly,
ROBERT A. KEASBEY.

CHARLES MUNSON BELTING COMPANY.

CHICAGO, ILL., December 14, 1893.

GENTLEMEN.—Our business, considering the times we have had this year, has been very good. In fact, it has been beyond our anticipations. We have reason to believe that we have had a better trade than any other manufacturer in our line of business. We have gained a great many new customers, which is probably due to the company's changing hands, and business being conducted in a more satisfactory way to our customers. But the main advantage that we can see in our trade this year has been on account of the quality of the leather. The Munson Eagle belt is fast gaining a reputation as being a superior belt to any other upon the market, and those who have used the Munson belt say that they notice a saving in their belt account. People do not have trouble in taking up their belts on account of slack; the belts transmit full horse power.

We have made preparations in the past thirty days to lay in a large stock of Eagle belting to meet the increased trade which we anticipate at the first of the year. This company has always been exceedingly busy from January until May. It can guarantee its customers prompt shipment upon receipt of orders, as it has increased its facilities for turning out leather belting.

Yours respectfully,
CHARLES MUNSON BELTING COMPANY,
W. C. GROETZINGER, General Manager.

RAILWAY EQUIPMENT COMPANY.

CHICAGO, ILL., December 14, 1893.

GENTLEMEN:—Concerning our business since January 1, we beg to state that up to a few months since we had a very large increase of business. Being particularly fortunate in having a superior line of overhead material, we were able to secure a very large number of the best contracts in different parts of the country as well as Canada.

Confining our business strictly to the manufacture and sale of electric street railway supplies, and carrying in stock everything in this line, our supply business had a steady increase. The financial troubles of the last few months have interfered very seriously with business, and a large number of contracts which were about to be closed were, of necessity, put over until next season.

Our line of customers has really increased during the last few months, but roads in all parts of the country are buying only absolute necessities, which reduces the volume of business very materially. On account of the large amount of business done early in the year, our business for 1893 will compare very favorably with former years.

Concerning the outlook for next year, we consider it very encouraging, and we are already figuring on a great deal of business which will undoubtedly be given out during the early part of next season.

Wishing the JOURNAL continued prosperity, and a happy new year, we are,
Very truly yours,
RAILWAY EQUIPMENT COMPANY,
W. R. MASON, General Manager.

FITCHBURG STEAM ENGINE COMPANY.

FITCHBURG, MASS., December 15, 1893.

GENTLEMEN:—We can hardly give any interesting details as to our business except that from September to September. This was about 30 per cent. larger than it had been any previous year, and has tended to larger sizes of engines, many of them for electric light and electric power purposes from 600 H. P. down. Our business has also shown a decided increase in the number of compound condensing engines used. We have been able to keep our full force busy full time up to the present date, although it is harder to obtain business, and prices are somewhat lower. We can hardly tell what the outlook is for 1894, the political aspect of affairs having a very decided effect upon those whom we see as prospective purchasers. The uncertainty in this direction affects us as well as them.

We recently received a letter from Mr. T. J. Fillebrowne, chief engineer of the Hoosac Valley Electric Railway Company, showing his opinion of our engines in street railway work, as follows: "The engines at railway plant are running splendidly. I cannot conceive of a better engine for a power station than the tandem compound. We cannot tell from any appearance of engine whether we are using 200 H. P. or the cars are all standing still. The speed is unchanged and that is all there is about it."

We have many engines in such work.

Yours very truly,

FITCHBURG STEAM ENGINE COMPANY,
F. FOSDICK, President.

HARRISBURG FOUNDRY & MACHINE COMPANY.

HARRISBURG, December 21, 1893.

GENTLEMEN:—The street railway work installed by us recently consists of two 200 H. P. Ideal tandem compound engines for the Wilkesbarre & Wyoming Valley Traction Company, Wilkesbarre, Pa., including a complete power plant, boilers, etc. We are now duplicating this plant with the Wilkesbarre & Wyoming Valley Traction Company, consisting of two more 300 H. P. Ideal tandem compound engines, with boilers complete, delivered and erected, and expect to have the same running by the 1st of January.

We have also equipped the Citizens' Electric Railway (Steelton, Pa.) power plant with engines and boilers and all appurtenances, consisting of one 300 H. P. Ideal tandem compound engine, and two Ideal tandem compound engines of 150 H. P. each.

We have sold through W. R. Fleming & Company two 300 H. P. Ideal tandem compound engines for Montreal, Can., and two 250 H. P. each for New Bedford & Fairhaven Traction Company, New Bedford, Mass. Also two 300 H. P. for Bridgeport, Conn.; two 150 H. P. Ideal tandem compounds for the Owensboro Street Railway Company, Ky.; one 50 H. P. for Oil City Electric Railway and Hanover, Pa. The above are exclusively for electric railway service.

We have also installed a large number of electric light plants: Two 300 H. P., tandem compound engines at Irwin, Pa.; two 300 H. P., tandem compound engines for the Maryland Electric Company, of Baltimore; also one 300 H. P. for Taunton, Mass., and a large number of direct connected electric light engines of various sizes.

Yours respectfully,

HARRISBURG FOUNDRY & MACHINE WORKS,
M. E. HERSHEY, General Manager.

DAVIS CAR SHADE COMPANY.

PORTLAND, ME., December 13, 1893.

GENTLEMEN—We are pleased to state that we have had a very satisfactory year, notwithstanding the general depression in business circles which has prevailed for the past few months. Our automatic shades have been indorsed by a large number of the leading railroads of the country, and are now in service on a large number of roads, including some of the largest systems in this country.

While we make a specialty of our patent automatic shades, yet we also manufacture all kinds of cloth rolling shades for cars, besides doing repairs. While we now have facilities for making all kinds of cloth rolling shades which are not surpassed by any concern in the country, our business is increasing so rapidly that we find it necessary to increase our capacity, and are now making preparations to this end. We have recently received several large contracts for the Davis automatic shades for spring delivery, and it gives us pleasure to state that the outlook for the coming year is encouraging in our line.

We have not issued any catalogues since early in the year, but are now preparing one which we expect will be ready for distribution early in January. It will be on a more elaborate scale than the last ones.

We have not only been successful the past year in interesting many roads which have never used automatic shades, but have found little difficulty in securing contracts from those which have tested the merits of other similar devices. The need of a desirable covering for car windows has long been felt, and prior to the introduction of automatic shades, nothing which seemed to fill the bill was obtainable. Slatted blinds have always been a nuisance, and the ordinary cloth rolling shades without any holding device, which have been used to some extent, were little improvement.

Automatic shades for railway and street cars are rapidly coming into favor, and nearly all new equipment is fitted with them. In our opinion it is only a matter of a short time when all other kinds of car window coverings will be things of the past.

Yours respectfully,

DAVIS CAR SHADE COMPANY.

E. E. PIPER, Treasurer and General Manager.

THE EDWARD P. ALLIS COMPANY.

MILWAUKEE, December 20, 1893.

GENTLEMEN:—We give below a list showing what we have done in the way of installing power in street railway service during this year, and some orders now being completed:

Brooklyn City Railroad Company, Brooklyn, N. Y., four 32 and 62 × 60 ins. and six 26 and 48 × 48 ins. compound condensing Baltimore City Passenger Railway Company, Baltimore, Md., three 30 × 60 ins. compound condensing. Cass Avenue & Fair Grounds Railway, St. Louis, Mo., three 34 × 60 and one 18 × 36 ins., compound condensing. People's Traction Company, Philadelphia, Pa., three pair of tandem compound condensing, 24 and 48 × 60 ins. Duluth Street Railway Company, Duluth, Minn., one pair of 26 × 60 ins. compound condensing. Central Railway Company, Peoria, Ill., one 26 × 48 ins. compound condensing. Valley Springs Railway Company, Memphis, Tenn., one 26 × 48 ins. compound condensing. Citizens' Passenger Railway Company, Indianapolis, Ind., three 22 and 42 × 48 ins., compound condensing. Louisville, Railway Company, Louisville, Ky., two 24 and 44 × 48 ins. compound condensing. Anderson Electric Street Railway Company, Anderson, Ind., two 22 × 48 ins. compound condensing. Southern Electric Railway Company, St. Louis, Mo., two 22 × 42 ins. compound condensing. La Crosse City Railway Company, La Crosse, Wis., one 18 × 42 ins. condensing. Con. Traction Company, Jersey City, N. J., three 16 and 32 × 42 ins. and one 19 and 36 × 48 ins. compound condensing.

In a general way the demand for more power in the street railway line has suffered quite as seriously as in the general manufacturing interests. Regarding the prospect for the coming year, we are unable, during these good Democratic times, to give any reliable forecast,

Yours truly,

THE EDWARD P. ALLIS COMPANY.

J. H. BICKFORD,

CONSULTING AND CONSTRUCTING ELECTRICAL ENGINEER.

SALEM, MASS., December 14, 1893.

GENTLEMEN:—My business for the last year comprised the designing of all and supervision of erection, except in two instances, of the following buildings and equipments for the roads named: Complete power station buildings and machinery, ultimate capacity 3,000 H. P., for Scranton Traction Company, Scranton, Pa.; one brick and iron car house, capacity fifty cars, for Scranton Traction Company, Scranton, Pa.; one brick and iron car house, capacity fifty-five cars, for Reading Traction Company, Reading, Pa.; one brick and wood car house, capacity twenty cars, for Reading Traction Company, Reading, Pa.; twenty-three miles of overhead trolley lines complete, for Reading Traction Company, Reading, Pa.; complete power station buildings and machinery, ultimate capacity 3,000 H. P., for Steinway Railway Company, Long Island City, N. Y.; complete power station buildings and machinery, ultimate capacity 2,500 H. P., for North Shore Traction Company, Salem, Mass.; one brick and iron car house, capacity 100 cars, for the Lynn & Boston Railroad Company, Lynn, Mass.; 700 H. P. additional equipment to Chelsea station of the Lynn & Boston Railroad Company; 700 H. P. additional equipment to Lynn station of the Lynn & Boston Railroad Company; power station buildings and general outline of machinery, of 300 H. P. capacity, for Northampton Street Railway Company, Northampton, Mass; power station buildings alone, for Alton Street Railway Company, Alton, Ill.

The prospects for business for the coming year appear well, provided promoters of enterprises can get money to float them. We already have in hand several schemes which will probably materialize sooner or later.

Yours truly,

J. H. BICKFORD.

VALENTINE & COMPANY.

NEW YORK, December 18, 1893.

GENTLEMEN:—Our business during the last year has been most prosperous. Early this year it became necessary to increase our storage capacity for varnish. The alterations have but just been completed. and now the largest of our several tank rooms has a capacity of 145,000 gals. Two other tank rooms have a capacity of 74,000 gals., giving a total for these three rooms alone of 219,000 gals., and this is exclusive of the varnish in the factory proper and stocks carried at our warehouses in Chicago, Boston and Paris, and in the hands of our regular agents. Thus it is that this company is enabled to hold an enormous stock of varnish for the purpose of ripening and maturing.

We have just received from our Canadian representatives some figures respecting the varnishes and colors used upon the vehicles shown at the exhibition recently held in Toronto, Can., which are highly gratifying and in line with our previous triumphs over foreign manufacturers. 291 vehicles of all kinds were there exhibited, ranging from broughams, landaus, landaulets, buggies, etc., down to sleighs and cutters. The exhibits included 42 different variety of vehicles, buggies and dog carts predominating; and of the above 291 vehicles, 161 were finished with Valentine's varnish, 69 with varnish of English manufacture, the remainder (used on a cheaper class of work) being Canadian. It is said that there was only one other American manufacturer of varnishes represented, and that upon one vehicle only out of the 291. Our superfine colors were only second to our varnishes in the record made at this exhibition. Only 260 of the 291 exhibits were painted, and on 98 of this number Valentine's superfine japan colors were used.

Yours truly,

VALENTINE & COMPANY.

THE LEWIS & FOWLER MANUFACTURING COMPANY.

BROOKLYN, N. Y., December 20, 1893.

DEAR SIR:—Replying to your inquiry of recent date requesting a synopsis of our company's commercial experiences for the year just ending, we have to state that we have not in the past taken up this subject for publication purposes, but inasmuch as the object the JOURNAL has in view is commendable, and will doubtless prove interesting reading to a large number of your subscribers, we herewith submit a general resumé of our business for the year 1893.

In entering upon the year 1893 we felt, at the very start, the impetus given to car manufacturers and railroad supply people by the general change all over the country from horse traction to electric power, and almost without cessation we have been obliged to work our shops overtime in order to make stipulated deliveries promptly; this has been the rule rather than the exception up to the present time, and the outlook for the year 1894 is even more promising, aside from the orders already received and which insures continued activity throughout the coming year; our inquiries, together with specifications and estimates already submitted is, we consider, proof positive that 1894 will eclipse all previous years' business results with our company.

We realized during the past year that there were several necessary changes to be made in our shops in order to facilitate prompt deliveries, and which we proposed to make a special feature, and with this idea in view we started in to reorganize the shops throughout with a good and efficient system, which we have accomplished after much labor.

We have secured the services of a new superintendent, who is well known as a practical car builder, and have also new foremen in all our various departments, and our staff of employes is composed of the best mechanical and skilled labor that can be procured.

It is a source of considerable gratification to be able to submit such a favorable condition of affairs when we take into consideration the continuous spell of financial depression the whole country has passed through.

Yours, very truly,

G. W. MYERS, Secretary.

THE CUTTER ELECTRICAL MANUFACTURING COMPANY.

PHILADELPHIA, PA., December 20, 1893.

GENTLEMEN:—From the date of its organization and up to the commencement of the year 1893, the efforts of this company had been in the direction of producing a line of special switches, shades, cut-outs and the like, adapted to incandescent lighting, and we had given no attention to the street railway needs. However, about the beginning of the year we turned our attention in this direction and, as a first effort to supply a want in this field, we have devised an automatic magnetic cut-out of unique design and extended scope. It is eminently adapted to street car work, as it will locate a ground or short circuit to the car in which it occurs, and will stop that car only, without disturbing the main magnetic cut-out at the power station. It may be adjusted and set to open at any predetermined overload, and will also open safely upon the occurrence of a dead short circuit with all the force of the power station dynamos behind it.

This device was first presented to the notice of the trade at the annual convention in Milwaukee, and it received the most flattering attention from all in interest. This attention has since been supplemented by inquiry and correspondence to an extent that promises a very successful trade in the immediate future. Already we have found it necessary to extend our factory in order to be able to supply all demands promptly.

It is our intention to produce other devices in the street car field, and we already have several in process of development. Our quadruple break switch, which we have been manufacturing for some time, is particularly designed to operate incandescent lights on a 500 volt circuit. These switches have long been in successful operation in other fields, and the street car people are beginning to substantially appreciate their merits.

We would say that the prospects for this company in the street railway field for the coming year are excellent.

Very truly yours,

LUCIUS T. STANLEY.

DETROIT ELECTRICAL WORKS.

DETROIT, MICH, December 20, 1893.

GENTLEMEN:—The railway business of the Detroit Electrical Works for 1892 and 1893 is shown by comparison as follows: 1892, total horse power of generators and motors sold, 5,508; 1893, total horse power of generators and motors sold, 3,576.

Among our orders closed during 1893 were the following: Detroit Citizens' Street Railway Company, Detroit, Mich., fifth, sixth and seventh orders, comprising 760 H. P. of motors; Calumet Electric Street Railway Company, Chicago, Ill., eighth and ninth orders, 480 H. P. of motors, and 1,064 H. P. of generators; Atlanta City Street Railway Company, Atlanta, Ga., first, second and third orders, comprising 280 H. P. of motors, and 212 H. P. of generators; Belle City Street Railway Company, Racine, Wis., 180 H. P. of motors, and 600 H. P. of generators. The first and latter two orders include spring supported, single reduction railway equipments.

The stationary motors and lighting station business is shown as follows: 1892, stationary motors aggregating 372 H. P.; 1893, stationary motors aggregating 550 H. P.

The sales in the telephone, telegraph and merchandise department show about even for the two years, being a little more in 1893 than in 1892.

The gross business of 1893 compared with 1892 shows a net falling off of 45 per cent., excluding for 1893, of course, the amount represented by orders carried over to 1894.

As a beginning for 1894 the company is carrying over from this year to next orders for railway apparatus as follows: Double reduction equipments, 150 H. P.; generators, 376 H. P.; spring supported, single reduction equipments, 1,150 H. P.; total, 1,676 H. P.

It seems quite probable that, inasmuch as there is now plenty of money idle in the banks, it will, at a not very distant date, begin to seek investment; but no doubt, investments, to be attractive in future, must, as a rule, have fewer elements of a speculative quality than heretofore. Again, the consumption now, while perhaps restricted to less than what has been the normal for several years past, is still going on, with the natural result, that manufacture must again be resumed when supplies are exhausted.

These two positive elements would seem to control the future more effectively than hopes or fears. The prospects for 1894 are not extremely difficult to analyze. Individuals and concerns are using up fully what they need to consume, the consumption is reduced to a minimum, money is plentiful and will seek good investments at no very late date, and everybody is very well contented to take a rest for a while with what they have of their own. Therefore, as soon as the consumption is ahead of the supply, good needs for money will arise, and everybody will get up and start ahead once more, keeping, perhaps, to narrower paths than heretofore, at least until the experience of 1893 is forgotten in the rush for a dollar.

Yours truly,

L. WARFIELD.

Business of the Westinghouse Electric & Manufacturing Company.

While the year 1893 has been remarkable as a period of great depression in the financial and industrial conditions of the country, there have been a few industrial establishments upon which the general conditions did not have the same effect as upon others. Among these the Westinghouse Electric & Manufacturing Company may be justly mentioned as one of the fortunate few, and the company has just closed a year of successful and profitable business.

Of course, it must not be forgotten that the company's standing in the business world, and the reputation of the Westinghouse apparatus is such that whatever business there is in the electrical industry the Westinghouse Company undoubtedly gets its own share of it. Hence it is not astonishing that many of the largest and most profitable contracts of the year were filled by that company.

In the lighting business the contract for illuminating the World's Fair was given to the Westinghouse Company, and here a record was made which has never been equaled in the world. The company furnished machinery for six months for 84,000 lights, for which the Columbian Exposition Company paid upward of \$500,000. The work was done to the greatest satisfaction of all parties, and during the entire period of the Fair, not once was there fault found with the apparatus or with the service it gave. Since the closing of the Exposition, the Westinghouse Company has taken back the entire plant, and the total capacity of apparatus, twelve 10,000 16 C. P. light dynamos, has been sold to different central station plants throughout the country. Another large contract for central station Westinghouse alternating current, electric lighting apparatus the company obtained from the Louisville Gas Company. Besides this work, Westinghouse alternating current and direct current lighting and power apparatus was installed in a number of new central stations and isolated plants.

The business of long distance transmission of power has been greatly developed, and, owing to the enviable position the company occupies in this respect by the control of the Tesla polyphase system, that branch of the electrical industry is practically entirely in the hands of the Westinghouse Company. That it is the only commercially practical system of economically efficient transmission of power cannot be better emphasized than by the fact that the Cataract Construction Company awarded the Westinghouse Company the contract for transmitting electrically the power of Niagara Falls. The importance of this is very great, when it is remembered that the entire electrical world had been bidding to obtain this work.

However largely the Westinghouse Company has been occupied in the production of general electrical work, the manufacture of railway apparatus has constituted the major portion of the business of last year. The Westinghouse electric railway apparatus is now accepted as standard throughout the country, and the best evidence as to what the users think of it is that wherever that apparatus has been installed it has never been thrown out or replaced by another system. The railroad manager realizes its advantages in the substantiality and durability of construction and ease of operation, while the investor appreciates its efficiency and cheapness of operation, which assures profits and dividends.

During the last year the company was engaged in filling the large unfinished orders for the Philadelphia Traction Company, which called for 600 single reduction motors. Even the last week of 1893, this company ordered of the Westinghouse Company, power station apparatus for a capacity of 11,250 H. P., consisting of six 1,500 H. P. and three 750 H. P. generators. All of these machines will be direct connected. In addition, the orders for the Chicago City Railroad Company and the South Chicago Passenger Railway Company were also completed, and they commenced operation about the time the World's Fair opened. The record of these roads during the busy period of the Exposition was phenomenal. The Lindell Street Railway Company, of St. Louis, also had its lines equipped with Westinghouse apparatus, and the lines of the Atlantic Avenue road, in Brooklyn, were also completed.

In spite of the large amount of unfinished contracts, the Westinghouse electric railway system was installed in all the larger cities of the Union, as well as in Canada.

The Business of the General Electric Company.

The progress made during the past year by the General Electric Company, both in the development of new and improved railway apparatus and in the amount of railway business done, marks more than ordinarily the character of the company. Despite the depressed condition of the whole business field, we learn that the number of orders received differ by but a few from those of so called good years, and while the amount of apparatus shipped is not so great, in diversity and improvement it has fully come up to expectations.

The list of new apparatus which it has brought out is surprisingly long, and as each device has proved a marked advance, so has it proved a marked success, so much so, indeed, that the orders for the new apparatus have come in in sufficient numbers to cause a sentiment of gratification to pervade the whole railway department. Foremost among the new devices is, of course, the new motor, known familiarly as the G. E. 800. This was shown in operation at the Street Railway Convention at Milwaukee, and each of its superior features was investigated and commended by all the members of the fraternity present. The G. E. 800 is and has been operating on a great number of roads, and in each and every instance has proved so successful as to elicit spontaneous letters of commendation from the managers, dwelling in particular upon its extreme lightness, its efficiency (qualities gained without sacrifice of either mechanical strength or electrical power) and general superiority over other motors which they had previously been using. The G. E. 800 is now in use in large numbers on the lines of the Denver Tramway Company; the Pittsburgh, Allegheny & Manchester Traction Company, of Allegheny, Pa.; the Cincinnati Street Railway Company; the Brooklyn City Railroad; the Union Railroad, of Providence; the East Cleveland Railway; the State Street Railroad, of New Haven, Conn.; the Buffalo Railway; the Union Depot Company, of St. Louis; the Trenton Passenger Railway Company; the Worcester Traction Company; the Reading Traction Company; the City & Suburban Railway Company, of Baltimore Md.; the Pacific Improvement Company and Pasadena Railway, both of San Francisco, and on many other lines throughout the United States.

The necessity for a more perfect controlling device called into existence the type K controller, from which every objectionable feature, noticed in preceding controllers, has been carefully eliminated. The type K, series parallel controller is perhaps the most compact and comprehensive controller now in use. In conjunction with the G. E. 800 motor, it forms an economical combination which it would be difficult to rival in the field of car operation, and its appreciation by railway men has been both high and extensive.

The activity of the engineering force of the General Electric Company, has, however, by no means been confined to the motor and controller. The requirements of the Intramural Railway at the World's Fair necessitated the creation of new apparatus to meet them. The successful operation of this road, which we have described in full, was, perhaps, the most striking feature of the Exposition. Millions of passengers were carried without either a hitch in the regularity of the service, or an accident to any person. The motors used, known as the L. W. P. 20, were built especially for this service, and four, with an aggregate of 533 rated horse power, were mounted on each motor car, drawing four trailers. They were regulated and controlled by the special series parallel controllers operated pneumatically. The cars were operated by direct coupled generators, and these were among the earliest slow speed generators used for railway service in this country. One in particular, the 750 k. w., was found to be sufficient to the entire operation of the road under ordinary conditions. In times of heavy travel, however, power was supplied from the great 1,500 k. w., direct coupled generator, which was at that time the largest electrical generator in the world. Its success has caused its duplication both in Brooklyn and Philadelphia. A circuit breaker was used in connection with this machine, that proved itself capable of interrupting a circuit of 10,000 amperes.

In addition to the direct coupled generators just mentioned, four of other sizes have been built. They are all of the multipolar type, have iron clad armatures, are of great mechanical strength, highest electrical efficiency, and perfect ventilation. The armatures are so constructed that any good electrical mechanic can readily inspect and repair any part of the armature winding without disturbing any other part.

In order to make the road equipment complete, and keep everything up to the standard of the generators, motors and controllers, the overhead devices were in great measure redesigned, and a new insulation, known as the L compound, introduced. The introduction of this new moulded insulating material and its success have evidently justified the steps taken.

There has also been a very large demand for the new panel switchboards which are confessed to be both simple and perfect, carrying all the measuring and indicating apparatus necessary, and, especially, the new automatic circuit breaker with electrical reset.

We must not omit mention of the thirty-ton electrical locomotive. Its appearance is an event hardly less important than that of the first steam engine. It was the first electrical locomotive in the world, and proved the feasibility of the operation of the steam road by electricity. At the World's Fair it was the center of attraction of every steam railroad man.

Among the most important orders and shipments of direct coupled generators received and made by the General Electric Company may be mentioned six of 1,500 k. w. to the Brooklyn City Railroad, two of which are in operation, three of 1,500 k. w. to the People's Traction Company, of Philadelphia; three of 730 k. w. to the Cass Avenue & Fair Grounds Railway, of St. Louis; two of 750 k. w. to the Union Railroad, of Providence; four of 500 k. w. to the City & Suburban

Railway Company, and four to the Baltimore & Ohio Railroad, both of Baltimore; four of 400 k. w. to the Union Depot Company, of St. Louis, and three of 250 k. w. to the Electric Traction Company, of Philadelphia; of the belt driven generators, twenty five of 500 k. w. have gone to the West End Railroad, of Boston, twelve to the Brooklyn City Railroad Company, three to the Atlantic Avenue road, of Brooklyn; three to the Union Railroad, of Providence; and other roads too numerous to mention in detail are now operated by these generators, as well as by generators of 300 k. w. and 100 k. w. capacities, making a total of direct coupled and belt driven generators of more than 500, while the total number of motors of all kinds turned out is considerably above 5,000.

There is an air of expectancy about the railway department of the General Electric Company which augurs well for the prospects of business during 1894. They are more hopeful even than they were at the end of last year, and the officials declare that, with their improved apparatus, they fear no competition, but are prepared to meet it and do an extremely large business.

Business of the Providence Steam Engine Company.

The Providence Steam Engine Company, of Providence, informs us, concerning its last year's business, that its improved Greene engines have been very satisfactory, and to judge by the work done business has been good with them. During the past year this company has installed or is now constructing the following engines: For the Union Railroad Company, of Providence, two compound condensing engines, of 1,800 H. P. capacity; for the Rotch Spinning Corporation's Mill, at New Bedford, one triple expansion engine of 550 H. P. capacity and another of 600 to 700 H. P., and in the same city has recently placed one 1,500 H. P. and two 600 H. P. compound engines. The company recently completed and is now engaged in the construction of compound engines for the Albany Electric Illuminating Company, of 400 H. P.; National Carbon Company, Cleveland, O., 900 H. P.; League Island Navy Yard and Charlestown Navy Yard, 250 H. P. and also some fifty other engines of from 1,200 to 75 H. P. each. The demand for the engine has required an enlargement of the works, and every available inch of ground is now covered with buildings to provide for the constantly increasing business.

Business of the Johnson Company.

The Johnson Company, of Johnstown, Pa., has done a large business during the past year in its various street railway specialties. Its girder rails, turntables, switches, curves and crossings are well known and have been largely used. The company, as is well known, has made a specialty of electrically welded rails and street construction; also electrically welded rails and chairs, and has shown its enterprise in going to great expense in experimenting in this and other lines to determine what improvements are possible in the girder rail system for street railway service. This company makes a specialty in the manufacture of patented specialties in street railway construction.

Equipment Notes.

The Billings & Spencer Company, of Hartford, Conn., has opened a Western office at 59 South Canal Street, Chicago, Ill., in charge of W. A. Davis. A complete line of its goods will be shown here.

Julius Meyer, consulting engineer, Temple Court, New York, has just completed for the stockholders of the Cincinnati Edison Electric Company, an investigation of that company's affairs and reported on the commercial and technical condition of the property.

J. D. Murray, of New Brunswick, N. J., has recently completed twenty miles of track in the work of electric construction, which the Baltimore (Md.) Traction Company is installing. Mr. Murray has had long experience in this class of work, and has laid a great deal of track in Baltimore and other cities.

Thomas S. Crane, expert in patent causes and in the designing of patent machinery, has opened an office at No. 10 Wall Street, New York. Mr. Crane has had an experience of thirty-six years as a mechanical engineer, and has prosecuted over 1,900 applications for letters patent in the United States and foreign patent offices.

The Ball Engine Company, of Erie, Pa., has sold its 500 H. P., cross compound, condensing engine exhibited at the World's Fair, to the Maryland Lighting Company, of Baltimore, Md. This engine received the highest award. The particular work of the engine at the Fair was the illumination of the electrical fountains.

William C. Baker, of 143 Liberty Street, New York, inventor and manufacturer of the Baker car heater, writes us that he is adapting his hot water car heaters to street cars, as well as to the large cars of steam railroads, the great desideratum being to have hot water heated pipes directly under the feet of each of the passengers as they sit in their seats.

The P. Wall Manufacturing Company, of Pittsburgh, Pa., is doing a good business. Mr. Wall tells us that he has recently shipped two roof gongs to the Melbourne Electric Railway Company, of Melbourne, Australia, showing that his goods are as well liked at the antipodes as in this country. Mr. Wall is also doing a large business in the United States.

The Phosphor-Bronze Smelting Company, Ltd., of Philadelphia, has moved its offices to 2,200 Washington Avenue of that city. At this point the company has erected a new foundry and smelting works, and has greatly increased its facilities in every department for the manufacture of "Elephant Brand" phosphor-bronze, ingots, castings, wire, sheet rods, etc.

The Bemis Car Box Company, of Springfield, Mass., has recently received an order from the Laclede Car Company, of St. Louis, for fifty more of its standard motor trucks, a total of 300. These will be installed on the lines of the Philadelphia Traction Company. The company has recently placed thirty-five trucks at Providence, R. I., among its other recent orders.

The Young Lock Nut Company, of New York, manufacturer of the Young gravity lock nut, has just issued a neat eight page circular containing an historical sketch of various forms of lock nuts, taken from the *Railroad Gazette*, together with press comments from several of the railroad journals, and a number of favorable testimonials from prominent railroad officials who have used these lock nuts.

The Berlin Iron Bridge Company, of East Berlin, Conn., is about to build a new car house for the Reading Traction Company at Reading, Pa. The building will be 180 ft. long and 85 ft. wide, with one row of columns through the center supporting the roof trusses. The side walls will be of brick, and the roof of iron. This company is also engaged in putting in place the roof of the new purifier house of the Northern Liberties Gas Company, at Northern Liberties.

The United Columbian Electric Company, of New York, manufacturer of the Winkler twin series motor, tells us that the Mobile (Ala.) & Spring Hill Street Railway, recently equipped with the Winkler system, has accepted all the equipments during the past month. The motors are showing very high economy, and in consequence the road has ordered additional equipments. These motors are replacing the steam dummies formerly in operation on the road.

The Clayton Air Compressor Works, of 43 Dey Street, New York, are working full time and full capacity at the shops in Brooklyn, and are even behind on their deliveries. In the prevailing business depression, this speaks volumes for the excellence of the air compressors built by this company. The company has recently taken out several valuable patents on a new triple compound, high pressure air or gas compressor, used largely by manufacturers of carbonic acid gas.

A. O. Schoonmaker, 158 William Street, New York, reports an increased demand for mica from the managers of electric street railroads. He is a large importer of East India mica, which is claimed to be the best in the market for insulating and other electric work. Mr. Schoonmaker offers this mica to the trade uncut or cut to size, and to meet the demand, he is now cutting it to shape ready for use for commutator segments, rheostats, etc. He will cut to any pattern wanted.

A. Groetzinger & Sons, of Allegheny, Pa., sole manufacturers of "Dermaglutine," write us that trade in "Dermaglutine" pinions has been picking up wonderfully lately, and orders are now coming in quite freely. Within the last month this has been especially true, the company having booked several large orders, principally from Western street railways. The general mechanical trade is now taking more interest in "Dermaglutine" than ever before, and orders are coming in generously from that source also.

The Allen Trolley Company, of Philadelphia, has changed its title to the Allen Electric & Supply Company. The office of the company is located at 232 Carter Street. The company reports a rushing business, has accepted the agency for the Graham truck, and proposes to push it from the Hudson to the Missouri Rivers. The trucks will be made in Philadelphia complete, and a sample truck will be on exhibition at the company's office. Consumers will save freight by ordering direct from the Philadelphia office.

The Laconia Car Company, Laconia, N. H., the largest builders of steam railroad cars in New England, has taken a large number of orders recently for street railway cars of all kinds, electric, cable and horse. The high class of work which this company has turned out for steam railway service is sufficient proof that its street railway cars will be of the very best workmanship. The company employs between 600 and 700 men, and its facilities for turning out work are of the best. We understand that the company's street railway department will be in the charge of F. E. Huntress, 8 Oliver Street, Boston, Mass.

T. J. Murphy & Company, of New York, have issued a circular giving size, styles and prices of electric slate for switchboards, bases, etc., manufactured by them of a carefully selected grade of Vermont slate. This slate can be drilled and tapped with great facility. A New York construction company recently drilled 12,000 quarter inch holes in a slate five-eighths of an inch thick, and containing only twenty-two square feet, making the holes about a quarter inch apart. This slab stood shop handling and transportation without injury. These slates are furnished in flomed and marbled finishes, which add to their strength and durability.

N. H. Green, of New York, general agent for the Maddox cotton and wire belting, informs us that the belting is giving excellent satisfaction wherever used. Numerous orders are being received, and prospects are bright for a large business in 1894. The following are in use and giving satisfaction: Chas. B. Paul, 467 Kent Street, Brooklyn, twenty-eight feet of nine inch belting for dynamos; McConway & Torley Company, Pittsburgh, Pa., fifty-six feet of six inch belting; Arlington Mills Company, Lawrence, Mass., twenty-seven feet of eight inch belting; H. W. Coleman Machinery Company, New Orleans, La., twenty-six feet of three and a half inch belting; Petross Stump Lumber Company, Tuscahoma, I. T., twenty-eight feet of six inch belting;

Steinway & Sons, New York City, sixty-seven feet of four inch belting, and others.

J. H. Stedman, transfer agent, of Rochester, N. Y., having devoted more than two solid years to the transfer business, has aroused, he believes, the street railway companies of the United States to the importance of short time limit and a way to prevent the fraud practiced by passengers and employes. His ticket, he claims, makes the former simple, and the latter almost absolute, and while simplifying detail and saving labor, improves the transfer business in every way. Upon entering the field Mr. Stedman found practically no system, no detective features, and few conveniences. Each company was using an individual idea, often jumped at in haste and continued for lack of something better. He combined his ideas with the consensus of the knowledge of a great many general managers of reputation and experience, evolving in this way his present system. The principles of the Stedman tickets are fully covered by patents, and he has announced his intention of defending his rights in the courts.

The R. A. Crawford Manufacturing Company, of Pittsburgh, Pa., is obtaining flattering orders for its automatic wheel guard board and pickup fenders. The company's recent orders include those for the complete equipment of all cars for the Philadelphia Traction Company, Citizens' Street Railway Company, Indianapolis; Central Traction Company, Pittsburgh; Pittsburgh & Birmingham Traction Company; Pittsburgh & Duquesne Traction Company; Pittsburgh Traction Company, with assured expectations of several more large orders for January. These safety appliances have received the endorsement and approval of leading street railway managers, being constructed on practical and mechanical principles that conform to railway requirements. The fender is the result of three years' study and practice on the part of the inventor, Mr. Crawford. By order of the Commissioners of Public Safety, of Pittsburgh, all street car lines in that city not already furnished with the automatic wheel guards and pickup fenders of the Crawford Company must be so equipped at once.

The Ball & Wood Company, of New York, reports that in spite of the business depression its factory is crowded with work. Although it is not customary to the Ball & Wood Company, of New York, to advertise its sales, yet recent inquiry shows such activity at the works of this company that for the encouragement of those who fear that the factories are all closing, we are permitted to publish the following recent orders on installations: At Binghamton, N. Y., two engines; at Faribault, Minn., two engines; at Hartford, Conn., one large compound engine; at Frankfort, Ky., one engine; at Meriden, Conn., three engines; at Naugatuck, Conn., two engines; at Buffalo, N. Y., one engine; at Canton, Maryland, three engines; at Sweveghem, Belgium, one engine, besides others in West Pullman, Ill.; Elizabeth, N. J.; Cloquet, Minn.; Waterbury, Conn.; Scranton, Pa.; Bath, Me., and Millville, N. J. In addition to the above, the five engines comprising the exhibit of the Ball & Wood Company at the World's Fair, have also been disposed of, these engines being the first out of Chicago as they were the first installed.

Samuel Lewis, of 10-18 Larrimer Street, Brooklyn, N. Y., manufactures a wood mat for street cars, which is growing in popularity with street railway companies. Besides his customers among the street railway companies, Mr. Lewis has supplied the orders of a large number of car builders, including the John Stephenson Company, the Lewis & Fowler Manufacturing Company, the J. M. Jones' Sons Company, the J. G. Brill Company, the Laclede Car Company and the Pullman Palace Car Company. It is a very common thing when a street railway company orders its cars for the specification to be included that the cars are to be equipped with the Lewis patent wood mat. These mats are interchangeable and reversible, and are made of well seasoned maple wood slats, assembled with strong screw rods, which cut their own thread. This renders the infiltration of dust or liquids impossible while maintaining the mats smooth and preventing warping, so that the underlying material is not injured. These screw rods also give great strength, and insure durability to the mats, so that some have been worn by usage until the screw rods in the middle of the slats were exposed without decreasing their firmness and strength. The mats are easily repaired by screwing two half slats in the place of the one broken. Mr. Lewis has been in the wood mat business for a long time, and brings to his work the accumulated experience of many years.

The Southwark Foundry & Machine Company, of Philadelphia, Pa., makers of the Porter-Allen automatic engine for street railway and electric lighting uses, reports through its St. Louis agents at 32 Laclede Building, that city, the sale of two 1,000 H. P. engines to the Union Depot Railroad Company, of St. Louis. One of these is to be installed in the railway company's Gryer and Jefferson Avenues station, and the other in the Bellefontaine station on North 20th Street. Each of these engines is to be direct coupled to a 1,000 H. P. General Electric Company generator running at 100 revolutions per minute. Three 750 H. P. Porter-Allen engines have lately been ordered by the Compton Heights, Union Depot and Merchants' Terminal Railway Company, the Park Avenue branch of the Lindell Railway system. Each of these is to be direct coupled to a 750 H. P. Westinghouse generator of the latest type, as exhibited at the World's Columbian Exposition. The Southwark Company claims that the 1,000 H. P. engines can work up to 1,500 H. P. with the greatest ease, and the 750 H. P. to 1,000 H. P., in keeping with the varying loads common to street railway working. The Porter-Allen engines supplied to the Lindell Railway's old power station at Compton Avenue and the Missouri Pacific Railway tracks, although belted to the old type of Edison generators, have long ago demonstrated their ability to meet all demands put upon them. And it was principally for this reason that it was awarded the second Lindell Railway contract.

The Pierce & Miller Engineering Company, of New York, has sent us some of the results obtained by the World's Fair engineers,

showing the combined efficiency of a McIntosh & Seymour engine and a 10,000 light Westinghouse dynamo driven by belt to be 86¼ per cent. The variation in speed of the engine was less than one revolution under a change of load from zero to 1,360 H. P. In the December issue of *Cassier's Magazine*, under "Current Topics," an interesting item is given of this machine. This is as follows: "A rather startling story is told by an engineer who visited the late World's Fair, concerning the perfection of the governor of the large McIntosh & Seymour tandem compound engine which was on exhibition there. The engine, like most of those shown, was furnishing power for electric lighting, and ordinarily carried a load of about 800 H. P., which was considerably below its full capacity. On one occasion, through a mistake of the switchboard attendant, this load was suddenly increased by something like 60 per cent., and was, a few moments afterwards, quite as suddenly reduced to the original figure without having attracted the attention of the engineer in charge by any change in the working of the engine, or without having in the least affected the various lights on the circuit. Changing the load on the engine by the amount noted, and with the result claimed, was about as severe a test of the governor as it is possible to make, and the builders of the engine ought to derive a goodly amount of satisfaction from it."

A. B. Wetmore, of 10 West 23 Street, New York, manufacturer and wholesale dealer in hard woods and North Carolina pine, has for many years been associated with the wholesale lumber trade of New York City, and has become prominent in the furnishing of special and difficult bills of lumber for car building and export trade. With the rapidly growing scarcity of good lumber, no industry has found it so difficult to fill its wants as the street car building trade. As will be seen elsewhere in this issue, Mr. Wetmore is a specialist in many classes of woods used in the construction of street railroad cars, and is prepared to furnish some of the best material and manufacture. The making of street car and coach panels, and especially the former, is a business requiring great judgment, skill and experience. The best whitewood timber for this kind of work must not only be large, but it must be of thrifty growth, making panels that are not only free from knots, but also from many of the defects which occur in very old whitewood trees. To obtain just such timber, to have it manufactured into truly made boards five-eighths of an inch thick, and from sixteen to twenty-six feet long and of a grade suitable for the work requires the attention of expert lumbermen. These Mr. Wetmore has had in his employ for a long time, and has produced results most satisfactory to the receivers of the lumber. Mr. Wetmore claims to have filled the contracts for panels of the most exacting purchasers, and his panels were used exclusively in the building of the cable cars made by the Stephenson Company for the Broadway Railroad.

The Fishkill Landing Machine Company, of Fishkill-on-the-Hudson, N. Y., builder of the improved Fishkill-Corliss engine, is doing a good business. Its engines are in demand by manufacturers generally, and are also used for electric lighting and street car purposes. The Rochester (N. Y.) Electric Light Company is using a Fishkill-Corliss engine of 500 H. P. Among the larger engines which this company has recently erected are two of 300 H. P. each for the Atlas Cement Company, at Copley, Pa.; one of 250 H. P. for the Grand Central Palace, New York City; one 175 H. P. for R. M. Wilson, Rome, N. Y.; one 175 H. P. for F. Hosch, Brooklyn, N. Y.; one 250 and one 100 H. P. for the Canda Manufacturing Company's car works at Carteret, N. J.; one 100 H. P. for the Smith Premier Typewriter Company, Syracuse, N. Y.; one 175 H. P. for the Cortland, (N. Y.) Wagon Company; one 200 H. P. for David Miller, New York; one 100 H. P. for the Eastman Kodak Company, Rochester, N. Y.; one 300 H. P. for the Metropolitan Realty Company, New York; one 200 H. P. to the National Casket Company, Oneida, N. Y.; one 300 H. P. for the Glens Falls Paper Mill Company, Fort Edward, N. Y.; one 250 H. P. for Kinney Brothers, New York, and one each of 300 and 350 H. P. for sugar plantations in Cuba. It will be recalled that the engines for the immense grain elevators of the New York Central & Hudson River Railroad Company, New York city, one the West Shore Railroad, at Weehawken, N. J. (one of 1,000 and one of 800 H. P.) were built by this company. The officers of the Fishkill Landing Machine Company are: Robert J. Halgin, president; W. F. Sage vice-president, and James L. Teller, secretary.

Mr. Wm. Hazelton, 3d, has been appointed the exclusive agent for the United States of the Société Anonyme Industrielle des Etablissements Arbel, Rive-de Gier (Loire), France. This company is probably the best known manufacturer in Europe of wrought iron, forged centers for all kinds of wheels, making a specialty of this business. During the World's Fair, Mr. Arbel, with a staff of engineers, visited this country, and during his stay here visited many cities, seeking particulars and information regarding the operation of street railways. The appointment of Mr. Hazelton as the American representative of the company is the first step of the company in establishing an American branch. Mr. Hazelton will open offices in the Havemeyer Building, New York City, January 1, 1894. The wrought iron, forged centers of the Arbel manufacture are especially adapted to cable and electric service, and are sold with a five years' guarantee. These centers are used almost exclusively in France and many other European countries. Since Mr. Hazelton resigned from the Short Electric Railway Company, last summer, he has, in addition to devoting much time to several railway projects in which he is interested, been negotiating with several large manufacturers to represent them in the East. He will continue in the contracting for and building of street railways complete, in which line he is well known, and has had a long practical experience.

Mr. Hazelton has the faculty of knowing a good thing when he sees it. He was one of the earliest workers in the electric railway field, and during his connection with the Sprague Electric Railway & Motor Company, of New York, was largely instrumental in starting

the great impetus in electric railway construction in the states of Pennsylvania, New Jersey and Delaware, where he represented that company. After the absorption of the Sprague Company with the Edison General Electric Company, Mr. Hazelton was general sales agent of the Wenstrom Consolidated Dynamo & Motor Company, and advocated the use of the slow speed, single reduction motor for street car service, which has since become a standard. While assistant general manager of the Short Company Mr. Hazelton was active in bringing out the first gearless motor used in street railway service. He has always been employed in new fields of work, and we anticipate a large success for him and for the company of which he is the representative, in introducing the Arbel wheels into the American field.

WESTERN NOTES.

The Valley Steel Company, of Belleville, Ill., is the title of the new company which has purchased the works of the Belleville Steel Company which failed some time ago. The new company has a capital of \$400,000, and expects to have the plant running by January 1, giving work to 800 men.

Taylor, Dee & Mack, of Chicago, is the title of the firm which is carrying on the business formerly owned by Taylor, Goodhue & Ames. The firm is at 348 Dearborn Street Chicago, and is agent for the Burton electric car heater manufactured by the Burton Electric Company, of Richmond, Va., one of the earliest car heaters put upon the market.

McLure & Kaufman, of San Francisco, have recently opened an office at 216 Bush Street, that city, for the sale of general street railway supplies. They are agents of Pittsburgh Steel Hollow Ware Company, of Allegheny City, Pa. J. A. McLure is well known in the field, having recently been connected with Siemens & Halske, and before that with the Short Electric Railway Company and the Sprague Electric Railway & Motor Company.

The Walker Manufacturing Company, of Cleveland, O., as mentioned elsewhere in this issue, is proposing to add an electrical department to its extensive works. Its facilities for the manufacture of a line of high grade generators and motors are of the best, and the well known reputation of this company for turning out work of standard quality especially fits it for entering the electric railway field. Mr. Walker, in this connection, recently assured a representative of the STREET RAILWAY JOURNAL that this work will be done in an entirely separate department, and will in no way interfere with the company's regular work of manufacturing cable and hydraulic machinery for which the Walker Company is noted the world over.

The Scarritt Furniture Company, of St. Louis, informs us that it is receiving numerous inquiries from various parts of the country regarding its new double seats for street cars, similar to those supplied to the Lindell Railway and Compton Heights, Union Depot and Merchants' Terminal Railway companies, of St. Louis, and which have been illustrated in the columns of the STREET RAILWAY JOURNAL. These inquiries have not only come from street railway companies, but street railway car builders as well. The superiority of these seats has often been remarked upon, and the Scarritt Company thinks that their use for street railway purposes has been proven a great success in the case of the two St. Louis companies above mentioned.

The National Electric Company, is a new corporation organized at Eau Claire, Wis., to operate the plant formerly owned by the National Electric Manufacturing Company of that place. The officers of the new company are: A. L. Ide, president; Peter Truax, vice-president; F. P. Ide, secretary, and W. A. Rust, treasurer. The company has issued an announcement to all interested in electric lighting, to the effect that it is prepared to furnish alternating and direct current apparatus, multipolar power generators and motors, transformers of any capacity and voltage, as well as other electrical apparatus and appliances, promptly upon receipt of orders. To the former patrons of the National Electric Manufacturing Company is especially extended a cordial greeting, as well as a solicitation for a continuance of patronage. The company will take pleasure in quoting prices to all, and in furnishing other information desired relative to its apparatus, promptly upon application.

The McGuire Manufacturing Company, of Chicago, writes us that its adjustable traction truck is becoming more and more popular. These trucks have been in use for nearly a year on the Cicero & Proviso Street Railway, Denver Tramway and the Citizens' Street Railroad, Indianapolis, and in every case the new feature has proven to be all that is claimed for it. The peculiarity is the fact that all the traction is placed upon the four drive wheels, leaving the four small guide wheels to be simply what they are called, on a straight track. But the moment the truck enters a curve, an ingenious cam arrangement shifts any desired proportion of the load on to these drive wheels while in the curve, thereby preventing derailment. The Patent Office has granted patents on the claims made for this feature, and after a thorough search through the condition of the art, nothing is found that operates at all like it. It is an interesting device and proved decidedly attractive at the World's Fair.

The Central Electric Company, of Chicago, reports that its sales of Anti-thunderbolt oil paper show a large and increasing demand for a product of this nature, which is absolutely reliable. This paper is a preventive for short circuits and grounds when used in winding armatures, fields and converters, and is unsurpassed for electric manufacturing and repairing. It will resist the highest voltages, also the action of oil, water and dampness and the injurious action of chemicals and gases, and it does not break or tear when folded. The genuine oil paper is stamped "Anti-thunderbolt." This company also writes us that it has made large sales on the various grades of P. & B. paints and varnishes, which it is handling as general Western agent for the stan-

dard Paint Company. The company's stock represents the different grades of these products, put up in packages ranging from one gallon to a barrel. It has also gotten out a striking advertisement of "Okonite," in the form of a neat leather pocket watch safe which it is now distributing.

The Brownell Car Company, has recently delivered a trial order of fifty of its celebrated "Accelerator" cars to the West End Street Railway Company, of Boston, Mass. They are eighteen feet in length and of the West End Company's standard dimensions, style and finish, except that they are provided with the advantageous features of the "Accelerator" type of car. The car company has received the most flattering assurances that the "Accelerators" furnished are doing all that was expected of them and very much more, as shown by comparing the registers of the old style cars and the "Accelerators." A large number of "Accelerators" have recently been shipped to Brooklyn and Baltimore, and the same success and favor with the public are heard on all sides in those cities as well as in Boston. The Brownell patent electric motor truck has met with great favor among the street railway fraternity, and already it may be seen under cars in the principal cities of the country where electric cars are used. As is well known, the truck is of the non-oscillating type without the introduction of the extended spring base feature, the advantageous equalizing levers doing away with all oscillation of the car body.

The Metropolitan Electric Company, of Chicago, has added another very important name to its list of specialties—a new patented incandescent lamp. This is to be known as the "Metropolitan," and embodies the latest improvements in incandescent lamp manufacture. By the utilization of new and improved methods, the lamp offers, it is claimed, a very high efficiency, and that it will maintain its full candle power throughout its entire life. The company has also secured the entire output of H. T. Paiste's factory, and hereafter will market exclusively these specialties. The company is also gathering together a very important line of electric railway devices, prominent among which are the Standard Paint Company's P. & B. specialties, the "Anti-thunderbolt" oil paper, special glass insulators, N. I. R. feed wire, etc. The "Mac Tape," with which this company has had great success, is guaranteed to withstand the severest climatic changes, not to be affected by acids, and to possess qualities that no other tape in the market has. It sticks to the wire and not to the hands, and will not oxidize the wire. Its adhesive qualities are such that it is practically indestructible, and, hence, will not deteriorate with age.

The Shultz Belting Company, of Broadway and Barton Street, St. Louis, reports business as very steady considering the dullness of the times. The company's works are running full time mostly on small work. Promoters of electric railways and electric lighting plants, especially the larger ones, are sending in no orders until money is easier and their projects receive more encouragement. Hides are very cheap, but the stocks are low as in almost every other line of trade, and the inducements to buy are great, but the unwillingness and sometimes inability of the banks and trust companies to lend money have tended to throttle legitimate enterprise for the present, and the leather belt business feels the effects of such a state of affairs. Notwithstanding this, however, there are enough orders to keep the company's works in operation and give employment to their operators. The management has recently received some glowing testimonials from a number of its largest customers, testifying to the superiority of the Shultz patent woven leather belt and their rawhide belt. The company's representatives in New York and other Eastern cities, as well as in London, England report the prospects for the immediate future as very encouraging in the belting business.

The Heine Safety Boiler Company, of 706 Bank of Commerce Building, St. Louis, maker of high class, safety, water tube boilers, is pleased to state that its books are sufficiently full of orders to keep its works running steadily for some time to come. Among the company's recent orders is one for eight boilers of 375 H. P. capacity each, an aggregate of 3,000 H. P., for the Midwinter Exposition Company, at San Francisco, Cal. This contract was obtained in the face of the severest competition, and awarded to the Heine Company solely on the well known merits of its boilers. These boilers will supply the necessary power for the entire Midwinter Fair. They will serve as the Heine Company's exhibit at the Fair. The company's employes are now busily engaged in installing the boiler equipment in the new Planters House, at St. Louis, consisting of two boilers of 300 H. P. capacity each, an aggregate of 600 H. P. There are a number of new orders on the company's books, mostly of a small character. Boiler makers are awaiting the same prospects as those in other pursuits, and are looking forward to the decision of promoters of new railway and lighting stations. The management has received numerous responses regarding its new book entitled "Helios," which go far towards establishing the fact that the Heine Company can hold its own at all times on account of the superiority of its product.

The St. Louis Register Company, 603 Houser Building, St. Louis, maker of the celebrated Security fare register, reports that it is receiving many orders and its fare registers that have been on trial for some time past have proven to their users the superiority of the Security register, and orders have followed. The company has several trial registers in use on the lines of the Chicago City Railway Company, of Chicago, Ill., and they are sustaining the reputation of the firm for accuracy, durability and simplicity. The company confidently expects an order from this railway for 1,200 or more of its registers. Reference to the company's advertisement on page 96 in this issue will reveal a very good cut of its new combination register for registering both full and half fares or full fares and transfers, as desired. At the recent convention of the American Street Railway Association, at Milwaukee, Wis., in October, both the combination and single type of registers attracted a great deal of attention from the delegates. The

company reports among its late orders one for the equipment of the cars of the Philadelphia Traction Company, with its Security registers, as mentioned elsewhere in this issue. The company's transfer registers are meeting with especial favor, and the St. Louis Register Company has received many orders for this machine.

A. W. Slee, 500 American Central Building, St. Louis, representative of Wm. Wharton, Jr., & Company, Incorporated, of Philadelphia, Pa., states that that company has just completed laying twenty-eight miles of its standard six inch, seventy-eight pound girder rail for the Union Depot Railroad Company, of St. Louis. A large amount of this has replaced a fifty-seven pound "butterfly" girder rail which was laid in horse car days, and has not been able to stand the constant and heavy wear and tear of electric motor cars. The Wharton Company has been supplying the Union Depot Railroad and Lindell Railway companies with its new "Integral" work in crossovers, frogs and switches. Both these companies have adopted the "Integral" as their standard. The Lindell Railway laid some "Integral," built-up and cast iron work about the same time, and it is almost useless to say that the "Integral" has survived the other two. The built-up work has become loosened and rattles, and the cast iron work, also made by the Wharton Company, has worn away too quickly under the weight of the heavy forty-eight foot electric cars used by the railway company. The management of the Union Depot Railroad Company is very well satisfied with the groove rail crossovers supplied by the Wharton Company. Mr. Slee, the company's representative, expects a revival of trade as soon as the spring weather sets in when the money market will be settled and in a condition to lay tracks.

Thos. Ashburner, of 608 Security Building, St. Louis representative of the Babcock & Wilcox Company, reports that the boiler business in the St. Louis district is very brisk considering the little work that is being done on street railway and electric lighting power stations. However, the Babcock & Wilcox Company is getting its share of the water tube boiler business in St. Louis, an order for four boilers of 250 H. P. capacity each, aggregating 1,000 H. P., having recently been received from the Union Depot Railroad Company, of St. Louis, for future delivery; also one from the Missouri Electric Light & Power Company, of St. Louis, for two boilers of 250 H. P. capacity each, aggregating 500 H. P. These have already been installed, and are giving great satisfaction. Also a third order for four boilers of 250 H. P. capacity each, aggregating 1,000 H. P., for the St. Louis Terminal Railway Association, to be installed in the new Union Passenger Station at St. Louis. The company considers this last a great achievement, as the odds were very great against it from outside as well as local competition. The company now recognizes the importance and great advantage of locating a district office in St. Louis according to its representative, and the good will and wishes of steam users go with it in its elegant quarters in the new Security Building. The office has been located in St. Louis only a short time, and the above, besides many smaller orders, attest the wisdom of the move and the substantial progress already made in the St. Louis district.

Guido Pantaleoni, of 608 American Central Building, St. Louis representative of the Westinghouse Electric & Manufacturing Company, reports business as very brisk in the St. Louis district. A large 500 H. P. Westinghouse generator, direct coupled to the latest type of Westinghouse vertical engine of 500 H. P. capacity, has recently been installed in the incandescent lighting plant of the Missouri Electric Light & Power Company, of St. Louis. This is a duplicate of one of the set of direct coupled generators and engines exhibited by the Westinghouse Company at the World's Columbian Exposition. The electric lighting plant above mentioned is one of the largest in the country, and is operated entirely by Westinghouse apparatus, both engines and generators. It is a model of economic management, and attests the superiority of the Westinghouse Company's apparatus. The plant was lately doubled in size, and the additional property adjoining will soon be built upon if the company's present success continues. The Lindell Railway, Southern Railway and Compton Heights, Union Depot and Merchants' Terminal Railway companies all report in a most flattering manner regarding the Westinghouse single reduction motors used by them, and recently adopted as their standard. The new power station of the Lindell Railway Company is being installed with Westinghouse generators only. There are to be three generators of 750 H. P. each, direct coupled to three Porter-Allen automatic engines, built by the Southwark Foundry & Machine Company, of Philadelphia, Pa. This is the first railway power plant in St. Louis to be equipped with the Westinghouse Company's apparatus, and according to that corporation's St. Louis representative, it will not be the last.

Littlefield & Meysenburg, 806 Bank of Commerce Building, St. Louis, representative of the Johnson Company, of Johnstown, Pa., informs us that this company has received the contract from the General Electric Company, of New York, to supply the rails for the electric railway being built by that corporation in Belleville, Ill. Mr. Atterbury, of the Belleville Electric Railway Company, has just closed negotiations for the equipping of the road with the Johnson girder rail at that company's St. Louis office. An order has also been received, for future delivery, from the Baden & St. Louis Railroad Company which is practically the northern extension of the St. Louis Railroad Company's Broadway cable line. It calls for six miles of the Johnson Company's standard six inch, seventy-eight pounds to the yard girder rail. No fishplates will be used, but the rails will be welded together electrically, making a continuous line of rails from one end of the road to the other. A seventy-eight pound rail was adopted in order to conform to the standard size in use on the Broadway cable road. The rails will not be punched, but their ends will be welded together. They will not be welded to chairs and will have no base, as in former practice, but will be of the standard shape and dimensions. No track wiring will be necessary in this system, the rails themselves forming

a complete and continuous circuit. One of the Johnson Company's electric welding cars will be sent to St. Louis, and as the rails are laid they will be welded, current being taken for the purpose from the ordinary street railway circuit of 500 volts. It may be stated here that the Johnson girder rail is the standard used by the syndicate owning this line, as well as five others in the city of St. Louis. Other systems there have also adopted it as their standard.

Personal.

Mr. F. E. McCarthy, of F. E. McCarthy & Company, Boston, visited us last month while in New York.

Mr. S. A. Douglas has been appointed general sales agent of the General Incandescent Arc Light Company of New York.

Mr. Daniel F. Lewis, president of the Brooklyn City Railway Company, has been quite ill, but his friends will be glad to hear that he is recovering.

Mr. Edward E. Higgins, financial counsel and street railway expert, has moved his offices to the Havemeyer Building, 26 Cortlandt Street, New York.

Mr. Charles R. Henderson, president of the United States Trust Company, at a meeting of the Board of Directors of the Metropolitan Traction Company, held in this city last month, was elected a director and president of that company.

Mr. H. J. Medbery, president of the Fiberite Company, of Mechanicville, N. Y., and manufacturer of the Medbury insulation, called at our office last month. Mr. Medbury reports an increasing demand for the well known insulation of which he is the manufacturer.

Mr. G. J. Melms, formerly receiver and superintendent of the Milwaukee Electric Railway, sailed for France last month, and proceeded to Basle, Switzerland, to meet Mrs. Melms, who has been abroad for several months. After spending two or three months on the continent they will return to their Milwaukee home.

Mr. James Ross, principal owner of the Montreal Street Railway Company, and Mr. F. L. Wanklyn, engineer of the same company, visited the States last month, and inspected a number of street railway power stations in the vicinity of New York, for the purpose of comparing our methods of station equipment with those in vogue on the other side of the line.

Mr. A. N. Connett, chief engineer of the Baltimore Passenger Railway Company, visited New York last month, and gave us an interesting account of the progress of mechanical traction in Baltimore. The Passenger Railway Company has decided to change the remaining horse lines, about twenty-five miles, to electric traction at once, and plans are now being prepared.

Mr. W. J. Stephenson, president of the Metropolitan and Columbia railroad companies, of Washington, D. C., was a welcome visitor at our office last month. The operation of the storage battery cars on the Metropolitan lines has been suspended, and in case the consent of Congress can be obtained, some method of underground electric traction will, doubtless, be installed in the future.

Mr. Charles A. Schieren, head of the popular belt manufacturers, Charles A. Schieren & Company, who was elected, last November, Mayor of Brooklyn, commenced his term of office January 1, 1894. Mr. Schieren has announced it as his intention to conduct the city government of Brooklyn on the same lines which have made his own business successful, those in selecting his assistants on the ground of personal merit, and not for any political pull which they may be supposed to have. The appointments made by Mr. Schieren, already announced, indicate that this policy will be strictly adhered to. Brooklyn's new mayor was born in Germany in 1851, and he has been a resident of that city since 1856. Mr. Schieren was elected on the Republican ticket, and his majority, as will be remembered, was phenomenal in Brooklyn.

Obituary.

STEPHEN WILCOX, vice-president of the Babcock & Wilcox Company, New York and Glasgow, died, November 27, at his residence, 298 Washington Avenue, Brooklyn, N. Y., aged 63 years. The cause of his death was pneumonia. Mr. Wilcox was one of the founders of the Babcock & Wilcox Company, whose business was established in 1868.

Within a few weeks following the death of Mr. Wilcox, on December 16, at Plainfield, N. J., occurred the death of the other of the principal members of the Babcock & Wilcox Company, Mr. George H. Babcock, in the sixty-first year of his age. He was of great inventive and mechanical genius, and was a lecturer in the mechanical engineering course at Cornell University.

ALBERT B. PULLMAN, formerly vice-president of the Pullman Car Company, and late the head of the A. B. Pullman Company, of Chicago, died at his home in Evanston, Ill., December 18. His death, though rather sudden, was brought on by a complication of diseases superinduced by a severe attack of grippe two years ago. Mr. Pullman was born in Auburn, N. Y., in 1828. He moved to Grand Rapids in 1851, engaging in the furniture business there. From there he went to Chicago in 1860, where he became interested with his brother, George M. Pullman, in raising and moving buildings. When the Pullman Car Company was started he became actively connected with the construction of its cars, his mechanical ability standing him in good stead. Several years ago he retired from the Pullman Car Company, but other interests have kept him prominent in railroad circles.

New Publications.

Catalogue of Railway and Machinists' Tools and Supplies, January, 1894. Manning, Maxwell & Moore, 111 and 113 Liberty Street, New York. 1,103 pp. and nearly 6 000 engravings.

This volume is more of an encyclopedia of every possible tool, machine or supply that could be used in connection with railway or machine shop work. The index of separate classes occupies twelve and a half pages alone. The paper and binding are of very high grade and the illustrations gotten up in the best style. Each article is illustrated and described and the price quoted. This concern deals in the best forms of every article in its line, without regard to where manufactured, and the aim of this catalogue is to put into condensed form information of value to prospective purchasers of any sort of railway or machinists' tools or supplies. In this this firm has succeeded admirably, and aside from being a standard book of reference in its class it would be an ornament to any office library.

The C. & C. Electric Company.

The C. & C. Electric Company is the title of a new corporation which will continue the business carried on in the past by the C. & C. Electric Motor Company, this new company taking over the assets and assuming the liabilities of the C. & C. Electric Motor Company. The C. & C. Electric Company is provided with an ample capital, and through the acquisition of a large and thoroughly equipped factory at Garwood, N. J., will have greatly increased facilities for the manufacture of electrical machinery and for the prompt and thorough performance of such contracts as may be entrusted to it. The manufacture of dynamos and generators has within the last two years become an important feature in the business of the old company, and it seemed desirable on the organization of the new company to make the slight change indicated in the name, the old title having become to some extent a misnomer. The general management of the company and the interests represented by it remain unchanged.

Technical Instruction by Correspondence.

The Correspondence School of Technology, recently organized in Cleveland, O., by E. P. Roberts, M. E., and whose prospectus and plans were recently noted in the columns of the STREET RAILWAY JOURNAL, has gotten out the first of its lecture courses. The lecture on Mechanical Drawing contains a full and explicit description of all the instruments and apparatus used, and directions for their use and care, with full details of the process of making a finished drawing, and numerous exercises. The lecture on Constructive Geometry contains a full summary of the science of constructive drawing, with definitions, problems and exercises. Return blanks are also furnished with each lecture for questions on the problems contained therein.

These lecture courses, to judge from the first of the series, will be an invaluable aid to anyone who, from business or other reasons, is prevented from attending technical schools or colleges. Later lectures will cover, in the same comprehensive manner, different branches of mechanical science.

The Fulton Truck & Foundry Company.

The Fulton Truck & Foundry Company is the title of a new company which has been incorporated to succeed the Fulton Foundry Company. The company has two acres of land in the city of Mansfield, O., on which it is building a large truck shop, the dimensions of which are 60x175 ft. The building is of brick. On the balance of the land the company expects to build a large foundry and a frog and crossing shop. On December 11, the following directors were elected: W. E. Haycox, C. J. Langdon, Jr., of Cleveland, and Reid Carpenter, S. N. Ford, M. D. Bushnell, W. S. Cappeller and G. W. Hancock, of Mansfield. On December 12, the directors elected the following officers: W. E. Haycox, president and general manager; M. D. Bushnell, vice-president; C. J. Langdon, secretary and treasurer.

The company writes that it will have the most complete outfit for the manufacture of street railway supplies in Mansfield, that can be found in the country, and that the foundry and machine shop in Cleveland will be retained. The company expects to be ready by February 1 to manufacture trucks and other railway supplies at Mansfield.

"394."

This is the name of a preparation, which when applied in small quantities to ordinary steam coal, will increase its firing properties from 10 to 20 per cent. This preparation is controlled for the Western and Northwestern States by the Northwestern Land & Coal Company, which quotes in its circulars testimonials from a number of steam users, which show a saving of from 20 to 33 per cent. in coal and of about 25 per cent. in ashes. To settle the question as to the value of this compound, a test was made in June, 1892, under the direction of Prof. Carpenter, of Sibley College, at the request of the editors of *Power*. This test was made with two kinds of coal, anthracite grate and bituminous slack, with and without treatment by the compound. The results showed that with anthracite grate under a small vertical boiler a saving of 9 per cent. in fuel was made, and with bituminous slack a saving of 16 per cent. This compound also prevents to a large extent the formation of smoke.

This company also controls the "Baker Process" for the manufacture of briquets of culm and lignite, or brown coal. These briquets make a quick, hot fire and lessen the smoke, and are especially valuable for use in locomotives, steamboats and domestic use.

List of Street Railway Patents.

ISSUED BY THE U. S. PATENT OFFICE, NOVEMBER 7, 1893, TO NOVEMBER 28, 1893, INCLUSIVE.

Prepared by E. W. Cady, Patent Solicitor, 99 Nassau Street, New York City.

NOVEMBER 7.

COMBINED RAIL SUPPORT AND CROSS TIE—Francis P. Reilly, New York, assignor by mesne assignments to the Johnson Company, of Pennsylvania. No. 508,049.

A metallic cross tie provided with vertical stamped up lugs and having a rail chair of box form fastened to a chair, the vertical webs of the chair being secured to the vertical lugs of the tie. The vertical webs of the chair are welded to the vertical lugs of the tie.

AN ELECTRIC RAILWAY SYSTEM—Carl T. B. Brain, Liverpool, Eng. No. 508,083.

A railway or tramway having a slotted power conduit is provided with a continuous cover for such conduit, consisting of hard bars or rail forming a bridge over the conduit slot, capable of supporting the road traffic and also being of a material capable of flexure, the bars or rails being connected together and adapted, by reason of their flexure, to be raised from the slot and in rear of the cover raising devices, to seat themselves. Also claims other specific details of construction.

SAFETY APPARATUS FOR ELECTRIC OR OTHER STREET RAILWAY CARS—William Cox, Hamilton, Can. No. 508,089.

An electric or other street railway car is provided with a safety device consisting of a rectangular frame double jointed at the corner, covered with wire cloth, netting or equivalent material and hinged to a gauge bar secured to the ends of the street car.

RAILWAY SWITCH—Edward B. Entwisle, Johnstown, Pa., assignor by mesne assignments to the Johnson Company, Pennsylvania. No. 508,095.

A spring switch constructed with a box or receptacle for the spring formed with a removable side for inserting and access to spring. The top of the box is provided with two inclines.

CONDUIT RAILWAY TROLLEY—Herbert A. Goreham, Decatur, Ill. No. 508,104.

A trolley for underground wire comprising a vertically slotted bracket, the trolley standard in the slot of the bracket, and the springs connecting the standard with the bracket and tending to force the standard downward.

CLOSED CONDUIT ELECTRIC RAILWAY—Otis B. Benton, Cleveland, O. No. 508,199.

Comprises a conduit for the feed wire, a service boxing or channel and towers connecting said conduit and boxes in connection with insulated flexible caps closely covering the tops of said towers, and contact makers in the towers passing through said caps and affixed thereto. Also embraces in an electric system, a movable contact maker, a current conveyor connected with the car and insulated means before and behind the said conveyor to depress said contact maker into contact.

CONDUIT ELECTRIC RAILWAY—Jacob Pawolowski, Cincinnati, O. No. 508,236.

Comprises in an underground conduit for an electric railroad, plain sections and interposed manhole sections having a continuous slot for the trolley arm, a downwardly projecting flange from one side of said slot, an upwardly spring-pressed trolley arm, a guard wheel carried by said arm and bearing normally upon the under edge of said flange, a trolley wire, hangers for supporting it from the top of the conduit, a main wire and feeders connecting the main and trolley wire.

ELECTRIC CAR ATTACHMENT—Isaac H. Davis, South Butte, Mont. No. 508,373.

Provides a car floor or analogous covering having an electric motor beneath the same and provided with an opening therethrough, with a metallic frame secured against the under side of the floor, and projecting inwardly beyond the walls of said opening to form supporting flanges, a cushion interposed between the said frame and the floor and covering said flanges, a plate of glass mounted in said opening and resting on the said cushion, and a guard hingedly mounted above the said plate of glass and having a series of openings therein.

NOVEMBER 14.

PASSENGER VEHICLE—John DeWitt, Washington, D. C. No. 508,414.

A passenger conveyance having a series of vertically adjustable seats arranged in step-by-step order and each provided with a foot rest.

FENDER FOR ELECTRIC CARS, ETC.—Caleb N. Homan, Lawrence, Mass. No. 508,472.

A car fender provided with a series of plates arranged in front of the car, each plate being carried by two or more coil springs, the outer ends of which are secured to an angular bar whereby each plate can yield independently of the other.

ELEVATED RAILWAY—Lysander Johnston, Chicago, Ill. No. 508,478.

An elevated railway structure comprising a plurality of yokes and supports therefor, said yokes being of inverted U shape and provided at the lower end with inwardly extending and upturned arms, and track rails of inverted U form, in cross section, resting upon and supported by the upturned lower ends of the said yoke.

ELECTRIC RAILWAY TROLLEY—Stephen D. Field, Stockbridge, Mass. No. 508,539.

A magnetically adhesive trolley for electric railways, embodying a wheel composed of magnetic metal and carrying two co-operating

coils, both adapted to be energized from a main conductor, but having one of said coils adapted to be connected to a return conductor and outside of the motor section, and the other adapted for connecting with the motor circuit.

CAR FENDER—Alfred L. Clarke, Springfield, O. No. 508,565.

A fender for railway cars consisting essentially of a fender frame supported on suitable flange wheels, which wheels are adapted to rest on and follow the track on which the car runs, a connecting bar from said fender frame to the main car supporting frame or truck, said connecting bar being at one end pivotally connected to said fender frame and at the other end to said car frame or truck.

CONDUIT FOR ELECTRIC RAILWAYS—Archibald J. Robertson, New York. Assignor to himself, George S. Brush, Brooklyn, N. Y., and Henry Carey, Elm Park, N. Y. No. 508,578.

A conduit or receptacle for naked electric wire having a storage capacity for water and having an inner surface of insulating material, whereby the water that may collect therein will be electrically insulated from the air.

ELECTRIC RAILWAY—John C. Henry, Westfield, N. J. No. 508,615.

Provides an electric railway, a series of poles arranged alternately on opposite sides of the roadway, a working conductor and short guy wires running out from each pole to said conductor. The working conductor is arranged in a zigzag or sinuous line in a horizontal plane, and there is used in connection therewith a car provided with a laterally movable trolley. Also in an electric railway, in which the track forms the grounded return conductor, a supplemental return conductor of comparatively high resistance connected at intervals with the track.

ELECTRIC CAR LIGHTING SYSTEM—John C. Henry, Westfield, N. J. No. 508,616.

Combines a series wound motor, an adjustable resistance in series therewith, a lamp or lamps controlled by the resistance, and means, substantially as described, adapted to increase the resistance when the motor exceeds a pre-determined speed and diminish the resistance when the motor falls below such pre-determined speed.

ELECTRIC RAILWAY TROLLEY—Walter H. Knight, New York. No. 508,622.

Combines with a suspended supply conductor, an electrically propelled vehicle and intermediate contact device, consisting of a trailing rod attached to one end of the car by a transverse pivot and carrying at its opposite end the contact device bearing upon the upper side of the supply conductor.

FLUID PRESSURE DEVICE FOR CONTROLLING ELECTRIC MOTOR—Horace F. Parshall, Lynn, Mass. and John W. Darley, Jr., Baltimore, Md., assignors to the General Electric Company, Boston, Mass. No. 508,630.

In a system of controlling electric motor, a source of fluid pressure, a cylinder carrying electric contacts and adapted by its rotation to vary the speed of an electric motor and means substantially as described, operated by the fluid pressure and adapted to rotate the cylinder.

CAR FOR ELEVATED RAILWAYS—John L. Pope, Cleveland, O. No. 508,631.

A car for elevated railways, forked at its under portion and adapted to be set astride a railway track, said car having an upper compartment and also compartments in the lower forked portion, a truck situated in the fork above the level of the track, and at the end of the car a platform extending across the track near the level, stairs leading to the platform from the lower compartments at the opposite sides of the car, and other stairs leading up from the other compartments.

SNOW SWEEPER—Norman C. Bassett, Lynn, Mass., assignor to the Thomson-Houston Company, of Connecticut. No. 508,668.

Comprises in a sweeper a carrier, a frame pivoted thereon and a rotary broom and motor geared together and supported on said frame on opposite sides of the pivot.

TROLLEY FOR ELECTRIC RAILWAYS—Norman C. Bassett, Lynn, Mass., assignor to the Thomson-Houston Company, of Connecticut. No. 508,669.

Embraces a pivoted trolley having tension springs attached to a toggle lever, a pawl to engage with the pole socket piece when the toggle is tripped and the pole drops and an arm on the toggle leader to normally hold the pawl out of engagement.

SWITCH FOR ELECTRIC RAILWAYS—Edward M. Bentley, New York. No. 508,672.

Combines with the main and branch conductors of an electric railway a switching conductor normally spring-pressed against the main conductor, a trolley pole carrying at its upper end a grooved contact device running in engagement with the other side of the conductor, and means for automatically depressing said conductor, below the normal plane of the main conductor at the junction, whereby said contact is enabled to pass from the main to the branch line without a jar.

BRAKE APPARATUS FOR ELECTRICALLY PROPELLED CARS—Francis O. Blackwell, New York, assignor to the Thomson-Houston Company, of Connecticut. No. 508,673.

Combines with a vehicle a brake shoe and an operating device for said brake shoe consisting of a rope attached thereto and wound loosely on the axle of the vehicle, and devices for tightening said rope on the axle irrespective of its direction of rotation, whereby in each direction of progress of the vehicle the tightening of the rope on the axle operates the brake shoe. Also embraces a brake actuated by the power of

the vehicle and the common controlling device for said brake and the motor.

ELECTRIC RAILROAD TRACK CLEANER—Hugh O'Connor, Passaic, N. J. No. 508,743.

Combines with a vehicle, a swinging arm pivotally secured thereto, a reversible metallic shoe secured to the lower end of said arm and provided with a brush and a rubber scraper, with means for operating the same.

ELECTRIC BRAKE FOR RAILWAYS—Armand de Bovet, Paris, France. No. 508,805.

A brake having a groove in its working face, an electric coil arranged to magnetize the parts of the pulley separated by said groove, a flexible plate carrying iron brake shoes entering said groove in the pulley and a circuit for the coil.

LIFE PRESERVING GUARD FOR CARS—Anton Knoblauch, Minneapolis, Minn. No. 508,888.

A life guard immovably secured to the end of the car, consisting of an upright portion and a lower and outwardly projecting portion, springs extending longitudinally and transversely between the ends of said parts, and a flexible facing covering said spring and having a corrugated surface.

REMOVABLE FRONT FOR STREET CARS—Preston W. Lupter, Pittsburgh, Pa. No. 508,892.

A detachable weather guard for street and other railway cars, consisting of a frame fitted with glass and constructed to conform to the contour of the overhanging portion of the roof, an outwardly flaring plate arranged at the base of the frame adapted to fit neatly above the apron of the platform, and means substantially as described for attaching the said guard in position.

NOVEMBER 21.

ELECTRIC RAILWAY CONDUIT—Granville T. Woods, New York, assignor to the Universal Electric Company of the City of New York. No. 509,065.

Comprises in an electric railroad system, an insulated lead or leads of the main circuit, a series of boxes having interior contact devices with which the main circuit is connected, each box being charged with oil or other insulating fluid in which the contacts are immersed, and having a porous medium or portion through which the oil exudes and coats the exterior of the box and its connections, and a switch arm carried by the box and controlling the inclosed main circuit contacts, and adapted to be operated by a contact brush or device carried by the passing car.

ELECTRIC RAILWAY—John H. Dale, New York, assignor to the Universal Electric Company of the City of New York. No. 509,072.

Comprises in an electric railway a fixed closed box, its contained contact with which the insulated lead of the circuit is connected, a shaft partly inclosed within and having its bearing in the box, its contact within the box, a spring within the box and acting upon the shaft to maintain its normal position, and a laterally projecting switch contact arm adapted to be operated by and make contact with the contact shoe of a passing car.

A TROLLEY MECHANISM—James T. Fuller, Calvert, Texas. No. 509,123.

A trolley pole having a yoke pivotally mounted thereon and provided with wings adapted to engage with said pole and limit the pivotal motion of said yoke.

SUPPLY SYSTEM FOR ELECTRIC RAILWAY—John C. Henry, New York. No. 509,312.

Embraces in an electric railway a track composed of insulated sections, continuous line conductors, branch circuits from said line conductors including the primaries of converters, and local circuits from the track sections including the secondaries of said converters, and adapted to be completed on the passage of the car.

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CONDUIT ELECTRIC RAILWAY—Adolph Worner, Buda-Pesth, Austria-Hungary, assignor to Siemens & Halske, Berlin, Germany. No. 509,421.

Embraces a subway including a series of yokes, each made in a single piece and comprising top horizontal bearing portions having adjacent vertical flanges, a traction and a guard rail mounted and secured on the said bearing portion respectively and provided with under shoulder to engage the said vertical flanges of the yoke; together with current conductors located oppositely in the same horizontal plane in said subway.

CONDUIT ELECTRIC RAILWAY—Edward H. Johnson, New York. No. 509,622.

A conduit for electric railways, having a conductor chamber, the diameter of which increases continuously from its surface opening to its bottom, and said opening being the full width of the chamber at that point.

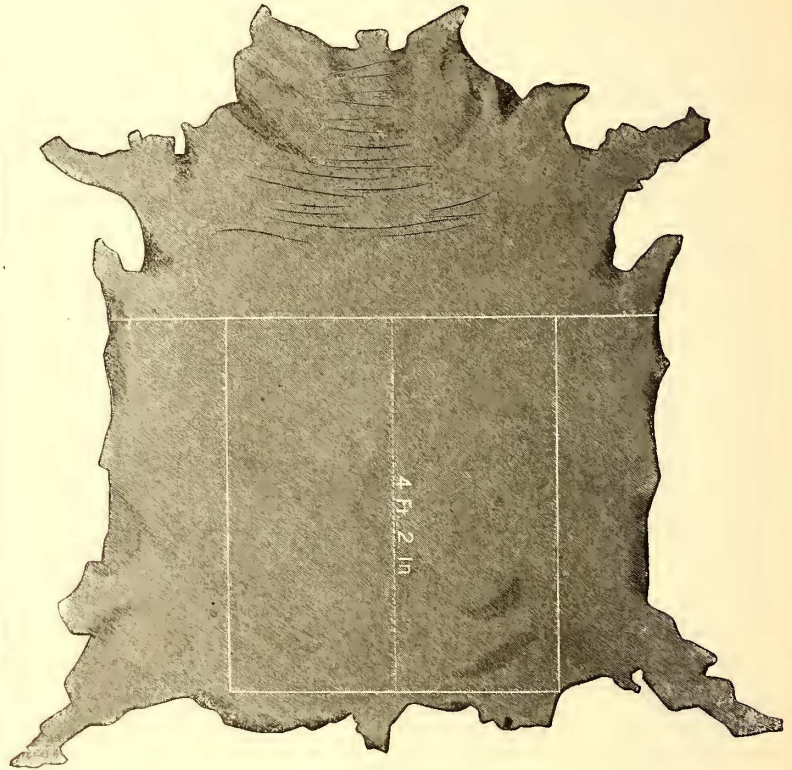
CAR FENDER—Ivory Bean, Brooklyn, Mass. No. 509,646.

A car fender composed of a series of bars shaped to form a forwardly extended crane, and a series of independently yielding wings or plates attached at their upper end to the frame and extended downwardly to a point just above the track, each of said wings or plates being adapted to yield at its lower end, while its upper end remains in a fixed position.

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.

WHAT IS "SHORT LAP" BELTING?

In the broad sense of the term, "short lap" would seem to indicate two short laps joined together. This is, however, erroneous as applied to belting. Most belt users are, doubtless, aware of this, but in order to avoid any misconception of the term, the Chas. Munson Belting Company makes the following explanation: The cut shows the part of the hide used in the construction of the company's Eagle belt. It will be apparent at a glance that these centers do not embrace any portion of the shoulder which lacks firmness and substance, but consist only of the best part of the hide, embodying uniformity in thickness and tensile strength. No centers exceeding four feet two inches long when cut from the rough part of the hide, as shown in the cut, are used. This represents the best stock obtainable for leather belting, and is called "short lap." A great deal of so called first class belting sold as "short lap," it is said, contains a large portion of the shoulder, which, aside from an inferior tannage, has other serious defects, caused by the inequality of substance and tensile strength, rendering the life of such a belt of very brief duration. This is one of the reasons why the Munson Eagle belt



has gained the reputation it possesses. It is strictly short lap, faultlessly constructed and guaranteed to give the best satisfaction.

The makers claim that ever since the introduction of the Munson belt there has never been a piece found in the belts longer than four feet two inches.

This company reports trade picking up wonderfully within the past two weeks, having received a number of large orders. The company's general trade is also picking up, and on account of the introduction of improved machinery and present capacity, it is in shape to conveniently increase its trade and execute all orders promptly. This company guarantees no delay in the prompt execution of orders, all of which have the proprietor's personal attention.

Comfort For Passengers.

Street car passengers now demand greater comfort, as well as greater speed, than formerly—much as it seems to be a necessity of the times in railroad travel.

The whole equipment of the railroads has been immensely improved within a very few years, and street and elevated cars are the next to demand reasonable comforts, such as comfortable seats, good light, speed, warmth and ventilation. Nothing is more conducive to the passengers' comfort than a comfortable and roomy seat; this the new Scarritt street car seat supplies. This seat faces in the direction the car travels; it is high backed, deep and spring seated, and the passenger enjoys a privacy which is impossible in old style seats.

The Lindell Railway, of St. Louis, has had in use for some time between 300 and 500 of these seats, and an extract of a letter from the general superintendent reads as follows: "Your seats are giving entire satisfaction, and I trust we shall always have the same favorable opinion that we now have." This seat is manufactured by the Scarritt Furniture Company, of St. Louis, at its car seat factory. It has equipped nearly 200 of the steam railroads of this country, as well as roads in ten foreign countries.

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., Dec. 18.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes sections for STOCKS (Albany R. R. Co., Watervliet Turnpike & R. R. Co.) and BONDS (Albany R. R. Co., Watervliet Turnpike & R. R.).

BALTIMORE STOCKS AND BONDS.—Corrected by HAMBLETON & Co., Bankers, 9 South Street, Baltimore, Md., Dec. 18. Stock quotations are prices per share.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes sections for STOCKS (Balto. City Pass. Ry. Co., Union Pass. Ry. Co., Balto. Traction Co.) and BONDS (Central Pass. Ry., Union Ry. Co., City & Sub. Ry. Co., Balto. Traction Co., Balt. Trac. Co., City Pass. R. R. Co.).

BOSTON STOCKS.—Corrected by R. L. DAY & Co., 40 Water Street, Members of Boston Stock Exchange, Dec. 18. Stock quotations are prices per share

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes sections for STOCKS (West End Pref., West End Com'n) and BONDS.

BROOKLYN STOCKS AND BONDS.—Corrected by C. E. STAPLES & Co., 215 Montague Street, Brooklyn, Dec. 18. Stock quotations are per cent values.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes sections for STOCKS (Brooklyn City R. R. Co., Brooklyn Traction Co., Coney Island & Brooklyn R. R. Co., Long Island Traction Co.) and BONDS (Broadway R. R. Co., Brooklyn Traction Co., Coney Island & Brooklyn R. R. Co., South Brooklyn Central R. R. Co., Brooklyn City R. R. Co.).

CHARLESTON STOCKS AND BONDS.—Corrected by A. C. KAUFMAN, Charleston, S. C., Dec. 18. Stock quotations are prices per share.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes sections for STOCKS (Charleston City Ry. Co., Enterprise Ry. Co.) and BONDS (Charleston City Ry. Co., Enterprise Ry. Co.).

CHICAGO STOCKS AND BONDS.—Corrected by WILLIAM B. WRBNN, 167 Dearborn Street, Chicago, Ill., Dec. 18.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes sections for STOCKS (Chicago City, Chicago Passenger, North Chicago City, West Division City, West Chicago Street) and BONDS (Chicago City, Chicago Passenger, North Chicago City, West Chicago Street).

CINCINNATI STOCKS AND BONDS.—Corrected by Geo. Eustris & Co., Bankers and Brokers, 26 West Third Street, Cincinnati, Dec. 18. Stock quotations are per cent values.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes sections for STOCKS (Cincinnati, Mt. Adams & Eden Park, Mt. Auburn Cable, Cln. Inclined Plane Ry., Cln. Newport & Cov. St. Ry.) and BONDS (Cincinnati Street, Mt. Adams & Eden Park, Cln. Inclined Plane Ry., S. Covington & Cincinnati).

CLEVELAND STOCKS AND BONDS.—Corrected by W. J. HAYES & SONS, Bankers, Cleveland, O., Dec 18.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes sections for STOCKS (The Cleveland Electric Ry. Co., The Cleveland City Ry. Co.) and BONDS (The Cleveland Electric Ry. Co., City).

DETROIT STOCKS.—Corrected by CAMERON CURRIE & Co., Bankers and Brokers, 82 Griswold Street, Detroit, Dec. 18.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid., Ask'd. Includes Fort Wayne & Belle Isle Ry. Co., Detroit Citizens Street Ry. Co., Wyandotte & Detroit River Ry.

HOLYOKE STOCKS.—Corrected by J. G. MACKINTOSH & Co., Bankers, Holyoke, Mass. Dec. 18.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid., Ask'd. Includes Springfield Street R. R. Co., Holyoke Street R. R., Northampton Street R. R.

LOUISVILLE STOCKS AND BONDS.—Corrected by ALMSTEDT BROS. Stock and Bond Brokers, 510 West Main Street, Louisville, Ky., Dec. 18.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid., Ask'd. Includes Louisville St. Ry. Co., Louisville St. Ry. Co., Louisville St. Ry. Co., 1st mort., Louisville City Ry. Co., Central Passenger Ry. Co., New Albany St. Ry. 1st Mort.

NEW HAVEN STOCKS AND BONDS.—Corrected by H. C. WARREN & Co., Bankers and Brokers, New Haven, Conn. Dec. 18. Stock quotations are prices per share.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid., Ask'd. Includes F. Haven & Westville R. R. Co., State Street Horse R. R. Co., New Haven & W. Haven R. R. Co., New Haven & Cent'l H. R. Co., Whitney Ave. Ry. Co., Bridgeport Horse R. R. Co., Hartford & Wethersfield Horse R. R. Co., State Street Horse R. R. Co., New Haven & W. Haven R. R. Co., Bridgeport Horse R. R. Co., Hartford & Wethersfield Horse R. R. Co., Deb. Series A., Hartford & Wethersfield Horse R. R. Co., Deb. Series B., Hartford & Wethersfield Horse R. R. Co., Deb. Series C.

NEW ORLEANS STOCKS AND BONDS.—Corrected by GEORGE LE SASSIER, 174 Common Street, New Orleans, La., Dec. 22. Stock quotations are prices per share.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid., Ask'd. Includes Carrollton R. R. Co., Crescent City R. Co., Canal & Claiborne R. R. Co., New Orleans City & Lake Co., Orleans R. R. Co., St. Charles Street R. R. Co., Canal & Claiborne Sts. R. R., Crescent City R. R. 1st Mort., N. O. City R. R. Co., N. O. & Carrollton R. R. Co., St. Charles Street R. R. Co.

MONTREAL STOCKS AND BONDS.—Corrected by GORDON STRATHY & Co. Members Montreal Stock Exchange, 9 St. Sacramento Street, Dec. 18. Stock quotations are per cent. values.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid., Ask'd. Includes Montreal St. Ry. (p'd up sh.), Montreal St. Ry.

NEW YORK STOCKS AND BONDS.—Corrected by JAMES MCGOVERN & Co., 6 Wall St., New York, Dec. 18.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid., Ask'd. Includes Bleeker St. & Fulton Ferry, Broadway & Seventh Avenue, Cen'l Park, North & East River, Central Cross-town, Dry Dock, E. B'way & Battery, 42d & Grand St. Ferry, 42d St., Manhat. & St. Nich. Av., Eighth Avenue, Houston, W. St. & Pav. Ferry, Second Avenue, Sixth Avenue, Third Avenue, 23d St., Ninth Avenue, Union Railway Co., Bleeker St. & Fulton Ferry, B'way & 7th Ave., 1st mort., 2d mort., Broadway Guaranteed 1sts, 2ds Interest as rental, Cen'l Park, North & East River, Central Cross-town—1st mort., Dry Dock, E. B'way & Battery, 1st mort., Scrip (can be called at par), 42d St. Manhat. & St. Nich. Av., 1st mort., 2d mort., Income bonds, Eighth Ave., Scrip., Houston, W. St. & Pav. F'ry, 1st, Second Avenue, 1st mort., Third Avenue, 23d St., Union Railway Co.

PHILADELPHIA SECURITIES.—Corrected by HUEN & GLENDINNING, 143 South Fourth st. (Bullitt Building), Philadelphia, Dec. 18. Stock quotations are prices per share.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid., Ask'd. Includes Citizens', Continental, Frankford & Southwark, Germantown, Green & Coates, Hestonville, Lombard & South, People's Traction Co., Philadelphia City, Philadelphia & Gray's Ferry, Philadelphia Traction (50 pd.), Ridge Avenue, Second & Third, Thirteenth & Fifteenth, Union, West Philadelphia, Metropolitan (N.Y.) Traction, Baltimore Traction, Buffalo (N. Y.) Railway, Newark (N. J.) Passenger, Pitts. & Birmingham Trac. Co., Baltimore Traction 1st Mort., Balt. Tr., No. Balt. Div., Gold, Germantown, 1st mort., 2d mort., Hestonville, 1st mort., 2d mort., People's, 1st mort., Cons. mort., West Philadelphia, 1st mort.

OMAHA STOCKS AND BONDS.—Corrected by RICHARD C. PATTERSON, Banker and Broker, 907 N. Y. Life Building, Omaha, Neb., Dec. 18.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes stocks like Omaha St. Ry. Co. and bonds like Omaha St. Ry. Co.

PITTSBURGH STOCKS AND BONDS.—Corrected by JOHN B. BARBOUR, Jr 306 Times Bldg., Pittsburgh, Pa., Dec. 18. Stock quotations are prices per share.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes stocks like Central Traction R. R. Co. and bonds like Citizens' Traction R. R. Co.

PROVIDENCE STOCKS AND BONDS.—Corrected by CHACE & BUTTS Bankers, Providence, Dec. 18.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes United Traction & Electric Co. bonds.

ROCHESTER, BUFFALO, PATERSON, COLUMBUS, WORCESTER AND BOSTON STOCKS AND BONDS.—Corrected by E. W. CLARK & Co., 139 So. Fourth St. (Bullitt Building), Philadelphia, Dec. 18.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes Rochester (N.Y.) Ry., Buffalo (N.Y.) Ry., Paterson (N.J.) Ry., Columbus (O.) St. Ry., North Shore Traction Co., Worcester Traction Co., and Consol. Trac. Co. (N.J.).

SAN FRANCISCO STOCKS AND BONDS.—Corrected by PHILIP BARTH, Broker, 440 California Street, San Francisco, Cal., Dec. 18.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes stocks like California St. Cable Co. and bonds like Ferries & Cliff House.

ST. LOUIS STOCKS AND BONDS.—Corrected by JAMES CAMPBELL, Banker & Broker, Rialto Building, 218 N. 4th St., Dec. 18. Stock quotations are prices per share.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes stocks like Cass Ave. & Fair Grounds and bonds like Citizens' Cable.

WASHINGTON STOCKS AND BONDS.—Corrected by CRANE, PARRIS & Co., Bankers, 134 F Street, N.W., Washington, D. C., Nov. 18. Stock quotations are prices per share.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid, Ask'd. Includes stocks like Wash'ton & Georgetown R.R. and bonds like Wash'ton & Geo'town conv't.

Financial.

THE Fort Lee (N. J.), Leonia & Hackensack Electric Railway Company has been placed in the hands of a receiver by Chancellor McGill. The railroad company has laid about a mile of track.

THE Lynn (Mass.) & Boston Railroad Company has asked permission to lease all the rights, franchise and property belonging to the Boston & Revere Electric Street Railway Company.

THE directors of the West End Street Railway Company, of Bos-

ton, have declared a dividend of 3 per cent. on common, and 4 per cent. on preferred, payable January 1. This is a reduction of 1 per cent. on common.

\$ \$ \$

THE Sioux City street railway companies, it is reported, will combine. A new company has been organized in that city by John Pierce, A. E. Pierce, Peter and Chrys Moller and H. A. Johns. The company is capitalized at \$1,000,000, with offices in New York and Sioux City.

\$ \$ \$

THE Connecticut State Board of Equalization has increased the value of the following New Haven street railway stocks for taxation as follows: Fair Haven & Westville Horse Railroad Company, from \$25 to \$40 per share; State Street Horse Railway Company, from \$25 to \$30.

\$ \$ \$

CHARLES GREEN, president of the People's Railroad Company, of St. Louis, has issued a call for a meeting of the directors of that corporation to authorize the issue of \$150,000 gold bonds. The object of this is to convert the Fourth Street & Arsenal Street Railroad from horse cars to an electric line.

\$ \$ \$

THE Union Street Railway Company, of New Bedford, Mass., appeared before the railroad commissioners December 18, on a petition for permission to increase the capital stock of the company to the sum of \$240,000, and for permission to issue \$500,000 of first mortgage or consolidated mortgage bonds.

\$ \$ \$

THE Paterson (N. J.) Railway Company submits the following statement of its operations for November: Gross earnings, 1893, \$18,680.51; 1892, \$20,950.26; decrease, \$2,269.75. Operating expenses, 1893, \$11,838.71; 1892, \$12,927.41; decrease, \$1,088.70. Net earnings, 1893, \$6,841.80; 1892, \$8,022.85; decrease, \$1,181.05.

\$ \$ \$

THE Columbus (O.) Street Railway Company submits the following statement of its operations for November: Gross earnings, 1893, \$41,150.25; 1892, \$37,004.27; increase, \$4,145.98. Operating expenses, 1893, \$24,182.41; 1892, \$23,388.86; increase, \$793.55. Net earnings, 1893, \$16,967.84; 1892, \$13,615.71; increase, \$3,352.13.

\$ \$ \$

THE Pittsburgh (Pa.) & Birmingham Traction Company submits the following statement of its operations for October: Gross earnings, 1893, \$25,123.78; 1892, \$29,681.61; decrease, \$4,557.83. Operating expenses, 1893, \$13,578.07; 1892, \$13,295.42; increase, \$282.65. Net earnings, 1893, \$11,545.71; 1892, \$16,386.19; decrease, \$4,840.48.

\$ \$ \$

THE Lynn & Boston Street Railway Company reports for the year ended September 30 as below, the returns including the East Middlesex road from May 1, 1893: Gross earnings, \$1,136,653; operating expenses, \$815,838; net earnings, \$320,815; charges, \$224,977; balance, \$95,838; dividend (8 per cent.), \$80,000; surplus, \$15,838; total surplus, \$77,748.

\$ \$ \$

THE North Shore Traction Company, of Lynn, Mass., submits the following statement of its operations for October: Gross earnings, 1893, \$94,852.75; 1892, \$87,975.07; increase, \$6,867.68. Operating expenses, 1893, \$62,868.09. Net earnings, 1893, \$31,974.66. We are unable to give the operating expenses and net earnings for 1892, as the various companies now comprising the system were operated separately.

\$ \$ \$

THE following is an abstract of the showing made by the Lowell (Mass.) and Suburban Street Railway Company to the railroad commissioners: Gross income, \$272,961.50; operating expenses, \$185,382.73; taxes, \$4,522.17; interest, \$45,021.85; dividends, \$21,000. Surplus for year, \$21,556.92; total deficit, \$8,827.19; capital stock, \$400,000; funded debt, \$905,000; unfunded debt, \$365,255.43; cash assets, \$65,539.69; total property assets, \$1,670,255.43. Miles run during year, 1,276,257; passengers carried, 5,573,627.

\$ \$ \$

THE annual report of the United Electric Railway Company, of Nashville, Tenn., submitted December 12, 1893, showed that the company had a satisfactory business during the past year. The aggregate number of passengers hauled, from November 30, 1892, to November 30, 1893, was 6,481,193 as against 6,616,230 for the preceding twelve months. The expenses were reduced over \$5,000 as compared with last year, and the percentage of operating expenses to gross earnings is estimated to be 59.91 per cent.

\$ \$ \$

THE agreement of consolidation between the Houston, West Street & Pavonia Ferry, the Broadway and the South Ferry railroad companies, of New York city, was filed December 14 with the county clerk. The name of the new company will be the Metropolitan Street Railway Company. The capital stock of the new company is to be \$8,200,000. The directors of the company are: Herbert A. Vreeland, Daniel B. Hasbrouck, Thomas F. Ryan, Charles E. Warren, R. Somers Hayes, Albert W. Fletcher, Hans S. Beattie, Henry A. Robinson and

Ralph L. Anderton, Jr. Mr. Vreeland is president, Mr. Hasbrouck, vice-president; Mr. Robinson, second vice-president; Mr. Beattie, treasurer, and Mr. Warren, secretary.

\$ \$ \$

THE annual meeting of the Philadelphia Traction Company was held November 28, at the office of the company, 41st and Haverford Streets. W. L. Elkins presided. The annual report of the company shows the following: Receipts, \$4,986,838.55. Operating expenses, \$3,310,498.24; rentals, \$1,283,590.65; total, \$4,594,088.89. Balance, \$392,749.66. It also announced a cancellation of thirty-five collateral trust bonds. The annual election of directors, resulted as follows: P. A. B. Widener, William L. Elkins, Thomas Dolan, James McManes, Joseph B. Altemus, George W. Elkins. After the meeting the directors met and organized by electing P. A. B. Widener, president; William L. Elkins, first vice-president; George D. Widener, second vice-president and D. W. Dickson, treasurer. The Board adopted a resolution declaring a dividend of \$1.50 per share, payable December 11, 1893.

\$ \$ \$

THE annual report of the Union Street Railway Company, of New Bedford, Mass., for the year ending September 30, shows the total income from the road to be \$182,463.90. The total operating expenses and taxes were \$134,587.86, leaving a net income of \$47,876.04. The total interest accrued during the year was \$7,087.46, leaving, after paying out \$18,200 as a 7 per cent. dividend, a surplus of \$22,588.58. A year ago the surplus was \$8,435.08. The income of \$182,463.90 is made up from the following sources: Passengers, \$180,673.33; sales of manure, \$540.03; advertising, \$615; sale of old iron, \$372.62; rents, \$16.12; pigs sold, \$233.76; miscellaneous, \$13.04. The expenses of \$134,587.86 are itemized as follows: Salaries of general officers and clerks, \$5,511.54; general office expenses and supplies, \$1,253.03; legal expenses, \$370; insurance, \$3,584.81; lighting, \$447.43; miscellaneous operating expenses, \$4,144.65; repairs of road bed and track, \$2,125.85; repairs of electric line construction, \$548.04; removal of snow and ice, \$1,189.73; repairs of buildings, 1,794.05; repairs of cars and other vehicles, \$3,923.02; repairs of electric equipment of cars, \$917.39; renewal of horses, \$4,296.69; harnesses, horse shoeing and veterinary care, \$416.93; sundry stable expenses, labor in stable and shops, \$16,704.10; provender, \$24,747.04; electric motive power, \$10,286.88; wages in conducting transportation, \$45,200.18; damages for injuries, \$379.81; bedding, \$854.67; repairing registers, \$113.15; repairs of electric station equipment, \$78.11; miscellaneous electric expenses, \$98.46; taxes, \$5,602.30.

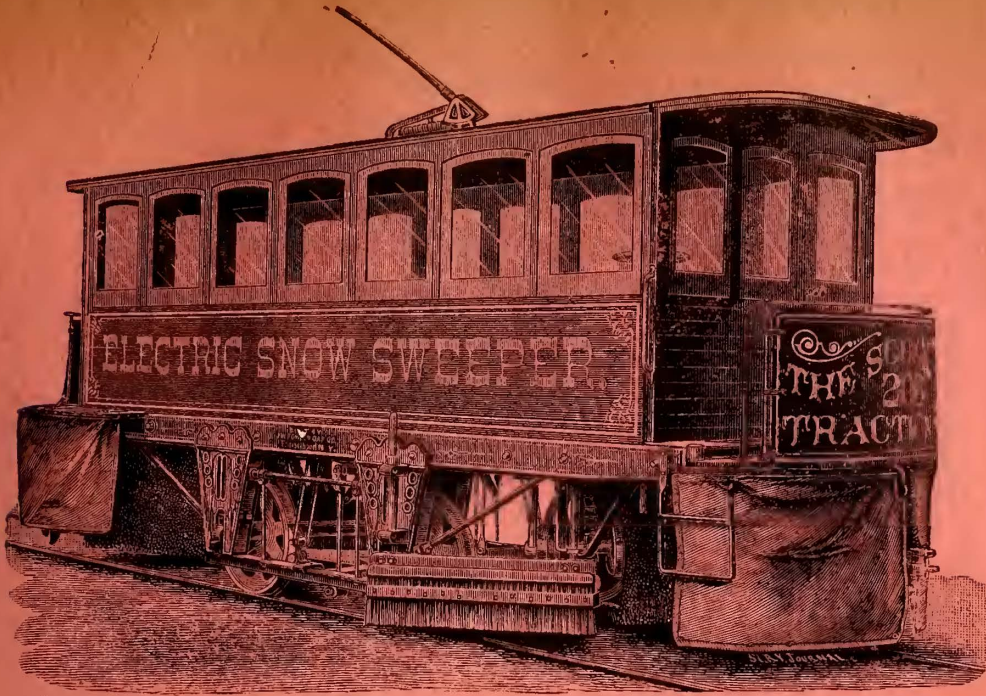
\$ \$ \$

J. & W. SELIGMAN & COMPANY, who are financing the consolidation of the Brooklyn Traction and Long Island Traction Companies, in a recent interview with a Boston News Bureau representative said: "Now that the stockholders of both companies have agreed to the consolidation it will be rapidly pushed to completion. Eventually the consolidation will include every road in Brooklyn, similar to the West End Company, of Boston. The Brooklyn and Long Island Traction companies now represent over three-quarters of the Brooklyn roads, and the DeKalb Avenue Company, the next largest road, of which Gen. Louis Fitzgerald is president, will, in all probability, come in under the new plan. The capital stock of the Long Island Traction Company will be increased from \$30,000,000 to \$42,000,000 (which will cover the \$20,000,000 bonded indebtedness of the Brooklyn Traction Company), and this capital stock is large enough to include any other companies that may be united with the Long Island Company. There will be no preferred stock, and no bonds, with the exception of the bonds issued to cover the indebtedness of the Brooklyn Traction Company and 5 per cent. bonds to be exchanged for the preferred stock of the Brooklyn Traction Company. By operating the roads under one management a considerable saving can be made in operating and administrative expenses."

\$ \$ \$

THE Broadway & Seventh Avenue Railroad Company, of New York, has recently issued \$12,500,000 first consolidated, 5 per cent., fifty year bonds, principal and interest payable in gold, secured by mortgage to the New York Guaranty & Indemnity Company, trustee. The bonds are sold by the Central Trust Company and the New York Guaranty & Indemnity Company, at 98½ per cent. and interest. Of the total amount of bonds \$4,850,000 are to be held by the trustee, for the purpose of acquiring all underlying bonds upon the railroad lines.

This mortgage is a first lien upon the entire line of cable railroad from 59th Street through Seventh Avenue and Broadway to the Battery, and upon the power house properties, consisting of the block of land bounded by the Sixth and Seventh Avenues and 50th and 51st Streets, and the property on the northwest corner of Broadway and Houston Street, and upon the other lines of railroad of the Broadway & Seventh Avenue Railroad Company, and upon all the personal property and equipment of said railroad company, subject only to unmaturing underlying liens upon the railroad lines, to the amount of \$4,850,000, and to real estate mortgages to extinguish which \$1,125,000 in cash is now on deposit with the trustee of the mortgage. The titles to the power house properties have been insured by the Title Guaranty & Trust Company to the amount of \$4,000,000. The president of the Broadway & Seventh Avenue Railroad Company certifies as to the present earning capacity of the road as follows: "In relation to the earning capacity of the Broadway & Seventh Avenue Railroad Company to meet the interest on the issue of \$7,650,000, 5 per cent. bonds, which you have purchased, I beg to state that the net earnings of the company, after deducting interest on underlying bonds, all operating expenses, liabilities, and rentals of every kind, are at present not less than two and a half times the amount necessary to pay the interest upon the bonds above referred to."



Snow Sweeper with full length cab, the motorman operating same on the inside. Same as built by us for Scranton Traction Co.

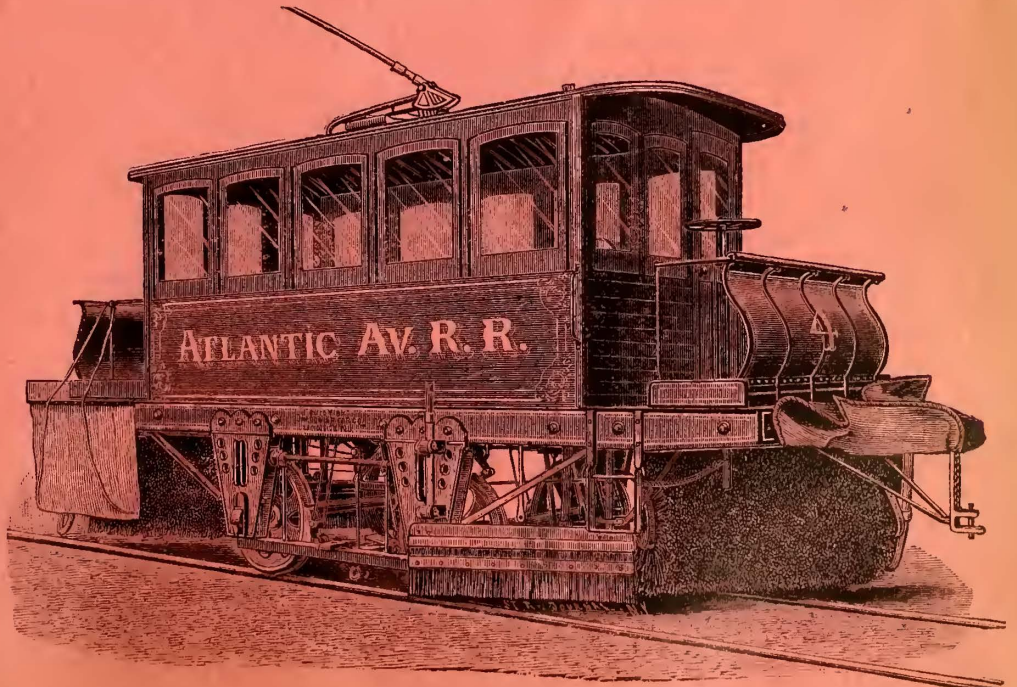
ELECTRIC SNOW SWEEPERS

BUILT BY THE

J. W. FOWLER CAR CO.

WORKS AND GENERAL OFFICE,
ELIZABETHPORT, N. J.

Electric Snow Sweeper to be operated with the motorman on the platform, motor operating the brooms inside cab. Same as built by us for the Atlantic Ave. R. R. Co., Brooklyn, N. Y.



J. W. FOWLER CAR CO.

BUILDERS

OF

OPEN

AND

CLOSED

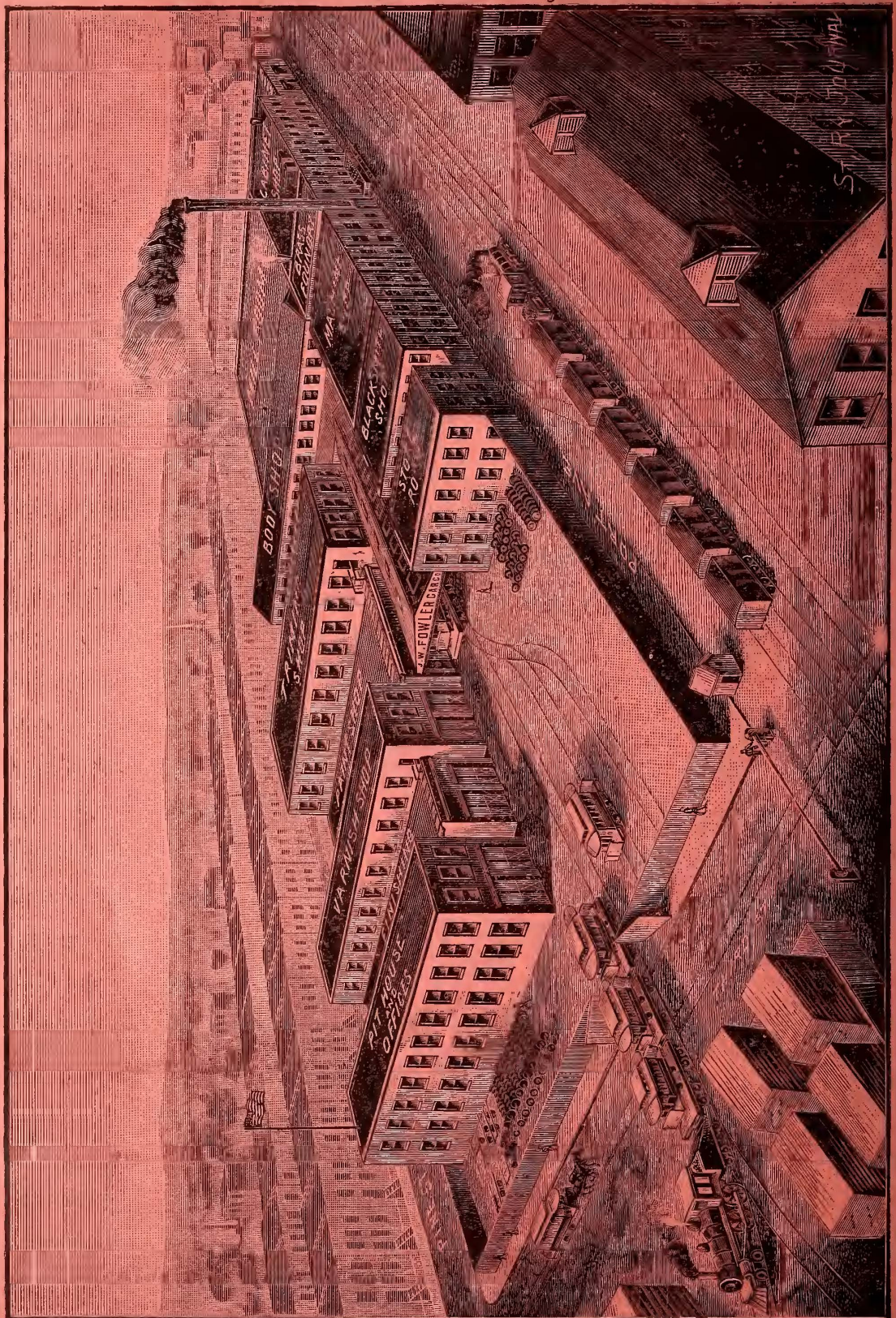
Electric,

Cable

AND

Horse

CARS.



WORKS AND GENERAL OFFICE,
ELIZABETHPORT, N. J.

NEW YORK OFFICE, HAVEMEYER BUILDING.

A New Departure for the Walker Manufacturing Company.

One of the most important events which have taken place in the electrical world during the past year has just been consummated, and no doubt will cause more general comment than anything which has occurred within the past two or three years.

The formal announcement has just been made that the immense works of the Walker Manufacturing Company, of Cleveland, O., which has been actively engaged in the manufacture of cable railway machinery, and which has been described in former issues of the STREET RAILWAY JOURNAL, is now making the necessary additions to its plant for the manufacture of the latest and most powerful types of generators and motors for electric railway and power transmission purposes ever constructed, not only in the United States, but in foreign countries. The Walker Manufacturing Company's facilities for large work are of the best, and the company has produced some of the largest pieces of machinery ever made in this country. It has cast safely and with ease a forty-two ton casting, and has a capacity to make a sixty ton casting, if needed; from this, some idea may be gained of its possibilities of handling the largest generators that may be required.

The plant, with its many additions, now occupies fully thirteen acres of ground. The location in Cleveland is unsurpassed, that city possessing great natural advantages for manufacturing. The buildings are of brick, fronting upon Waverly Avenue, and occupy a commanding view of Lake Erie. The idea which one gets upon a survey of the Walker Manufacturing Company's works is, immensity; and this idea is fully sustained by the modern machinery with which the plant is equipped.

The machine shop, which is said to be the finest in the United States, is 171 ft. wide, divided into three bays, each 57 ft. In length, two of the bays are 280 ft., and the third 430 ft. From the floor to the highest part of the roof is 54 ft.; massive wrought iron pillars support the roof which is of iron and glass, thus affording plenty of light. In each bay is a thirty ton, rope power, traveling crane manufactured by the Walker Manufacturing Company for its heavy work.

In Bay A most of the fitting and erecting is done. In this bay are arranged all the drill presses and similar tools used in fitting and finishing work. Large pits, walled and paved with bricks, are arranged for erecting work in them that would otherwise be inconvenient to get at. A thirty ton crane travels the entire length of this bay. In Bay B are arranged all the large lathes, planers and floor boring machines. One of the planers is 10 x 25 ft., and can use four tools if necessary. The floor boring and milling machine has a capacity of fourteen feet horizontal and a six foot vertical lift and a six foot feed horizontally. The floor bed outside of the machine proper is 20 x 20 ft. Numerous lathes, planers and shapers are found in this bay. A thirty ton crane travels the entire length of this bay also. In Bay C are boring mills of the following sizes: 7 ft., 10 ft., 14 ft., 16 ft. and 16 to 24 ft. capacity. Horizontal boring and other machines, also a ten foot Gleason gear planer capable of cutting spur or bevel gears thirty inches face. The immense pit lathe with which all the large gears, belt and rope pulleys have been turned is in this bay. The large girders of the lathe are ninety feet long. All the driving gears of this powerful tool are of cast steel. Two thirty-two foot diameter by eight feet six inches rope pulleys, each 104 tons, have been turned in this lathe at one time. A depressed railroad track from the L. S. & M. S. R. R. runs across this bay, so that cars and locomotives can run into the shop. Two immense platform scales are also arranged at this point for weighing shipments. Work is transferred from machines, scales, to or from railroad cars, with another thirty ton crane which travels the entire length of the bay, 430 ft.

In the matter of complete cable plants the company has supplied fully twenty different roads, among which are included roads in Australia and England.

Although it may be an old story by this time, the capacity of the works for turning out spur gearing is worthy of repetition. A machine cut spur gear of 192 teeth, claims the distinction of being the giant wheel of its kind ever placed in use, as will be seen by the following dimensions: 30 ft. 6 ins. pitch diameter; 30 ins. face, 6 ins. pitch; 27 ins. bore; diameter of hub, 9 ft. 2 ins., weight of hub, 15 tons; weight of gear, 65.75 tons. This wheel was shipped by the Walker Company to the diamond mines of South Africa.

The metal for both foundries is supplied from four Walker improved cupolas of the following dimensions: Two, 60 ins. in diameter; one, 72 ins. in diameter; one, 84 ins. in diameter, affording a capacity of 80 tons of metal per hour.

The cupolas are built upon a scientific plan of economy, and melt an average of 13.10 lbs of iron per pound of coke. The air is supplied from a three cylinder, vertical blowing engine. Hydraulic power is used for breaking metal and elevating all the necessary coke, iron and lime stone. The elevator will raise a load of six tons, the power being developed in a fourteen inch accumulator of fourteen feet

stroke, with an average pressure of 1,000 lbs, to the square inch. The ovens are 24 x 30 ft., 20 x 30 ft., and 18 x 25 ft., respectively. They are, of course, of the latest design, and it is almost unnecessary to add that gearing and crank handles serve to operate the carriages. Large casting pits are located at various parts of the foundry floor, ranging from twenty-four to twelve feet in diameter, and reaching a depth of twenty-five feet. The capacities of the crane ladles vary from three to twenty five tons.

Inasmuch as a good share of the work done in constructing electrical machinery consists in castings, the foregoing description of its foundry will indicate the superior facilities of the Walker Manufacturing Company in its new department.

The type of motor to be offered by the Walker Manufacturing Company will, it is believed, elicit marked commendation, and will admittedly be a distinct advance on existing machines. In the past there has been a somewhat universal feeling that the weight of the apparatus has been greater than either strength or electrical efficiency demanded.

This imperfection in other machines results very largely from an improper distribution of the metal. With the new generators and motors of the Walker Manufacturing Company, particular care has been used in designing the castings, so that the maximum of strength and electrical efficiency, with the minimum of weight, may be obtained. It is confidently believed, that as regards these three important features—lightness, efficiency and strength—the Walker Manufacturing Company's motor will be appreciated by those interested in electrical power and traction.

H. McL. Harding, of New York, and J. L. Barclay, of Chicago, are interested with the Walker Manufacturing Company in this department. Their continuous connection with the business of selling and manufacturing electric railway appliances from the very inception of the industry, renders them well fitted for what they have undertaken. Having been connected with the Sprague Company, in 1887, and afterwards with the Westinghouse Company, their exceptional and rare experience has enabled them to know thoroughly the faults of existing machinery, and is a practical assurance that the new type to be manufactured by the Walker Manufacturing Company will come as near perfection as human ingenuity and experience can produce. From the facts just stated, it is quite apparent that the machinery now being manufactured will not in any way be experimental.

John Walker, the founder, vice-president and general manager of the company, has had an exceptional and uniformly successful experience as a practical and mechanical engineer. He is a native of England, but has been a resident in this country for twenty-five years. Mr. Walker has taken out sixty-two patents for valuable machinery and mechanical devices, but his fame may be said to have been made upon his invention of differential drums for cable roads.

J. B. Perkins, president of the company, is one of the best known business men in Cleveland and elsewhere. His great wealth has made him a prominent factor in financial circles, while his executive abilities have long been recognized in the many enterprises with which his name has been associated. W. H. Bone and Z. M. Hubbell, respectively manager and treasurer of the company, have occupied their present positions for several years.

In the electrical power and traction department, Mr. Harding will be in charge of the Eastern business, with headquarters in New York. Mr. Barclay will have the management of the Western business, located in Chicago.

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Railway Statistics.

This topic is discussed at considerable length in the Seventh Annual Report of the Interstate Railroad Commission, just issued. The total railway mileage on June 30, 1892, was 171,563.52 miles, an increase of 3,160.78 miles; the total number of railway corporations was 1,822, being a net increase of 37 during the year; 899 maintained independent operating accounts, and 712 were independent operating companies. Of the 761 subsidiary roads, 320 were leased for a fixed money rental and 186 for a contingent money rental; 9 roads were abandoned. There were 19 mergers, 17 reorganizations and 16 consolidations. The capitalization of roads reported was \$10,226,748,134. There were 560,958,211 passengers and 706,555,471 tons of freight reported as carried during the year ending June 30, 1892. The gross earnings reported were \$1,171,407,343, and the operating expenses were \$780,997,996, leaving net earnings of \$390,409,347, to which add \$141,960,782 as income to railways from investments. After payment of \$416,404,938 as fixed charges, \$97,614,745 was paid in dividends, and \$4,314,390 in other payments, leaving a surplus of \$14,036,056. The passenger revenue for the year was \$286,805,708; and freight revenue amounted to \$799,316,042. There were 821,415 persons employed in railway service at the end of that year, of whom 2,554 were killed in accidents and 28,267 were injured. 376 passengers were killed, and 3,227 were injured. Earnest recommendation is made for an amendment providing a penalty for the failure of carriers to file their annual reports within a specified time.

Of Interest to Travelers.

The Baltimore & Ohio Railroad announces that it has placed on sale round trip tickets at reduced rates to the winter resorts in Florida and the South, and also to such points of interest as Luray, Natural Bridge and Gettysburg. This company has also arranged to place on sale excursion tickets to San Francisco and other points in California, on account of the Mid-Winter Fair, at unusually low rates. Excursion tickets are now on sale to Baltimore and Washington via the famous Royal Blue line.

With its vestibuled train service, via Washington, to Cincinnati, St. Louis and Chicago, the Baltimore & Ohio is in the best of condition to handle Western and Southern travel. That the line is a popular one, is attested by the immense World's Fair business handled this summer.

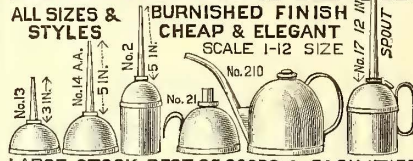
Those contemplating a trip West or South this winter should write to C. P. Craig, general Eastern passenger agent, 415 Broadway, New York, for rates and other information.**

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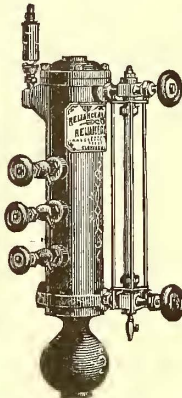


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