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THE CINCINNATI, NEWPORT & COVINGTON RAILWAY.

This company has absorbed all of the street railway lines formerly operated under several names, and embracing the territory of Covington, Newport, Bellevue and Dayton, and the neighboring villages and suburban districts, and aggregating nearly sixty miles of track, for the most of which the company holds a perpetual franchise. The company caters to a population south of the Ohio of about 100,000, crosses the river to Cincinnati over three bridges, and penetrates to Fountain Square, receiving a

of Cleveland, treasurer, and James Hoyt, of Cleveland, secretary. The resident operating officers are S. Bigstaff, general manager; G. M. Abbott, secretary and treasurer; T. M. Jenkins, superintendent. Mr. Jenkins was for a number of years assistant superintendent of the Albany, (N. Y.) Railway, and received a good training under the well known general manager of that system. In his present position he is executive officer in all matters of discipline, operation and construction.



FIG. 1.—EXTERIOR OF POWER STATION OF CINCINNATI, NEWPORT & COVINGTON RAILWAY—NEWPORT, KY.

large resident and pleasure traffic from the latter city. The road, in the opinion of many, is one of the most promising street railway plants in that section, if not in the entire country. The lines operate in two states, three counties, five cities, and seven villages.

MANAGEMENT.

John J. Shipherd, of Cleveland, is president of the company, and was the prime mover in the purchase of the lines and the consolidation of the old companies. To him great credit is due for the judgment and foresight that has provided the people in the district with rapid transit. Chas. E. Orr, of Pittsburgh, is vice president, H. P. Eells,

The capital stock of the company is \$3,000,000, and there are \$3,000,000 of bonds. The local offices of the company occupy a large brick building on the north-west corner of 4th and Scott Streets. This building was formerly occupied by a bank, and is provided with large burglarproof and fireproof vaults built into the walls, and the rooms are handsomely furnished with convenient counters, desks, cases and other office fixtures, making it in all respects a first class street railway office.

PHYSICAL FEATURES.

The cars are operated mostly by electric power, there being only one or two short mule lines, on one of which,

including one of the bridges to Cincinnati, the mule cars are run only two or three times a day, for the purpose of holding the franchise. Some of these lines, which we have before described, were electrically equipped as early as 1890, the Short system of motors and generators being employed. The purchase of the lines by the new company was made in July, 1892, and the work of reorganization and re-equipment at once begun. The track construction through the principal streets has been entirely renewed, a new power house and several car barns erected, and a large extension made to the lines, and a new equipment of rolling stock and motors provided. The lines, when the extensions are completed, will be operated in divisions, over all of which, with one exception, the cars will cross over to Cincinnati.

The standard rail for track construction in the paved streets is eighty pound, seven inch girder rail, and that in the present construction was purchased from the Pennsylvania Steel Company, and from the Johnson Company. The paving consists of asphalt and vitrified brick, of the

bridges the construction is of T rails and wooden blocks. In the opinion of the superintendent, a T rail construction, with asphalt or brick paving, is most desirable for city streets, both from the standpoint of the public and that of the operating company. On the asphalt streets, granite blocks are placed each side of the rails, and toothed into the paving material, the blocks being placed flatwise and parallel with the rail, and endways, alternately. The construction on suburban lines consists of a fifty-six pound T rail, with a clay, gravel and macadam foundation, according to the kind of soil, making a regular steam roadway.

On the extension to Ludlow, which is now being constructed, and where the formation is a stiff clay, the excavation is being made across the street eighteen inches in depth, and then, at the outside ends of the ties, a ditch is cut eighteen inches below the street excavation. In the bottom of this, a four inch porous drain pipe is placed. The ditch is then filled with gravel above the pipe, and the pipe is connected with catch basins at suitable inter-

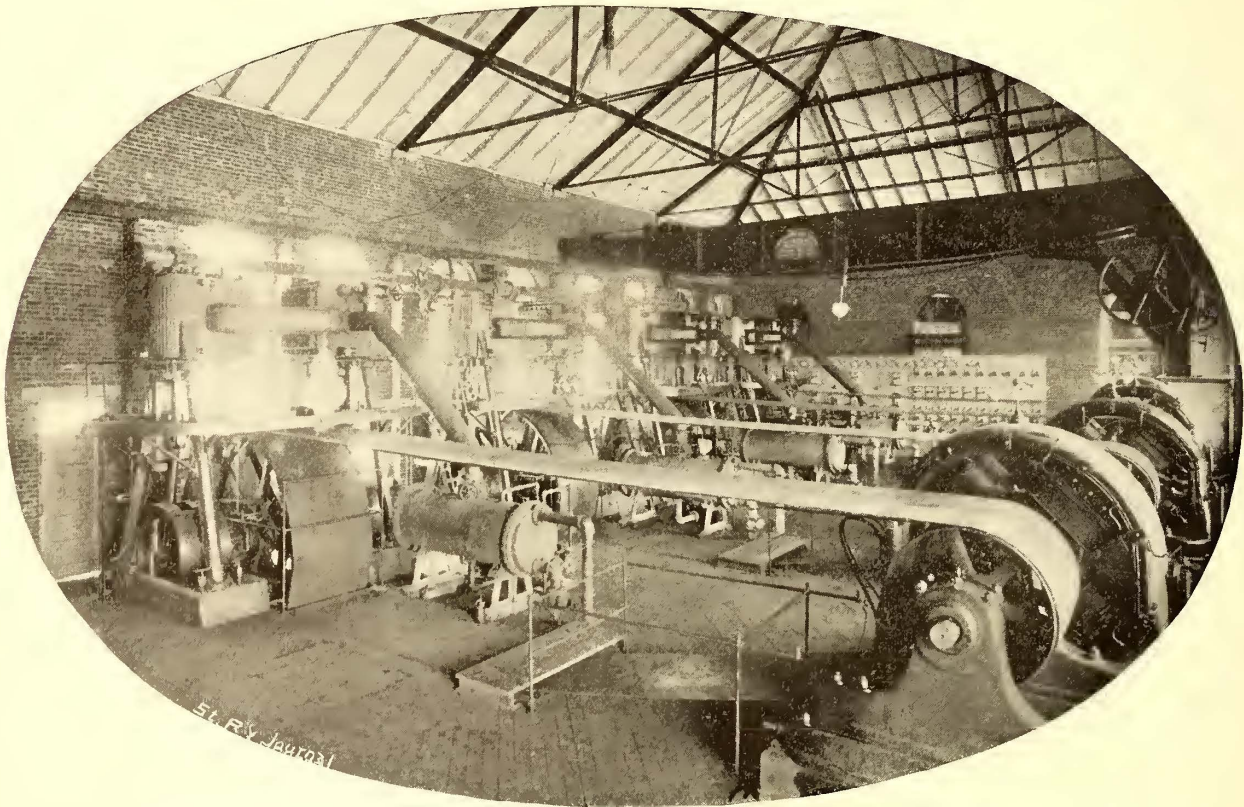


FIG. 2.—INTERIOR OF POWER STATION OF CINCINNATI, NEWPORT & COVINGTON RAILWAY—NEWPORT, KY.

Hallwood type, and is all done by the city at a cost for brick of from \$4.18 to \$4.22 per running foot, measured to the middle of the streets which are from forty to sixty feet in width. In the process of track construction, the surface is excavated to a depth of eighteen inches, when the foundation is thoroughly rolled with a twenty ton steam roller. A foundation of broken stone (three inch mesh), from six to eight inches deep, is then thoroughly rolled, on which the ties are placed (two feet centers) and tamped up with fine grit composed of the screenings of broken stone. The space between the ties is then filled up with broken stone, above which is the paving foundation. Oak ties, 5 × 7 ins. × 8 ft., are employed on all city and suburban construction, and cost in this market thirty-five cents each. No tie rods are employed, but on the alternate ties tie plates and brace plates are provided. Where a brick paving is to be employed, the foundations are prepared in the same manner, only the rails are surfaced up and supported on blocks and stones, when a foundation of concrete is tamped in, and the space between the ties filled up with the same material to the top of the ties, when a layer of sand is spread over, on which a single layer of brick is placed edgewise. On the approaches to two of the

vals, which provides for suitable drainage of the foundations. A foundation prepared of broken stone and gravel is then prepared, and on this oak ties, 5 × 7 ins. × 8 ft., are placed, and on the portions which are to be paved with brick a concrete foundation is provided, as before described. The special work on the entire system was furnished by the Cleveland Frog & Crossing Company, and by the Johnson Company. The latter company furnished the special work for the sections constructed with the Johnson rail.

Spiral transition curves are provided on all turns, so that the cars enter and leave the curves with a very easy movement. At one of the steam railway crossings a derailling switch is placed. This is of the tilting tongue type and was manufactured by the Cleveland Frog & Crossing Company. On all suburban lines the practice of the present engineer of the company is to make as short curves as possible except where corners are turned, the theory being that the cars can round the short curves quicker, then speed up on the tangents, and make better headway than following steam practice, which employs a long radius usually. On the Fort Thomas line, however, which was laid out under the supervision of a former en-

gineer, steam practice was followed and long curves were employed, necessitating a large amount of grading. The number of cubic yards of grading for the four miles of double track on this line amount to 180,000 cu. yds.

BONDING.

On that portion of the system first reconstructed a No. 6, B. & B. gauge, iron wire was employed for bonding the rails, and although having been in service for more than a year, seems to be all right so far. In more recent construction, however, a No. 6 copper rail bond is being employed, and this is being attached to the rail by means of a channel pin devised by the electrician of the company. A split copper washer about one inch in diameter is first placed on the wire a short distance from the end, then inserted in the channel pin, when the latter being upset, the channel pin head and the washer are made to embrace the rail firmly. The surface of the rail is faced off in the process of drilling the bond hole, thus giving a large and sure contact with the rail. The rails are then cross bonded over 500 ft. and both tracks about every 1,000 ft. One return feed wire is also provided with which the rails are connected at certain intervals. Eleven No. 0000 return wires connect the track with the station. These are to be increased to twenty-two to equal the number of feed wires.

OVERHEAD CONSTRUCTION.

On all the original electric construction a double trolley was provided in order to comply with the requirements of the local authorities in Cincinnati. About one-third of the present equipment is still double trolley, but only single wires are being installed on all extensions, and all the rails are wired for a ground return. The cars, however, are all provided with two trolley poles, each having an independent base, and the change is made from double to single trolley on the Covington and Newport sides of the bridges, by pulling down and fastening one trolley pole and throwing a canopy switch which makes the contact for ground return. The return from single to double trolley is done by returning one pole and replacing the switch, the change being made without stopping the car. At the street corners, overhead insulated crossings are provided on which, for a short distance, the trolley wheel runs on a wooden surface and the cars pass the dead point by momentum. The overhead switches and crossings were manufactured by the Railway Switch Company, of Cincinnati, and are very ingeniously devised. The management is not in favor of the double trolley, and will change the entire system to single trolley, as soon as permission to do so has been had. The overhead construction, nearly over the entire system, even on the suburban lines, is supported on tubular iron poles. On one short line octagonal wooden poles are provided. The poles are all painted and numbered. The Garton lightning arresters are placed on the poles every 1,200 ft., and Westinghouse arresters on all the feeder and junction boxes outside the station and also inside the station on each section of the feed wires. Both types of arresters, so far, have proved very efficient. No guard wires are employed.

ROLLING STOCK.

The Accelerator type of car is the standard closed car of the company. The equipment consists of forty-five of these cars, which are manufactured by the Brownell Car

Company, of St. Louis. One particular feature of these cars is a blind window or panel midway of the car on each side, which is painted green and bears the monogram of the operating company. On the inside of this panel a plate glass mirror is provided. There are also twenty-six Stephenson sixteen foot cars, which belonged to the original equipment, and are occasionally operated. There are also forty open cars all of the Brownell make.

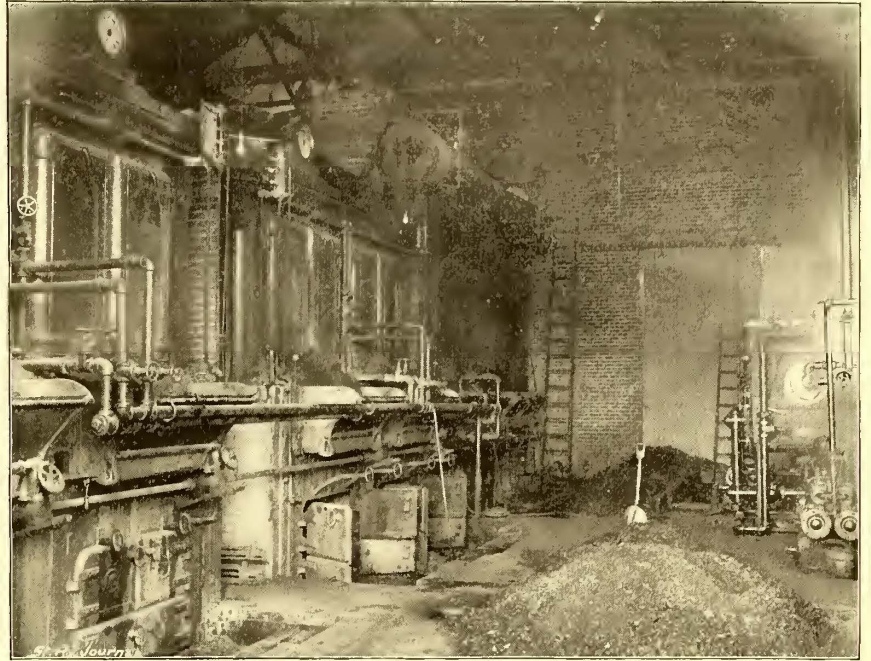


FIG. 3.—BOILER ROOM—CINCINNATI, NEWPORT & COVINGTON RAILWAY, NEWPORT, KY.

Twenty of these are of the latest type and have the new Brownell reversible seats, with a seating capacity for thirty-two people. These seats are readily reversed by taking hold of the round cross bar, which forms the upper part of the back support, and throwing it over to the opposite side—a very ingenious arrangement. By means of the folding seat seven inches of room is gained over the old style, and the device accomplishes for street

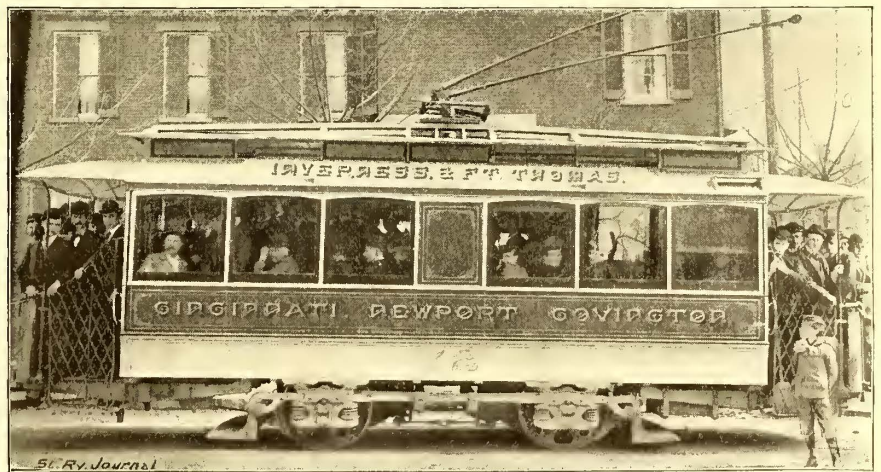


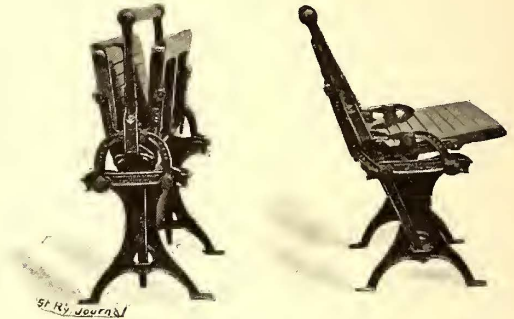
FIG. 4.—CAR—CINCINNATI, NEWPORT & COVINGTON RAILWAY.

cars what the folding opera chair has done in theatres and public halls. In a car with seven seats, forty-nine inches in length can be saved, yet the passengers have the same accommodation that they have now in a stationary seat car. Another great advantage claimed for this over the ordinary seat, is the convenience of cleaning out the cars. All the seats can be folded up and the car can be swept out almost as easily as if there were no seats at all. They are shown in Figs. 5 and 6.

The curtains, which have waterproof material on the outside, are of the roller type, and the ends of the curtain sticks slide in channels cut in the posts, and at the ends are provided with the new triangular or cam attachment, which holds them in place. In case of storm the curtains effectually close the car. The new open cars are provided with a bronze rod or pipe attached to the outside post on each side of the cars, which extends the full length of the car, midway between the floor and the eave plates, adding greatly to the strength of the car. Below these are wire screens, about two feet wide and painted green, and which are employed on all the cars on each side in order to protect the passengers from coming in contact with the walls and bridge columns on the central bridge, which is very

wide tread being in favor with the management, especially for suburban work. The standard axle is of steel, three and five-eighths inches in diameter. The standard shoe with which the cars are equipped is of the Brownell type. These are so arranged that a set of shoes can be taken off and a new set put on in half an hour. The motor equipment is all of the Westinghouse type, each car being provided with a double equipment of twenty-five horse power motors. The controllers are all of the latest type—Westinghouse No. 14.

One of the cars has been equipped with a pair of revolving wire brushes for the purpose of removing dirt and snow from the rails. These brushes are each about twelve inches long and ten inches in diameter, and are



FIGS. 5 AND 6.—OPEN CAR AND FOLDABLE SEATS—CINCINNATI, NEWPORT & COVINGTON RAILWAY.

narrow, so the passengers are required to enter and leave all the cars at the platforms. The ceilings in all the cars are painted white, with delicately painted borders. No advertisements are allowed in any of the cars. The Meaker register is provided, and those in the new open cars are of special design, with the name of the operating company in small gilt letters on the front. The outlines of the new cars are very graceful, the roof having a slight curve from end to end, and provided with double planks for the support of the trolley base, and are supplemented by the well known truss construction of the above named car company.

In addition to the car equipment, a closed freight and mail car is provided, on which freight and mail bags are carried between the stations and offices in Cincinnati and Covington. This, when in use, is towed by the motor cars. All the cars have painted upon the dashboards,

attached to a shaft at an angle of about 45 degs. by means of a bell crank joint which is supported just in front of the wheels by means of a pipe frame, which is hinged under the front end of the platform and supported in front of the wheels by means of chains, which connect with a foot lever on the platform, and by means of which the brushes may be raised or lowered. The shaft is revolved by means of a sprocket chain which embraces a small sprocket wheel on the shaft and an idler wheel just back of and below the axle. The axle is provided with a sprocket wheel which, by the lifting of the idler, is brought in contact with the chain, setting it and the brush shaft in motion, being so arranged as to revolve the brushes rapidly, which serves effectually to clear the track of any obstructions. The device has been designed by the foreman of the repair shop, and is working so successfully that an additional number of cars will be equipped.

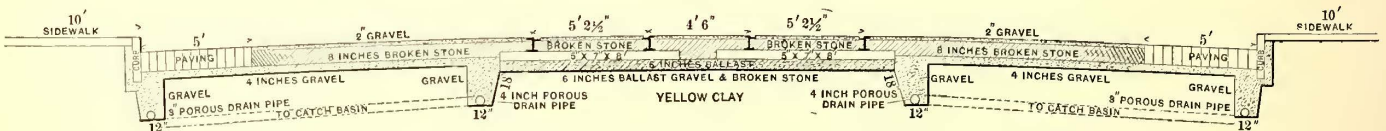


FIG. 7.—SECTION OF TRACK CONSTRUCTION—CINCINNATI, NEWPORT & COVINGTON RAILWAY.

“United States Mail Line.” A sprinkling car is also provided, with tank and the usual apparatus for sprinkling, by which some of the streets on the Dayton division are sprinkled at the expense of the street railway company.

The forty-five Accelerator cars and twelve of the open cars are mounted on the Brownell trucks, while twenty of the open cars have Dorner & Dutton forged trucks. Twelve of the Brownell trucks have an inside duplicate equipment of brake mechanism which has been designed by the superintendent, and which is operated by means of a straight lever in position against the dashboard. These are provided as emergency brakes in case the ordinary equipment should fail on any of the steep grades, which on some portions of the Cincinnati division amount to 8 per cent. The wheels are thirty-three inches in diameter, and until recently have been purchased from the different makers, but more recent purchases have been from the Bass Foundry & Machine Company, of Fort Wayne, Ind., made after a pattern designed by the superintendent. These wheels have a two and a half inch tread and seven-eighths inch flange, and weigh 350 lbs., a

The winter cars are all equipped with electric heaters, two types being employed, the Dewey, manufactured by the Central Heating Company, of New York, and those of the Consolidated Heating Company, of Albany, N. Y. This method of heating is very satisfactory to the public, and the policy of the company is to provide everything that will please its patrons. It is proposed now to provide electric buttons at convenient places in the cars so that the passengers can signal the conductor.

POWER EQUIPMENT.

The power for operating the system is generated at two stations. The old station, which formerly provided all the power for the system, stands on 2d Street, in Covington, near the end of the suspension bridge, but at present supplies the power for operating the sections across the bridges and on the Cincinnati side only. A new central station has recently been erected in Newport, beside the Licking River near 11th Street, above the second bridge connecting Newport and Covington, the two cities being separated by the Licking River, which

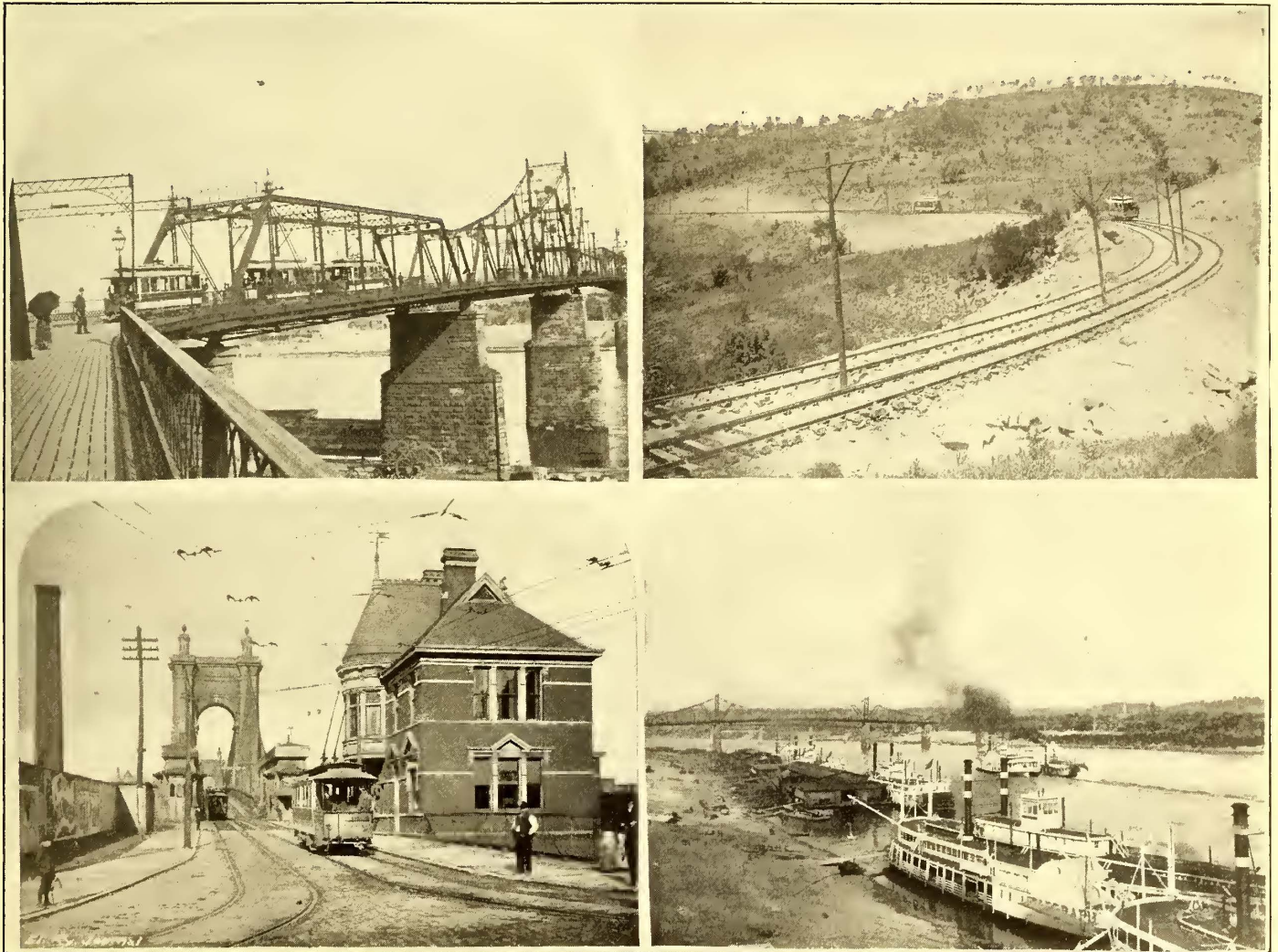
forms a junction with the Ohio at this point. The new station is of brick, having a ground dimension $169\frac{1}{4} \times 70$ ft., with a wing for the boiler room 70×50 ft. The roof of the station is of slate, and supported by steel trusses. The smokestack is of brick, circular, and 135 ft. in height; the base is nine feet in diameter, but tapers to six feet at the top.

The original design was for a double station with switchboards at either end of the building, and the first half has been equipped with this view, but it is the intention of the management to add to the equipment as necessary, placing the switchboard in a tower on the side so that one set of engineers can operate the entire station.

The boiler equipment, which is located in the wing, in the rear of the engine room, consists of four Babcock & Wilcox boilers of 250 H. P. each, and two Stirling boilers,

station is such that the building can be moved up or down the incline by means of wire ropes and hoists to adjust it to the height of the water in the river which has an extreme variation between low and high water of forty feet. Two hoists are provided and also safety ropes, and the arrangement is such that the power of six men can operate it. The water and steam pipes are provided with junctions (the former of which are ten inches in diameter), so that attachments can be made at different stations as conditions may require. The station has a pumping capacity of 2,000,000 gals., and the feedwater is lifted into a tank near the boiler room, having a capacity of 39,000 gals., the entire lift above low water being eighty feet.

Pittsburgh and Kanawha coal is employed, which is delivered by carts from neighboring coal depots, being



CENTRAL BRIDGE FROM COVINGTON APPROACH.
SUSPENSION BRIDGE—COVINGTON APPROACH.

FORT THOMAS LINE—HORSE SHOE BEND.
VIEW OF RIVER AND STEAMBOATS.

FIG. 8.—VIEWS ON LINE OF CINCINNATI, NEWPORT & COVINGTON RAILWAY.

each of the same capacity on all, are provided with Roney mechanical stokers. The auxiliary steam equipment consists of a Webster purifier and pumps of the Blake type. A hot well, which was formerly in the engine room, has been removed to a corner in the rear of the boiler room. This was rendered necessary as the vapors in the hot room destroyed the insulation on the trunk wires which pass under the floor in the basement. The feed and condensing waters are obtained from the river, from which the station is distant about 800 ft. The pumps for lifting the water are located on the river bank, and are housed in a small wooden building, provided with wheels and supported on an incline track laid on the sloping banks of the river. Steam is delivered to the pumps from the station by means of a four inch pipe which is provided with a covering for most of the distance. The suction pipe is provided with a screen, and the whole arrangement of the

brought from the mines on barges, and costs delivered about \$1.25 per ton. From twenty-six to twenty-eight tons are consumed a day for fuel, the cost being about \$.0119 per car mile.

The power equipment consists of four 500 H. P. vertical compound, condensing engines of the marine type, which were manufactured by the Cleveland Ship Building Company. These exhaust into Brooklyn surface condensers placed between the engines and generators, as shown in the illustration (Fig. 2), the condensers being the standard in use on vessels in the United States Navy. The flywheels of the engines are eleven feet in diameter, and the governing mechanism is contained in the fly wheel. The cylinders are 18-34 x 28 ins., and are run at 130 revolutions. The tops of the cylinders extend about sixteen feet above the floor, and are provided with iron platforms and iron steps, so that all the operating parts are readily

reached by the attendants. A band wheel eleven feet in diameter with a fifty inch face is used. It is placed between the frames, with the cranks on the outside of the main bearings, at right angles to each other. The wearing surfaces of the crossheads and the main bearings, are lined with anti-friction metal. The shaft is of mild steel forging, eight and one-half inches diameter in journals. The valve motion is very accurate, and the engine is under perfect control, notwithstanding the rapidly varying load. The high pressure valve is actuated by an eccentric connected to a flywheel governor; the low pressure valve is moved direct by an eccentric keyed to the main shaft. The throttle valve is six inches in diameter and is operated by a hand wheel placed in a convenient position for operating from the floor. Around the engine at a

light up when a call is rung so as to attract the attention of the attendants in case the noise of the machinery should prevent them hearing the bell call. All the appointments of the station are very complete, and the details as to cleanliness and operation reflect creditably upon the engineer in charge.

The original equipment of the old station, referred to above, consisted of three high speed engines, two of them being of the Armington & Sims type, and of 125 H. P. each, and one of McIntosh & Seymour make of 150 H. P., and were arranged to belt direct to Short eighty kilowatt generators. More recently, however, the equipment of the station has been increased by the installation of a 400 H. P. Corliss engine, manufactured by Lane & Bodley, of Cincinnati, and which drives, by means of belting and



OFFICE OF STREET RAILWAY COMPANY.
NEWPORT CAR HOUSE.

MADISON AVENUE CAR HOUSE AND REPAIR SHOPS.
DAYTON CAR HOUSE.

FIG. 9.—OFFICE AND CAR HOUSES—CINCINNATI, NEWPORT & COVINGTON RAILWAY CO.

convenient height is placed a platform of iron grating and iron pipe railing. The engines are belted direct to Westinghouse generators by means of forty-eight inch belts, the distance between shaft centers being about fifty feet.

The four generators are of the M. P. type, of 500 H. P. each. The belts are of three ply leather, and were manufactured by the Bradford Belt Manufacturing Company, of Cincinnati. The arrangement of station and switchboard is shown in the illustration, Fig. 2. The latter is of white marble and equipped with Westinghouse instruments. A current of 550 volts is carried. An overhead, ten ton, hand power crane, manufactured by the Phoenix Iron Works, of Cleveland, completes the principal station equipment.

In connection with the telephone equipment of the station, colored incandescent lights are provided, which

countershaft, the Short generators referred to above, the high speed engines being used only in case of emergency.

Still more recently an additional unit of power has been installed, consisting of a 500 H. P. vertical engine, of the same make as those described above for the central station, and which is belted direct to a 400 H. P., M. P. Westinghouse generator. This unit has a separate switchboard equipped with Westinghouse instruments, while the switchboard for the balance of the station is provided with instruments of the Short type. The boiler equipment of the station consists of four tubular boilers, of 100 H. P. each, which are equipped with Murphy smokeless furnaces. These furnaces, the superintendent states, operate very satisfactorily when the boilers are moderately fired, and the grates last from six to eight months; but when it is necessary to force the fires, the grates require changing frequently.

The same is true of other auxiliary equipment, including the pumps; as long as they are not overtaxed, everything works in a satisfactory manner, and this, said the superintendent, is the secret of success with all street railway appliances, as nearly all breakdowns come from overloading. The same quality of coal is supplied as described for the central station, and it requires ten tons a day, of nineteen hours each, at a cost of \$12.50, to operate the twenty-two cars, the average number on the Cincinnati side of the river. Some of the grades are 8 per cent., as



JOHN J. SHIPHERD,

PRESIDENT CINCINNATI, NEWPORT & COVINGTON RAILWAY CO.

before noted, and the approach to the suspension bridge, on the Cincinnati side, is especially difficult, as it consists of a long curve on a 7¼ per cent. grade. The approach to all the bridges is over a considerable grade, and, with one exception, on difficult curves.

A comparison is made in this station on the cost of operating with condensing and non-condensing engines. With the compound engines water for condensing purposes costs six cents per 1,000 gals., or a total cost of \$200 per month for water, and for feedwater only about \$50. This expense offsets the extra cost for oil which is consumed on the countershaft and extra bearings connected with the single cylinder engine, so that the cost of operating the engine with either system is about the same, there being a 50 per cent. saving in oil, ordinarily, with the direct connected apparatus.

CAR BARNS.

Four car barns provide storage for the rolling stock. These, with one exception, are frame buildings with corrugated iron sheeting painted chocolate color, but on one of the barns the sheeting is pressed to imitate brick. The principal barn is of brick and is located on the corner of State and Madison Streets in Covington, and contains the principal repair shop. The storage tracks have a capacity for holding thirty-five Accelerator cars, or forty cars of the ordinary type. There are two pits in the barn proper and two in the repair shop, each having a capacity for six cars. The trolley wires are protected by inverted wooden troughs. The tool equipment of the repair shop is operated by a fifteen horse power Card motor, and the tool equipment consists of one twenty inch lathe having a twelve foot base, one fourteen inch lathe, one shaper, one drill press, a thirty-six inch car wheel borer and a 100 ton wheel press. Most of the tools are of the Niles manufacture. There is also a small complement of wood working machinery, consisting of a band saw, cross cut saw

and other tools with a twenty-four inch Sturtevant fan. The blacksmith shop has two forges and the usual equipment of blacksmith tools. In connection with repairs, it may be stated that four extra armatures only are provided for 154 motors, and so far the repairs to motors have been very slight. Each of the car barns is provided with an office for the foreman, and in each case is carpeted and kept in a neat condition.

In connection with each of the offices, a safe is provided in which the conductors deposit their receipts. These safes are located in the foreman's office, but are provided with a trap to which access is had from the outside. These safes, which were designed by the superintendent and manufactured by the Littleford Brothers, of Cincinnati, are about four feet high and fourteen inches square, and are so constructed as to be fireproof.

The traps in the safes through which the deposits of money are made are of sufficient size to drop the bags and returns, and are modeled after the tilting traps in the more recent type of letter boxes. The contents of the safe are removed through a door near the bottom of the safe on the side projecting into the foreman's office. These safes cost about \$35 each. A special attendant collects the receipts and delivers them at the central office every morning.

At each of the car barns there is a fireproof oil room, constructed of brick, with iron doors and cement floors, where all the oil is stored and the lamps filled and trimmed. These oil safes are about nine feet square and ten feet in height inside, and cost about \$120 each. All the barns are provided with arc and incandescent lamps.

The 11th Street barn, which was built after designs made by the superintendent, has a capacity for storing twenty-six cars, has a ground dimension of 75 x 100 ft., with eight storage tracks. The roof is supported by frame trusses. The office is located at the front center of the building and has a store room above. The cost of the entire structure was about \$2,300. The superintendent is of the opinion that were he to apply he could secure the prize offered by the J. G. White Company, as noted in the last issue of the STREET RAILWAY JOURNAL, for an inexpensive car barn. At some of the stations sand driers are provided, which consist of metal sheets resting on an ordinary brick flue in which the fire is kindled. There are also salt bins, and at one station we noted that



MAJ. SAMUEL BIGSTAFF,
VICE-PRES. AND GEN. MAN. CIN.,
NEWPORT & COVINGTON RY. CO.



THOMAS J. JENKINS,
SUPERINTENDENT CIN., NEWPORT
& COVINGTON RY. CO.

the track scrapers had all been recently painted and numbered to correspond with the car number, and put away for winter use.

OPERATING FEATURES.

The superintendent hires and discharges the car employes. The engaging and control of other employes is left to the heads of the different departments, and the superintendent holds them responsible and requires that they employ only good men. For instance, the chief

engineer of the power station engages all his assistants, and the chief electrician, the superintendent of the overhead construction, the track master and foremen of the car barns are each responsible for the men under their immediate charge. The granting of leaves of absence to the car men is left entirely with the foremen of the different stations. The foremen also have authority to suspend car men in case of gross violation of rules when the matter is referred to the superintendent. The heads of the different departments report to the superintendent in person at his office every morning, when a conference is held from nine to ten o'clock, and all matters pertaining to the operation of the lines are carefully discussed, and orders issued. This practice has resulted in a very efficient service in all departments, and is commendable. The superintendent makes it a practice never to reprimand his employes when on duty, but in case any violation of rules is noted they are called before him, and suitable admonition rendered with careful instruction as to their duties. The discipline is firm and fair, and the superintendent makes it a practice to deal in a pleasant manner with the men even when discharging them. An employe once out is never reinstated. The aim is to employ only men of good habits. In case men contract the habit of drinking or visiting objectionable resorts they are soon dismissed.

New motormen, before being assigned to their regular work, are required to serve as students over all the company's lines, and then to spend a week or more in the repair shops, where they are allowed to study the mechanism of the motor, and the foreman instructs them in the manipulation of the switches, and especially as to what to do in emergency cases, when and how to reverse, and how to adjust the fuses. Men who have been employed on street car lines in other cities are required to bring letters of recommendation from their former employers.

Car men are required to wear a blue uniform, and their caps are of a style somewhat different from those usually worn. The pay of motormen and conductors is 16 $\frac{2}{3}$ cents an hour, or \$2 a day of twelve hours. Three crews are provided for each two cars.

The men longest in the employ of the company have the choice of runs which are divided into odd and even numbers. The odd numbers, or day runs, are considered the preferable, while the even numbers are the late day runs. The runs which are numbered 1, 3, 5, 7, etc., are the first to start out in the morning, and are manned by the regular crews, while the runs numbered 2, 4, 6, 8 are also early runs, but the cars are manned by tripper crews. The regulars of the odd runs are relieved at the dinner hour by the trippers of the even runs, whose cars in turn are taken by the regulars of the even numbers. After the dinner hour, the trippers go home for sleep and rest, and again come out to relieve the cars of the even numbered runs for the supper hour, when they again take the odd runs and finish the night work, while the regulars of these runs go home for rest. This arrangement evens up the work all round, and is very satisfactory to the men.

The pay of all trackmen is \$1.50 for spikers, and \$1.65 for handy men. The fare is five cents. No tickets are sold. A book of tickets is provided the officers and employes. Policemen and firemen ride free when in uniform. No passes are granted to city officials, and only a few to newspaper men.

Under the present management the operation of the system has been very free from accidents.

The entire force seems to, unconsciously, have become a "mutual admiration society." The president is proud of his subordinates, and the excellence of the equipment. The superintendent, in turn, admires the president, and is proud of his employes, while all the foremen and employes have a good word for the management, take great interest in their work, and, what is still better, the public boast of their transit facilities, and are in hearty sympathy with the management.

FRANCHISES AND BRIDGE TOLLS.

The franchises secured by the operating company through the principal streets of Covington, Newport and Dayton, are exclusive and perpetual, and what may be termed compensation for the use of streets on the south

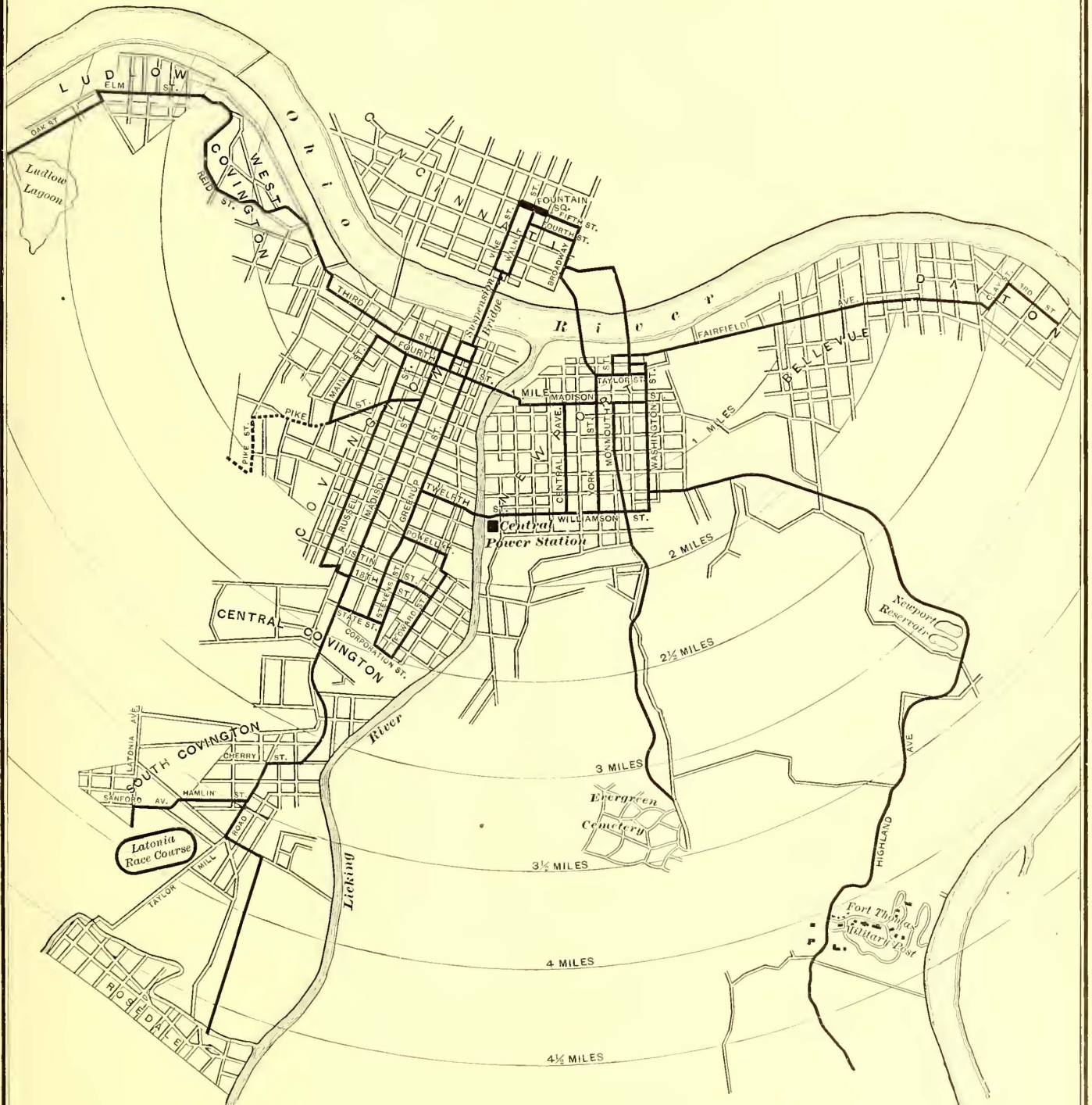
side of the Ohio is very moderate, but it is not so liberal in Cincinnati. In lieu of all license, paving and street repairs, except such as are incident to track repairs, the company makes an annual payment to the city of Covington of \$2,600; to Newport the annual payment for the same purpose is \$500; in Dayton, \$200, and in Bellevue, \$1 per car per year. For the privilege of operating through the streets in Cincinnati, a payment of 1 $\frac{1}{4}$ per cent. of the gross receipts from all the Newport system is required. Besides this, an annual car license of \$4 per foot for inside measurement of each car is required in Cincinnati. The payment to Cincinnati authorities for operating the cars of the Covington system is \$30 per car. Nothing is paid on the gross receipts to Cincinnati, for the cars of the Covington system. The tolls over the suspension bridge are eighteen cents per car per trip; over the Newport Bridge fifteen cents per trip. Between Newport and Covington the tolls over the lower bridge are half a cent per passenger, and those over the upper bridge are not yet adjusted.

EXTENSIONS AND PARKS.

The extensions are now being constructed, one to and beyond Ludlow, and the other, known as the Evergreen line, which will terminate at the Evergreen Cemetery. The construction of the former has been referred to above. The line runs from Covington through Ludlow in a direction parallel to the river, and over most of the route a good view is had of the river and Cincinnati. The line curves in and out among the highlands back of Ludlow, opening up a new residence territory through which streets have recently been graded, making the route a very attractive one both for new residents and pleasure traffic. Some of the hills along which the line passes are 400 ft. above low water mark in the river, and 800 ft. above sea level. The line terminates below Ludlow in what is termed the lagoon, about four miles distant from Fountain Square, in Cincinnati, where a very attractive pleasure resort is being provided. The lagoon, so termed, consists of a basin a short distance back of the Ohio, which embraces a tract of ninety acres, and receives the drainage of seven square miles of territory. A small stream passes through the basin, and during high water in the Ohio the basin is flooded. It is now proposed to convert this lagoon into a permanent lake, and for this purpose a dam is being constructed across the mouth of the creek. When finished it is proposed to stock the lake with game fish and provide drives both for vehicles and bicycles entirely around the shore. The numerous islands which will be formed, are to be connected by rustic bridges, and a fleet of electric launches will be provided. The natural forest on each side of the lake is to be converted into parks, and provided with pavilions. The dam is to be located near the mouth of the creek, and will be fifty-two feet in depth between the sloping banks; the top will be 500 ft. in length, the thickness at the base of the dam will be 220 ft., and it will taper to forty feet on the top, providing a roadway. The flood gate, consisting of a cast iron pipe, thirty-six inches in diameter, will be placed at the bottom of the dam with the upper end protected by a coffer dam. Both ends will be protected by screens to stop the entrance of fish from the river or the escape of the game fish. In the construction of the dam, Wakefield lap sheet piling in a ten foot puddle wall, will be provided. The surface will be furnished with two feet of gravel on which will be placed eighteen inches of rip-rap. The overflow channel will be lined with stone laid in cement, and will be 24 \times 10 ft. and the outer slope for the same width paved. The location is a very delightful one, the region being surrounded by steep hills cut up by numerous gorges and dotted over by farm houses and suburban homes, so that it will form an attractive resort for people of Cincinnati and neighboring cities, and the new line will doubtless become one of the best paying lines of the entire system.

The Milldale line which runs to South Covington terminates at Latonia race track, four miles from Fountain Square. This line caters to a large pleasure traffic, as races and other amusements are provided at frequent intervals during the season at the tracks.

MAP SHOWING
THE LINES OF THE
CINCINNATI, NEWPORT AND COVINGTON
RAILWAY CO.



Another line running through an attractive country is the Fort Thomas line put into operation last month. Fort Thomas is a United States Government Post, embracing a tract of 100 acres, and provided with officers' quarters and barracks, sufficient for the accommodation of a large garrison, and which is located on the bluffs 450 ft. above and overlooking the Ohio River, giving a commanding view of the valley for many miles. The location is distant from the river at Covington about four miles in a southeasterly direction, the river making a big bend between the two points, and is about seven miles by rail from Fountain Square, Cincinnati.

The location is reached by the new electric line which ascends and traverses the crest of the intervening highlands, curving around bluffs and peaks, and giving here and there through clefts in the hills, glimpses of Cincinnati in the distance. The average grade in the ascent is $2\frac{1}{2}$ per cent. and in a few places is 4 per cent. The proportion of tangent and curves, over the distance of a little more than four miles is, respectively, 12,877 and 9,283. The changing scenes of valley and hill, woods and cultivated farms, river and city views, cottages and mansions, together with the bracing atmosphere of the elevation (800 ft. above sea level), makes the trip one of the most enjoyable to be found in all the surrounding region.

Electric Railway Construction in Philadelphia.

The electric railway construction in Philadelphia is being rapidly pushed forward, and the greater part of the track work within the city limits has been completed. As mentioned in our January issue, the city streets occupied by tracks have been repaved by the street railway companies in connection with this new track construction, the performance of this work being part of the conditions under which the electric franchises were granted. The result is that Philadelphia is now one of the best paved cities in the country. Asphalt is used on a number of the streets, and Belgian block is employed on those where the traffic is the greatest.

The Philadelphia Traction Company has proceeded further in the equipment of its system than any of the other companies, and has now in operation the Thirteenth & Fifteenth Streets line, the Twelfth & Sixteenth Streets line, the Ridge Avenue line, the Seventeenth & Nineteenth Streets line, the Eighteenth & Twentieth Streets line, the Twenty-second & Allegheny Streets line, the Jefferson & Manchester Streets line, the York & Dauphin Streets line, and others within the city. Those to be started next by this company are the Darby Road line, the Chestnut & Walnut Streets line, the Lancaster Avenue line, the Haddington line, the Market Street extension of the cable line and the extension of the Ridge Avenue line.

The Electric Traction Company has put in operation its Tenth & Eleventh Streets line. The other companies have, as yet, not any cars in operation.

The track construction is most substantial throughout, and consists of heavy, nine inch girder rails, weighing about ninety pounds to the yard, mounted directly on ties, and employing tie rods, in most cases, every six feet. The manufacturers of the rail used are the Wm. Wharton Company, the Johnson Company and the Pennsylvania Steel Company.

Span wire construction, center, double bracket poles and side bracket poles are used, the former construction being the most common.

THE PHILADELPHIA TRACTION COMPANY.

The current for operating the city lines of the Philadelphia Traction Company is supplied from two stations very similar in appointments and capacity, and located, respectively, at the corner of 13th and Mt. Vernon Streets, and on Market Street, near 33d Street. The former station has been in operation since about January 1, 1894, and was fully described in our January issue. The Market Street station was put in operation May 20, and will have an ultimate capacity of 6,500 H. P.

The steam equipment will consist of four 500 H. P. Westinghouse direct connected engines and generators

and three 1,500 H. P. Wetherill-Corliss engines, direct connected to Westinghouse generators of the same size. As shown in Fig. 1, three of the Westinghouse engines are now in place. The engine room, which is light and well ventilated, contains one twenty ton, electric traveling crane, manufactured by Wm. Sellers & Company, of Philadelphia, and one ten ton crane of the same manufacturers. These cranes have a span of eighty feet from center to center of the carrying wheels, and consist of two plate girders, each five feet two inches deep throughout their entire length. Heavy horizontal and diagonal cross braces are provided, and the girders are connected by plates at the ends, forming a combined girder of great lateral stiffness. On the inner side of each girder near the bottom is a T rail which is carried on the lower flange of the girders, and upon which the trolley wheels run. Diagonal struts on the outside, connecting the lower flange with the cross braces on top, provide for the eccentric load. As the hoisting trolley runs entirely within the bridge, the arrangement secures freedom from vibration and racking of the girders.

The bridge is provided with double flanged, steel tired wheels, twenty-eight and a half inches in diameter.

The switchboard, which is located near the southern wall of the building, is double decked like that in the Mount Vernon Street station, described in our January issue, and has a capacity for 150 feeders. The board is of the panel type and has an iron framework. The instruments are mounted on slate. The equipment includes Westinghouse and Weston appliances, lightning arresters, meters, etc., and Hill switches. The lower deck is set sufficiently in front of the upper to provide a commodious platform in front of the latter, from which the connections on the latter can easily be set. This platform is provided with a handsome brass railing, and a stairway is located at each end to provide access to it. The board is placed at some distance from the wall so that all terminals are easily accessible.

The boiler room is located directly in the rear of the engine room, from which it is separated by a fireproof brick wall, as in the Mount Vernon Street station. The characteristic feature of both these stations, it will be remembered, is the mechanical draft system which was installed by Westinghouse, Church, Kerr & Company, and has given excellent satisfaction in the present station. In this system the gases of combustion, after leaving the economizers, pass through Sturtevant exhaust fans, one being provided for each half of the boiler room. These exhaust directly into the stacks, which in consequence can be made very much shorter and of cheaper construction than if a natural draft were depended upon. The gases are so cooled through their passage through the economizers as not to burn the blades of the fans.

A slight difference in construction of the system is employed in this station from the Mount Vernon Street station, and each fan is directly driven by a separate engine of twenty-five horse power. The advantages claimed for this method, besides that of economy in construction from avoiding the use of the tall stack, are: Perfect control of combustion regardless of fuel or barometer, perfect smokelessness when combined with mechanical stoking, temperature of flue gases down to 200 degs., temperature of feedwater up to 300 degs., from which results a large net economy of fuel. It is estimated that the first cost of a mechanical draft, including the economizer, seldom exceeds, and with inexpensive foundations is always much less than, that of an equivalent brick chimney in which the flue gases are wasted at 400 to 600 degs.

The boiler equipment will consist ultimately of sixteen Babcock & Wilcox boilers of 265 H. P. each; six of these are new in type. The economizer used is of the Green type, and the engines will be run non-condensing. The pumps are of the Worthington type. The separators, which are shown in Fig. 2, are located over the boilers, are of the Stratton type and four in number, two being sixteen inches and two eighteen inches in size. The heaters are of the Goubert make and are located directly back of the pumps. Two are in place and two more are to be installed. This part of the equipment is similar to that at the 13th Street station of the company, and was

selected on account of the excellent results attained there in the generation of steam.

Coal and ash mechanical conveyors supplied by the Link-Belt Engineering Company will be used, and the general arrangement will be very similar to that at the Mount Vernon Street station, except that the coal bin will be located outside of the building. The water tanks will be located underneath the floor. The iron work was supplied by Levering & Garringues.

As will be remembered, a special feature of the Mount Vernon Street station was a completely equipped testing room, and a similar room is being fitted up in the Market Street station. The room is entirely protected from all external magnetic induction, by being completely lined with corrugated iron, and is supplied with all the necessary instruments for careful insulation tests of the underground feeders and other parts of the railway circuits. In the center is a table for supporting the instruments. This consists of a single slab of stone mounted on a solid brick pier carried down to solid rock, and entirely discon-

is now engaged in constructing a large power station on Delaware Avenue, between Beech and Laurel Streets, which will be put in operation early in the fall. This station will have a capacity of 6,000 H. P., and will be equipped with Porter-Allen engines, Babcock & Wilcox boilers and General Electric generators. Later in the year work will be started on additional power houses, and Engineer Kerr of the company states it is anticipated that within eighteen months there will be from 125 to 160 miles in operation.

The present station is of brick, with the southern wall of corrugated iron to permit of extensions in that direction. The engine room contains two Porter-Allen engines manufactured by the Southwark Foundry & Machine Company, with cylinder dimensions, $14\frac{1}{2} \times 24$ ins. by 14 in. stroke, and one McIntosh & Seymour tandem compound engine, with cylinder dimensions, $16\frac{1}{2} \times 36$ ins. by 17 in. stroke. Each of these is directly connected to a 250 K. W. General Electric generator, which operates at a speed of 200 revolutions per minute.

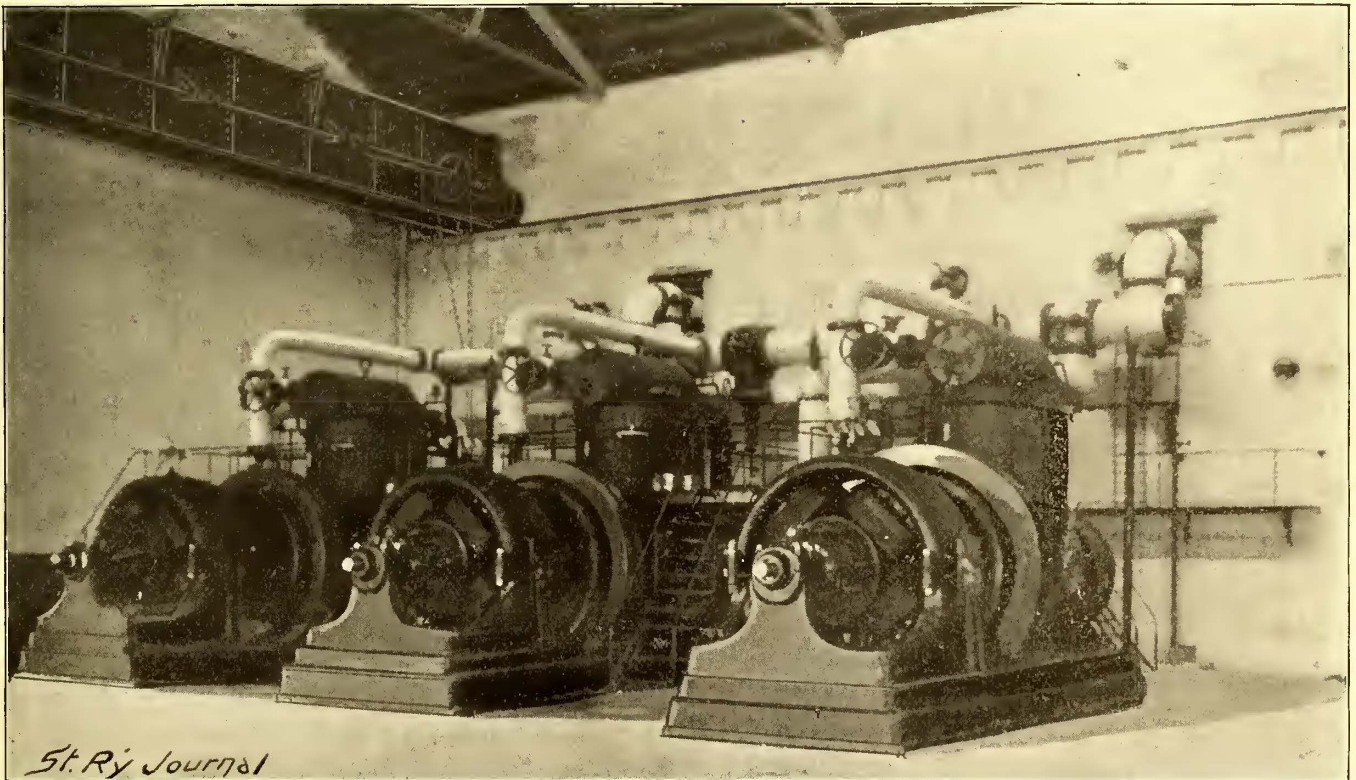


FIG. 1.—INTERIOR OF POWER STATION OF PHILADELPHIA TRACTION CO. ON MARKET STREET, SHOWING ENGINES IN PLACE.

nected from the walls of the building, insuring entire freedom from vibration.

The feeders for all the Philadelphia lines within the city are underground. The cables adopted by the Philadelphia Traction Company were manufactured by the Standard Underground Cable Company, of Pittsburgh, and are placed in conduits principally of the National type manufactured by the National Conduit Manufacturing Company, of New York.

Views of the cars have been published in previous issues. The engineers of the Philadelphia Traction Company are: Electrical engineer, F. Uhlenhardt, Jr.; mechanical engineer, J. E. Grist.

THE ELECTRIC TRACTION COMPANY.

The Electric Traction Company, of Philadelphia, which includes the Lombard & South Streets Passenger Railway, Frankford & Southwark City Passenger Railway and leased lines, put its first line, the 10th and 11th Streets line into operation the latter part of April. The present power station of the company, which is the smallest which the company will build, is located on Hutchinson Street near the corner of Oxford Street. The company

The switchboard is located a short distance from the northern wall of the building and is supplied with the standard General Electric circuit breakers, large station ammeters and voltmeters, together with a number of special devices designed by Chief Engineer Edward B. Ives. It is of slate mounted on an iron frame, which is insulated from the concrete floor.

The boiler room contains four Babcock & Wilcox boilers of 250 H. P. each, set in two batteries of two each. The mechanical draft system of Westinghouse, Church, Kerr & Company is used, two Sturtevant exhaust fans operated by direct connected engines being employed. The stack is of iron, only sixty feet in height and six inches in diameter, the short stack being made possible by the employment of mechanical draft. The equipment of the boiler room also includes two 600 H. P. Goubert feedwater heaters, Stratton separators and Green economizers. Chapman valves are employed throughout, and all the larger valves are by-pass valves. All live steam piping is extra heavy, and all piping is so arranged that any engine can be run from any boiler and any boiler or engine can be cut out without interfering with the operation of the remainder of the plant. The power house

operates on 150 lbs. pressure, and is non-condensing.

The station is next to the track of the Philadelphia & Reading Railway, so that fuel is received directly from the cars, without city transportation. The boiler room is located below the level of the railway tracks, and coal is dumped directly into the boiler room from a siding.

As with the other Philadelphia roads, all the feeder system is underground, the feeders being laid in a special type of creosoted tubes, manufactured by the Wyckoff Company, of Williamsport, Pa.

These feeders lead, at the station, to a cable vault, made of brick arches and iron girders, and are absolutely fireproof. All the underground cables were furnished and put in place by the John A. Roebling's Sons Company, of Trenton, N. J. The overhead system, which is of the bracket type, contains a number of interesting features described in our January issue. The cars of the company were illustrated in our last number.

the rail, and which span the joint plate. Connections are made every block to the return feeders which are placed in subways.

The subways, which contain all the underground feeder cables, are of vitrified Akron clay, manufactured by H. B. Camp, of Cuyahoga Falls, O. The feeders are of 1,000,000 circular mills capacity each, and are now being drawn into the subways. They were all supplied by the Safety Insulated Wire & Cable Company, of New York, the contract given for these having been the largest which was ever awarded for work of this character by any street railway company.

The company has received fifty of its new cars, and these are being mounted with electrical equipment. 125 of these cars will use the General Electric 800 motor, and 125 will be equipped with the Sperry motor equipment. The cars are exceedingly tasteful in design, and are said to be as handsome as any ever built for regular passenger

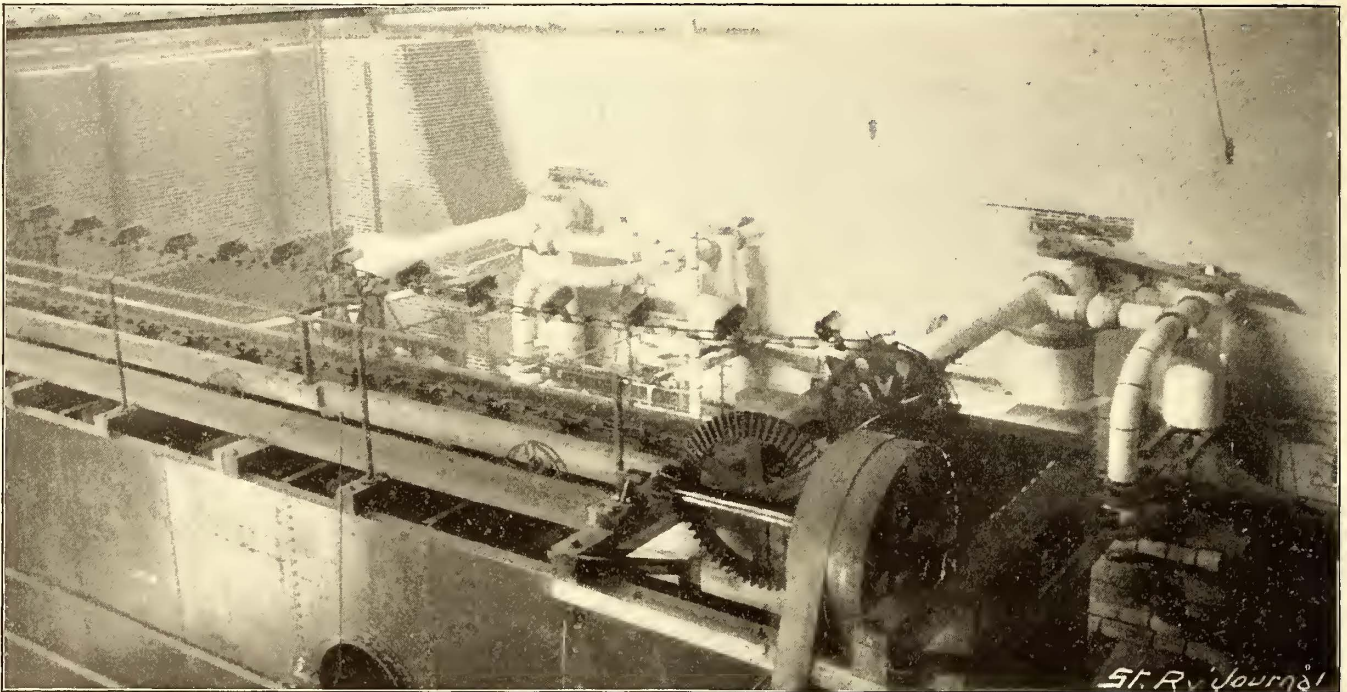


FIG. 2.—VIEW OF SEPARATORS—MARKET STREET POWER STATION OF PHILADELPHIA TRACTION CO.

THE PEOPLE'S TRACTION COMPANY.

The track construction of the People's Traction Company is being pushed forward rapidly, under the supervision of Chief Engineer L. H. McIntire, and the power station is nearing completion, so that it is expected that operations will be commenced about the last of June. A brief description of the work accomplished by the company is given below, and full details of the plant will be published after the road has commenced operations.

The power station is located between Delaware Avenue and Beech Street, near Fairmount Avenue, where will be one of the most handsome buildings for the purpose in the country. The engine plant will consist of Allis engines of the twin tandem compound, condensing type, of 2,000 H. P. each. Each will drive a 2,000 H. P. General Electric generator located between the pairs of cylinders, and whose armatures are mounted directly on the engine shaft. Two of these engines are now erected, and one of the armatures, which is being built on the shaft, will be finished June 1. The armature on the second engine will be completed about June 20. The boilers, which are of the Babcock & Wilcox type, and twelve in number, are erected, and will be under steam about June 15.

The overhead work is nearly completed, and the reconstruction of the horse car tracks will be finished by the middle of June.

The company is using a ninety-three pound, nine inch Johnson girder rail laid on 5 x 9 in., yellow pine ties, located two feet between centers. The joints are connected by copper bonds, with forged ends riveted into

service. They were supplied by the St. Louis Car Company and the Lamokin Works. Star headlights, manufactured by the Star Headlight Company, of Rochester, will be used. The Sperry cars will use an electric brake attachment, which will be separate from the regular hand brake, and which operates a friction plate or disk against the inner surface of the car wheel.

THE HESTONVILLE, MANTUA & FAIRMOUNT PASSENGER RAILWAY COMPANY.

The work of electrical construction is going forward rapidly, under the supervision of Electrical Engineer A. Langstaff Johnston. The company is using the Johnson nine inch girder rail, mounted directly on the ties, of which thirteen are used to every thirty feet of rail. The rails are bonded with the Johnston bond, and cross bonded at every third joint. This bond, which is illustrated elsewhere in this issue, is the invention of the electrical engineer of the road, and has a number of valuable features, one of which is that it provides a contact surface at the rail, twelve times the cross section of the bond itself. The bond is manufactured by the Car Equipment Company, of Philadelphia.

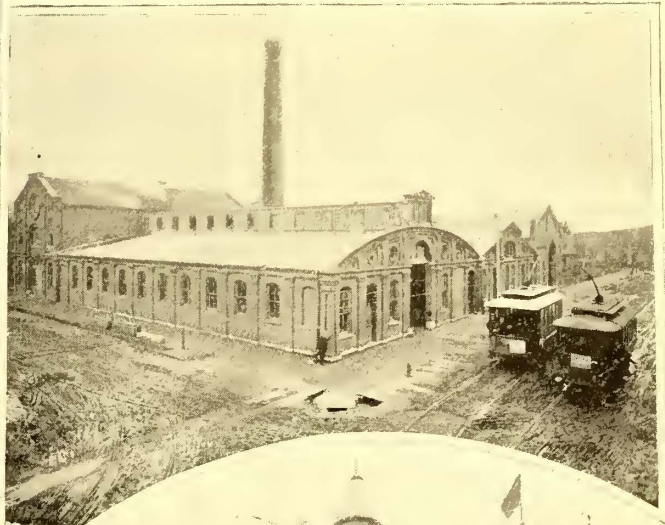
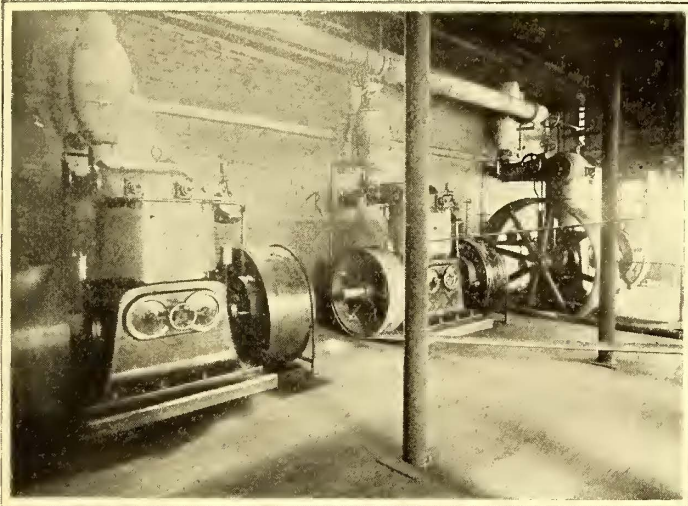
The power station will be located on the Schuylkill River, near 26th Street, and will contain engines of the Providence Steam Engine Company's make. Babcock & Wilcox boilers will be used, and the current will be generated by General Electric generators. The details of the steam equipment have not yet been decided upon.

The Street Railway System of Terre Haute.

Terre Haute covers a rectangular area of about nine square miles, fronting the Wabash River. It is not divided by anything, except railways, and is quite compactly built. The city is a great center of production and distribution. It is located in the best corn and wheat region in the Central States, and its flour output is about thirty-five car loads per day. The city has 300 manufacturing establishments representing an investment of \$10,000,000, employing 8,000 hands, and the largest distillery in the world is located there. The breeding of horses also forms a large industry, and during the coming year stakes and purses aggregating \$85,000, the largest ever offered for a meeting in the history of light harness racing, have been guaranteed by the capitalists and business men of the city. The fact that the city is situated over a large bed of coal and that the coal is mined within the city limits, gives a good

capital public buildings. The miles of track owned by the company are sixteen and a half, covering twelve miles of street. Among the interesting features of the street railway system from an operating standpoint is the fact that the lines are laid throughout with T rails, as described below. The construction is giving very excellent satisfaction, and a paper describing the special methods employed and the successful results obtained is to be read by one of the officials of the company at the next meeting of the American Street Railway Association at Atlanta.

Power House.—The power station and car house of the company is located on North Wilson, 9th and Cherry Streets, and measures 150 × 142½ ft. Here are also a well equipped machine shop and car and motor repair shops. The building is of brick, wood and iron, and is provided with a slate roof over the engine room. The stack is 110 ft. in height, and twelve feet square at the base. The engine room, which measures 45 × 28 ft., con-



VIEWS ON THE LINE OF THE TERRE HAUTE STREET RAILWAY CO.

idea of the advantages from the point of cheap fuel under which the street railway lines of the city operate.

The business of the city is done chiefly near the center, and the lines of street railway, dividing the whole city as they do quite evenly, carry passengers to the business center of the city without transfer. The street railway system was operated by horses until January 1, 1891, when the two main lines of the system were equipped electrically, and since that period other lines have been rebuilt and extensions made, until the mileage at the present time is about double what it was then. The northern terminals of two lines reach Collett Park, an attractive pleasure resort. The southern terminus of the main line extends to the campus of Coates College for Women, and at the eastern terminus of the main line, in a beautiful valley two miles east of the city, lies the celebrated race track—the fastest in the world—which holds the world's record, both pacing and trotting. The street railway lines also pass the State Normal School, City High School, Rose Polytechnic Institute, and other prin-

tains two Westinghouse automatic, compound, non-condensing engines of 100 H. P. each, and one of 250 H. P. These are direct belted to two 100 H. P., bipolar United States, and one 250 H. P. Westinghouse multipolar generator. The belt in the latter case is a twenty-four inch perforated, of Schieren's make, while the smaller engines use fourteen inch belts. The switchboard is of marble, equipped with Weston and Westinghouse meters, Wirt lightning arrester, etc.

The room containing the boilers measures 54 × 48 ft. The steam generating equipment consists of three tubular boilers, fifty-four inches in diameter by sixteen feet in length, and containing each thirty-six four inch tubes. The furnaces are equipped with Roney stokers, operated by a Standard five horse power engine. One Stilwell-Bierce open heater, and a second heater of the Collis make, and of 1,000 H. P. capacity, form part of the equipment of the station. Roberts steam gauges and Deane duplex pumps are used. The stack is equipped with a Green fuel economizer, of 250 H. P., and each of the engines is

supplied with a Westinghouse steam loop. Both globe and gate valves are used, and the magnesia coverings are used on the piping.

The arrangements for handling the fuel are most complete, and manual labor is eliminated as much as possible. Coal is conveyed to the boilers from the bins by chutes, which feed direct into the furnaces. The ashes are dumped into steel side ash cars, which are drawn out by the regular electric cars, and unloaded at the suburban terminus of the lines.

Near to the power plant there is a drill well eighty-five feet deep, operated by a pump which, running at slow speed, can supply 4,000 gals. per hour. This pumps directly into a water tank of 12,000 gals. capacity, and in this way the company insures itself against any lack of water supply.

Next to the power station, as mentioned, are the car houses. These are three in number, measure 100 x 50 ft. each, and are of brick with stone trimmings. There are six tracks in each house, two of which are raised on pillars, so that the motors can be easily inspected after the day's run. The car houses are equipped with Hathaway transfer tables.

Track.—The track is laid with T rails, and the method of roadbed construction employed is extremely interesting, owing to the popular interest felt at

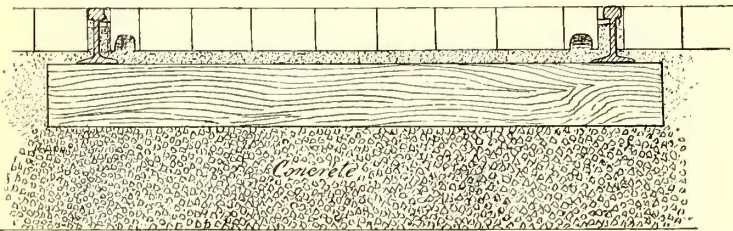


FIG. 1.—T RAIL TRACK CONSTRUCTION—TERRE HAUTE

the present time in T rail construction. The weight of the rail used is sixty pounds in the suburbs and seventy-two pounds in the center of the city. The form is the Shanghai, rolled by the Illinois Steel Company. Fig. 1 shows a section of track. As will be seen, the rails are mounted directly on ties 5 x 7 ins. x 7 ft., which are of white and burr oak. The paving is carried up flush with the outside of the rail, and on the inside a special brick block, moulded to suit the purpose, is employed. The space between the rails and the blocks on each side is filled with grouting, and the ties rest on a bed of concrete ten inches in depth. The space between the brick blocks within the tracks is laid for part of the distance along the road with brick, for another section with asphalt, and on a third division with gravel. All the crossings were supplied by Elliott, of East St. Louis, and the Paige Iron Works, of Chicago.

The rails are double bonded at the joints, and are connected to a supplementary iron and tinned copper wire. Seven-sixteenths of an inch iron bonds are used where the streets are unpaved, and No. 0000 copper bonds are employed in the paved streets.

Overhead Lines.—The overhead construction is carried on cedar poles thirty feet in length and measuring twelve

inches in diameter at the base and seven inches at the top. The trolley wire used is a hard drawn No. 1 copper wire, and triple braided No. 0 Okonite is used for feed wires.

Rolling Stock.—The rolling stock consists of twenty-eight motors cars and twelve trail cars. The former were

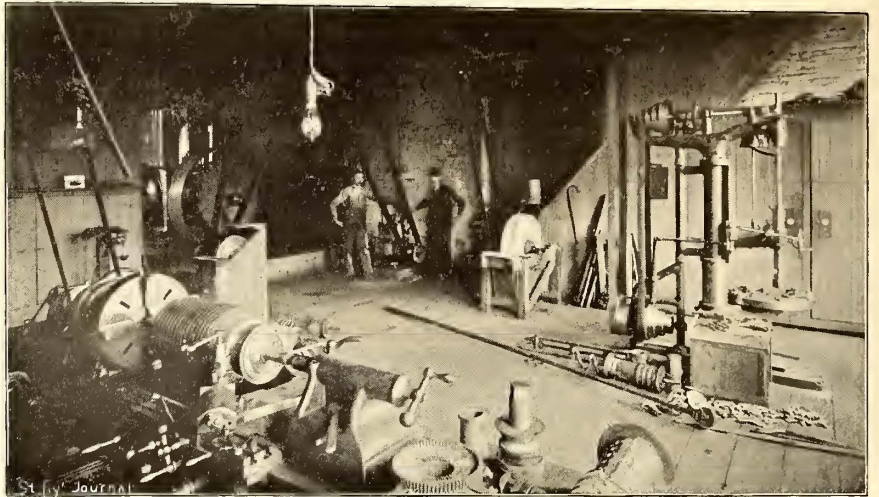


FIG. 2.—REPAIR SHOP—TERRE HAUTE STREET RAILWAY CO.

built by Stephenson, Pullman, the Centropolis Car & Manufacturing Company and other makers. Five of the trail cars were built by the Pullman Car Company, and the others were manufactured by the Terre Haute Street Railway Company. All are mounted on McGuire trucks, and are operated by Westinghouse No. 1, No. 3 and No 12 motors. This road was first to place in service the new Westinghouse No. 12 motors. These motors are giving good satisfaction, and the officials of the railway company speak loudly in their praise. The gears used are steel and cast iron, the latter being made by the railway company.

The cars are supplied with Lewis & Fowler ten inch, Meaker square, stationary and portable, and New Haven registers, and two types of electric heaters are used. The seats are covered with Wilton carpets, and the sand boxes



FIG. 3.—AT THE RACE TRACK—TERRE HAUTE.

are of the DeWitt type. The company purchases its wheels from the Terre Haute Car & Manufacturing Company, and fenders from the Crawford Manufacturing Company of Pittsburgh, Pa. The rolling stock of the company also includes a Lewis & Fowler electric sweeper,

a reversible snow and track sweeper, built by the Fleming Manufacturing Company, of Ft. Wayne, Ind., and having scrapers at each end. Dorner & Dutton track scrapers are carried on cars.

Machine Shops.—The repair shops are well equipped, and as already mentioned, the company makes a considerable portion of its supplies, as well as doing a great deal in the repair line. The machinery in the repair shops includes one twenty inch lathe, manufactured by the Ohio Machine & Tool Works, a thirty inch drill press, emery wheel, etc. The armature winding room, which is located over the machine shop, is 28×28 ft. All armatures, fields, heaters, etc. are rewound here, and any other needed repairs to the electrical apparatus can be made by the company's own employes.

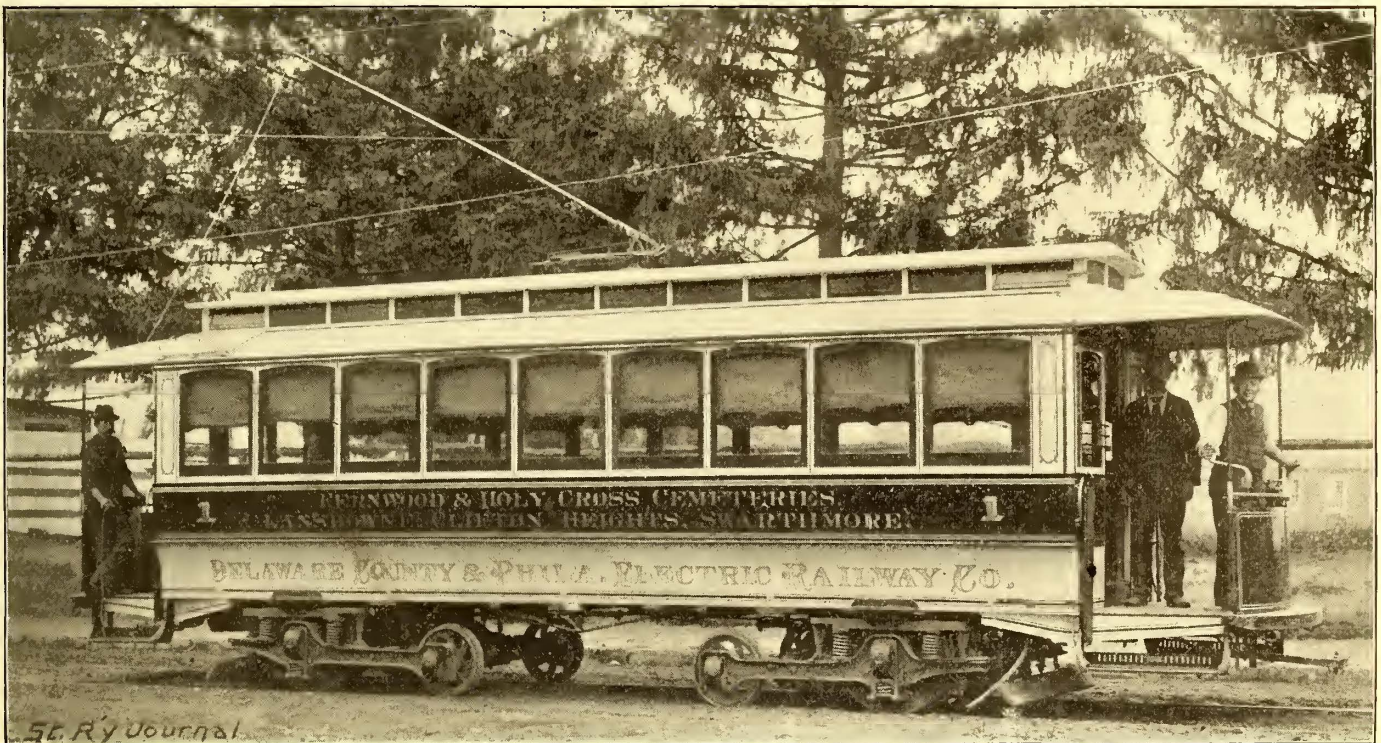
Adjoining the machine shop is a car repair shop 50×25 ft., where the cars be thoroughly rebuilt and repaired; and near this is a paint shop 25×24 ft., where the company's cars are repainted. The company also has a blacksmith shop 25×12 ft. Here all the iron work

in gold. The Illinois Trust & Savings Bank, of Chicago, is trustee of the mortgage.

Franchise, Officers, etc.—The original franchise, which allowed only the use of animal power, extended from date of adoption until 1898. This was amended in 1888 to permit the use of electric power, and the franchise was also extended until 1938. The franchise is practically exclusive, covering all the streets of the city. The number of passengers carried annually is now between 2,500,000 to 3,000,000. The officers are: President, Russell B. Harrison; treasurer, L. D. Thomas; superintendent and purchasing agent, M. F. Burke; assistant secretary and cashier, P. P. Thomas. The company has an Eastern office, at No. 1 Broadway, New York City.

New Suburban Line Near Philadelphia.

The Delaware County & Philadelphia Electric Railway, which was thrown open to the public service May 7, is of peculiar interest at the present time, as being typical



SUBURBAN CAR—DELAWARE COUNTY & PHILADELPHIA ELECTRIC RAILWAY.

for the entire system is formed, and motor bearings are repoured.

Organization.—The Terre Haute Street Railway Company received an ordinance from the city March 20, 1866, and the first line, extending from the Union Depot to First Street, was put in operation the following year. The system has been gradually extended and the number of cars in operation increased until the present time. The ownership of stock was held chiefly by the original incorporators until 1889, when the road was sold to three resident citizens of Terre Haute, who changed the system from a horse to an electric road, making extensive improvements and extensions until 1893, when the road was sold to its present owners. During the ownership of the original street railway by these persons, they purchased the Vigo County Street Railway together with its extensive franchise, covering the county roads of Vigo County and consolidated this with the Terre Haute Street Railway.

Capital Stock and Funded Debt.—The amount of common stock authorized is \$200,000 in shares of \$50 each, all of which is issued and outstanding. There is no preferred stock. \$500,000 of first mortgage bonds are authorized, issued and outstanding. These are coupon, dated July 1, 1892, bear interest at the rate of 6 per cent. per annum, and both principal and interest are payable

now of the suburban and interurban electric rapid transit, attracting so much attention in all parts of the country.

The part of the road now in operation is four miles in length, and extends from the Philadelphia line at Angora, through Fernwood, Lansdowne, Burmont, Clifton Heights and Primos, in Delaware County. The extension to Media and West Chester is now building, and within sixty days, it is expected, the cars will be running into Philadelphia as far as 38th Street, over the Electric Traction Company's Lombard and South Streets extension.

The road is a series of long and heavy grades, some of them 10 per cent., but the cars run at the rate of thirty miles an hour, and have no difficulty in climbing the hills. On opening day, one car, loaded with the officers, directors and guests, ran over the line, four miles, in nine minutes, including stops.

The electric apparatus is entirely of the General Electric Company's make, the motors being of the 800 type.

The rolling stock consists of handsome closed cars, thirty-five feet over all, built by the Lamokin Car Company, and the high speed and traction on heavy grades is the result of using McGuire adjustable traction trucks, equipped with the cushion steel tired wheels.

The officers are: James S. Austin, president; S. L. Kent, vice-president; W. H. Sayer, treasurer; Samuel Haige, secretary, and T. S. Hayward, superintendent.

THE INTRINSIC VALUE OF STREET RAILWAY INVESTMENTS.*

BY EDWARD E. HIGGINS.

SIXTH PAPER.

Class VI. Surface and Elevated Railways in American Cities of over 500,000 Inhabitants.

There are four cities in the United States having a population of over 500,000 inhabitants by the census of 1890, and another whose rich and populous suburban district brings it within this class. The total track mileage in these five population centers exceeds 1,800, of which about 70 per cent. is operated by horses, 13 per cent. by electricity, 7 per cent. by the cable system and 9 per cent. by steam (elevated). All of these cities are represented in the Table of Statistics.

The properties of this class are among the safest and most profitable in the entire range of capital investment. Defaults in interest charges are almost unknown, and dividends on stocks have been, with few exceptions, regular and satisfactory, in spite of extreme overcapitalization of costs. So well recognized are these facts that the securities are, as a rule, closely held by "insiders," and have not, at least until recently, formed an important feature in stock exchange transactions.

The primary causes of this unusual investment prosperity may be briefly set forth as follows:

1. The first experiments in street railroading were naturally made in the larger cities, and the results were then so problematical that capital could not be brought in upon short time franchises. Those granted, therefore, were, as a rule, practically perpetual (999 years), frequently exclusive upon the streets granted, and without serious burdens of special taxation, paving, etc.

2. The distances in these cities are so great as to necessitate patronage of all existing transportation facilities between the business and residential districts.

3. The crowded sidewalks and increasing street traffic in general make walking difficult and disagreeable, and short distance riding—the most profitable to the street railway companies—is steadily increasing.

4. The steady growth of urban population already severely taxes the street railway facilities, and the problem is, and always will be not how to obtain traffic, but how to take care of all that is offered.

5. The gross receipts per car mile and per mile of street are thus much heavier than in smaller cities, and, as the magnitude of the enterprises permits greater perfection in organization, the percentage of operating expenses is comparatively lower. Moreover, the properties of this class are able to obtain the very best managing ability in the market, this being an element of safety of no mean importance.

6. Finally, the local market for these securities is so broad, and the knowledge of all the conditions affecting gross and net revenue can be made so intimate, that the securities can be instantly converted into cash under pressure of necessity, and become, therefore, much safer to the ordinary investor than those which have a more limited market.

Cities of this class differ from each other in so many important respects that it will be impossible to draw any general conclusions applicable to all. Each case, therefore, must be taken up and discussed in detail in order to arrive at any just idea of its possibilities.

CASES NOS. 123 AND 127.

This is an important and extremely valuable street railway property, nearly all of which is under one management. It serves a large metropolitan area consisting of a densely populated city of 450,000 inhabitants, surrounded by a group of the richest and most beautiful suburban residential cities and towns to be found in the country and perhaps in the world. This outward expan-

sion of the residential area tributary to the city itself is the result of many contributing causes, among the most important of which may be counted the existence of a magnificent system of steam and street railways reaching every part of the territory with constant and frequent service. The steam railways within this area carry about 60,000,000 passengers per annum, and the surface system, nearly all of which is now operated by electricity, carries about 150,000,000 passengers.

The extent and importance of this system is shown by its track and street mileage, 267.3 and 170 respectively. Its burden of funded debt is small, being but \$16,300 per mile of track. Its capital stock represents the accumulated cash investments of many years, together with profits (based on earning power) realized in recent consolidations. The cost of duplicating the tangible assets as they exist to-day would probably be not less than 60 per cent., nor more than 75 per cent. of the total capital liabilities.

This system is serving about 4,000 inhabitants per mile of street with twenty-six car miles per capita. Extreme congestion in the heart of the city prevents a more frequent service in the suburbs. If this could be given the surface system would gain largely at the expense of the competing steam railway system. The passenger income was, in 1892, \$37,000 per mile of street, \$354 per car mile and \$9.35 per capita. The earnings of the last five years, during which the electric mileage has been rapidly increasing, has shown a somewhat greater ratio of increase than the normal, but hardly as great as might have been expected nor as great as that realized elsewhere under similar circumstances. This is partly because the system has always been overtaxed, especially in the congested district above referred to. The operating expenses are \$272 per car mile and 76.7 per cent. of the passenger income. This large percentage (which was reduced, however, to 73 per cent. in 1893) is partly due to imperfect early apparatus and construction, partly to the severe conditions of traffic, which are particularly destructive on track, and partly to special causes which need not be referred to here. The unusual earnings and expenses per car mile are due in part to the long cars (30 ft. to 40 ft.) which are in general use on the greater part of this system. The net income is equivalent to 8 per cent. on the entire capital liabilities, and regular 8 per cent. dividends are now being declared after meeting fixed charges.

Case No. 127, is an extension of Case No. 123 and serves a much larger area and population. Its main characteristics are not materially different from those of Case No. 123, and the two may be profitably studied together.

CASES NO. 124, 125 AND 126.

These systems all serve the same city, Case No. 124 being its entire surface system, Case No. 125 its elevated system, and Case No. 126 a combination of the two, forming its transportation system. This city (with a few unimportant suburban townships) forms a part of a much larger metropolitan area embracing nearly 4,000,000 people. Its manufacturing interests are extensive and its dock and warehouse properties give it some commercial importance, but its business interests are chiefly local and a large proportion of its population find daily employment outside its limits.

In 1890, the surface system was capitalized with moderation, its total capital liabilities being but \$52,500 per mile of track. The fixed charges were small and the stocks of the various companies paid large dividends and were held at high figures for investment. Since 1890, control of the principal properties has passed into other hands, various amalgamations have been made, and elec-

tricity is being introduced throughout. Both the capital stocks and the funded debts of the underlying companies have been largely increased, and dividends on certain of their stocks have been guaranteed by controlling "traction companies."

The surface system in 1892 consisted of 320 miles of track and 158 miles of road, and served a population of 5,100 per mile of road, with about 30 car miles per capita. The congestion of traffic in one portion of the city is about as serious here as in Case No. 123, and unless it can be remedied, the system cannot reach its full development and the competition of the elevated system must remain important.

The passenger income in 1892 was nearly \$6,000,000, equivalent to \$36,900 per mile of street, and \$7.20 per capita. The operating expenses, with as yet comparatively small electric mileage, were 82.6 per cent. of the gross, and the net income was equivalent to nearly 6 per cent. on the capital liabilities.

With the complete conversion of this system to electric operation, with careful and conservative management and with reasonable freedom from mistakes of construction, it is probable that this complete city system will soon develop an earning power of perhaps \$9,000,000 gross, and \$3,000,000 net. Any increase in the net beyond the figure last named will be the result of unusual skill and ability in management.

The elevated system in this city (Case No. 125) shows a net income nearly as large as that of the surface system as compared with passenger receipts less than 50 per cent. those of the latter. This is, however, a return in 1892 of but 2.6 per cent. on the enormous capital liabilities of the elevated system, which are undoubtedly greatly in excess of the actual cash investment. The passenger income was equivalent to \$109,400 per mile of street, \$.68 per train mile and \$3.31 per capita, while the operating expenses were 62.2 per cent. of the gross and \$.425 per train mile. The car mileage was probably about three and one-half times the train mileage.

The elevated system in this city has been seriously injured during the past year by the introduction of electricity on the surface lines in competition with its own. It is hardly probable, however, that this falling off in receipts will be permanent since the density of the population will inevitably increase, and all existing transportation systems will eventually be heavily taxed.

The combined transportation system of the city (Case No. 126) exhibits a passenger income of \$8,528,891, equivalent to \$46,600 per mile of street and \$10.58 per capita while the net income was 25 per cent. of the gross.

CASE NO. 128.

This system serves a city of large area and of great manufacturing and commercial importance. The present city limits include a somewhat crowded business and residential "heart," surrounded by what were formerly suburban villages and townships which still retain their names and characteristics, although now a part of the larger corporation. The population of this city is nearly all self contained, few business men living outside the city limits. The suburban traffic on two of the important steam railroads entering the city is enormous. The street railway system has been operated until recently, almost entirely by horses, although with a small proportion of cable mileage, and the service has been poor and unsatisfactory. Within the last two years extensive changes of motive power have been commenced, and two years hence the entire city system, with the possible exception of the cable lines, will be operated by electricity.

The system consists of 371 miles of track and of 300 miles of street, its peculiarity being the large number of loop roads and single track mileage, the cars going up one street and returning by a parallel street one or two blocks away.

The gross income was, in 1892, \$8,245,509, equivalent to \$27,400 per mile of street, and \$7.85 per capita, a low figure for the complete surface railway system of a city of this size. The operating expenses are low for what is chiefly a horse railway system, being but 68.8 per cent. of

the passenger income. The net income is equivalent to 13.6 per cent. on capital liabilities of \$56,600 per mile of track.

The complete equipment of this system by electricity will doubtless be followed by an unusually large increase in the passenger income which may easily reach a total of \$12,000,000. Much of this increase will, of course, be "stolen" from the steam railway companies which now obtain most of the traffic between the outlying and the central districts. The operating expenses of the four or five controlling companies in this system should not exceed 65 per cent. of the passenger income, and a net income of \$4,000,000 is reasonably to be expected.

CASE NO. 129.

This system serves an immense area tributary to the most highly contracted and densely populated business district in America. The problems of engineering and management in this city are of the most complex description. The principal street railway lines are operated chiefly by the cable system, and are taxed to their utmost capacity, each grip car drawing three or four trail cars at certain periods of the day. Here, again, we have an enormous suburban traffic carried on by a number of steam railway companies, the details of which are not obtainable.

The surface railway system consists of 428 miles of track laid through 214 miles of street, the entire mileage being practically double track. The large cable railway mileage is no doubt primarily responsible for capital liabilities of \$105,000 per mile of track, and it is important to know that in this city, as in the others of this class, the funded debt is considerably less than the capital stock, and that the latter represents, in nearly every case, a large cash investment.

The passenger income obtained by the surface system of this city is \$11,507,792, equivalent to \$53,700 per mile of street, \$256 per car mile and \$10.36 per capita. These figures do not seem large considering the size of the city, and the cause is doubtless to be found in the steam railway suburban service referred to above. The operating expenses are \$.157 per car mile, and but 61.4 per cent. of the passenger income, a practical commentary on the advantages of the cable system on heavily patronized lines. The net income reaches the so far unprecedented figure of \$4,572,661, equivalent to 10.2 per cent. on the capital liabilities.

A large proportion of the horse railway mileage in this city is being converted to electricity, and a moderate increase in gross and net may be expected for the future. Elevated railroad construction is also going on, one line being already in operation, but the conditions of traffic in this city do not justify the belief that the elevated railroad system will meet with as large a degree of financial success as has been found with Case No. 131, or even with Case No. 125.

CASES NOS. 130, 131, AND 132.

We have now to consider the surface, elevated and transportation systems of the largest city in the United States. By far the greater part of its population is situated on a long, narrow island about twelve miles in length by two in width. The remaining territory is a much less thickly settled district on the main land, of about equal area and possessing much the same proportions as to length and breadth. The commercial and business interests of the city are nearly all located in the lower half of the island, and the residential area covers the upper half. The entire tide of travel, therefore, moves up and down the island daily, a condition which ensures the development of maximum street railway traffic.

The elevated system (Case No. 131) carries nearly all of what may be called the "through traffic" between the residential and business areas, together with a not unimportant amount of local or short distance traffic. The surface system, with the exception of one or two through cable lines recently built, is given over almost entirely to local traffic, to the service of ladies for longer distances and to crosstown riding. Each of the two general systems has at present, therefore, a separate function, and

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

SEE "INTRINSIC VALUE OF STREET RAILWAY INVESTMENTS."

Horse railways are given in Roman figures.

Case Number	Miles of Track					Miles of Street	Capital Stock			Funded Debt			Capital Liabilities			Floating Debt		Case Number
	Horse	Electric	Cable	Miscel.	Total		Total	Per Mile Track	Per Capita	Total	Per Mile Track	Per Capita	Total	Per Mile Track	Per Capita	Total	Memo.	
123	174.0 99.3	83.0 168.0	.....	.....	257.0 267.3	163.3 170.0	10,113,350 15,752,200	39,300 59,200	14.90 23.20	4,034,442 4,365,000	15,600 16,300	5.90 6.40	14,147,792 20,117,200	54,900 75,300	20.90 29.70	1512,435 959,178	Net. ..	123
124	277.6 271.9	11.3 38.8	.....	1.2	8.0 319.9	147.7 158.8	9,572,480 9,816,230	32,200 30,700	12.00 12.20	5,996,705 9,259,500	20,200 28,900	7.00 11.50	15,569,185 19,075,730	52,500 59,700	19.00 23.70	535,120 156,310	.....	124
125	.....	.....	.....	54.8 54.3	54.8 54.3	24.8 24.4	16,833,600 16,833,600	307,100 310,000	20.80 20.80	21,331,500 22,135,700	389,400 407,700	26.40 27.40	38,165,100 38,969,300	606,500 717,700	47.40 48.30	552,637 470,613	.....	125
126	277.6 271.9	11.3 38.8	.....	1.2	62.8 374.2	172.5 183.2	26,406,080 26,649,830	75,000 71,100	32.80 33.00	27,328,205 31,395,200	77,600 84,000	33.90 39.00	53,734,285 58,045,030	152,600 155,100	66.60 72.00	17,517 314,303	.....	126
127	262.2 159.4	121.0 248.8	.....	.....	383.2 408.2	.....	11,300,500 17,302,200	29,500 42,400	12.30 18.80	5,154,942 6,715,500	13,400 16,500	5.60 7.30	16,455,442 24,017,700	43,100 58,800	17.90 26.10	1761,763 813,665	Net. ..	127
128	322.3 331.3	6.0 6.0	23.0 34.0	.....	351.3 371.3	279.5 300.6	12,311,016 14,914,895	35,000 40,200	11.70 14.20	6,105,400 6,131,360	17,400 16,500	5.80 5.80	18,416,416 21,046,255	52,500 56,600	17.50 20.00	.....	.....	128
129	313.6 315.1	.....	69.8 86.0	.....	383.4 427.7	192.2 214.4	22,750,000 24,750,000	59,500 57,900	20.50 22.30	17,689,500 19,959,500	46,200 46,700	15.90 18.00	40,439,500 44,709,500	105,700 104,600	36.40 40.30	.....	.....	129
130	251.4 264.8	.....	11.5 11.5	.....	262.9 276.3	132.5 145.1	21,391,800 24,230,000	81,400 87,700	14.10 16.00	21962000 23,707,000	83,500 85,800	14.50 15.70	43,353,800 47,937,000	164,900 173,500	28.60 31.70	511,870 644,434	.....	130
131	.....	.....	.....	94.2 100.2	94.2 100.2	35.6 36.2	26,632,045 29,991,180	282,700 299,300	17.60 19.80	29,318,000 34,493,000	311,300 344,200	19.40 22.80	55,950,045 64,484,180	593,900 643,500	36.90 42.60	1502633 6726588	.....	131
132	251.4 264.8	.....	11.5 11.5	94.2 100.2	357.1 376.5	168.1 181.3	48,023,845 54,221,180	134,500 144,000	31.70 35.80	51,280,000 58,200,000	143,600 154,600	33.80 38.40	99,303,845 112,421,180	278,100 298,600	65.50 74.20	2014503 7371022	.....	132

INTERURBAN STREET RAILWAYS IN AMERICA.

133	.....	6.4	.....	.....	6.4	6.0	60,000	9,400	3.50	50,000	7,800	2.90	110,000	17,200	6.50	2,487	Net.	133
	.....	6.9	.....	.....	6.9	6.5	60,000	8,700	3.50	50,000	7,300	2.90	110,000	15,900	6.50	20,981	..	
134	14.0	.....	.....	.....	14.0	14.0	100,000	7,100	3.30	25,000	1,800	.80	125,000	8,900	4.20	34,720	Net.	134
	14.0	.....	.....	.....	14.0	14.0	97,800	7,000	3.30	85,000	6,100	2.80	182,800	13,100	6.10	8,179	..	
135	31.3	7.0	.....	.....	38.3	36.6	245,000	6,400	7.90	47,000	1,200	1.50	292,000	7,600	9.40	265,887	Net.	135
	14.9	26.2	.....	.....	41.2	39.0	230,000	5,600	7.40	475,000	11,500	15.30	705,000	17,100	22.70	150,943	..	
136	5.8	.....	.....	.....	5.8	5.5	100,000	17,200	2.30	.....	.....	.....	100,000	17,200	2.30	81,746	Net.	136
	.....	6.1	.....	.....	6.1	5.5	135,000	22,100	3.10	100,000	16,400	2.30	235,000	38,500	5.50	5,070	..	
137	.....	.....	.....	.....	.....	17.3	1,000,000	45,000	20.00	700,000	31,500	14.00	1,700,000	76,600	34.00	.....	.....	137
138	28.2	9.7	.....	.....	37.9	.....	250,000	6,600	3.70	475,500	12,500	7.00	725,500	19,100	10.70	111,256	Net.	138
	19.2	24.0	.....	.....	43.2	.....	300,000	6,900	4.40	1,300,500	30,100	19.10	1,600,500	37,000	23.50	276,072	..	
139	24.8	.....	.....	.....	24.8	16.0	224,000	9,000	2.40	.....	.....	.....	224,000	9,000	2.40	10,403	.....	139
	15.0	17.0	.....	.....	32.0	22.1	324,000	10,300	3.40	350,000	10,900	3.70	674,000	21,100	7.20	116,534	.....
140	.....	46.0	.....	.....	46.0	41.5	5,100,000	110,900	53.70	1,865,000	40,700	19.70	6,965,000	151,500	73.40	.....	.....	140
141	56.1	7.0	.....	.....	63.1	52.6	469,000	7,400	3.80	47,000	740	.40	516,000	8,100	4.10	276,290	.....	141
	29.9	43.2	.....	.....	73.1	61.1	554,000	7,600	4.40	825,000	11,200	6.60	1,379,000	18,900	11.00	267,477	.....
142	60.0	28.3	.....	.....	88.3	.....	937,150	10,600	5.40	645,000	7,300	3.70	1,582,150	17,900	9.10	138,072	Net.	142
	40.9	56.8	.....	.....	97.7	.....	1,250,000	12,800	7.20	1,050,000	10,700	6.00	2,300,000	23,500	13.20	130,559	..	
143	42.0	15.5	.....	.....	57.5	36.7	1,099,700	19,100	5.60	1,252,155	21,700	6.40	2,351,855	40,900	11.90	12,526	Net.	143
	3.8	56.5	.....	.....	60.3	38.5	2,080,000	34,500	10.60	1,563,348	25,900	8.00	3,645,348	60,400	18.50	70,465	..	
144	64.7	.....	3.0	.....	67.7	54.6	2,000,000	29,500	9.20	.....	.....	.....	2,000,000	29,500	9.20	55,700	.....	144
	73.3	.....	3.4	.....	76.7	59.6	2,500,000	32,600	11.50	.....	.....	.....	2,500,000	32,600	11.50	226,787	.....
145	88.2	38.0	.....	.....	126.2	.....	1,187,150	9,400	4.90	1,120,500	8,900	4.60	2,307,650	18,400	9.60	249,328	Net.	145
	60.1	80.8	.....	.....	140.9	.....	1,550,000	11,000	6.40	2,350,500	16,700	9.70	3,900,500	27,700	16.10	145,513	..	

aa. The street railway mileage is closely approximate, but not exact. dd. The track and street mileage are closely approximate, but not exact. ff. This case covers nearly the entire street railway system of the city, but certain small and unimportant operating roads are omitted in 1892. gg. One surface railway included in this system is the horse railway division of an extensive steam railway, and the capital liabilities properly chargeable to the city road cannot be ascertained. The capital stock and funded debt are here assumed to be \$100,000 per mile of track each, figures which, for various reasons, seem to be a fair representation of the value of this property as compared with the capitalization of the other systems in the city. s. Current assets exceed current liabilities. z. Approximate.

SERVING OVER 500,000 POPULATION.

PART II.—STATISTICS OF OPERATION.

Electric, Cable and Steam Railways are given in Italics.

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Case Number	Population	Area Served	Population		Year Ending	Car Mileage		Passenger Income				Operating Expenses			Net Earnings				Case Number
			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	u
123	678,000 <i>678,000</i>	....	4,200 <i>4,000</i>	.....	9-30-1890 <i>9-30-1892</i>	17,818,475 <i>17,880,715</i>	26.3 <i>26.4</i>	5 727,495 <i>6 341,853</i>	35,200 <i>37,300</i>	.322 <i>.354</i>	8.45 <i>9.35</i>	4493,994 <i>4864,049</i>	.252 <i>.272</i>	78.3 <i>76.7</i>	1 322,823 <i>1 547,164</i>	.074 <i>.087</i>	23.2 <i>24.4</i>	9.4 <i>7.7</i>	123
124	806,000 <i>806,000</i>	....	5,400 <i>5,100</i>	.....	6-30-1890 <i>6-30-1892</i>	21,416,916 <i>.....</i>	26.6 <i>.....</i>	5 097,978 <i>5 861,202</i>	34,500 <i>36,900</i>	.238 <i>.....</i>	6.33 <i>7.27</i>	4349,857 <i>4839,352</i>	.203 <i>.....</i>	85.3 <i>82.6</i>	834,007 <i>1 115,301</i>	.039 <i>.....</i>	16.3 <i>19.1</i>	5.3 <i>5.9</i>	124
125	<i>806,000</i> <i>806,000</i>	....	<i>32,500</i> <i>33,000</i>	.....	<i>6-30-1890</i> <i>6-30-1892</i>	<i>b 13,670,486</i> <i>b 13,708,429</i>	<i>24.2</i> <i>24.3</i>	<i>2 250,371</i> <i>2 667,689</i>	<i>90,700</i> <i>109,400</i>	<i>.164</i> <i>.195</i>	<i>2.79</i> <i>3.31</i>	<i>1 492,555</i> <i>1 658,752</i>	<i>.109</i> <i>.121</i>	<i>66.2</i> <i>62.2</i>	<i>524,938</i> <i>1 021,586</i>	<i>.038</i> <i>.074</i>	<i>23.3</i> <i>38.2</i>	<i>1.4</i> <i>2.6</i>	125
126	806,000 <i>806,000</i>	....	4,700 <i>4,400</i>	.....	6-30-1890 <i>6-30-1892</i>	35,087,402 <i>cc.....</i>	50.7 <i>.....</i>	7 348,349 <i>8 528,891</i>	42,500 <i>46,600</i>	.209 <i>.....</i>	9.12 <i>10.58</i>	5 842,412 <i>6 498,104</i>	.166 <i>.....</i>	79.5 <i>76.2</i>	1 358,945 <i>2 136,887</i>	.039 <i>.....</i>	18.5 <i>25.1</i>	2.5 <i>3.7</i>	126
127	920,000 <i>920,000</i>	....	.....	.....	9-30-1890 <i>9-30-1892</i>	20,793,214 <i>21,424,661</i>	22.6 <i>23.3</i>	6 657,961 <i>7 419,481</i>	.....	.320 <i>.347</i>	7.24 <i>8.06</i>	5 257,226 <i>5 747,169</i>	.253 <i>.269</i>	78.9 <i>77.5</i>	1 475,111 <i>1 727,177</i>	.071 <i>.081</i>	22.2 <i>23.3</i>	9.0 <i>7.2</i>	127
128	1,047,000 <i>1,047,000</i>	....	3,800 <i>3,500</i>	.....	6-30-1890 <i>6-30-1892</i>	.....	.....	7 500,278 <i>8 245,509</i>	26,800 <i>27,400</i>	.....	7.14 <i>7.85</i>	4984,237 <i>5679,759</i>	ee... <i>ee...</i>	66.4 <i>68.8</i>	2 756,462 <i>2 861,269</i>	.....	36.8 <i>34.7</i>	15.0 <i>13.6</i>	128
129	1,110,000 <i>1,110,000</i>	....	5,800 <i>5,200</i>	.....	n 1890 <i>n 1892</i>	36,105,755 <i>44,950,642</i>	32.5 <i>40.5</i>	8 891,010 <i>11 507,792</i>	46,300 <i>53,700</i>	.247 <i>.256</i>	8.00 <i>10.36</i>	5 618,459 <i>7 059,695</i>	.156 <i>.157</i>	63.2 <i>61.4</i>	3 315,322 <i>4 572,661</i>	.092 <i>.102</i>	37.3 <i>39.7</i>	8.2 <i>10.2</i>	129
130	1,515,000 <i>1,515,000</i>	....	11,400 <i>10,500</i>	.....	6-30-1890 <i>6-30-1892</i>	36,366,645 <i>.....</i>	24.0 <i>.....</i>	10 933,145 <i>11 684,454</i>	82,000 <i>80,700</i>	.300 <i>.....</i>	7.17 <i>7.70</i>	8 227,996 <i>9 036,244</i>	.226 <i>.....</i>	75.5 <i>77.3</i>	2 763,481 <i>3 807,820</i>	.076 <i>.....</i>	25.3 <i>32.5</i>	6.4 <i>8.0</i>	130
131	<i>1,515,000</i> <i>1,515,000</i>	....	4,300 <i>4,200</i>	.....	<i>6-30-1890</i> <i>6-30-1892</i>	<i>38,417,600</i> <i>45,534,350</i>	<i>25.3</i> <i>29.9</i>	<i>9 498,743</i> <i>10 684,979</i>	<i>266,800</i> <i>295,300</i>	<i>.242</i> <i>.237</i>	<i>6.25</i> <i>7.05</i>	<i>5 482,228</i> <i>5 923,213</i>	<i>.138</i> <i>.130</i>	<i>57.7</i> <i>55.3</i>	<i>4 117,928</i> <i>4 913,111</i>	<i>.107</i> <i>.108</i>	<i>43.3</i> <i>45.9</i>	<i>7.4</i> <i>7.6</i>	131
132	1,515,000 <i>1,515,000</i>	....	9,000 <i>8,400</i>	.....	6-30-1890 <i>6-30-1892</i>	74,784,245 <i>hh.....</i>	49.2 <i>.....</i>	20 431,888 <i>22 309,433</i>	121,600 <i>123,400</i>	.270 <i>.....</i>	13.42 <i>14.74</i>	13 710,824 <i>14 959,457</i>	.180 <i>.....</i>	67.2 <i>67.0</i>	6 881,409 <i>8 720,931</i>	.092 <i>.....</i>	33.7 <i>38.9</i>	6.9 <i>7.8</i>	132

INTERURBAN STREET RAILWAYS IN AMERICA.

133	17,000 <i>17,000</i>	....	2,800 <i>2,600</i>	.....	9-30-1890 <i>9-30-1892</i>	92,400 <i>185,784</i>	5.4 <i>10.9</i>	23,085 <i>38,340</i>	3,800 <i>5,900</i>	.250 <i>.206</i>	1.36 <i>2.25</i>	12,967 <i>30,494</i>	.141 <i>.164</i>	56.3 <i>79.6</i>	10,249 <i>8,194</i>	.110 <i>.044</i>	44.2 <i>21.4</i>	9.3 <i>7.4</i>	133
134	30,000 <i>30,000</i>	....	2,100 <i>2,100</i>	.....	9-30-1890 <i>9-30-1893</i>	.....	.....	21,310 <i>28,199</i>	1,500 <i>2,000</i>	.....	.71 <i>.94</i>	16,478 <i>20,823</i>	.....	77.4 <i>73.8</i>	5,256 <i>8,206</i>	.....	24.7 <i>29.1</i>	4.2 <i>4.5</i>	134
135	31,000 <i>31,000</i>	....	800 <i>800</i>	.....	9-30-1890 <i>9-30-1892</i>	317,797 <i>399,192</i>	10.3 <i>12.9</i>	99,089 <i>114,482</i>	2,700 <i>2,900</i>	.311 <i>.286</i>	3.20 <i>3.70</i>	71,689 <i>84,038</i>	.225 <i>.210</i>	72.3 <i>73.7</i>	30,138 <i>33,462</i>	.095 <i>.084</i>	30.4 <i>29.3</i>	10.3 <i>4.8</i>	135
136	43,000 <i>43,000</i>	....	7,800 <i>7,800</i>	.....	9-30-1890 <i>9-30-1892</i>	49,418 <i>228,857</i>	1.2 <i>5.3</i>	16,685 <i>61,496</i>	3,000 <i>11,200</i>	.337 <i>.269</i>	.39 <i>1.43</i>	14,309 <i>40,226</i>	.289 <i>.176</i>	85.6 <i>65.4</i>	2,611 <i>22,641</i>	.053 <i>.099</i>	15.6 <i>36.7</i>	2.6 <i>9.6</i>	136
137	..... <i>50,000</i>	....	..... <i>2,900</i>	.....	..... <i>6-30-1893</i>	.....	.....	..... <i>166,486</i>	..... <i>9,600</i>	..... <i>.....</i>	..... <i>3.32</i>	..... <i>107,796</i>	..... <i>.....</i>	..... <i>65.1</i>	..... <i>58,690</i>	..... <i>.....</i>	..... <i>35.4</i>	..... <i>3.5</i>	137
138	68,000 <i>68,000</i>	....	..... <i>.....</i>	.....	9-30-1890 <i>9-30-1892</i>	630,176 <i>782,910</i>	9.3 <i>11.5</i>	228,504 <i>259,625</i>	..... <i>.....</i>	.363 <i>.332</i>	3.36 <i>3.82</i>	176,110 <i>200,746</i>	.279 <i>.257</i>	76.8 <i>77.3</i>	55,115 <i>60,856</i>	.088 <i>.078</i>	24.1 <i>23.4</i>	7.6 <i>3.8</i>	138
139	94,000 <i>94,000</i>	....	5,900 <i>4,300</i>	.....	9-30-1890 <i>9-30-1892</i>	460,291 <i>662,993</i>	4.9 <i>7.1</i>	136,053 <i>189,688</i>	8,500 <i>8,600</i>	.296 <i>.286</i>	1.45 <i>2.02</i>	111,431 <i>140,165</i>	.241 <i>.211</i>	81.6 <i>73.7</i>	26,676 <i>51,465</i>	.058 <i>.078</i>	19.6 <i>27.1</i>	11.9 <i>7.6</i>	139
140	..... <i>95,000</i>	....	..... <i>2,300</i>	.....	..... <i>12-31-1893</i>	.....	.....	..... <i>310,927</i>	..... <i>7,500</i>	..... <i>.....</i>	..... <i>3.27</i>	..... <i>149,240</i>	..... <i>.....</i>	..... <i>47.9</i>	..... <i>162,950</i>	..... <i>.....</i>	..... <i>52.4</i>	..... <i>2.3</i>	140
141	125,000 <i>125,000</i>	....	2,400 <i>2,000</i>	.....	9-30-1890 <i>9-30-1892</i>	778,088 <i>1,062,185</i>	6.2 <i>8.5</i>	235,142 <i>304,170</i>	4,500 <i>4,900</i>	.300 <i>.287</i>	1.88 <i>2.43</i>	183,120 <i>224,203</i>	.235 <i>.211</i>	77.9 <i>73.6</i>	56,814 <i>84,927</i>	.073 <i>.080</i>	23.7 <i>27.9</i>	11.0 <i>6.1</i>	141
142	174,000 <i>174,000</i>	....	..... <i>.....</i>	.....	9-30-1890 <i>9-30-1892</i>	2,344,563 <i>2,761,036</i>	13.5 <i>15.9</i>	701,962 <i>818,003</i>	..... <i>.....</i>	.300 <i>.296</i>	4.03 <i>4.70</i>	587,122 <i>682,374</i>	.251 <i>.247</i>	83.6 <i>83.4</i>	97,173 <i>119,157</i>	.045 <i>.043</i>	13.8 <i>14.5</i>	6.2 <i>5.2</i>	142
143	197,000 <i>197,000</i>	....	5,400 <i>5,100</i>	.....	6-30-1890 <i>6-30-1892</i>	4,924,128 <i>.....</i>	25.0 <i>.....</i>	621,265 <i>770,079</i>	16,900 <i>20,000</i>	.126 <i>.....</i>	3.15 <i>3.90</i>	519,504 <i>475,058</i>	.106 <i>.....</i>	83.7 <i>61.7</i>	117,368 <i>287,219</i>	.024 <i>.....</i>	18.8 <i>37.2</i>	5.0 <i>7.9</i>	143
144	217,000 <i>217,000</i>	....	4,000 <i>3,600</i>	.....	6-30-1890 <i>6-30-1892</i>	.....	.....	944,939 <i>1141,641</i>	17,300 <i>19,120</i>	..... <i>.....</i>	4.35 <i>5.25</i>	768,213 <i>1034,275</i>	..... <i>.....</i>	81.4 <i>91.2</i>	190,159 <i>125,030</i>	..... <i>.....</i>	20.1 <i>11.0</i>	9.5 <i>5.0</i>	144
145	242,000 <i>242,000</i>	....	..... <i>.....</i>	.....	9-30-1890 <i>9-30-1892</i>	2,974,739 <i>3,543,946</i>	12.3 <i>14.6</i>	930,466 <i>1077,628</i>	..... <i>.....</i>	.313 <i>.305</i>	3.84 <i>4.46</i>	763,232 <i>883,120</i>	.257 <i>.250</i>	82.0 <i>81.8</i>	152,288 <i>180,013</i>	.051 <i>.051</i>	16.2 <i>16.7</i>	6.6 <i>4.6</i>	145

bb. Estimated on basis of 3.5 car miles per train mile. cc. Including estimated car mileage elevated railway system. (See bb.)
 ff. This case covers nearly the entire street railway system of the city, but certain small and unimportant operating roads are omitted in 1892.
 hh. Estimated on basis of 5 car miles per train mile. The train mileage for a suburban division of the elevated system is not included in 1890, but is not large. n. Fiscal years of the several roads end at different dates. ee. Operating expenses cannot be checked as they are not given in detail.

although the surface railways contemplate the adoption of some motive power other than horses in the immediate future, it is probable that the business of the elevated system cannot be seriously injured by surface railway competition, owing to crowded streets and necessarily slow speed.

The elevated system consists of 100 miles of track built through 36 miles of street, and is capitalized at \$64,484,180, equivalent to \$643,500 per mile of track. An enormous overcapitalization both of original and present value of tangible assets. It is giving a service of over 9,000,000 train miles and 45,000,000 car miles per annum. Its gross passenger receipts amount to \$10,684,979, equivalent to \$295,300 per mile of street, \$.237 per car mile and \$7.05 per capita. The operating expenses are \$13 per car mile, and 55.3 per cent. of the passenger income, figures which are gradually being reduced in the expectation of reaching an operating percentage of 50. The net income is \$4,913,111, equivalent to 7.6 per cent. upon the capital liabilities.

Severe, and largely unwarranted criticism of the management of this elevated system is locally fashionable. As a matter of fact its organization and management are wonderfully perfect, and the admiration of "those who know." The pressure upon the system in early morning and late at night cannot possibly be taken care of with existing terminal facilities, and the overcrowding of trains is an almost necessary evil.

The surface system is controlled by seven independent companies which have no general transfer arrangements for interchange of passengers. It consists of 276 miles of track laid through 145 miles of street, and serves a population of about 10,500 per mile of street with approximately 25 car miles per capita. The capitalization is based purely on earning power and has little or no relation to cost of construction, the funded debt alone being \$85,800 per mile of track and the total capital liabilities \$173,500.

The gross income is a little larger than that of the elevated system, namely, \$11,684,454, equivalent to \$80,700 per mile of street, about \$.30 per car mile and \$7.70 per capita. The operating expenses are about 77 per cent. of the passenger income, and the net is \$3,807,820, equivalent to 8 per cent on the capital liabilities.

With the introduction of the cable system on the principal through routes of this city, a large increase in gross income may be expected, together with a decrease in operating expenses, which will make a net income more than double that of the present quite a thing to be expected.

The entire transportation system of this city (case No. 132), shows a passenger income of \$22,369,433, equivalent to \$123,400 per mile of street, about \$.27 per car mile and \$14.74 per capita; with a net income of \$8,720,931, equivalent to 7.8 per cent. on capital liabilities of nearly \$300,000 per mile of track.

Class VII. Interurban Electric Railways in America.

With the exhaustion of the supply of large and small cities and towns available for street railway operations has come the promotion of interurban electric railways. Attempts in this direction have been comparatively recent and have met with determined opposition from the steam railway companies, who have justly feared serious injury to their business from electric railway competition, and it is hardly possible at present to speak with any certainty as to results or probabilities in this comparatively unknown field.

I have placed in the Table of Statistics thirteen cases, nine of which may be considered as interurban systems proper, three are systems which connect a series of towns tributary to a more important city, and one is a combination of two large cities seven miles apart. These cases can hardly be considered typical or other than isolated examples of results which have been partially worked out in this field, but they are interesting as throwing some light on possibilities.

Case No. 133 is a six mile single track road serving three small manufacturing towns. Its gross receipts amount to \$2.25 per capita, a figure somewhat larger than

is usual in single cities of but 17,000 inhabitants. Its net income amounts to 7.4 per cent. on capital liabilities of \$15,900 per mile of track.

Case No. 134 is a fourteen mile horse railway serving two unimportant cities located in a farming and lumbering country. This road is earning but \$.94 per capita. The traffic is derived only from travel between the two cities, with little or no local business. The road is operated with economy and its net income is equal to 4.5 per cent. on capital liabilities of \$13,100 per mile of track.

Case No. 135 serves six townships, the largest of which has 14,000 inhabitants and the smallest three less than 1,700 each. The territory traversed is interesting and beautiful, and summer pleasure riding is an important element in traffic. The difference between this system and case No. 134, just described, is remarkable and shows at a glance how impossible it is to generalize these interurban roads.

Case No. 136 serves three villages within the limits of a single city and two townships several miles away—all rich and beautiful residential territory in the vicinity of a large city. It can hardly be said that this system serves a population of 43,000, since it does not reach the greater part of the principal city and has little or no local traffic. Its gross receipts per capita are not large, but it is well managed and its net income has gradually risen until it is now nearly 10 per cent. on capital liabilities of \$38,500 per mile of track.

Case No. 137 is an excellent example of an interurban system. The largest city of the group contains about 25,000 inhabitants and is a county town. Two cars give an excellent but not well patronized local service within this town. A line runs thence a distance of about six miles, through a scattered population of about 1,000, to a town of about 4,000 inhabitants. Another line runs seven miles away, through a scattered population of about 1,500, to a group of three important manufacturing towns having an aggregate population of about 20,000. The total track mileage is 22. A fifteen minute service is given on all lines and the system earned in 1893 \$166,486, equivalent to \$9,600 per mile of street and \$3.32 per capita, a decidedly satisfactory result. The operating expenses in the second year of operation were 65.1 per cent., and the net was equivalent to 3.5 per cent. on heavy capital liabilities of \$76,600 per mile of track.

The largest city of Case No. 138 has about 31,000 inhabitants and is a dull, sleepy coast town with large fishing interests, but of little manufacturing importance. Connected with this by the street railway system under discussion are six townships, two of these having a population of about 10,000 each, two of about 8,000 each and two of about 1,000 each. The whole territory covered is an attractive summer pleasuring ground, and that there is a large amount of regular and summer traffic is shown by the passenger income, which is \$259,625, equivalent to \$3.82 per capita. The operating expenses, with about half the road under electricity, were 77 per cent. in 1892, and the net was equivalent to about 4 per cent. on capital liabilities which represent twice the cost of building such a property *de novo*.

Case No. 139 serves seven towns of from 2,000 to 6,000 inhabitants, and one city of 27,000 inhabitants, all more or less tributary to an important manufacturing city of 45,000 inhabitants. The local traffic in the two larger cities is doubtless of some value, but the passenger earnings amount to but \$189,688, equivalent to \$8,600 per mile of street, \$.286 per car mile and \$2.62 per capita. The net is equivalent to about 8 per cent. on moderate capital liabilities of \$21,100 per mile of track.

Case No. 140 is another excellent example of a true interurban system. It serves a scattered mining population which earns high wages, spends money freely, is fond of riding and makes it a point to "go up to town" every evening. As a consequence, the cars operated are earning about \$50 per diem each, and are crowded at certain hours of the day. The principal city has about 40,000 inhabitants, and in the valleys through which this system extends over twenty-eight towns and mining settlements of from 200 to 10,000 inhabitants are found. The system is

heavily overcapitalized, the funded debt alone representing more than twice the actual cash cost of construction and equipment, but the net income in 1893 was apparently sufficient to meet fixed charges and leave about 1 per cent. for the stock. The low ratio of operating expenses (47.9) is due in part to the cheapness of fuel, but, although the roadbed is of T rail throughout, and its repair and depreciation account is therefore a minimum, it is probable that the ratio of operating expenses will gradually increase in years to come.

Case No. 141 is a combination of Cases Nos. 135 and 139, and consists of three street railway properties serving fourteen cities and towns through the combined farming and manufacturing district previously described.

Case No. 142 serves a rich suburban residence and manufacturing district tributary to, and (by this system) connected with a large and important city. One of the most important features is a heavy business traffic between the metropolis and an adjacent city of 25,000 inhabitants. Six or eight miles farther away the system reaches a city of nearly 60,000 inhabitants, which is the center of a network of lines radiating to a number of more or less important residential towns and villages, nearly all served by the system under discussion. Still farther away from the metropolis a connection is made with the system described in Case No. 138, and the combination of the two, forming the most important interurban system represented in the table, is shown in Case No. 145.

Case No. 143 is a combination of two systems, one of which has been already represented in the table (Case No. 100) as serving an important manufacturing city of about 60,000 inhabitants and a group of suburban townships. The other system serves a city of over 90,000 inhabitants about six miles away, and an interurban line connects the two, adding about 8,000 to the total population served. This case is hardly, properly speaking, an interurban system, but is merely represented here for what interest it may have as a combination case.

Case No. 144 has already been placed in the tables (Case No. 111) as a city system. In reality, it is neither that nor an interurban system, since the local traffic in its principal city of 130,000 inhabitants, and in another of nearly 30,000 inhabitants is a most important source of revenue, while the system serves, not only these two cities, but six others of from 2,000 to 20,000 inhabitants.

All of the interurban systems described above, with the exception of the two smallest, are excellent properties, and are safely profitable. There can be no question that in thickly settled manufacturing and residence territory, a network of lines connecting the various settlements will be well patronized for both pleasure and business reasons. It is only since the introduction of improved forms of motive power that "pleasure riding" has become so important a source of street railway revenue. There is no reason why it should not increase in years to come, particularly through the country districts served by interurban roads, such as those just described.

Nevertheless, a great many doubtful interurban "schemes" are being urged upon capital in these later days. The great difficulty with many of the projects is that they are building too much mileage for the possible patronage. It cannot usually be wise, for example, to build a line through ten or fifteen miles of farming country in order to connect a village of 2,000 inhabitants with a town of 5,000 by a fifteen minute schedule—an extreme case, perhaps, but one which we can easily find paralleled in recent prospectuses.

Of a somewhat different character are the more ambitious projects for connecting important cities 100 miles or more apart by a system of electric railways which shall develop a large local and pleasure traffic en route, with little expectation of through business. Such roads come in direct conflict with existing steam railways, and naturally arouse their bitter opposition. From the steam railway point of view it does not seem quite fair for local authorities to grant to the electric railway companies the free use of costly highway systems built at the expense of the public, when the steam railways have been obliged to purchase their rights

of way and to assume heavy burdens for expense of grading, bridges, viaducts, etc. This is especially an injustice also if the right to carry freight shall also be granted to companies operating upon the public highways, and if the attempt is made to obtain such rights on any large scale we may expect a "war of corporations" of the most bitter and determined nature.

CONCLUSION.

The street railway field has been so thoroughly exploited, especially during the last five years, that it is now difficult to find many wholly new opportunities for the profitable investment of capital. All, or nearly all the cities of the United States of 10,000 inhabitants or over, together with perhaps half of the smaller cities exceeding 2,500 inhabitants, are served by street railways. It is probable that few valuable routes in these cities are now unoccupied and it is certain that much unprofitable mileage has been built. During the past five years extensive consolidations have been made, and many others are yet possible. The gross street railway mileage of the country, therefore, is not likely henceforth to show more than a gradual increase unless the demand for interurban systems shall reach large proportions.

Completing this hasty and imperfect review of the street railway industry in the United States, it may be said broadly that the substitution of cable and electric for animal motive power has dignified the industry and has raised it immeasurably in the estimation of investors. Its future is bright, and, in spite of the many instances of unrealized hopes which time will surely bring, its intrinsic earning power is certain to compare most favorably with that in other fields of industrial enterprise.

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.

EDITORS STREET RAILWAY JOURNAL:

The following notice appeared in the March issue of the *Electrical and Street Railway Reporter* published in New York: "A receiver for the McGuire Manufacturing Company, of Chicago, has been applied for through Richard B. Davis, of Petersburg, Va., counsel for the company." Unless very carefully noticed, one might think a receiver was asked for the McGuire Manufacturing Company, while in fact the McGuire Manufacturing Company is asking for a receiver for a railway company. The McGuire Manufacturing Company is one of the strongest concerns, with as high a credit as any in the street railway business.

The paper referred to made a correction in its April issue; but good news never travels so fast as bad; therefore, we ask you to publish the above.

Yours very truly,
MCGUIRE MANUFACTURING COMPANY.

A CERTIFICATE of the consolidation of the Metropolitan Street Railway Company, the Metropolitan Crosstown Railway and the Lexington Avenue & Pavonia Ferry Railway, of New York, was filed with the Secretary of State, May 28. The amount of the capital stock of the combination, which is to be known as the Metropolitan Street Railway Company, is \$13,500,000. There are nine directors, as follows: Herbert H. Vreeland, Thomas F. Ryan, R. S. Hayes, Albert W. Fletcher, H. S. Beattie and Ralph L. Anderton, Jr., of New York; Daniel B. Hasbrouck and Charles E. Warren, of Brooklyn, and Henry A. Robinson, of Yonkers. The new road assumes all the debts of the others, amounting to \$9,250,000. The shares of the new company are to be given share for share for those of the companies combined. The capital stock is equal to the combined stock of the three.

AN electric railway has been put in operation in Lyons, France, by the Compagnie des Omnibus et Tramways, of that city.

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

Address all communications to

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

MR. ROBERT W. BLACKWELL, M. I. E. E., 39 Victoria Street, London, England, has been appointed European representative of the STREET RAILWAY JOURNAL. Mr. Blackwell is well known among street railway and tramway managers on both sides of the water. He was president of the Bentley-Knight Electric Railway Company, of New York, from 1884 to 1890. During the latter year he removed to London, where he has since been engaged in electric traction matters, having been associated for several years with the late Mr. Anthony Reckenzaun. Our new London office is on the first floor of the New Albany Buildings overlooking Victoria Street, the great thoroughfare between the Victoria, Charing Cross and Waterloo Stations, and close to the Institutions of the Civil, Electrical and Mechanical Engineers.

Hurry Has Been the Bane of street railway operations to a greater extent than is often realized. Franchises have been secured with a limiting clause that the line should be in operation at a certain period, or extensions have been contemplated for the purpose of meeting a prospective traffic that would be inaugurated on a certain date incident to the establishment of an exposition, race track or something of the kind. Also under fear of adverse climatic conditions hurry orders have been placed for rolling stock, equipment, etc. The result too often is that the appliances of the roadway fail, owing to the fact that in the hurry of construction some of the minor details had been overlooked or inferior materials employed. The result has been great expense for repairs and renewals and annoying failures that would never have occurred had longer time been allowed for perfecting the details of equipment. In justice to themselves the manufacturers should generally refuse to fill hurry orders, for with the

best intentions the chances are that some element of weakness will be found in the machine or device which will ever after work to the prejudice of the firm.

The Exhibits made by the manufacturers of street railway appliances at the annual conventions of the American Street Railway Association form one of the most interesting and instructive features of these gatherings, and are greatly appreciated by the delegates who thus have opportunity to inspect in practical operation the apparatus designed for street railway service. The executive committee of the Association recognizes the value of this department of the meetings, and, as is well known, has always shown the utmost willingness to assist towards its success by arranging for suitable exhibition rooms, and in other ways to be of help to intending exhibitors. In the circular just issued by the secretary of the Association, to manufacturers who intend to be represented at the Atlanta Convention, next October, the suggestion is made that all apparatus intended for exhibition purposes be shipped in ample time before the meeting, to insure delivery and erection at the Exhibition Hall before the assembling of the delegates. We cannot too strongly urge compliance with this important point. The duration of the Convention is none too long, as it is, for the delegates to become acquainted with the important features of the apparatus shown, and no time should be lost after the Convention opens in preparing exhibits for inspection.

Much Injury Has Been Occasioned the legitimate street railway business of many cities by the organization of new companies by irresponsible persons. Fair competition is often a benefit, inciting as it does to better results and a more perfect service, and as a city increases in size it is to be expected that new companies will engage in the field of transportation. There are other kinds of competition, however, and one of these is from a company which has been organized by persons who have no real intention of keeping control of the road after cars have been put in operation. In many cases the promoters of such companies, in order to secure franchises in cities where there was a competition between themselves and the local corporation for the same franchises, have made offers to the local authorities to pay into the city treasury extravagant amounts either as lump sums or as an annual per cent. on the gross receipts for the franchises, well knowing at the time that the business would never warrant the outlay, the only object in the minds of the promoters being to secure the franchises and in some way to dispose of the securities. In some cases these offers have forced the legitimate competitors to agree to the same terms, and we now find roads loaded with obligations, which if met will ever tend to cripple the service, while they leave but little encouragement for the accumulation of sufficient funds to renew the plant when worn out. This state of affairs should serve as a lesson to local authorities, and they should be keenly alert to know the antecedents and intentions of the promoters before granting the contemplated franchise.

The Future Prospects of the Electric Railway Construction and supply business seem brighter than ever before. The field, instead of growing narrower with the general electrical equipment of the present horse roads, is broadening in many directions, and with the new

roads made possible only by the trolley, there are now as many miles of railway and as many cars to be equipped with electric apparatus as ever before. When we consider that very little has been done in the line of railway construction in other countries, and that interurban lines of considerable length are certain to be among the products of the near future, it is easy to see that we are on but the threshold of an era of extended electric railway transportation. This is of itself a distinct advantage to street railway companies even for those who have roads already equipped. The larger the market for electric railway apparatus the greater the stimulus to manufacturers to develop new appliances and improve those already designed and in use. A radical change in practice which forms one interesting feature of the evolution of the equipment business has already occurred. This is that the large electrical, manufacturing and supply companies are confining themselves more to the simple manufacture of electrical apparatus, and the contractors to supplying only the labor or superintendence required in road equipment than formerly. The selection and purchase of all parts of the railway equipment are being done more and more by the officials of the railway company directly. The effect of this custom, we think, will be beneficial in two ways. In the first place, it permits the street railway companies to secure their supplies directly from the manufacturer without the use of an intermediary and thus buy at better prices. And secondly, the influence on the manufacturing companies must be better, as each becomes responsible only for the equipment which it supplies.

To Street Railway Companies, as to other business enterprises in general, the last year has been unsatisfactory from a financial standpoint. The universal depression has been indicated, in their case, by a general falling off in receipts, and while this has been accompanied by a retrenchment in operating expenses, more or less extensive, according to the size of the road, it can safely be said that many roads have shown a large decrease in net receipts per mile of track during the last nine months. While this is true, it is interesting to notice that the number of roads, of moderate size or larger, which have gone into the hands of receivers has been small. None of the prominent street railway properties were declared insolvent during the year, and, so far as we have been able to learn, with but two exceptions, no receivers have been appointed during this time for any road of prominence in any city of over 50,000 inhabitants. During the same period, however, there has been a very large number of steam railway companies which have gone into receiverships owing to their inability to pay the interest on their funded debts. These failures have not only comprised short lines, but such important trunk roads as the Reading, Erie, Northern Pacific, Union Pacific, New England and Atchison. While these corporations may not have enjoyed a very high reputation for financial strength before their declaration of insolvency, they were the owners of extensive properties, and the securities of all, especially the one last named, were held by many for investment purposes. Not only have street railway companies held their own as shown, but many have built important extensions, re-equipped, and made other costly improvements. In fact, the total amount of new work done in the reconstruction of existing street railway properties during the past twelve months, so far as we can

judge, has fallen but little behind, if it is at all less than, that of the previous year. The experience of the last year has shown that street car travel has become a necessity to the majority of the denizens of our cities. It is no longer considered a luxury to be dispensed with during hard times, and the continuance of the traffic can be depended on with more certainty than on the steam roads.

Street Railway Men at Atlanta are already making extensive preparations for the Convention, October next, and unless indications mislead us, that meeting will mark a most important epoch in the history of the Association. That the Association has done a most important work in the past no one familiar with its history will deny, but that the time has come for a new lease of life by more actively taking upon itself new duties as the field broadens, is evident. In other words, the Association must keep abreast of the progress made in street railway development, and should lead, not follow. We hear many suggestions for improvement and new work. Not the least among them is the matter of encouraging exhibitors. This feature of the annual gathering is important, in fact is the life of the Convention. A correspondent in the April issue of the *STREET RAILWAY JOURNAL* called attention to the importance of the Convention setting apart certain fixed times to inspect the exhibits in a body. All will agree, we think, that this should be begun at Atlanta. Many manufacturers go to large expense in placing an attractive exhibit before the Convention, and are entitled to every possible consideration. Another suggestion, which comes from prominent members of the Association, is that the work heretofore has been too much hurried, and that more time should be taken by the Convention; that the sessions should continue for at least three days, and the fourth day be given to pleasure trips, inspecting points of local interest, etc. We understand an effort will be made to inaugurate this change at the Atlanta meeting. In a recent conversation with President Payne he expressed himself as heartily in sympathy with the changes as herein outlined, and with the idea of greatly broadening the work of the Association in the future. We believe the time has come when the Association, to do its best work, should employ someone to devote his entire time to its needs. The most natural person to select for this position would be the present secretary. Mr. Richardson has been the secretary of the Association from its beginning, and deserves great credit for the efficient and business like manner in which he has conducted its affairs. He is thoroughly familiar with the details, and is alive to the future needs of the Association. The objects to be accomplished are most worthy, and we hope to see marked advance made at the Atlanta meeting.

"American Street Railway Investments"—our long promised financial supplement—will be ready for distribution this month. We should be ungrateful indeed did we not express once more our appreciation of the hearty good will and co-operation which have been so freely extended to us by the street railway managers of the country. This friendliness has been particularly gratifying, partly because the attempts of others to properly cover this field have been to a much less extent successful, and partly because it is evident that the old spirit of reserve and jealousy which has for a long time prevented street railway investments from taking their proper place among the

industrial enterprises of the country is passing away. The fact is generally recognized to-day that the ability to obtain frequent and accurate reports concerning the operation of important properties is a *sine qua non* with those who are sought as investors, and that a most important factor in the demand for investment securities is a market so broad as to insure ready sale under pressure of necessity. "American Street Railway Investments" contains a careful financial description of nearly 1,000 street railway properties operating in over 600 cities and towns, a large amount of valuable descriptive and statistical matter bearing upon the value as street railway centers of over fifty cities and towns, and a large number of maps of the principal systems. Five years ago, such a publication would have been impossible. To-day it expresses in the clearest and best manner possible, the immense strides which have been made in the street railway industry by the introduction of the cable and electric systems of motive power.

* * * * *

Other indications of this striking development are found in the series of articles by Mr. Higgins, which are concluded in this issue. These articles are unique among financial essays. In few other fields of industrial enterprise is it possible to compare and discuss results philosophically or in such a way as to deduce laws or general conclusions to any such extent as has been done here. Mr. Higgins' work in this field has received the profound and thoughtful attention of street railway managers and financiers throughout the country, and will undoubtedly have a large influence in shaping the future of the industry. Within a short time we shall announce the republication in book form of these essays with the author's corrections and additions.

William J. Clark.

No man connected with street railway interests is more widely known and more heartily esteemed by his friends than William J. Clark, who has just been appointed general manager of the railway department of the General Electric Company. Few, perhaps, have done more to advance the commercial side of the application of electricity to street railway purposes, and a brief sketch of his life will be of unusual interest at this period of his career.

Mr. Clark was born in Derby, Conn., July 20, 1855. He commenced business at the age of nineteen in the wholesale and retail coal firm of Merritt, Clark & Son. This connection continued until 1888. From 1879 to 1887 he also held the office of postmaster at Birmingham, Conn., and prior to 1887 held other important political offices in that State. While postmaster at Birmingham he was often called upon by the post office department to act as post office inspector. His investigations included the "Star Route" frauds, frauds in the Brooklyn post office, the famous mail robbery on the Chicago & St. Louis Railway post office route in 1886, and the Jersey City post office burglary, and many others. Mr. Clark's friends will recognize his characteristic energy and cleverness in the fact that while acting as post office inspector he succeeded in convicting over 100 criminals, and failed to convict only three. This was no child's play, and Mr. Clark's courage was tested quite as much as his skill and ability. In one instance he was shot at twelve times; two attempts were made to poison him, and another conspiracy to assassinate him was organized by the post office criminals.

In 1886 Mr. Clark began his street railway career by securing a charter to build a street railway connecting Ansonia, Derby and Birmingham, Conn. In 1887 he con-

tracted with the Van Depoele Electric Company for the equipment of this line, which was the first of its kind in New England. This enterprise suggested the reorganization of the Van Depoele Company, and the negotiations which were begun with that end in view finally culminated in the sale of the Van Depoele electric railway patents to the Thomson-Houston Company, with whom Mr. Clark became connected on April 1, 1888, as general agent of the railway department. In this year he also succeeded in securing the famous amended charter of the Thomson-Houston Company from the Connecticut Legislature. It will be remembered that the passage of this charter caused an advance in the stock of this company of over 100 per cent. Mr. Clark continued to act as general agent of the Thomson-Houston Company until its consolidation with the Edison General Electric in 1892. During this time he visited almost every state in the Union, and was instrumental in carrying through some of the very largest equipment deals ever known in the United



WILLIAM J. CLARK.

States. He also distinguished himself by his skill in aiding many of the greater companies in securing electric franchise rights.

After the formation of the General Electric Company Mr. Clark was put in charge of the railway department at its New York office. He remained in this position until October 1, 1893, when he was appointed manager of the Cincinnati office of the same company, and was called from that place to take his present position, where the best wishes of his many friends follow him.

THE regular monthly meeting of the Massachusetts Street Railway Association was held at Young's Hotel, Boston, May 17, thirty being present. Col. John H. Cunningham presided. After dining, the members listened to remarks by Hon. Amos F. Breed, of Lynn, Hon. E. P. Shaw, of Newburyport, and Hon. Charles B. Pratt, of Worcester.

THE Middletown-Goshen Traction Company, of Middletown, N. Y., commenced operations April 7. The officers of the company are: President, James C. Hinchliffe; vice-president, M. J. Wightman; secretary, E. J. Wightman; general manager, W. B. Rockwell.

EDITORIAL CORRESPONDENCE.

FORT WORTH, DALLAS.

Fort Worth, Tex.

This city, although one of the youngest in the State, is one of the most progressive and enterprising, and having had a marvelous growth thus far presages, what its people claim, that it is to be the metropolis of Texas. It became an incorporated town in 1872 without a single railway; was incorporated as a city in 1876 with a population of 1,100, but now has a population of about 33,500 and is an important railway center, having nine lines of steam railway connecting with all parts of the country.

The water works system is very complete and was recently erected at a cost of \$160,000, and is apparently of sufficient capacity to supply the city for many years to come. The building is a handsome brick structure, and is located near the city limits on the west side of the city, and supplanted the old station which was on the north side. The equipment is of the Holly type, and consists of two vertical, triple expansion, condensing engines of 950 H. P. each, which have a pumping capacity of 8,000,000 gals. in twenty-four hours. The water supply is obtained from thirteen artesian wells which are located in the neighborhood of the station, and from which the water flows through a connecting pipe to a large cistern or reservoir from which it is lifted by the pumps and forced directly into the main. The water is said to be of exceptional purity.

In public and office buildings, handsome homes and school and church edifices, Fort Worth is distinctively rich. The new city hall, one of the finest municipal buildings in the State, cost upwards of \$125,000. The government building or post office cost \$275,000, while the new car house, now in process of construction, is to cost \$425,000. All these structures are of native sandstone or granite, and are admirably designed. There are thirty manufacturing establishments, while the public improvements in the line of sewers, water works and sanitary appliances are first class in every particular, the city being regarded as one of the healthiest in the Union.

STREET RAILWAYS.

The street railway lines embrace about forty miles now in operation which are controlled by four companies, some of the tracks formerly operated having been abandoned. The gauge of all the lines is four feet, and on all the T rail, spiked directly to the ties, is employed. This construction is admissible in the business streets as only macadamized pavement is employed, the wearing surface of which is composed of a species of gravel which, because of its cementing qualities, forms a durable roadway, and which is found in great quantities along the river bottom.

North Side Street Railway Company.

This company operates, under a lease, the lines of the Fort Worth Street Railway Company, and embraces twelve and one half miles of track, all of which is now being electrically operated. This company, like many others, having been unfortunate and having suffered from the hard times, was compelled to place its affairs in the hands of a receiver, and the property has recently been sold and the management reorganized. For a considerable period the affairs of the company have been in the

hands of N. Harding, receiver, and the operation of the lines managed by G. B. Hendricks, who has been able to show quite a saving over operating expenses. The lines of the North Side Company were the first to be electrically equipped in the State of Texas, having been started April, 1889. The original equipment consisted of Rae motors, but these were supplanted in 1890 by the General Electric F 30 type. The average number of cars now run is twelve, and these are all of Brownell make, and are mounted on Bemis trucks, and all have a double motor equipment. The Lappin brake shoe is employed, and is said to be giving excellent satisfaction.

One car is equipped with an anti-oscillating device which was illustrated and described in our February issue, and which was a joint invention of B. F. Cholor of Fort Worth, and G. B. Hendricks. The device seems to accomplish all that is claimed for it so far as we could ob-

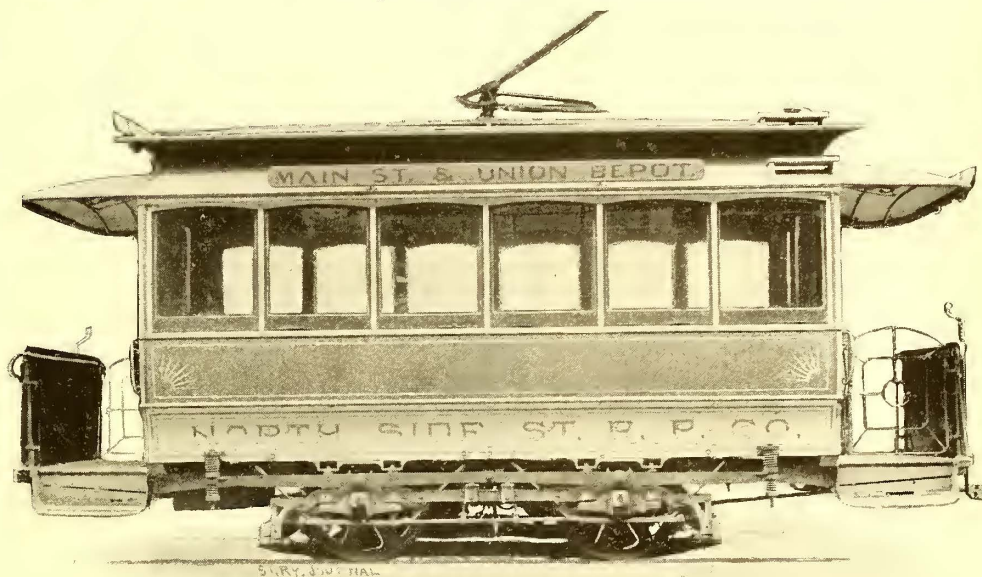


FIG. 1.—CAR WITH NON-OSCILLATING TRUCK—NORTH SIDE RAILROAD CO., FT. WORTH.

serve, and it prevents teetering even on a rough track and when the car is running at high speed. The device consists of a pair of levers composed of flat rolled bars or bars of malleable iron, which are placed on each side and just under the car body. These levers are fulcrumed at the journal box, and joined by a bolt near the middle of the car. The outer ends are attached to the car sill by means of a yoke and pair of vertical spiral springs which can be adjusted to any desired tension by means of the bolt which holds them in place. Any tendency of the car body to go down at one end operates with the same force to pull down the other end, and corrects the tendency to teeter. The device can be attached to any pattern of truck at a comparatively small cost.

The cars are provided with Brownell fare boxes and operated without conductors. On the Main Street line which connects with the Union Depot, and on which the cars are run to connect with the incoming trains, an assistant superintendent collects the fare at the depot when there is a crowd, and deposits the amount in the box. Special attention is given the depot traffic, an agent being on hand on the arrival of trains to inform incoming passengers that the cars pass the principal hotels, while these agents also assist the passengers in regard to baggage transfer.

The power station is located on the west bank of the river, just north of a bridge over which the track descends from the bluff and crosses over the bottom to the stock yards, a few miles west of the city. The

station equipment consists of a 500 H. P. Hazleton boiler having two furnaces, which are provided with Roney stokers to which the coal is delivered from hoppers, first being elevated by chain and spiral conveyor. The fuel consists of Indian Territory and Texas coal costing from \$2.35 to \$2.55 per ton delivered, and it requires about four tons per day to operate twelve cars for seventeen hours. There is also an auxiliary equipment of two tubular boilers of 275 H. P. each.

The power is supplied by a 300 H. P., cross compound, condensing Hamilton-Corliss engine having cylinders 13 X 30-48 ins. The power is transmitted from the fly-wheel by nine one and a quarter inch continuous ropes to a countershaft. From this shaft the power is supplied by leather belts back to three D 62 Thomson-Houston generators. In the early installation of the plant ropes were employed for transmitting power to the generators, but these were abandoned and belts substituted. The feedwater is obtained from an artesian well 275 ft. in depth located some little distance from the station, in which the water rises within thirty feet of the top, and from which it is pumped into an elevated tank holding about 10,000 gals., the steam for operating the pump being conducted to the well through a one inch pipe. The water is said to be absolutely pure so that no scale forms in the boilers. The condensing water is obtained from the river. The home made oil separator has been devised by the engineer of the station, which consists of a six inch iron pipe about two and one half feet in length, which is filled with coils of old baling wire; the water being led into this, the oil collects on the wire, and is led off through the waste pipe.

EMPLOYES.

Motormen are paid \$1.50 per day, and have every fifth day off. Country bred men and men with families are said to make the most efficient motormen. A very strict watch is kept over the men by the manager and his assistants, and they are discharged when anything goes wrong. If men are seen to enter saloons or are found drunk, whether on or off duty, or are found to be associating with bad characters, it is a cause for discharge. The use of profane or vulgar language or any discourtesy to passengers is also regarded as a cause for discharge. Strict discipline has resulted in securing a very desirable class of men.

Motor armature repairs are made in the company's shops, but generator armatures are sent to the St. Louis Machine & Oil Company, St. Louis, for repairs.

The franchise of the company was given for ninety years from 1876. New franchises are now granted for fifty years.

The Fort Worth & Arlington Heights Street Railway Company.

This line was originally constructed by the Chamberlain Investment Company for the purpose of developing Arlington Heights, a suburb of Fort Worth, about five miles distant, and embracing a tract of 14,000 acres. The line is single track and about six and a half miles in length, which starts at the Union Depot, foot of Rusk Street, runs along this street, paralleling the lines of other companies to 7th Street, then turns west on 7th Street, crosses the Clear Fork of the Trinity River, and continues along Arlington Boulevard, which is 125 ft. in width, across the river bottom, and ascends the heights over a grade, for about a mile, of 4.2 per cent. Four cars are run at present on a headway of from seven-

teen to twenty minutes. On the level strip of line, across the valley, a very high rate of speed is attained. The trip, including stops, is usually made in about thirty minutes.

Thirty-five pound T rail is employed, and outside the city limits the construction is of the ordinary steam railway type with gravel ballast.

The rolling stock consists of over five closed cars and seven open cars, mostly built by the Pullman Company, there being two closed and one open car which were built by the Woeber Brothers of Denver. Three types of motors are employed, there being two equipments of Edison fifteen horse power motors, three of Thomson-Houston of same capacity, and three equipments of Westinghouse twenty horse power motors.

The cars are provided with fare boxes of the National type and with registers of the same make. The motormen collect the fares, deposit them in the boxes, and ring up the registers. In summer, when the traffic is heavy,

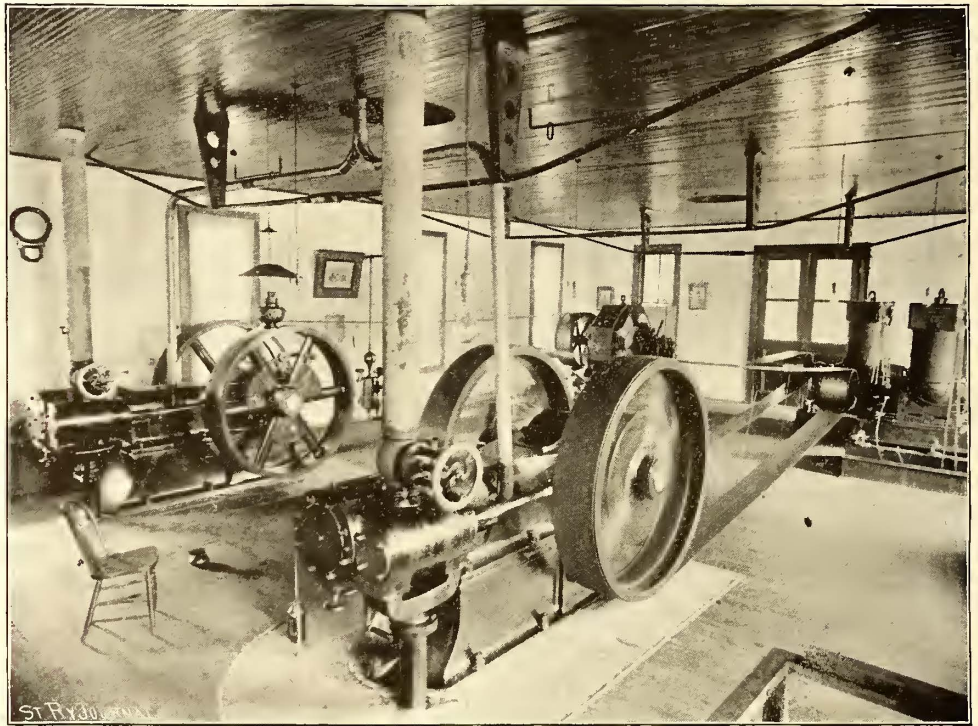


FIG. 2.—INTERIOR OF POWER STATION—FT. WORTH & ARLINGTON HEIGHTS RAILWAY.

conductors are employed. Motormen are paid \$45 a month.

The cars are equipped with electric heaters, of which three different types are employed, and the New Departure bell is employed for signaling.

The car barn is located at the terminal of the line at Arlington Heights, and consists of a wooden structure, of tasty design and of ample capacity for storing all the company's cars. There are pits and the usual appliances for the car and motor repairers. One portion is partitioned off and furnished for the superintendent's office, and adjoining it is the store room.

The power station, which is a small, brick structure, is located on the Clear Fork of the Trinity near the bridge where the line crosses the river and at the city limits. The equipment consists of three Heine safety boilers of 110 H. P. each, having Roney mechanical stokers, and the usual steam pressure carried is 125 lbs. Texas coal is employed, which costs delivered \$1.40 per ton, and it requires about six tons per day to operate the four cars. There are two Ideal engines of 125 H. P. each, and three Edison generators of fifty kilowatts each.

To the usual ventilating tube of these engines, the superintendent has attached a four inch tin pipe, which connects with one at the ceiling and passes out at the roof and serves to carry off the oily vapors which, without this precaution, condensed and settled upon the belt-
ing and the machinery.

Arlington Heights is a very attractive locality and is rapidly building up. The elevation is about 135 ft. above Fort Worth, giving a very commanding outlook, as noted in the introduction to the notes. There are quite a number of very fine homes, while the streets are broad and well graded and graveled, and are bordered by young trees, which have been recently planted. The principal attraction of the location is "Ye Arlington Inn," one of the finest all-the-year-round hotels in the locality, and which is patronized not only by tourists, but also by the commercial travelers who prefer it to the city hotels, as the service is superior to that found in most cities. It is easily reached, as the cars are run to meet all trains, while an agent is at the depot to superintend the transfer of baggage and look after the comfort of the travelers.



S. HORN,
SUPERINTENDENT FT. WORTH & ARLINGTON
HEIGHTS RAILWAY CO.



GEO. B. HENDRICKS.
GENERAL MANAGER NORTH SIDE RAILWAY CO.,
FT. WORTH.

The exterior of the inn presents a pleasing semi-colonial design. The structure is four stories high and is built of a combination of pressed brick, red sandstone, and natural wood. There are numerous broad verandas and private balconies. The interior finish and furnishings are apparently of the best the experience could suggest, but our space will not allow a description in detail. Beautiful plants and shrubs adorn the lawns about the hotel, while on the north the bluff slopes off abruptly to the valley park 200 ft. below, and in this direction one of the loveliest views is had of the surrounding region. The settlement is provided with an electric light plant, a water works plant and all the sanitary requirements of a modern city. The street railway company runs a freight and express car back and forth between Ft. Worth and the Heights several times a day, for the purpose of transporting groceries and other freight, which is delivered from the station by wagons to the residents, free of charge.

The town of Arlington Heights was laid out with the most liberal proportions, and a large sum of money has evidently been spent in its development, there being a lake, parks, and other attractive features; and had it not been for the general depression in business affairs, it would have doubtless become a large residence city equal to the expectations and plans of its promoters. It is only a question of time, however, when it will thus develop and make a handsome return for the investment.

The Fort Worth & Arlington Heights Street Railway Company is a separate corporation from the Investment Company, although some of the parties are interested in both enterprises. H. W. Tallant whose death is recorded elsewhere in this issue, was president of the street

railway company, The operation of the line, however, for a long period has been superintended by S. Horn, who also has a general oversight of the lighting and water plants and the other property of the Investment Company. Mr. Horn was formerly with the North Side Street Railway Company, and supervised the original electric equipment of that system.

City Railway Company.

About three years ago the lines controlled by this company were electrically equipped, the Detroit motors being employed. These motors are still running, but the cost of keeping up repairs is very great. Formerly the system embraced sixteen miles of track, but only ten miles are now being operated. The rolling stock consists of fourteen motor cars, only four of which are being regularly operated, and those are run with fare boxes, without conductors.

The power for operating the system is rented from a neighboring lighting plant, the company's plant having been sold, as it was found to be cheaper to rent power than to operate the plant.

Motormen are paid \$1.50 per day, and have every fifth day off. Trackmen receive the same wages.

D. P. Quigg is superintendent, and in charge of the local affairs of the company. The lines will, doubtless, soon be sold, and possibly consolidated with some of the other systems.

The Polytechnic Street Railway Company.

This company takes its name from the Polytechnic Institute which is located two miles and a half from the Union Depot, from which the tracks run out to the Institute, and the cars are operated by animal power. Only one car is run, except on Saturdays and Sundays, when two cars are operated. It takes, ordinarily, one hour to make the round trip.

The region is rapidly building up, and the line will eventually, doubtless, develop into a good paying one. Steps are being taken preparatory to equipping the line with electric power.

At present the affairs of the company are being managed by E. Fosdick, with Harry G. Borny as secretary.

The Mistletoe Hill Railway,

which was operated by animal power, has been abandoned, although the tracks remain in the streets. The same is true of the Riverside Street Railway. The original car equipment of the latter line consisted of two thirty-six foot, eight wheel, straight side cars which were equipped with the Rae motors. These cars are at present stored at the barn of the Fort Worth & Arlington Street Railway, at Arlington Heights, and will doubtless be re-equipped and operated in the near future.

Dallas, Tex.

What was said above regarding northern Texas and the advantages of Fort Worth in its relation to the surrounding region, climatic conditions, etc., is equally true of Dallas, for this city is located thirty-five miles due east from Fort Worth on the line of the Texas Pacific Railway, and between the two cities a spirited, but friendly, rivalry exists. Dallas, however, is some years older than Fort Worth and has the start of her rival in population, in amount of business done, and in the general appearance of her business streets and public buildings, and somewhat of an advantage in the development of street railways.

The city occupies a plateau three miles square on the east bank of the Trinity River, about 350 miles above its

entrance to Galveston Bay. The elevation provides for good natural drainage, which is supplemented with about sixty miles of sanitary sewers and four miles of storm water sewers. In this connection should be mentioned a very excellent water works system, costing \$800,000, which gives an abundant supply of water, which is drawn partly from the river and partly from artesian wells. In time, it is expected, the entire supply will be drawn from wells, the quality from the latter being soft and pure. The amount of water pumped by the station is 41,030,000 gals. per day, and there are two large settling reservoirs, with a capacity of 135,000,000 gals., while a third with 750,000,000 gals. capacity will be built. There are fifty-six miles of water mains, with all the necessary hydrants and connections.

About thirty miles of the city streets are paved, the material employed being chiefly *bois d'arc* sawn and round blocks laid on a gravel foundation. *Bois d'arc* is a native wood practically indestructible, and is used in the East as a dye wood. The city is in shape like a fan. Some of the streets, unfortunately, as in many Southern cities, are

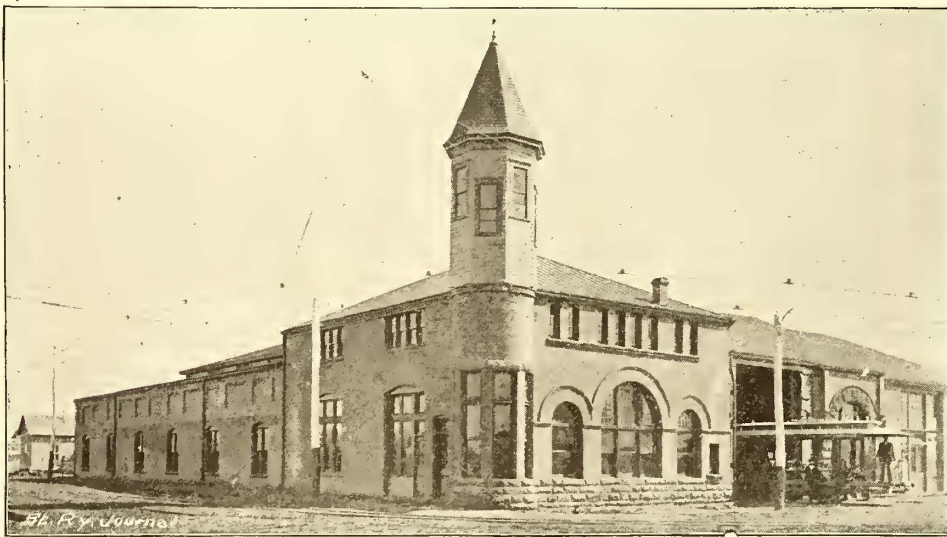


FIG. 3.—CAR HOUSE—QUEEN CITY RAILWAY, DALLAS.

narrow and do not run at right angles or parallel. This is occasioned by the land having been held originally under Spanish land grants, measured by metes and bounds, or located by warrants, before the state survey.

All the public improvements in Dallas, have been developed on a liberal scale, and with a view to providing a healthy and desirable residence city, placing the city in the front rank of Southern cities in this respect, and showing remarkable enterprise for so young a city. The first settler is said to have located here in 1841, but the place was not incorporated as a town until 1856, and in 1858 the records of the first census ever taken show a population of only 1,299. For the last twenty years, however, the population is said to have doubled every four years, and now, it is claimed, the number of its people is 61,000, including the suburb of Oak Cliff, which is on the opposite side of the river. The first railroad, that of the Houston & Texas Central, entered the city in 1872, the Texas Pacific followed in 1876, and now there are five trunk lines, with twelve outlets by rail. Not only does the city enjoy excellent railway transportation, but by improvements being made in the Trinity River, which include a system of locks and dams, water transportation, it is expected, will soon be had with the Gulf of Mexico, which will doubtless serve to keep freight rates at a low figure for all time to come. The river is virtually only a canal carved out by nature with steep but uncaving banks, and with sufficient depth for small steamers and freight barges. Already a steamer is plying daily between Dallas and McCommas' Bluff, thirty-five miles below. From its location (there being an immense area of rich and productive land tributary to it) and its solid and substantial growth thus far, Dallas claims to be the Queen City of the Southwest, and may

well do so, for the possibilities of the city, as a manufacturing center, are both brilliant and innumerable. It is already a great commercial and distributing center full of ambition and the genius of modern life, so that it is bound to grow to a still greater extent within the next few years. In this connection it is worthy of note that Dallas is the headquarters for Texas and part of the Indian Territory, for the trade in agricultural implements and farming and mining machinery, there being nine houses engaged in this line, with an aggregate of sales last year amounting to \$7,000,000.

STREET RAILWAYS.

The railway lines of the city embrace fifty-one miles of track, and are controlled by five companies, which operate by both animal and mechanical power. Nearly all the lines make the Exposition or Texas State Fair Grounds an objective point, and as the neighborhood is well built up, cars are run throughout the year, but during the Fair season cars are run on very short headway. The location is about two miles east from the business center of the city. The tract embraces 120 acres and is ornamented with shade trees and shrubbery. There are two race tracks, one a mile long, while the buildings are of magnificent proportions and pleasing in design.

The Queen City Railway Company.

There are embraced in this system, which has absorbed the North Dallas Railway, about ten miles of track, and the lines are operated under the direction of A. W. Childress, president of the company, and C. L. Wakefield, secretary and treasurer, who also acts as executive officer, with R. S. Wakefield as assistant superintendent. The principal line on Elm Street, the retail street of Dallas, was originally planned for a cable road. The material was distributed over the entire distance, three

and two-tenths miles, and about a mile and a quarter of conduit and track construction was completed in 1891, when the work was suspended, and the line was electrified in 1893, the work of reconstruction having been begun in March, and the line started the first of August. In rebuilding the cable portion the slot rails were removed, a portion of the concrete and the tops of the yokes were broken off and the ties for the new construction placed on the remaining concrete bed with a gravel cushion between. A forty-five pound T rail is employed, which is spiked directly to the ties, which are of long leaf yellow pine 6 X 8 ins. X 7 ft. long, and cost in this market \$40 apiece. In the paved streets the rail is spiked directly to the ties and short tie blocks are used. So far the track is standing up exceedingly well. The overhead construction is especially fine, all the latest insulating devices being employed, and No. 0 trolley wire is employed. Along the business street the trolley is protected by three guard wires placed about two feet above the trolley, suspended from different eyebolts and the span wires are then thoroughly insulated. Three No. 0000 feed wires are employed, and two No. 0000 return wires connect the track with the station. The rails are joined by a single No. 00 copper bond wire. A pressure of 525 volts is carried, and the loss has been found to be only 2 per cent. The power is rented from the Dallas Electric Light Company, for which the street railway company pays \$3 per day per car, which are run usually about eighteen hours. The overhead work is in charge of W. C. Ure, the electrician, who was foreman in charge of constructing the overhead lines.

The rolling stock consists of six open and twelve closed cars of the latest design, and very attractive. Twelve of these were manufactured by the American Car Com-

pany, and the other six are mounted on McGuire Columbian trucks, having a six foot base and on which a thirty-three inch wheel is employed. Car bodies were manufactured by the St. Louis Car Company, and mounted on Bemis trucks, on which a thirty-six inch wheel is employed. There are twelve equipments of W. P. 30 Thomson-Houston motors and six single equipments of F No. 40 Thomson-Houston motors, both types of which are standing up excellently well under the traffic. Both rawhide and wave pinions are employed, which are purchased for the most part from Davis & Cougill, of Omaha. On some of the lines a seven minutes headway is maintained, and on others it is twenty minutes. The speed is from eight to twelve miles an hour, and on some of the divisions the cars make an average of 120 miles a day, on others 115 miles. The lines of the company run to the Exposition Grounds, at which the racing tracks are said to be second to none in the country.

The cars are run without conductors' and are provided with fare boxes. The motormen are paid twelve and a half cents an hour, trackmen \$1.50 per day. The fare is five cents, and transfers are issued at two points, one being at an extension and the other at a crossing. Children's tickets, good for children under ten years of age, are sold fifty for \$1.50; these tickets are also good on school days for school children of all ages. All passes are in the form of tickets, so that every passenger has to deposit either ticket or fare. The conditions of the franchise are that on one street a payment of \$500 a year is required, on another \$600, so that the annual payments to the city amount to \$100 per car per year, on the basis of eleven cars now in service.

The car barn occupies what was designed to be the cable power station, and is a handsome brick structure located at the corner of Peak and Elm streets within the city limits. To accommodate the electric cars, it was necessary to raise the roof over the storage tracks about four feet. There are six storage tracks and one pit for repairs, capable of accommodating five cars.

One portion is set off for a washing room, in which a concrete floor is provided. In the portion which was designed for the power plant the foundations which were prepared for the engines and machinery remain, as do also the walls of the tension runs. A portion of this section has been provided with a floor, and is used for a store room and a repair shop, and a portion of the front of the building was designed for the company's offices, but has never been finished, and is now occupied by the trainmen. Against the wall outside the office room a large blackboard is provided, on which the names of the motormen and leaving time are written. This board is supported by hinges and can be swung back against the wall, being so arranged that both sides of the board are utilized for names.

By a recent regulation of the company the motormen are now all uniformed in gray cadet suits and helmets of the same color for summer. The neat appearance of cars and station, the politeness of the employes and excellence of discipline, reflect creditably upon the management. Each employe is practically a "drummer for business" for the road, which speaks well for the friendly feeling which exists between them and the management.

The Dallas Consolidated Traction Co.

The cars of this company are operated both by animal and electric power, there being twenty-two cars regularly run by mules, two animals to a car, and ten electric cars. On a portion of Main Street both systems run over the same track. The company owns in addition quite a number of open and closed cars, which are not, at present, being operated. A fire on December 5 last destroyed the Main Street car barn and stables, together with twelve motor cars, fourteen other cars and eighteen mules.

The electric portion of the system began operating

in October, 1890, and in October, 1892, the entire system was placed in the hands of a receiver, and has since been operated under the direction of the Court. S. P. Cochran is receiver, and, although having had no previous experience in street railway business, has managed the business admirably and in an economical manner, showing good returns. His principal assistants in the management are J. L. Sale, purchasing agent, and Wm. Dresser, superintendent. Recently an addition has been made to the electric mileage by the equipment of 21,000 ft. of double track and 24,000 ft. of single track. This extension was over an outlying district, the formation being black prairie soil, while the overhead equipment is supported on center poles hewn and painted. The overhead construction, which has now been in service for about four years, began to show signs of failure, so is now being thoroughly overhauled.

The rolling stock was principally manufactured by the St. Louis and Laclède car companies, and the cars are mounted on Bemis, Brill and St. Louis trucks. The original

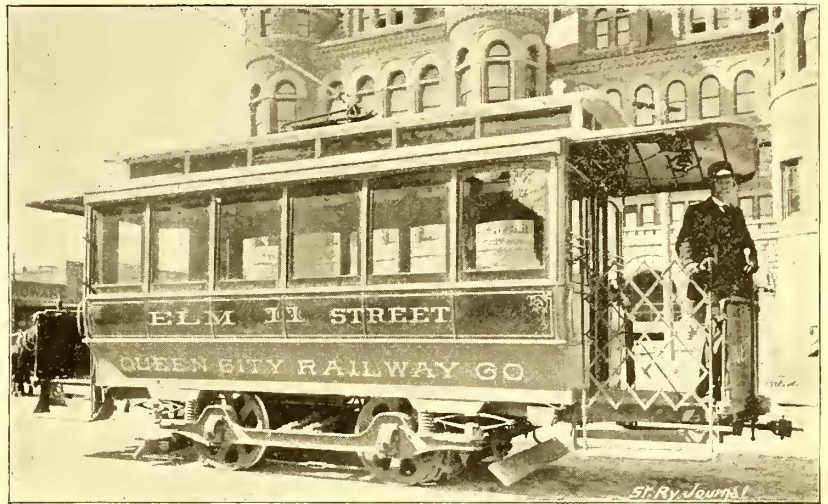


FIG. 4.—CAR ON COMMERCE STREET—DALLAS, TEX.

motor equipment consisted of both Thomson-Houston and Edison machines. There are six motors of the old F 30 type, and six equipments of the Edison No. 6. More recently four G 8 Thomson-Houston motors have been added. The power is rented from the Dallas Electric Light Company. The Street Railway Company furnishes the generators which consist of two of the Thomson-Houston D 62 type, and one Edison generator.

Fare is five cents. Tickets in books of 100 are sold for four cents to working girls and school teachers. Tickets in books of fifty are also sold to school children for three cents, good at any hour and any day. Transfers are issued at two points. The cars are run without conductors, fare boxes of different makes being provided.

Ordinary employes receive \$1.25 a day for the first four months of service, \$1.50 for the second four months, and \$1.75 after this. They are allowed one day off every fifth day with full pay. Thirty-three regular drivers and motormen are employed, and fifteen extras. The officers claim to have a very excellent class of men, quite a number having been in the company's service for seven years. The cars are run usually until eleven o'clock at night, and on Saturday and Sunday nights until twelve o'clock.

Since the fire a car barn has been improvised from the Live Oak Street stable, which has been remodeled, and a portion is being equipped for a repair shop. On one of the poles in front of this barn a switch is provided with which the barn wires can be cut out and in. When it becomes necessary to run a car out or in the barn an attendant throws the switch lever and holds it in position until the car is in place, when the current is cut out. This arrangement is a precaution against the possibility of fire from the current or from a lightning discharge.

Quite a number of the one horse cars are being fitted with a single motor, and are to be operated for the sum-

mer traffic. None of the grades on the line are very severe, the surface being generally level.

The cost of feeding the animals is about \$.14 a day. Prairie hay is fed together with oats and corn unground. Mules cost usually from \$40 to \$50, and those standing about fourteen and a half hands high are preferred.

The track construction consists of T and Johnson girder rail. The girder rails were formerly laid on chairs in the paved streets, but these have been taken out and a three inch block substituted. The paving, which is of *bois d'arc*, as before noted, cost \$1.25 a square yard, and there is also considerable macadam pavement on the streets through which the lines pass.

The Dallas Rapid Transit Company.

The lines of this company, which are now in the hands of a receiver, were built about four years ago for the purpose of developing suburban property on the east side of the city. The system forms an irregular loop of about seven miles, half of which is in the city and the other half through a sparsely settled district on the east side of the limits, together with a line crossing the loop near the cen-

eight Edison double reduction motors and two equipments of Westinghouse motors. In the repairing of generator and motor armatures the superintendent uses an insulating material which he prepares himself, composed of asbestos paper, treated with boiled linseed oil and coach japan varnish, and for the ends of the armatures he employs duck which has been treated in the same manner. This is prepared and hung up in sheets and used when required, and thus far has proven a very durable material.

The cars are equipped with National fare boxes and are run without conductors. Motormen are paid \$1.50 per day for twelve hours' work.

The car station is a plain wooden structure located in the suburbs, as noted above, and has an equipment of tubular boilers and two Armington & Sims eighty horse power engines which are belted direct to two fifty kilowatt Edison generators. Texas and Indian Territory coal is employed for fuel, the former

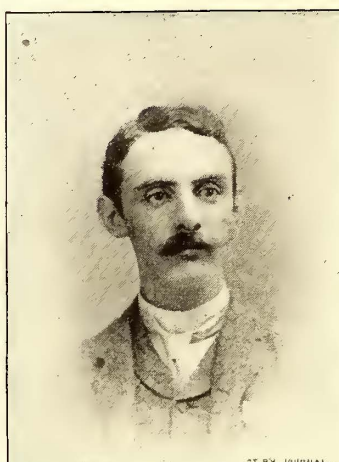
of which is \$1.25 a ton and the latter \$2.50 per ton, and the daily expense for coal consumed for the operation of six cars is about \$6.00. In addition to the ordinary switchboard equipment, the superintendent has provided several home made lightning arresters. One of



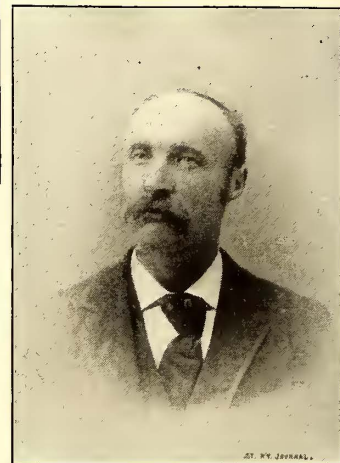
A. W. CHILDRESS,
PRESIDENT QUEEN CITY RY. CO.,
DALLAS.



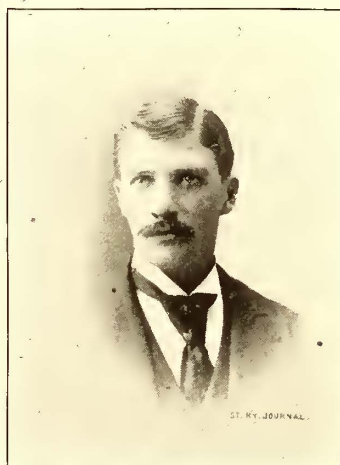
SAM'L P. COCHRAN,
RECEIVER DALLAS CONSOLIDATED
TRACTION CO.



J. L. SCALE,
SECRETARY DALLAS CONSOLIDATED
TRACTION CO.



GEO. D. HARTSON,
SUPERINTENDENT DALLAS RAPID
TRANSIT CO.



R. S. WAKEFIELD,
ASSISTANT SUPERINTENDENT QUEEN
CITY RY. CO.



C. L. WAKEFIELD,
SUPERINTENDENT QUEEN CITY
RY. CO.

ter, of about three miles. The portion outside the paved streets is virtually a steam track, being laid with T rails, and much of the way through private property. By economical management the system is paying expenses, and as soon as the city takes on a new growth it will doubtless prove a paying proposition. Like all the other lines of the city, the loop passes along the front of the Exposition Grounds.

The power station is located on the eastern part of the line well in the country two miles from the post office, and near the line of the Texas Trunk Railway. The system is being operated under the supervision of George T. Hartson, who in his capacity combines superintendent, electrician, chief engineer, bookkeeper and master of repairs. Mr. Hartson has had a long experience in electric street railway work, having been employed on the early Sprague electric road in Richmond, Va.

The rolling stock consists of ten motor cars, but only six are run regularly. Some of these were built by Lewis & Fowler, some by the Pullman Company of Detroit, and others by the St. Louis Car Company. All are mounted on the Manier truck. The motor equipment consists of

these consists of carbon pencils, with the points separated about one sixteenth of an inch, which has proven very efficient, but the peculiarity of the device is that when there is a heavy load on the line a blue flame or arc is noted between the points, but when the load is light, although the voltage remains

the same, no arc appears. Two other lightning arresters on the switchboard are made of serrated copper plates about eight inches in length after the style of some of the early lightning arresters, except that the plates are longer than those usually used. In case the plates are melted together across the gap by an arc the connection is cut out with a knife. The trolley wire, which is composed of No. 4 Birmingham gauge copper, has grown crystallized by four years of service and frequently comes down. The experiment is being made of using a three-eighths inch steel wire for a trolley, and leading in a current from the feeders at short intervals, the object being to get a strong trolley wire that will not come down by its own weight. The economy of this construction is not yet apparent. A new splicing joint has been devised by the superintendent for repairing broken trolleys. It consists

of a cast bronze rod having lugs near the center, and flat, concave ends. The ends of the trolley wire being bent, they are hooked over the lugs, and the wings of the joint are then turned over to embrace the wire, making



FIG. 5.—TROLLEY WIRE CONNECTOR—DALLAS, TEX.

a smooth track for the trolley wheel. A cast iron trolley wheel is being employed on some of the cars, which has proved very durable, and, in the opinion of the superintendent, is just as efficient as those of brass. The income of the line being limited, the superintendent has demonstrated the old adage that "Necessity is the mother of invention."

The Dallas & Oak Cliff Railway Company.

This company has recently been reorganized. The lines, which embrace eleven miles, are at present operated by steam dummies, but are to be electrified, and it is expected will be operated by electric power within ninety days.

The president of the company is Henry C. Scott, of St. Louis. Vice-president C. F. Carter is in charge of the local affairs of the company and B. F. Sibert is superintendent. This is also a loop suburban line which starts near the Court House in Dallas, runs west parallel with the river for a short distance, then crosses the river bottom and over a long bridge and high embankment, and describes a circle through and around the suburb of Oak Cliff on the southwest side of the river and returns to Dallas over a second bridge further down the river at the foot of Main Street. An effort is being made to secure an entrance into the heart of the city of Dallas from some of the existing lines.

Oak Cliff, as its name implies, occupies an elevated plateau, and is a very desirable residence location. The present population is about 4,500. There are probably in this suburb a larger number of beautiful homes than in any other city of its size in the South.

There are a number of fine school buildings and a female college which occupies a very imposing building, and is one of the most noted schools in the State. As a residence city the location has many attractions, and is bound to grow in proportion to the City of Dallas, so that the railway system will doubtless become a very important one.

North Dallas Circuit Railway Company.

Only two cars are operated over this system at present. Power is rented from the Dallas Electric Light Company. The system embraces about four miles of track, laid with a forty pound T rail. The cars are equipped with Thomson-Houston motors. Royal A. Ferris is general manager and in charge of the local affairs of the company.

ADIEU TO TEXAS.

We take a reluctant leave of Texas, for our reception and entertainment have been so generous by the street railway men of all the cities we have visited that we have been made to feel quite at home, and take our leave with exalted views of the State, its resources and the size and beauty of its principal cities, with regret that time has not permitted a visit to some of the other cities of the state, which have equally as complete and interesting railway systems as those in the four cities described. We take our leave over the lines of the Texas & Pacific Railway, which occupies the same relation to northern Texas as does the Southern Pacific to the southern counties, and which was described in our last issue. The main lines of this system have a length between New Orleans and El Paso, the western terminal on the Colorado River, of 1,487 miles. There are two branches between the cities, Marshall and Fort Worth, one only about seventy-five miles north of the other and going through some of the northernmost cities of the state.

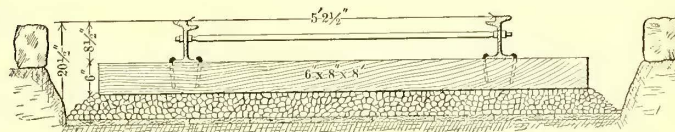
The passenger equipment is excellent and the service

efficient in every particular. The territory through which it passes has many interesting and wonderful features, so that a tour over its lines is very enjoyable and instructive.
C. B. F.

Track Construction at New Orleans.

We present herewith a sectional engraving showing the type of track construction selected as standard by the New Orleans Traction Company, of New Orleans, La. The rail is eight and a half inches deep, of the Johnson girder type, weighing from ninety-three to 100 lbs. to the yard, and the joints are united by twelve bolt fish plates the bolts being one inch in diameter.

As mentioned in our April issue, the peculiarity of the ground, which being low, is exceedingly wet and spongy, made a special construction necessary, as the soil could not be relied upon to hold the ties in position. The



TRACK CONSTRUCTION AT NEW ORLEANS.

surface of the street is first excavated to a depth of about twenty and a half inches; then as a foundation a covering of one inch cypress plank is placed at the bottom of the trench, and upon the planking is placed a layer of Rosetta gravel from six to eight inches in thickness, and on this gravel bed the ties are placed two feet centers. The rails are spiked directly to the ties, and the space between and over the ties is filled with the excavated material, except where block paving is employed.

The company has recently received fifteen miles of feeder cables, 500,000 circular mills, from the John A. Roebling's Sons Company, of Trenton, N. J. The wire is of the waterproof, triple braided type, and the company will use at present an overhead return, although an underground copper return of some twenty No. 0 wires laid in a wooden conduit may be used later. The rails will be bonded with three No. 0, tinned copper wires.

Suburban Roads in St. Louis.

There is talk of extending the Manchester Road line of the Lindell Railway Company to the suburban towns and villages of Clifton Heights, Arloe, Gratiot, and others within the city limits, and out into St. Louis County.

The St. Louis & Kirkwood Electric Railway Company has awarded the entire contract for its construction to the Suburban Construction Company. The railway has a private right of way from the southwest corner of Forest Park, St. Louis, to Meramec Highlands, St. Louis County, a distance of about fifteen miles. The company is capitalized at \$300,000. Its city connection will very likely be with the Lindell Railway line at Forsythe Junction.

The Manchester Road Electric Railway is at present constructing its roadbed, and the Forest Park & Clayton Electric Railway Company is ready to start its cars very soon. There are in all six electric roads laying tracks in or already running into the county, the latter numbering four.

The St. Louis County Street Railway has been running its line from the city limits to Normandy for a month past. Its line is operated by horse power, but will be changed to electricity some time in the near future.

AN electric street railway was opened to public traffic in Hamburg, Germany, on March 29, 1894. It was constructed by the Union Electric Company, of Berlin, and the overhead trolley system is applied. This street railway has thirty-five kilometers of track and forty-two motor cars, each of them equipped with a General Electric fifteen horse power motor.

Wood Paving in Sydney, Australia.

The city of Sydney is heavily committed to the use of wood blocks as a material for the pavement of the roadways. According to City Surveyor Richards, who has kindly sent us a copy of the last annual report, that city has an area of more than seventy-seven acres, or a length of more than thirteen miles, laid with it. The experience in Sydney has been entirely different from that of New York City, where the results with this kind of paving have been far from satisfactory.

The different timbers used and the amount of wear noticed are as follows: Blue gum, $\frac{1}{10}$ in. per annum; mahogany, $\frac{1}{8}$ in.; turpentine, $\frac{1}{17}$ in.; brush box, $\frac{1}{7}$ in.; spotted gum, $\frac{1}{4}$ in.; Baltic, $\frac{1}{10}$ in.; colonial cedar, $\frac{1}{12}$ in.; black butt, $\frac{1}{16}$ in.; colonial pine, $\frac{1}{22}$ in.; blue gum, $\frac{1}{12}$ in. (about); red gum, $\frac{1}{10}$ in. The cost of wood paving varies from 20s. to 25s. per yard, including excavation, etc.

The Capital Railway of Frankfort, Ky.

In the great distillery district of Kentucky, or "Blue Grass" region, as it is called, little or no attention has been usually given, when locating a distillery, to the matter of transporting the output or supplies. The main idea in the location of these plants has usually been to secure a pure and sufficient supply of limestone spring water, this being one of the leading causes that has made this section so famous for its output of superior whiskies. The Capital Railway of Frankfort is to be congratulated on being the initial enterprise in Kentucky to give these distilleries cheap transportation for their grain, coal and wood to their plants, and their output of whiskies to the steam railway connections. In the city of Frankfort, daily, long lines of heavy wagons could be seen handling this business, which is now being done in an entirely satisfactory manner by the little "Lightning Bug," shown in Fig. 2.

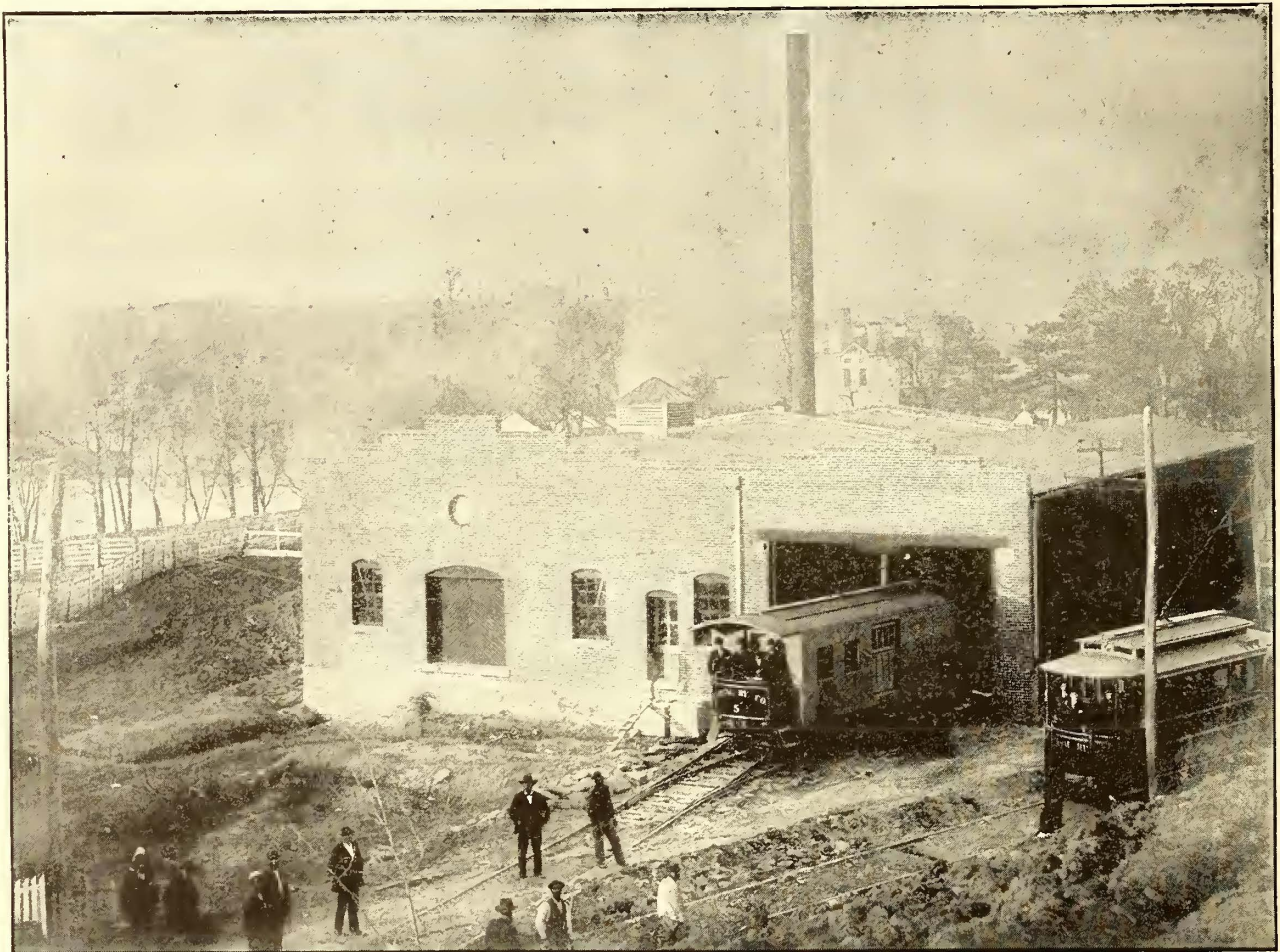


FIG. 1.—POWER STATION—CAPITAL RAILWAY CO., FRANKFORT, KY.

Mr. Richards recommends paving with close joints in distinction from the original theory that there must be a broad interval filled in with grouting between the rows of blocks to provide the necessary foothold for the horses, and states that he believes that any of the following timbers would suit admirably for so paving roadways: Blue gum, red gum, black butt, tallow wood, mahogany and turpentine.

Lack of space prevents our giving further extracts from this most interesting report.

THE Heilman locomotive was to have commenced regular service on the line between Paris and Mantes before the end of May. Careful experiments will be made to learn exactly the difference in consumption of fuel between this locomotive and an ordinary locomotive. Plans for a 1,200 H. P. locomotive are being drawn up.

The power house, illustrated by Fig. 1, is a substantial brick building 52 x 125 ft., with a double track barn 26 x 125 ft. attached. The boiler room, which is separated from the engine room by a brick partition, is only 35 x 52 ft., and contains 200 H. P. capacity, boiler plant, with heater, boiler feed pumps, etc. The engine room contains two 100 H. P. Jenney dynamos, driven by one of the latest type of Dick & Church tandem compound engines of 200 H. P. capacity.

The switchboard is of the improved Jenney type with marble panels, and all connections are made from the rear of the board. The instruments used are of the Weston make. The electrical station equipment was furnished and installed by the Jenney Electric Motor Company, of Indianapolis.

Tests of the generating plant have been made with very heavy overloads, the apparatus showing remarkable results in the way of regulation and capacity.

The freight motor car is of a special design twenty-

eight feet in length, mounted on a pair of heavy trucks, with five foot wheel bases. The body is extra heavily built to withstand the severe strain of having loaded freight cars as trailers, and in appearance is very much like an ordinary baggage car as used on steam roads. Fig. 3 illustrates this car hauling three box cars around a curve. Four twenty-five horse power motors controlled by a single specially designed controller, are attached, one to each of the four axles of this car, making each wheel a driver. The total weight, when empty, of this car and equipment, is fifteen tons, and when not used for handling full loads is used for handling small shipments, barrels and boxes.

Besides the freight motor car described above, three eighteen foot, closed, passenger cars, handsomely finished, painted a light and attractive color, are used. These cars are equipped with twenty-five horse power motors and haul trailers. The cars were made by the Barney & Smith Car Company, of Dayton, O.

The track is a fifty-six pound T rail laid on 6x8 in. x8 ft. white oak ties, two feet between centers, and ballasted with crushed blue limestone rock. Heavy cuts and fills are numerous, the nature of the country through which this road runs being very mountainous and the grades very severe, being in some instances 8 per cent., and in one instance a reverse curve was necessary on a 7 per cent. grade, but even here absolutely no difficulty was experienced in handling from two to three heavily loaded box cars with the freight motor cars.

The overhead line is of the Creaghead patent, flexible, side bracket construction, specially made for high speed roads in the suburbs, but in the city is side pole and span wire construction, using No. 6 trolley wire.

Frankfort is a city of about 10,000 people, is the capital

city and river, with a baseball and football ground and grand stand, dancing pavilion, band stand and numerous summer houses, nice walks, rustic seats and other attractions.

The design and construction of this road was supplied for the contractor, Frank Whitley, of Springfield,



FIG. 2.—ELECTRIC LOCOMOTIVE—CAPITAL RAILWAY, FRANKFORT.

O., by the Creaghead Engineering Company, of Cincinnati, under the personal supervision of George R. Scruggs. The stockholders of the local company are the principal business men of the city, of which Pat McDonald is president, and John T. Buckley is secretary and general manager.

Electric Emergency Ambulances.

The question of ambulances being operated in St. Louis, on the Union Depot Railroad Company's lines, has been agitated. It is proposed to run these for emergency calls from the City Hospital to any point on the above system, which means a great deal, as it reaches most of the important points in the central, northern and southern portions of the city. The advantages of an ambulance car over the ordinary van can readily be appreciated. They can be run much more rapidly, are smoother, and, on account of size, are more comfortable for a patient than the ordinary wagon.

HEALD & HOLLIDAY, of Ironton, O., are promoting the formation of a

company to build and operate a dummy railroad in Adams County, O., between Manchester and West Union. The franchise has been secured and the company will be incorporated during June. A \$40,000 bond issue will be made. The distance is ten miles, and construction will be begun soon.

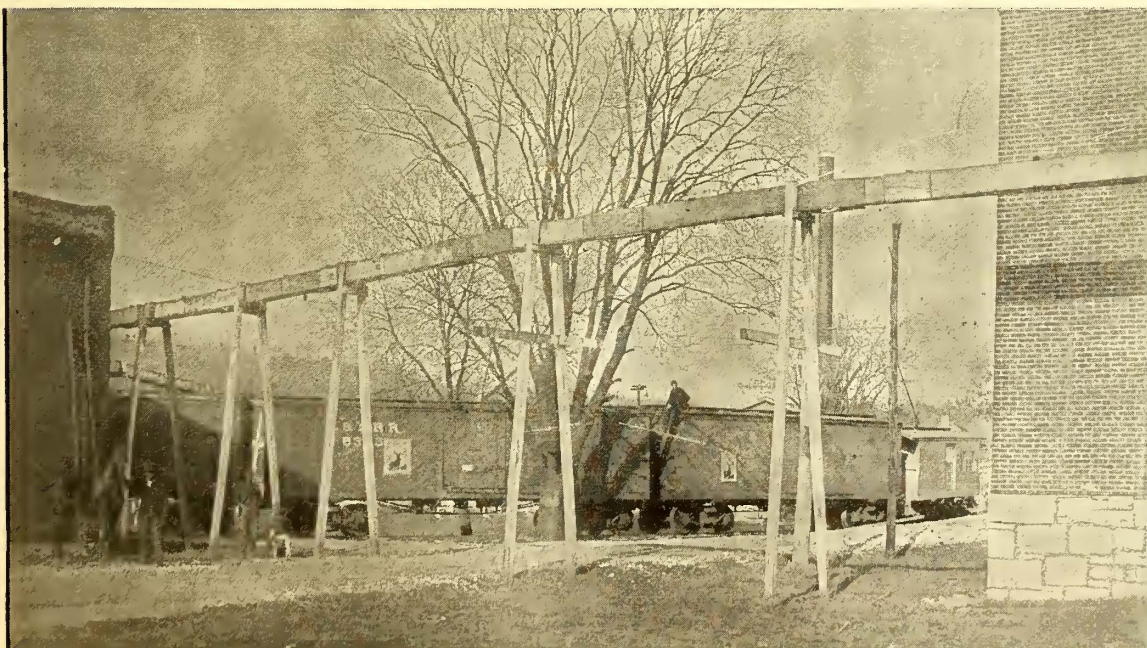


FIG. 3.—ELECTRIC LOCOMOTIVE DRAWING THREE FREIGHT CARS—CAPITAL RAILWAY, FRANKFORT.

of the state, and has numerous manufacturing establishments. The railway is so situated that it covers a large area, making the four miles of track used for passenger traffic quite profitable. In addition to which the management has a beautiful park, containing about forty acres situated on an elevation of about 500 ft. overlooking the

The Johnson-Lundell Surface Contact Electric Railway System.

The different systems which have been presented to the public for operating electric cars without the use of overhead wires, have always been popular with the general public. The trolley system *per se*, has never been a favorite with most city residents, and it has only been permitted because the other advantages of electric cars have more than counterbalanced the objections to the system from an æsthetic point of view. This general desire for a method of operating cars, which should avoid the use of an overhead construction, has been evinced by the popularity with the traveling public of storage battery cars, and the interest felt in conduit systems proposed and in operation here and abroad. In connection with the practical operation of an open conduit system which will be tried by the Metropolitan Traction Company on one of the uptown avenues in New York, as stated elsewhere in this issue, a description of the surface contact system of Messrs. Johnson and Lundell, of New York, will not be without interest. This system has been in operation for some months on a vacant lot at the corner of First Avenue and 69th Street, New York, where an experimental track 1,200 ft. in length has been installed.

In this system the contact conductor is laid midway between the track rails, flush with the pavement as shown in Fig. 3. The current is taken into the car by means of a metallic brush, which bears upon this center rail, the current afterwards returning to the generators at the central station by the track rails. This contact rail is divided into sections about eight feet in length and insulated from each other. By an ingenious magnetic device, which will be described later, each section is connected

first question, that of drainage, is eliminated, and there is no excavation with resulting movement of the subsurface pipes to increase the first cost of the road.

The objections which have been met with in systems of this kind before, such as difficulty of insulation against

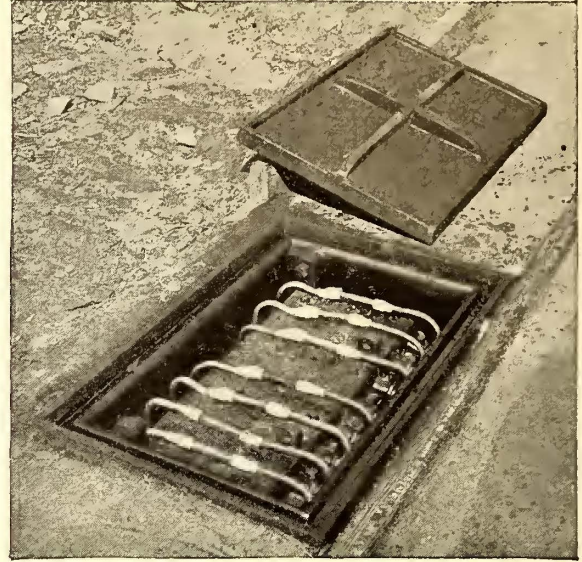


FIG. 1.—SECTION BOX—SURFACE CONTACT RAILWAY SYSTEM.

leakage, complications of the switching devices, the difficulties encountered at crossings, etc., seem to have been entirely overcome in the Johnson-Lundell system. As these are points about which a street railway manager



FIG. 2.—CAR MOUNTING GRADE—SURFACE CONTACT RAILWAY SYSTEM.

with the feed wires only when the car is directly over it. All other sections are entirely out of connection with the source of supply, so that there is no possibility that passing pedestrians or horses can receive a shock by touching the center rail. The advantages of a contact system of this character over that in which the conductors are carried in a conduit with an open slot, are obvious from the standpoint of drainage and cost of construction. The

would be apt to inquire first, a detailed description of methods employed to operate the line is given herewith. The contact rail, or working conductor in the experimental track, consists of a copper faced rail mounted on a continuous creosoted stringer, bolted directly to the ties, so that no cutting of the latter is necessary. The distance between the track rails on either side of this conducting rail is then paved with asphalt, extending below

the stringer. This makes the surface conductor watertight against seepage, and leaves only the surface water to be cared for. The potential used is only 300 volts, and careful tests have shown that even if the track was submerged for a depth of two inches—a condition impossible under ordinary conditions for any great distance—the leakage per car in operation would only be two amperes, or considerably less than one horse power. Experiments have also been made to test the question of possible leakage under the worst conditions of winter, by dumping on the tracks slush, mud and refuse taken directly from the streets, but in no case was the maximum leakage given above exceeded. On roads where there is heavy vehicular traffic, and where asphalt paving between the rails would not prove desirable, Belgian blocks with pitch or tar grouting has been found to give just as satisfactory results.

The question of leakage and insulation of the contact conductor having now been disposed of in a satisfactory manner, that of the magnetic devices for switching the current in and out of circuit with the sections is to be considered. The switching devices are located in watertight boxes, placed along the line of route at intervals of every forty feet. Each box is hinged on brackets in its manhole so that it can be easily inspected. The connections are made with copper-carbon contact switches, operated by electro-magnets, which are extremely simple in construction. The breaking of the circuits is made absolutely without spark or arcing by an ingenious electrical device. These magnetic devices operate equally well when cars are run in either direction, and are positive in their action.

For carrying the cars over switches, crossings, etc., of other railways, and at other points where the continuity of the conductor rail must necessarily be broken, the inventors of this system have avoided all complicated switch mechanism in a novel way. This is by the use of a storage battery which necessarily need not be of large capacity, since it is only required at such times. In fact, with careful judgment on the part of the motorman, the number of places at which the battery may be used can be materially reduced by passing over crossings or switches under headway. The battery employed is of the chloride accumulator type, in which dislodgment of the active material and buckling of plates, the two great drawbacks of storage battery traction to street cars, are impossibilities. This battery, owing to its small capacity, occupies comparatively little space in the car. It is carried under the seats, is connected in parallel with the direct supply of current, and is operated by the same controller, so that no extra controlling apparatus is required, and when not delivering current, the battery is being charged from the central station. This battery is also employed to excite the section magnet of the first section when the car is started, the section being dead when the current is off.

The car shown was built by the J. G. Brill Company, of Philadelphia, Pa., and is equipped with a single thirty-five horse power Lundell motor, geared by chain and

sprocket wheels to both axles. The armature is wound in two circuits, so that the controller, which is of an improved series parallel type, can be used. To avoid any sudden strain on the armature from reversing the current or otherwise, an ingenious mechanical device for transmitting power is introduced between the armature and

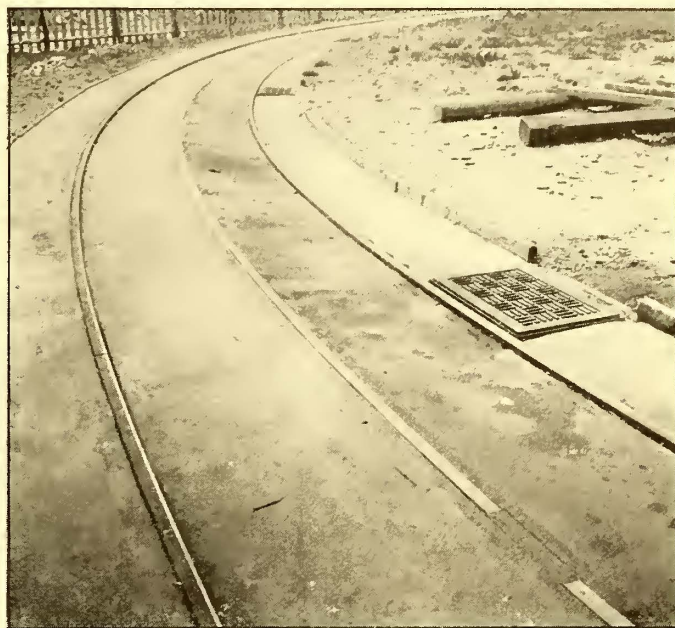


FIG. 3.—VIEW OF TRACK—SURFACE CONTACT RAILWAY SYSTEM.

the driving sprocket wheels. Keyed to the former is an iron disk, and pressed against this are two other disks attached rigidly to the sprocket wheels. The friction is regulated by means of a spring bolt and nut, and the tension is so regulated that the disks will slip in case the

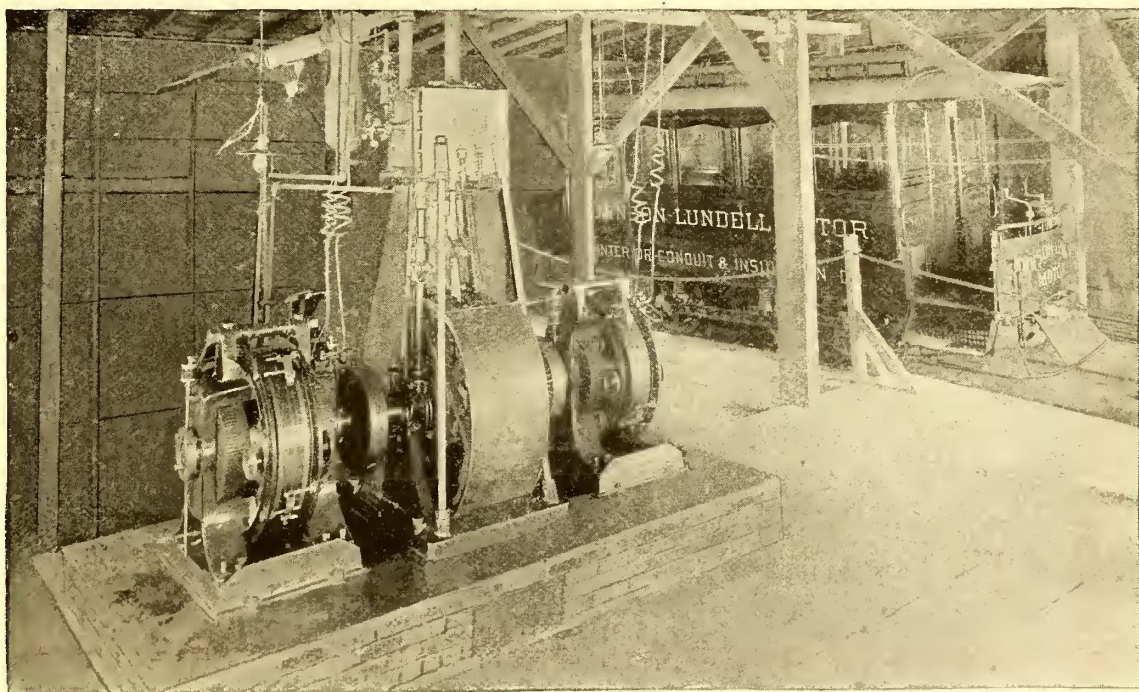


FIG. 4.—ENGINE AND LUNDELL GENERATORS—SURFACE CONTACT RAILWAY SYSTEM.

strain on the armature is more than its normal load. In this way the motor can be reversed without danger of burning out any of the armature coils. A view of the power station is shown in Fig. 4.

The underground feeder system of the inventors is also used in the experimental track. The feeders are all enclosed in the telescopic, iron armored, insulating conduits of the Interior Conduit & Insulation Company.

The inventors of the system are well known in electrical circles. Mr. Johnson was one of the pioneers in electric railway work, having been president of the Edison Electric Light Company and the Sprague Electric Railway & Motor Company, for all of the time during which the systems of these concerns were developed. He is now president of the Interior Conduit & Insulation Company, and patentee of many valuable improvements in the electric railway and lighting fields. Mr. Lundell was for a long time connected with the Sprague Electric Railway & Motor Company, and is the inventor of the Lundell type of dynamos and motors.

The Card Electric Street Railway Motor.

The Card Electric Company, of Mansfield, O., whose stationary electric motors are well known, has just put upon the market an electric railway motor equipment which possesses a number of novel features, and which is doing excellent work on several roads. We present, in the accompanying engravings, views of different portions of the motor, from which a very good idea of it can be obtained.

Sufficient power capacity is provided in the motor, so that a single equipment only is required upon the ordinary eighteen foot car, or one of shorter length, and where the grades do not exceed 8 per cent. By using only one motor, it is claimed that an equipment just as reliable and just as convenient to operate is secured, with greater simplicity, less first cost and less cost for repairs. In regard to traction, the company claims that one motor equipment will give all that is required. This is shown in the town of Mansfield, where an electric road equipped with four fourteen foot and five sixteen foot closed cars, two eight seat and two nine seat open cars have been in operation since 1888. There are

per car may be necessary, and for such conditions the Card Electric Company is designing a double motor equipment which will soon be placed on the market.

Two views of the motor, with case closed, are given in the accompanying engravings (Figs. 1 and 2). As will be noticed, all the working parts are entirely protected within the cast frame of the motor, and all dirt and moisture is excluded. Fig. 2, which is the rear view, shows the steel bar for strengthening the cast extensions which form the spring supports. The bar rests in grooves cast for the purpose, and is clamped down by two eye bolts fastened by pins between the hinged ribs at the bottom and clips over the top. In this way the strain is equally divided between the four parts, and all danger of breaking after long service through a gradual crystallization of the cast metal is claimed to be overcome. An important feature of the motor is the accessibility of all parts. The motor

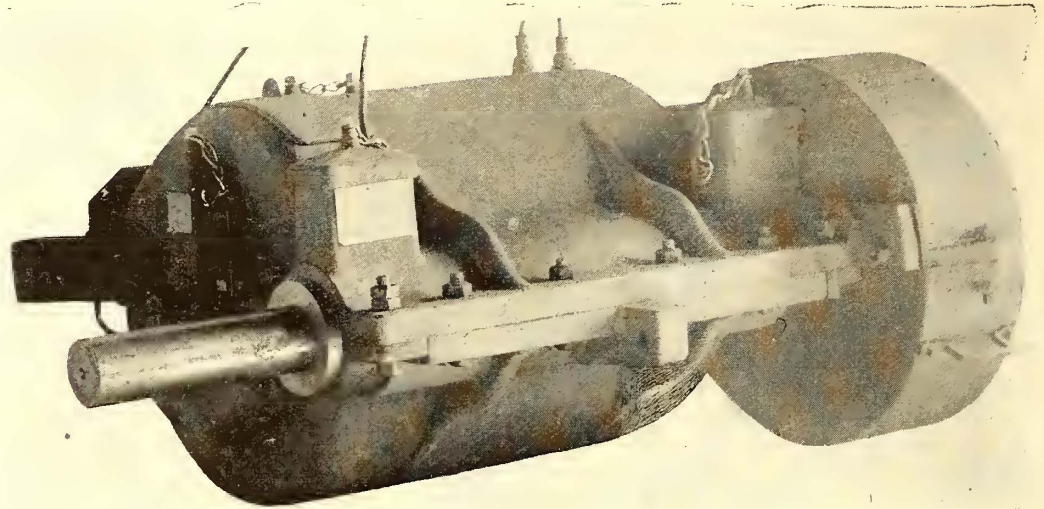


FIG. 1—FRONT VIEW OF CARD MOTOR.

frame is hinged, and by means of a small chain block fastened to a beam of the car body and to the lower half of the motor case, one man can raise or lower the latter with ease. The armature can then be easily taken out by removing the journal caps.

The armature core is built up of the best magnetic iron, and is slotted to receive the conductors. The slots are insulated with mica, as are also the ends of the core. The shaft is hammered steel four inches in diameter through the core portion, with a one inch

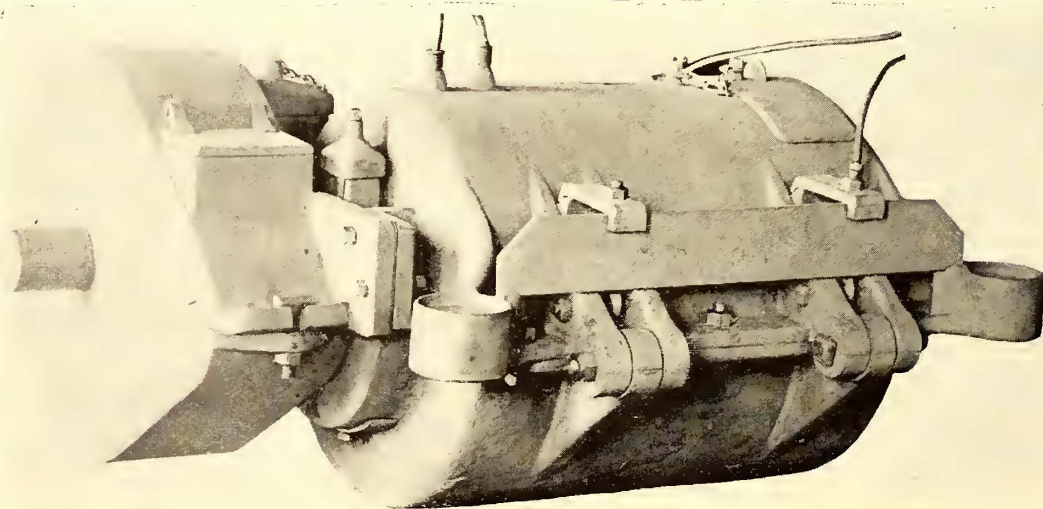


FIG. 2—REAR VIEW OF CARD MOTOR.

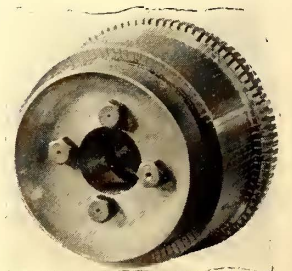


FIG. 3.—COMMUTATOR.

seven and a half miles of track, and a number of grades, one of which is $7\frac{1}{2}$ per cent., and extends 1,500 ft. The cars are equipped with a modified form of Daft motor, and although only one motor geared to one axle is used per car, no difficulty has been met with in securing traction. In large cities where large cars are used, and trail cars are often necessary to handle the traffic, two motors

square key to prevent turning. The ends are reduced to receive the commutator and oil disk without reducing materially the strength or rigidity of the shaft.

A view of the commutator is shown in Fig. 3. It is simple in construction, and so designed as to be easily removed from the shaft. An important feature of its construction is that between the hubs of the end plates is

located a rubber ring which is of such size that when the commutator is on the shaft it will fit the shaft snugly and effectually prevent any oil passing through to the armature or working its way outward into the commutator. Each of the field coils is wound in two parts and separately covered, the first with muslin saturated with shellac, and then with two windings of waterproof tape. It is then given two coats of insulated compound. After this the parts are bound together with tape and placed in an oven heated by steam to 150 degrees until every particle of moisture is driven out. In winding the wire on the forms each layer is coated with shellac until saturated. The gear case is made of malleable iron, and is hinged so as to be readily removable.

A view of the motor with lower half of case lowered is shown in Fig. 4. This engraving shows a novel feature of the equipment, a commutator turning attachment which will be found most convenient, especially on small roads. Superintendents have found that no matter of what material

the centers, and the armature ever after will run eccentric with the shaft and soon be destroyed. In the Card motor equipment the commutator can be turned off without removing the armature from its bearings. The motor case and armature is first lowered and the pinion released

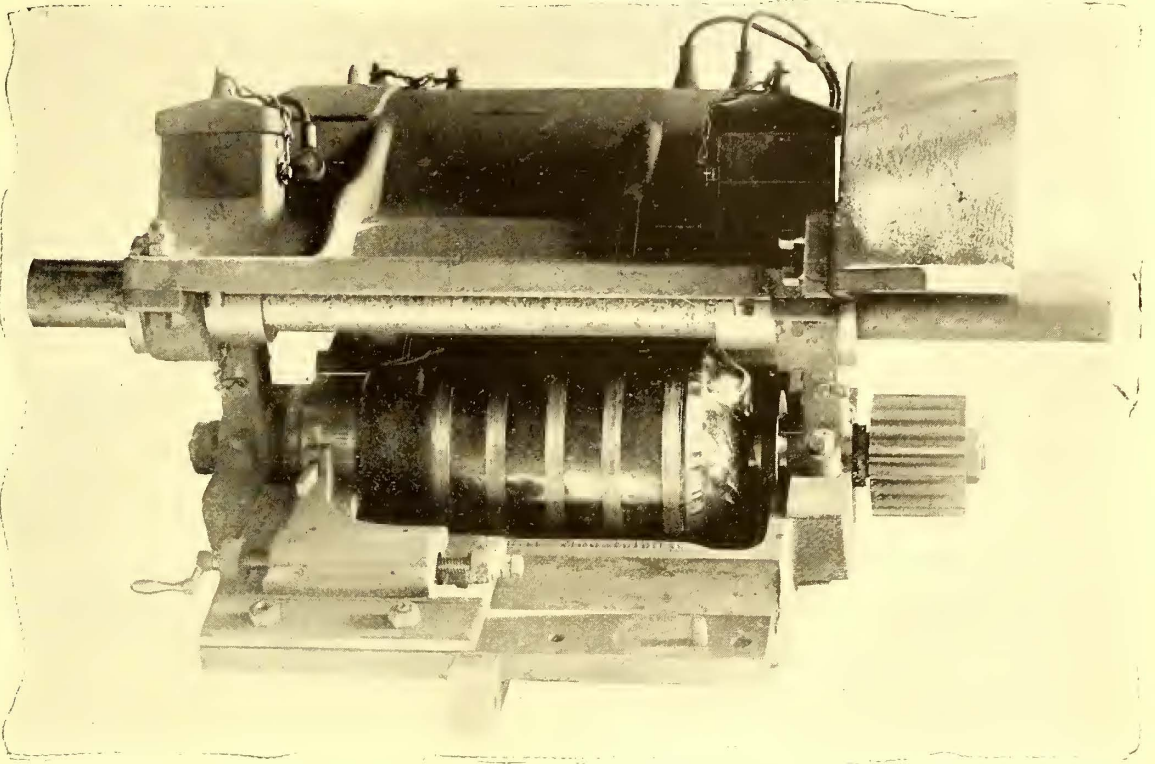


FIG. 4.—CARD MOTOR WITH ARMATURE LOWERED SHOWING COMMUTATOR TURNING ATTACHMENT.

from the gear wheel. The pinion is then used as a means for turning the armature. This is done with a leather belt making connection with a pulley and crank handle

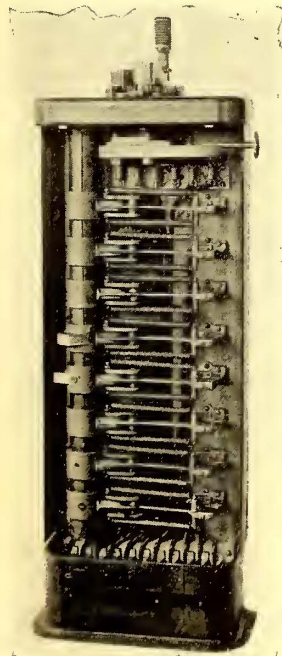


FIG. 5.—CONTROLLER.

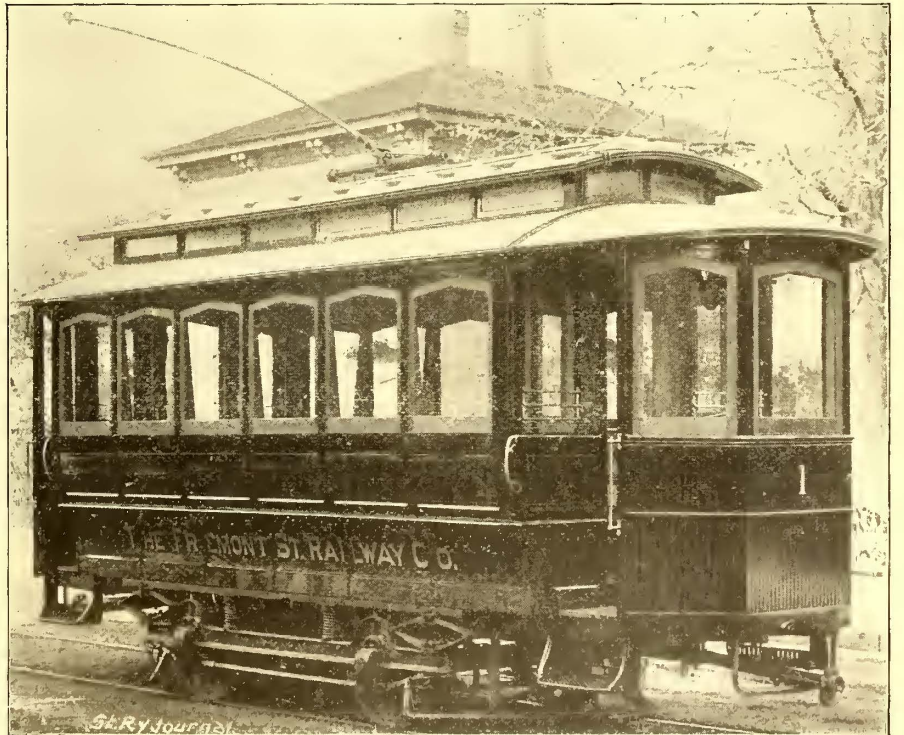


FIG. 6—CAR WITH CARD MOTOR EQUIPMENT.

a commutator is made it will sometimes need turning off. To do this in the old way necessitates the taking of the armature from the motor and sending it to a lathe, perhaps in some machine shop some distance away. Here a careless workman, perhaps, may throw out

and the turning attachment shown in Fig. 4. The speed can be made anything desired, and as good a job of turning done as in any lathe.

A view of the controlling stand is shown in Fig. 5. The operating handle is connected by gears to the switch

cylinder, and immediately under the cover is the reversing switch, the handle extending through the case at the right. On the longer shaft are placed eight cams insulated from it by heavy hard rubber tubing and secured by hard rubber pins. Beside each cam is a switch fastened

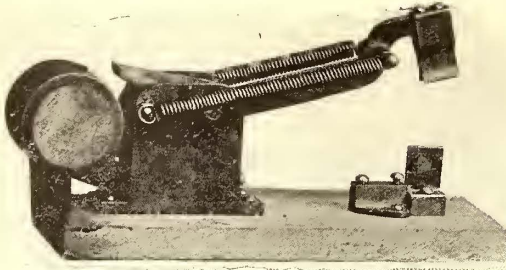


FIG. 7—CARD CONTROLLER SWITCH.

by a suitable bracket to the back near the shaft. Each switch is provided with contact pieces to engage with clips on binding blocks fastened to the back. The operation of the controller switch can easily be seen from Fig. 7. By it there can be no drawing out of arcs or burning of contacts. Each switch is an exact duplicate of all the others. The cams are made all alike, and there is only one size of machine screw and wood screw used in the entire stand. The flexible method of suspension is adopted, the motor being supported both from the rear and the front and equalizing the weight as much as possible.

Fig. 6. gives a view of a car on the Fremont Street Railway, of Fremont, O., equipped with the Card motor. The truck used was manufactured by the Fulton Foundry & Machine Company, whose factories are at Mansfield. The car also is a product of this city's industry, having been manufactured by S. N. Ford & Company.

Exhibits at the Atlanta Convention.

The secretary of the American Street Railway Association, Wm. J. Richardson, has issued a circular to intending exhibitors, detailing the conditions under which the exhibits will be made at Atlanta next October. As already stated, the exhibit will be held in the Machinery Hall of the Piedmont Exposition Company, of Atlanta, Ga., a plan and engraving of which have been published in the STREET RAILWAY JOURNAL.

The building has been engaged for two full weeks, beginning October 10, and ending October 24, thereby giving ample time for the removal of the largest exhibits. Several intending exhibitors at Milwaukee, it will be remembered, were sadly disappointed by the non-arrival of their goods until after the meeting was over. This was in large part due to the congested condition of freight traffic on trunk lines, owing to the World's Fair and the nearness of Milwaukee to Chicago. The secretary, therefore, impresses upon all intending exhibitors the advisability of securing a time limit delivery; better still, to ship in plenty of time.

A blank application for space, copy of rules and a lithographic sketch of the floor space similar to that published in our February issue, will be sent by the secretary to all who desire space for exhibition purposes. This plan shows that the Convention Hall is in the same building and on the ground floor, also that the railroad facilities for freight purposes cannot be surpassed, inasmuch as the tracks on one side run the entire length of the building.

It is stated that some of those who exhibited at Milwaukee have already applied for space at Atlanta, and this the secretary rightly thinks is, perhaps, the best evidence of the value of making exhibits at these annual meetings, where street railway men gather in large numbers from all over the United States and Canada.

Further information can be obtained from N. W. L. Brown, chairman of exhibits, Equitable Building, Atlanta, Ga., or upon application at the secretary's office, 166 Montague Street, Brooklyn.

The Association is anxious to extend every possible facility to intending exhibitors, and all who expect to be represented should make application as soon as possible.

Electric Freight Cars.

The practice of electric railway companies to do considerable freight business in addition to passenger transportation is growing to be more common, and it opens up a line which in many cases may prove to be extremely profitable. We present herewith engravings of two electric freight cars, one a box car, and the other an open car, which have been recently manufactured by the New Castle Car Manufacturing Company, of New Castle, Pa., for just this class of work. The box car shown in Fig. 1



FIG. 1—BOX FREIGHT CAR.

was built for the McKeesport & Wilmerding Transfer Company, of McKeesport, Pa. It has an eighteen foot body, and is equipped at each end with a regular four foot platform, having brake, dash, etc. The height of the car inside is seven feet, and it is lined with Georgia pine flooring. The car has a sliding door at each end, and also one in the center at each side. The car is mounted on McGuire Columbian trucks and equipped with Westinghouse motors.

The open car shown in Fig. 2, is eighteen feet in length, equipped at each end with a four foot platform, containing brakes, gongs, etc. The flooring is one and a half inch hard wood; the railings are four feet high, and so arranged in sections that they can easily be removed. This car is built for a trail car, and mounted on McGuire

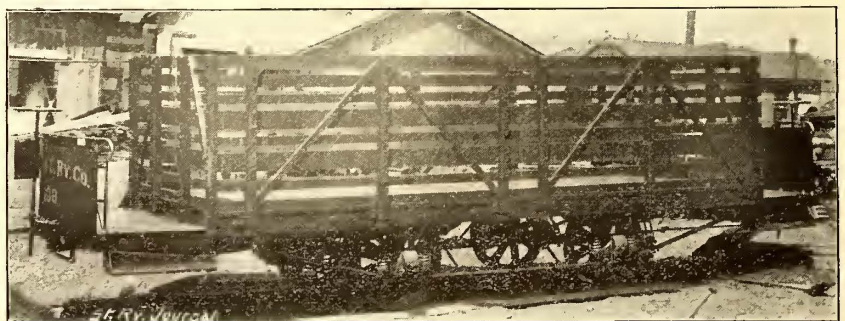


FIG. 2.—FREIGHT TRAIL CAR.

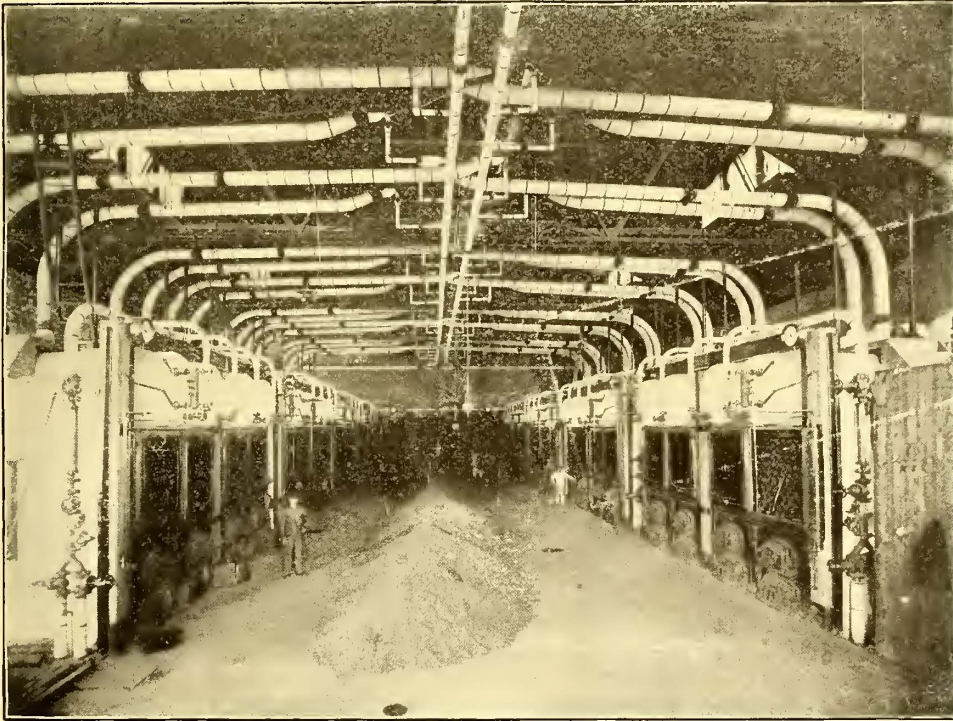
trail car trucks, and is intended to be used in hauling garden truck from Neville Island to Pittsburgh.

The electric line for which these cars have been built connects with the West End Railway, of Pittsburgh, and the cars will be used to enable the farmers along the line of route to market their products in Pittsburgh. By their means freight can be shipped within a few rods of the market house in Pittsburgh and, of course, at the smallest possible expense.

The Jackson Street cable line of the Sioux City Railway Company was changed to an electric line last month.

Boiler Plant of the Southern Station of the Brooklyn City Railway.

A description was published in our last issue of the coal handling apparatus of the southern station of the Brooklyn City Railway. A view of the boiler room of the station is presented on this page. This street railway company will have installed, on the completion of its eastern power station, sixty-four water tube boilers, 250 H. P. each. At the southern station, steam is taken from drums over each boiler to two twenty inch mains through eight inch wrought iron bends—these appear making the arch of white seen in the view. An interesting feature of the pipe work at this station is that all flanges, eight inches and above, are permanently joined by a double row of



BOILER ROOM—52D STREET STATION OF BROOKLYN CITY RAILROAD CO.

rivets. The main pipes are all in duplicate, and doubly connect both to the boilers and to the engines. The feedwater mains are also run double.

The three plants at present operated by this company will generate, when completed, 21,000 H. P.

All of the exposed steam surfaces, and also the feedwater system and the steel flues have been insulated with magnesia coverings, by Robert A. Keasbey, of New York.

This station is especially interesting as being one of the largest, and among the best and most thorough installations of non-conduction covering that has been applied to what is practically a single establishment.

A Danger Signal for Electric Roads.

The Lindell Railway Company, of St. Louis, has adopted a very ingenious signal on its Washington Avenue line, at Grand and Lucas Avenues. There is a double track curve at the point mentioned. About the center of the curve, overhead, is a signal lamp with a red semaphore on one side and a white one on the other, at right angles to the first. It is so arranged that when a car approaches the curve from either direction, the red light appears to a car coming the other way, and thus prevents two from rounding the curve at once, averting a collision. The whole device is worked by the trolleys, and the points, one on each street, at which they strike the piece communicating the current to the lamp mechanism, are at an equal distance from the curve, and thus the car nearer the curve has the right of way. The trolley of the latter, on reaching the middle of the curve, strikes another point which turns the white light towards the car

on the other track, signifying that the way is clear, and that it can come ahead. The lamp also serves as a danger signal to vehicles and pedestrians crossing the tracks at this point. It is lighted up by an incandescent lamp.

San Francisco Cable Sheaves.

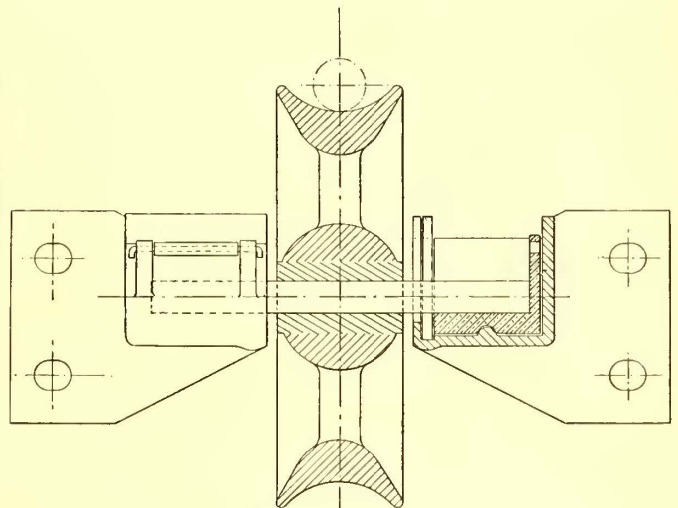
The engraving herewith shows in vertical section, through its shaft, a type of cable sheave which has given excellent results on two of the cable railways in San Francisco.

The speed of all the cables in that city, excepting two, is eight miles per hour, or 704 ft. per minute. Now as the usual size of carrying pulleys is from ten to twelve inches diameter, this makes their speed 230 to 275 revolutions per minute. The sheaves are spaced thirty feet apart, and the weight of the one and a quarter inch steel rope, supported by each sheave, is seventy-five pounds. As a mile of double track requires 352 sheaves, the items of first cost, lubrication and renewal have been very carefully considered by the railroad companies.

To sum up, the conditions under which each sheave runs are, therefore, these: 220 to 270 revolutions per minute for eighteen to twenty hours every day in the year, supporting a weight of about seventy five pounds. The sheaves are, of course, under ground, and get a great amount of dust and grit, and, in rainy weather, mud and water.

The form of sheave and box shown was adopted about three years ago after a thorough trial, a pulley with these boxes being placed on the road and run for fourteen months with one filling of lubricating compound.

The sheave is made of old steel wire cable melted up, which produces an exceedingly hard and brittle casting, so hard in fact, that a soft iron hub center has to be inserted in the mould so that the sheave can be bored. This boring is absolutely the only machine work required.



SECTION THROUGH SHAFT—CABLE SHEAVE.

The arms are made curved to prevent cracking when the metal cools, as there is very little strength in this kind of material. The rim is heavy and acts as a flywheel, so that when the rope is raised from the sheave by the grip of a passing car, the wheel does not lose its speed, and when the rope again falls there is no dead wheel to set in

motion. This thick rim and hard material also insure a long run before the sheave is worn out by the cable. The rim is made three inches wide, so that there is little danger of the rope falling off. The shaft is cold rolled, so it requires no turning.

The main portion of the box is cast iron, and is bolted directly to the wrought iron yoke which carries the track and slot rails. The bolt holes are made slotted one way in the casting, and punched slotted the opposite way in the yoke, so that the box can be adjusted in all directions.

The rabbit is cast separate and dropped into the box; it is a loose fit, but centers on the tapering sides. When it becomes worn out it is easily removed with a hook, and a new one dropped into its place. The old rabbits are melted and recast, so that there is no waste.

The rabbit forms a half bearing, which is all that is needed, as the pressure is always downward. The top of the box is filled with heavy lubricating compound, which rests directly upon the shaft. There is a wooden slip in the front end of the box to prevent the compound from working out or the dust from getting in. The cover is of sheet iron and is hinged. When the rope jumps off the sheave, as it sometimes does, it runs on this smooth cover, and so is not injured, until the next car passes and replaces it.

The flange for bolting is placed central, so that one box does for either right or left side of the pulley.

New 2,000 H. P. Walker Generators.

A special feature of the electrical work of the Walker Manufacturing Company is the construction of large, direct coupled generators. A recent machine built by this company, has a capacity of 2,000 H. P., ten poles, and runs at a speed of eighty revolutions per minute. The manufacturers will make three sizes of generators on this plan, namely 1,500 H. P., 2,000 and 3,000 H. P. capacity.

The bed plate of the machine is cast in one piece, and rests on a solid stone or brick foundation which is made a part foundation of the engine. From this foundation is built the enormous masses of iron which go to make up the completed machine. The engine shaft carries the armature and commutator directly attached to it. The

Walker Manufacturing Company also manufactures the large shafts and flywheels for many of the engine builders, and it is very convenient for a purchaser of a direct coupled plant to have the entire engine, shaft, flywheel, armature and steel magnets made at the same place, as they are all fitted together in the shop, and everything is made fast, and put in good order before shipment.

These are probably the largest power transmitting dynamos made in the world, and no pains are spared in making them perfect in every particular. They run from no load to full load, and even 50 per cent. overload, without the slightest sparking at the commutators, or heating in any of its parts, and run quietly, without the noise so common to large generators. The brushes are all moved at one time by the hand wheel fastened to the base of the machine. The lower brushes and also part of the machine are reached by steps leading down into the pit below, so that every convenience for operation is provided for.

The facilities of the Walker Manufacturing Company for making large castings enables it to make every part of these machines. Each individual casting is made as large as is practicable to carry on freight cars and to erect in plants. This company is bringing about a new era of large power transmitting machinery for both street railroad work and long distance transmission, and is also going largely into electrical apparatus for elevated railways and interurban and cross country railroad apparatus. These machines are arranged to be direct coupled to either vertical or horizontal engines, and also arranged to be attached to both tandem and cross compound and triple expansion engines.

Earnings of Street Railroads.

The following table has been compiled by L. W. Serrell, M. E., from the reports of the railroad commissioners of different states. It shows the comparative statistics of twenty-one street railway companies in towns of 50,000 inhabitants, or less, and in different sections of the country. It gives the population of the various cities mentioned, the number of times the population is carried per annum, the ratio of the operating expenses to the gross receipts, etc.

Operations of 21 Electric Roads in Towns of 50,000 Inhabitants or Less; Compiled from R. R. Commissioners' Reports.

Name of Road or City.	Population 1890.	Capital Stock.	Bonds.	Miles Track.	Gross Earnings.	Operating Expenses.	Net Earnings.	Passengers Carried.	Times Pop. Carried per Annum.	Gross Earnings per Capita	Ratio O E	Remarks.
Auburn, N. Y.	25,858	50,000	200,000	5.5	\$36,729	26,473	10,256	765,749	30	\$1.50	72	Elec., June 30, '93.
Amsterdam, N. Y.	17,264	250,000	170,000	7.5	44,598	32,393	12,199	586,914	35	1.75	.....	Elec., June 30, '93. Furnish elec. power. Receipts from same \$19,500.
Findlay, O.	18,674	200,000	200,000	8.5	45,855	30,829	15,025	917,100	48	2.40	67	Elec., 1891.
Des Moines, Iowa	50,093	1,000,000	600,000	34	186,051	113,956	72,096	3,836,125	76	3.80	60	Elec., Dec. 31, '91.
Erie, Pa.	40,634	400,000	200,000	23	125,648	70,529	55,118	2,636,620	64	3.20	59	Elec., Dec. 31, '91.
Fitchburg, Mass.	29,302	167,000	30,000	13	94,672	64,816	29,856	1,430,465	49	2.45	68	Runs to Leominster. Pop. 7,266. Elec., Sept. 30, '93.
Galveston, Texas	29,084	1,000,000	300,000	38	156,448	101,378	55,069	3,071,789	106	5.30	65	Elec., Dec. 31, '91
Gloucester, Mass.	21,262	180,000	60,000	8	52,694	35,860	16,834	1,047,296	50	2.50	68	Elec., Sept. 30, '92.
Harrisburg, Pa.	33,285	125,000	.....	11	58,736	37,446	21,290	1,171,670	55	2.75	64	..... 30, '93.
Jamestown, N. Y.	25,000	1,000,000	300,000	18	107,459	66,489	40,969	2,127,672	55	2.76	62	Elec. June 30, '91.
Norwalk, Conn.	20,000	70,000	60,000	3½	75,949	65,723	10,226	1,719,620	.....	.....	.....	Elec., June 30, '93; *Pop. estimated. Road runs to Cayuga Lake.
Pawtucket, R. I.	27,502	200,000	.....	12	11,646	4,698	6,948	233,926	46	2.30	.....	Elec., 4 mos. operation, from July 4th to Nov. 4th, '93.
Schenectady, N. Y.	18,393	300,000	300,000	5.2	62,249	52,727	9,522	1,222,435	44	2.20	84	Part horse & elec., Dec. 31, '91.
Taunton, Mass.	25,488	100,000	.....	13	74,143	54,890	19,253	746,416	40	2.00	.....	June 30, '93. Furnish elec. power. Receipts from same, \$38,000.
Springfield, Mass.	58,186	1,000,000	.....	34	44,963	40,014	4,949	862,005	34	1.70	88	Horse, Sept. 30, '93.
Brockton, Mass.	39,021	250,000	300,000	22	391,173	291,559	99,614	7,551,473	130	6.50	74	Elec., Sept. 30, '93. Run to Chicopee, 14,007 pop. included.
Augusta 10,521	19,152	.....	.....	.....	142,082	99,963	42,119	3,010,831	77	3.85	68	Elec., Sept. 30, '92; has branches to Avon, Holbrook, Whitman, Randolph.
Hallowell 3,147 Me.	.....	.....	.....	.....	142,082	99,963	42,119	3,010,831	77	3.85	68	Elec., June 30, '93.
Gardner 5,481	.....	.....	.....	.....	142,082	99,963	42,119	3,010,831	77	3.85	68	Elec., June 30, '93.
Waterville 7,091 Me.	9,591	.....	.....	.....	142,082	99,963	42,119	3,010,831	77	3.85	68	Elec., June 30, '93.
Fairfield 2,500	.....	.....	.....	.....	142,082	99,963	42,119	3,010,831	77	3.85	68	Elec., June 30, '93.
Plymouth 7,292	8,874	70,000	35,000	6½	142,082	99,963	42,119	3,010,831	77	3.85	68	Elec., Sept. 30, '93. Has \$12,000 surplus.
Kingston 1,582 Mass.	.....	.....	.....	.....	142,082	99,963	42,119	3,010,831	77	3.85	68	Elec., June 30, '93.
Glens Falls 10,386	17,290	120,000	100,000	8	142,082	99,963	42,119	3,010,831	77	3.85	68	Elec., June 30, '93.
Fort Edward 3,242 N. Y.	.....	.....	.....	.....	142,082	99,963	42,119	3,010,831	77	3.85	68	Elec., June 30, '93.
Sandy Hill 3,662	16,044	60,000	50,000	6½	142,082	99,963	42,119	3,010,831	77	3.85	68	Elec., Sept. 30, '93.
Attleboro 7,575	.....	.....	.....	.....	142,082	99,963	42,119	3,010,831	77	3.85	68	Elec., Sept. 30, '93.
N. " 6,727 Mass.	.....	.....	.....	.....	142,082	99,963	42,119	3,010,831	77	3.85	68	Elec., Sept. 30, '93.
Wrentham 2,742	.....	.....	.....	.....	142,082	99,963	42,119	3,010,831	77	3.85	68	Elec., Sept. 30, '93.

The Brownlee Injector.

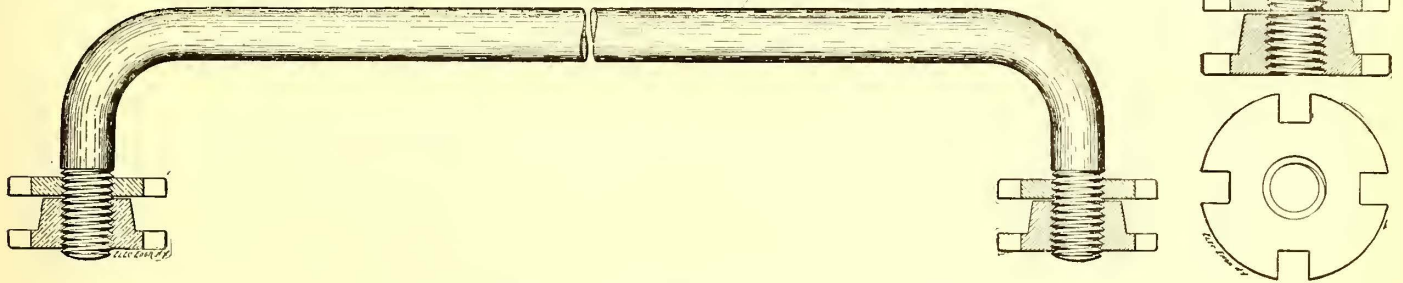
This injector, which is handled exclusively by the Young Lock Nut Company, of New York, is giving excellent results on a number of stationary and locomotive boilers, and has a number of advantages. The special points of excellence claimed for this injector are: That it is strong and simple; it may be attached either to the boiler or to the steam pipe; shaking and jarring will not cause it to break; it will lift hotter water than the usual forms employed; variations of the steam pressure will not cause it to break; if a check valve or feed pipe leaks, the plug as designed acts as a check and prevents the boiler from emptying; any part may be removed without it being sent to the factory, the parts being made interchangeable.

A special feature of the injector is the absence of valves, the only part approaching a valve being a conical way-plug, by which the operation of the injector can be controlled.

The Johnston Rail Bond.

Reference is made elsewhere in this issue to the new type of rail bond invented by A. Langstaff Johnston, engineer of the Hestonville, Mantua & Fairmount Passenger Railway Company, of Philadelphia, Pa., and manufactured by the Car Equipment Company of that city.

The peculiarity of the bond consists in the method of connection with the web of the rail. This is made by providing the bond with two nuts, one of which is cone shaped. These are brought up tight to make perfect electrical connection, and by their amount of surface provide a contact surface at the rail, having twelve times the cross section of the bond itself. This gives no points of increased resistance to produce places of low electro-motive force along the line, and as the bond makes a perfectly watertight connection, there can be no deterioration in the conductivity at these points. Fig. 1 shows the bond



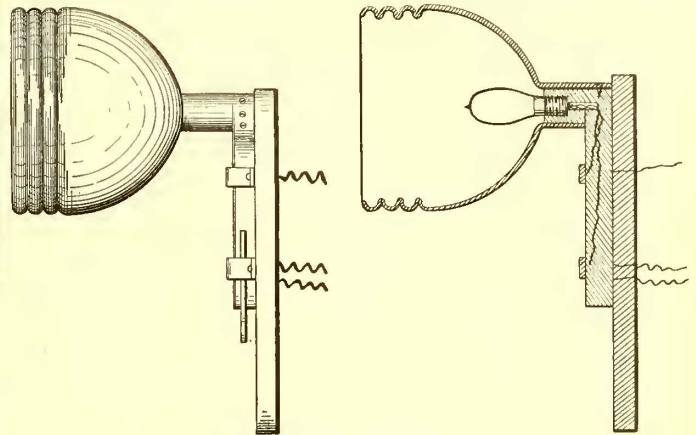
FIGS. 1 AND 2.—JOHNSTON RAIL BOND AND NUTS.

complete, and Fig. 2 view of nuts employed. As will be seen, the system is applicable to any size of bond wire.

The bond has been used exclusively on the line of the Hestonville, Mantua, & Fairmount Passenger Railway and on other roads.

To get perfect electrical contact with the web of the rail, it is necessary to face the latter immediately surrounding the hole, in order that the contact ends may have a clean, bright surface against the side of

an electric headlight far outweigh any disadvantages. The arrangement is very simple, as shown. The headlight can be changed from one end of the car to the other easily. The chief advantages are that

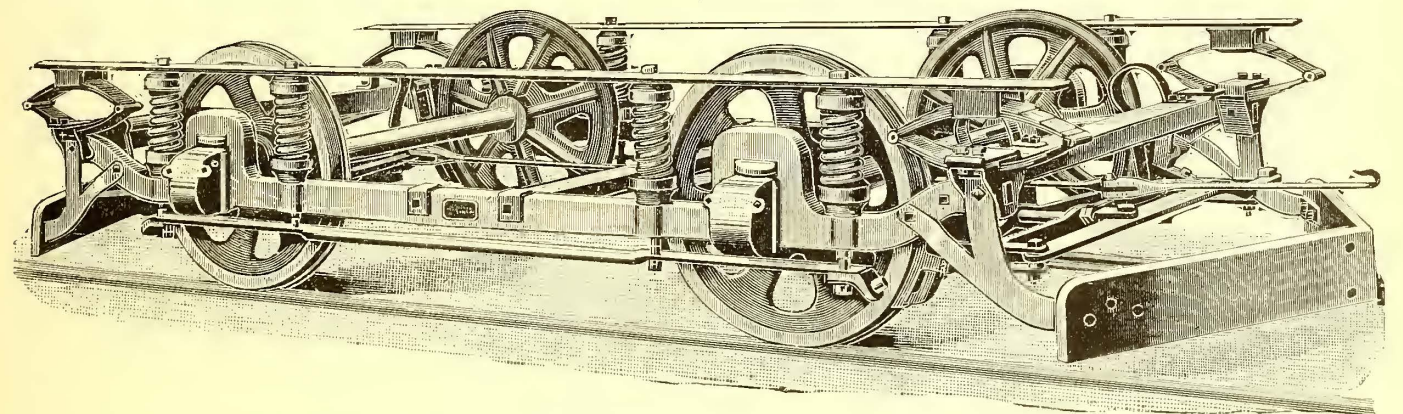


ELECTRIC HEADLIGHT.

the expense of cleaning an oil lamp and chimneys is avoided, and that the light costs practically nothing for maintenance.

New Motor Truck.

We present herewith an engraving of a motor truck, No. 25, manufactured by the Dorner & Dutton Manufacturing Company, of Cleve-



NEW MOTOR TRUCK NO. 25.

land, O. The truck has solid forged side frames made from refined iron and without bolts or nuts. On these frames are carried the cross bars for motor supports and brake rigging. Round pressed rubber springs are used between the axle box yokes and the top of the journal boxes to prevent any strain and jolts to the truck and car body when passing over rail joints and crossings. These springs also go far toward preventing the pounding of the rail joints.

the rail. The Car Equipment Company, the manufacturer of this bond, has made special tools for facing the rail for the contact of these nuts, by which the work is admirably accomplished.

An Electric Headlight.

The Changeable Electric Headlight Company, of Syracuse, N. Y., has recently put upon the market an electric headlight, which is shown herewith. The principal argument which has been advanced against electric headlights of the past has been that when the trolley was off the wire, or the car had left the track, the headlight, which was an important part of the equipment of the car, went out.

While this argument might have some weight in the early days of electric railroading, the Changeable Electric Headlight Company believes that it is no longer of importance, and that the advantages of

The car body is supported on eight spiral and four elliptical springs arranged in the manner shown. The ends of the side frames are inclined upward to allow truss braces for long car bodies.

The truck has a compound lever brake, the leverage being twelve to one. Attachable brake shoes with malleable iron heads, and cast and wrought iron surfaces are used. The journal boxes are dust tight and self oiling, and are equipped with phosphor bronze bearings. The axles are of the best forged steel or iron, and free from welds. Extra heavy wheels complete the equipment.

THE Slate Belt Electric Street Railway Company, of Bangor, Pa., was organized April 27 with a capital stock of \$200,000. Thos. H. Seem of Bangor, is the president of the company. Other stockholders are Wm. A. Winsboro, Geo. W. Mackey and Charles N. Miller, all of Bangor.

The Works of the Curtis Electric Manufacturing Company.

The operation of electric motors, and the conduct of electric apparatus under service, are familiar to our readers, but comparatively few, perhaps, are familiar with the details of manufacture. A trip through a well equipped motor manufactory will reveal to many street railway managers that the care and attention to details required in the manufacture of generators and motors is greater than many appreciate. A representative of the STREET RAILWAY JOURNAL had recently the pleasure of inspecting the works of the Curtis Electric Manufacturing Company, of Jersey City, N. J., whose apparatus is now meeting with extended use, and from whose factory motors are now being turned out at a rapid rate.

The Curtis works are situated on Pacific Avenue, Jersey City, directly on the line of the Newark branch of the Central Railroad of New Jersey, and about one mile from the main terminus of the road. The works occupy a single building, 75 × 100 ft., and constructed especially for the purpose for which it is now used. It is five stories in height, and has a steel frame and floor beams, with corrugated iron sides. The building is isolated from any other, so that the workmen have practically perfect light and air, while at night, when work is being carried on by artificial light, the building presents a brilliant spectacle.

On entering the ground floor of the factory, the visitor enters the business office of the company, near which are the quarters of the treasurer and bookkeeping departments. Passing through these he enters the main shop where all the heavy machine work is performed, and where the completed motors are shipped. A spur from the Central Railroad of New Jersey runs entirely through the shop, and freight cars can be here loaded with motors by a swing crane. On the occasion of our recent visit we noticed a number of motors being shipped to Brooklyn to complete the recent order for 120 equipments from that city for the Brooklyn Heights Railway Company, also a number of motors destined for Baltimore, Philadelphia and other cities.

Along the western side of this room are located the heavy planers, most of which were built by the Pond Machine Tool Company, of Plainfield, N. J. Here are brought the rough steel castings which form

the building are located a number of heavy Bliss punches for stamping out the armature disks from sheet iron, each armature core containing over 900 disks. Some of these punches are employed for stamping blanks from the sheets, and others for slotting and cutting keyways in the disks. Close to these punches the work of armature manufacture is



FIG. 2—TAPING DEPARTMENT—CURTIS WORKS.

completed by hydraulic presses, manufactured by R. Dudgeon, of New York. This compresses the disks required for an armature under 15,000 lbs. pressure, after which, and while the pressure is on, the disks are bolted together on the shaft.

The stock room of the company is also located on this floor. It occupies the southwest corner of the building, and all material received



FIG. 1.—SHIPPING DEPARTMENT, MAIN FLOOR—WORKS OF THE CURTIS ELECTRIC MANUFACTURING CO.

the frame of the Curtis motor. Close to these planers are a number of Niles radial drills on which the fields are drilled. Both planers and drills are provided with special features for the work to which they are devoted. The third operation to which the castings are subjected is that of boring the fields. This is accomplished on boring mills. Each of these borers turns out a field in nine hours. It should be mentioned that all handling of heavy castings is done by a series of traveling cranes, mostly of the Harrington make, by which a field can be transferred from any portion of the works to another. At the south end of

by the works, whether it be a car load of coal, or box of mica, has to pass through this department and be recorded. All records of shipments are made here also.

From this floor we will next pass to the third floor, upon which are located all of the light machine tools. All of the armature work and all of the pinion and gear turning and cutting is done here. The machines for this class of work are located along the east side of the building, and the lathes here are from the works of Pratt & Whitney, Brown & Sharpe, and the Niles Tool Works, and are the very finest

tools made to-day. The pinion blanks are here cut to gauge, are bored, reamed, faced, keyseated and slotted. The shafts are turned here also, all this work being done to gauge, and all parts being interchangeable. Among the machines noticed here are Beaman & Smith millers, for milling the split gear faces, Lodge & Shipley gear lathes, for turning up the gear blank, reaming it out and facing it up, automatic gear cutters, a Niles slotter, Brown & Sharpe vertical chucking machines, and a pinion tooth cutter of the same make, capable of cutting two pinions at the same time. All the bolts, pins, rails, bushings, pinions, etc., are also manufactured in this department.

The machine tools for copper and brass work are located at the northern end of this floor, among them being a number of tools for finishing up the commutator bars, slotting controllers, a number of complicated lathes, manufactured by the American Tool Company, of Providence, which is capable of performing the work of some half dozen other tools, such as cutting, facing, milling, threading, tapering, etc. In the northwestern part of this floor the controllers are assembled, and the commutators placed on the armatures and finished up preparatory to testing.

The northeast portion of this floor is partitioned off for a tool room. Here are kept the standard calipers and other measurements for all the work done in the factory. All of these gauges are returned to this department every night, and before being given out in the morning, are tested with a standard set, which is kept locked up and not even allowed to be used in the tool room. This portion of the work is carried on by the most expert mechanics, and the gauges, calipers, etc., are standardized by Brown & Sharpe verniers, which are set by a magnifying glass, and which shows variations of .00025 of an inch. All the special tools used in the factory are

The floor above this, which is the top floor, is devoted to the assembling of the commutators and the manufacture of the rheostats. It contains a cutting machine for manufacturing the rheostat strips from sheet iron, and a folding machine by which these strips are given



FIG. 3.—CONTROLLER DEPARTMENT—CURTIS WORKS.

their proper shape, after which the sheet mica for separating the laminae is slipped into place.

We have now followed both the field and armature in their pro-

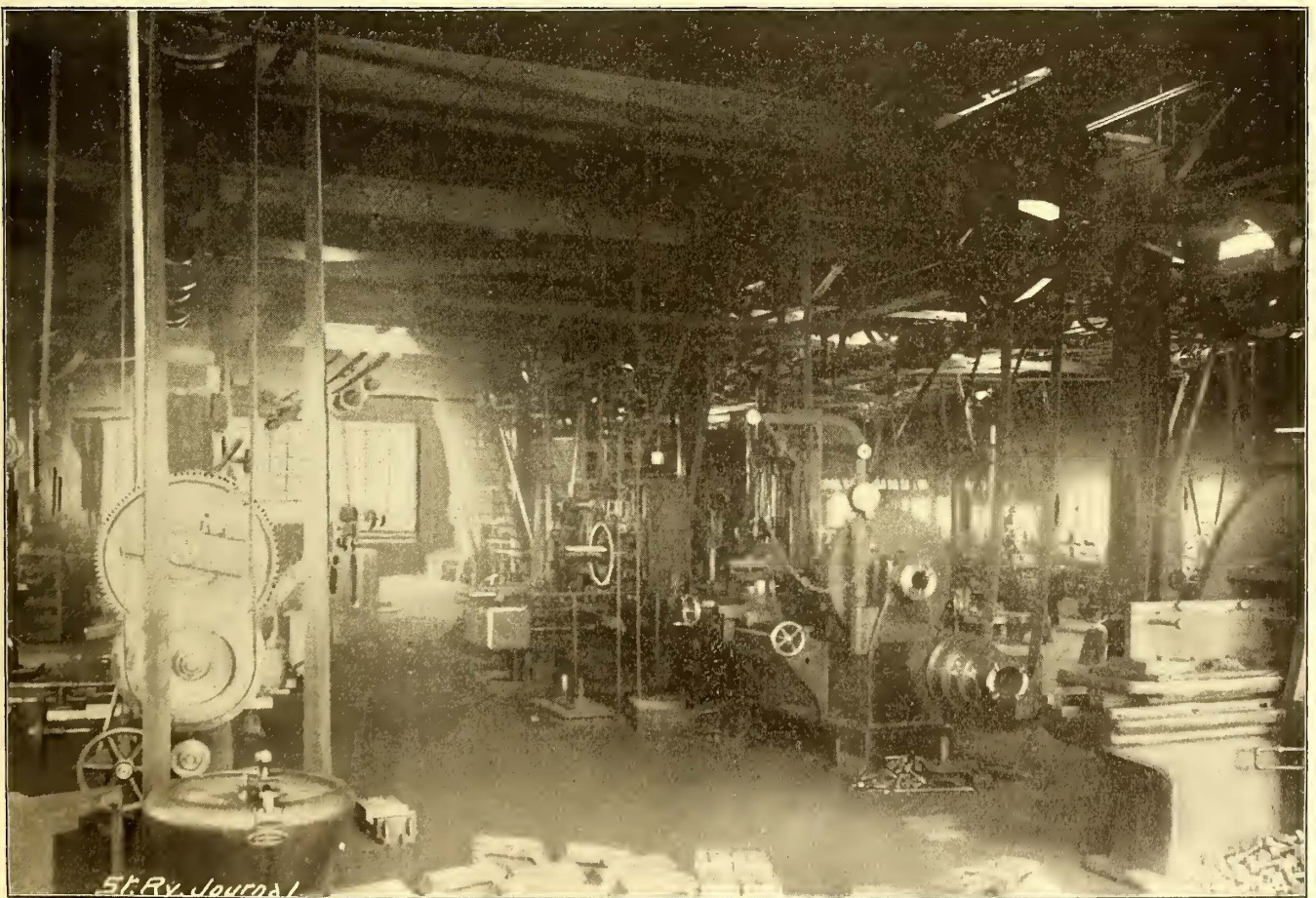


FIG. 4.—LIGHT MACHINE SHOP—WORKS OF THE CURTIS ELECTRIC MANUFACTURING CO.

manufactured here. The slotting punches for the presses are kept here, and all tools come to this department to be sharpened. The equipment of this department includes Pratt & Whitney lathes, shapers, drills, Brown & Sharpe grinding machines and other tools of all kinds, etc.

cesses of manufacture until they are ready to be wound with their electrical conductors. This work is performed on the second floor of the factory. All coils used for both armature and fields are machine wound, and of course all winding is done before the coils are set in

place. The armature coils, after coming out of the form on which they are wound, are first shellacked, then dried. They are then wound with several coverings of insulated tape, then bent on a special machine into the proper form to fit the armature. The next stage is to assemble the coils on the armature core where they are clamped in place by a plate and nut, threaded on the shaft. Wooden strips are then driven in above the coils and tied down with binding wire. The commutator is then slipped on and the lead wires soldered to the commutator bars. The commutator is insulated from the head of the armature by mica cloth, and is held in place on the shaft by a long key and heavy nut. By oil guards and grooves cut in the armature shaft oil is prevented from coming out on the commutator.

The field spools, after being wound on this floor, are bent into the proper shape on a forming machine, are then taped, then enveloped with sheet mica, then wound with another coil of tape. They are then shellacked and placed in the baking room to be dried.

The final stage is now reached, that in which the apparatus is tested before being sent out for service. This is accomplished in the



FIG. 5.—WINDING ROOM—CURTIS WORKS.

basement of the building. The motor is mounted on a shaft in the position in which it will operate. It takes current from a 500 volt generator, which it also drives as a motor by means of a countershaft, the auxiliary power being taken from the driving shaft of the building. This portion of the work is most carefully carried on, and complete records of every test are preserved by the company.

In the basement is also located the steam plant for operating the factory. This consists of two Babcock & Wilcox boilers of 125 H. P., which supplies steam to a McIntosh & Seymour engine. This engine is at present overloaded, and will soon be replaced by one of 150 H. P. capacity. The heating plant, consisting of a Sturtevant blower, which drives air through a nest of steam pipes, and the lighting plant, comprising a 300 light machine, are also located on this floor.

Throughout the entire work the greatest care is taken to insure the very best results, and to this is largely due the excellent reputation enjoyed by the Curtis motors. The company is always glad to receive visitors interested in street railways at its works and to allow them to inspect the various processes of manufacture.

The Works of a Large Wrought Iron Bridge Company.

The works of the Wrought Iron Bridge Company, which are situated at Canton, O., comprise one of the best equipped shops for the handling of heavy material in this country, and a trip through the im-



FIG. 1.—NEW WORKS OF THE WROUGHT IRON BRIDGE CO.

mense establishment of this concern will be found both interesting and instructive. As the work of this company is well known in power house construction, a brief description of some of the most interesting features is published herewith.

A distinctive feature of the plant is the transmission of power by electricity. Instead of using the old fashioned, cumbersome and power consuming shafting and belting, the power from the engine room is distributed among the various departments electrically. The Wrought Iron Bridge Company is said to have been the first bridge company to adopt this method of transmission. It is giving good satisfaction, and the superintendent says that he would have no other. Twenty-two motors altogether are used, and the company has never suffered five minutes' delay on account of accident to dynamos or motors.

The plant is built on a tract of land, twelve acres in extent, in one of Canton's suburbs. It is located on the Coshoston and Zanesville branch of the C. C. & S. R. R., and independent switches are run to the works from the Baltimore & Ohio Railroad, and from the Pittsburgh, Ft. Wayne & Chicago Railroad, thereby giving it excellent shipping facilities. Electric cars run within seven minutes' walk of the office, and it is understood that they will, in the near future, run directly by the company's ground.

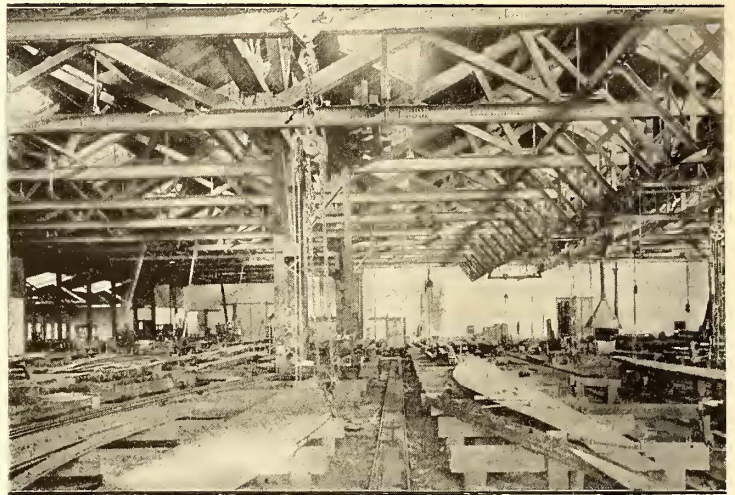


FIG. 2.—INTERIOR OF NEW WORKS OF THE WROUGHT IRON BRIDGE CO.

The main switch track from the railroad enters the ground at the northeast corner, and from it switch off other tracks which distribute the material to the different departments. The stock house and skids are accessible by narrow gauge tracks, on which suitable cars convey the material to the shops, as requirements demand. The material for built up members is conveyed to the shops on the north track, unloaded on adjacent skids in the shop, laid off and marked for punches and shears. The material then passes from the punches and shears to the straightening machines or conveying rolls, then to the assemblers, and



FIG. 3.—SMITH SHOP—WROUGHT IRON BRIDGE CO.

from the assemblers to the reaming tools. From the reaming tools it passes to the riveters and riveting machinery; then to the planers, fitters and drills; lastly to the storage department, when it is ready for shipment.

The several operations through which the material passes are carried on by machinery especially designed for the work performed, and the progress of the material while undergoing manufacture is from north to south. When it arrives at the south side it is in a finished condition ready to be loaded on cars for transportation to its destination.

The main railroad switch track enters the shop on the south side, four feet below the level of the main shop floor. For fourteen feet on each side of the track for a considerable distance, arrangements have been made for the storage of finished work, thus permitting the operation of painting and loading to be carried on under cover. The plant has a total loading capacity of 500 ft. of track.

The main building covers a square area 256 ft. on a side. Of this the first thirty-one feet in depth from the north side is divided into smaller departments. All but 188 × 64 ft. on the southeast end is used as a main shop for the manufacture of built up members. A space 150 × 64 ft. at the southeastern end of the building is used for a forge shop. This is connected by narrow gauge tracks with the yards, stock house and main shop. Each line of trusses every sixteen feet apart is built with a lower member adapted for the use of a trolley, giving every trolley, except on the column lines, a travel across the entire shop of 225 ft.

The engine room is 38 × 64 ft., and contains besides the engines, the electric power generators, incandescent and arc light dynamos, air

ment. In the opinion of the managers of the company, this disposition is far superior to the ordinary method and has shown in practice most excellent results. On the track the car rides easily and steadily, and the oscillation is reduced to a minimum on good track, while on a rough roadbed there is none of that disagreeable jar, resulting from too stiff elliptical springs, placed at the extreme end of the spring base. The company looks forward to a large sale of this truck.

Electric Welding of Rails in St. Louis.

The Johnson Company, of Johnstown, Pa., shipped one of its two electric welding equipments to St. Louis during the latter part of the winter, and rail welding has been going on ever since it has come upon the ground. The Baden & St. Louis Railroad is the company for which the work is being done, and as its management is anxious to have the road completed as soon as possible, so as to catch the summer travel to Calvary and Bellefontaine cemeteries, welding has been



FIG. 4.—ENGINEERS' ROOM—WROUGHT IRON BRIDGE WORKS.

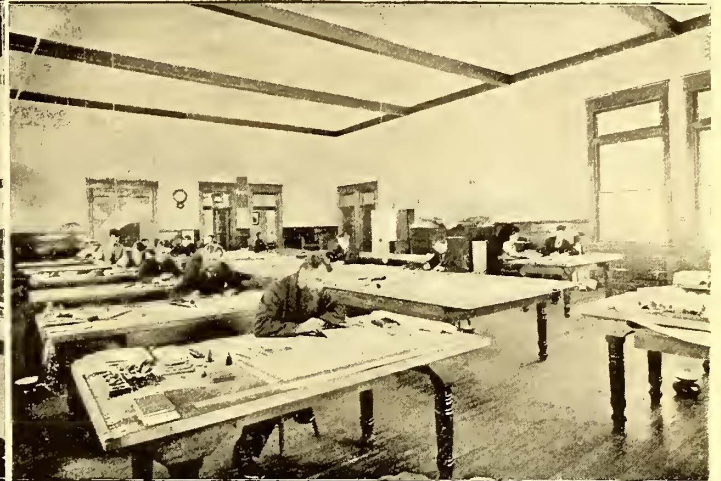


FIG. 5.—DRAFTING DEPARTMENT—WROUGHT IRON BRIDGE WORKS.

compressors, receivers, pressure and heating fans. The engines were built by the Russell Engine Company, of Massillon, O., and General Electric generators are in use. The boilers are of the Hazelton or Porcupine type, and are giving excellent satisfaction. A Bunnell feed-water heater and purifier, manufactured by the Bradley Manufacturing Company, of Syracuse, N. Y., is employed, extracting all lime or other foreign matter from the water before it passes into the boilers. The furnace is equipped with the Murphy smoke consumer. The exhaust steam, besides heating the feedwater, is used during the cold weather for the heating of the works.

The Wrought Iron Bridge Company has laid the foundation for solid growth by providing the best of facilities for economical manufacture, and with the advantages which the company possesses its managers feel certain that they will receive a fair share of the street railway business.

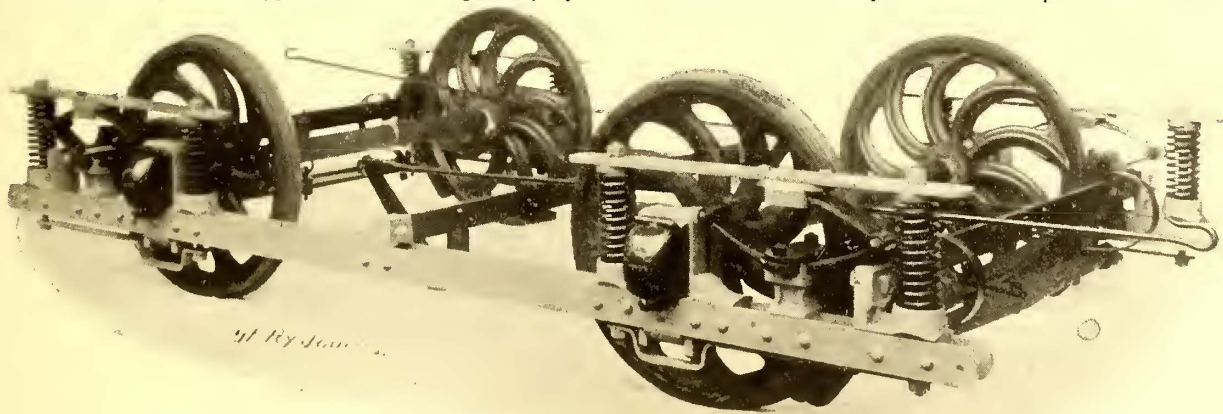
New Elliptical Spring Truck.

The accompanying engraving shows a new elliptical spring truck put upon the market by the Sheppard Manufacturing Company, of

going on night and day, two shifts of men being required for the purpose.

The process of electrically welding rails in this case is as follows: The tender car goes ahead of the welding car to prepare the rails for the process. To make a good weld it is absolutely necessary that the ends of the rails come in contact at all points, and to insure this they are ground with an emery wheel. In case the rails are too far apart, a clean cut shim, or thin section of a rail, is placed between the two, fitting tightly and insuring a good weld. Babbit metal clamps are then applied to the joint, holding the ends evenly and tightly together. The welding car then comes along with its own power, it being provided with two motors, and the traveling crane with the welding apparatus is lowered, so that the joint is between the two jaws of the welder. Two pieces of steel of the same quality as the rails are put one against the lower half of their channels on one side and the other on the lower half of the other side.

The jaws of the welder, whose inner faces are of Babbit metal, then come together, being actuated by a hand wheel, and hold the two pieces of steel tightly to the joint. The alternating current General Electric dynamo is then started up, but the current is not transmitted to the welder until the dynamo is at full speed. When the current is



NEW ELLIPTICAL SPRING TRUCK.

Louisville, Ky., and called by its makers their No. 3 motor truck. In general design the truck is similar to others made by this company, except that there is the addition of the four elliptical springs shown.

As will be noticed, the truck uses a coil or spiral spring outside of the elliptical spring, differing in this respect from the usual arrange-

turned onto the welder the steel pieces rapidly become molten, and at the end of an average of four minutes they have formed a homogeneous mass with the rails. The same process is gone through with the upper halves of the rails, and in this case also the average time required for a weld is four minutes. When the welding is finished a ridge formed

across the head of the rail during the process is hammered down while in a soft state. The average time consumed at each joint is about ten minutes, that is, from the time the current is applied to the joint till the time the welder is removed. To insure good work care is taken to keep the voltage constant at the power station of the Cass Avenue & Fair Grounds Railway, whence current is obtained. All joints are gone over and inspected to be made reliable. Current is supplied to the car through a trolley wire strung along the line, and is transformed on the spot from a constant to an alternating current.

The Peckham Automatic Life and Wheel Guard.

An automatic life and wheel guard, combining simplicity, lightness and strength, was recently placed on the market by the Peckham Motor Truck & Wheel Company, and is shown in the accompanying engravings.

The guard is constructed of one inch wrought pipe, and carries a wire screen, five feet eight inches long and thirty inches wide. It is

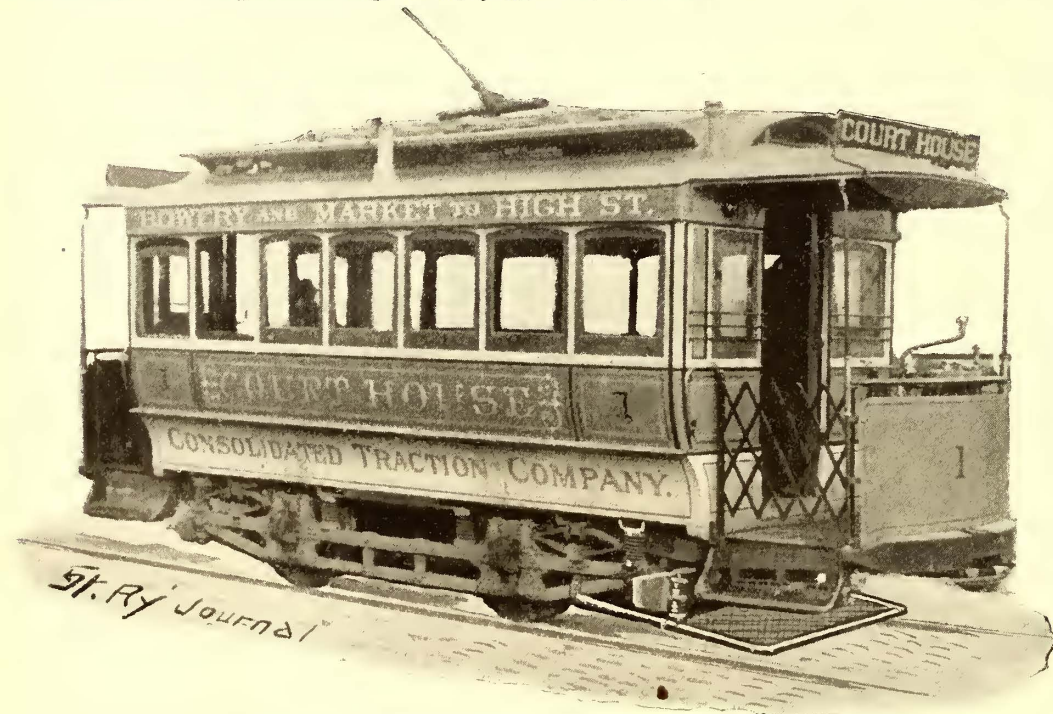


FIG. 1.—CAR EQUIPPED WITH PECKHAM'S FENDER.

attached to the guard plank by two cast iron brackets, in which are pockets for two spiral springs, one of which allows an upward movement, in case of striking an immovable object. The rear extension is bolted to the truss bar of the truck, and is provided with three holes, so that it is easily adjustable, and can be carried at any distance above the

Compound, Duplex, Double Plunger Pump for Boston.

The accompanying engraving illustrates a pump which was recently built for the West End Street Railway Company, of Boston, by

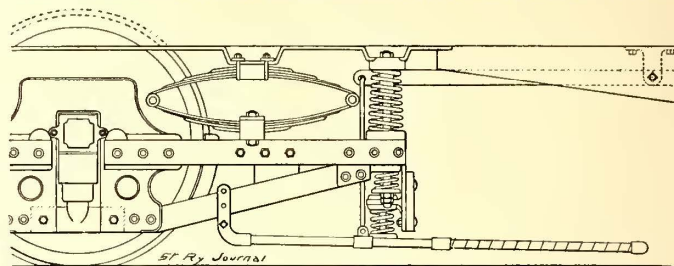


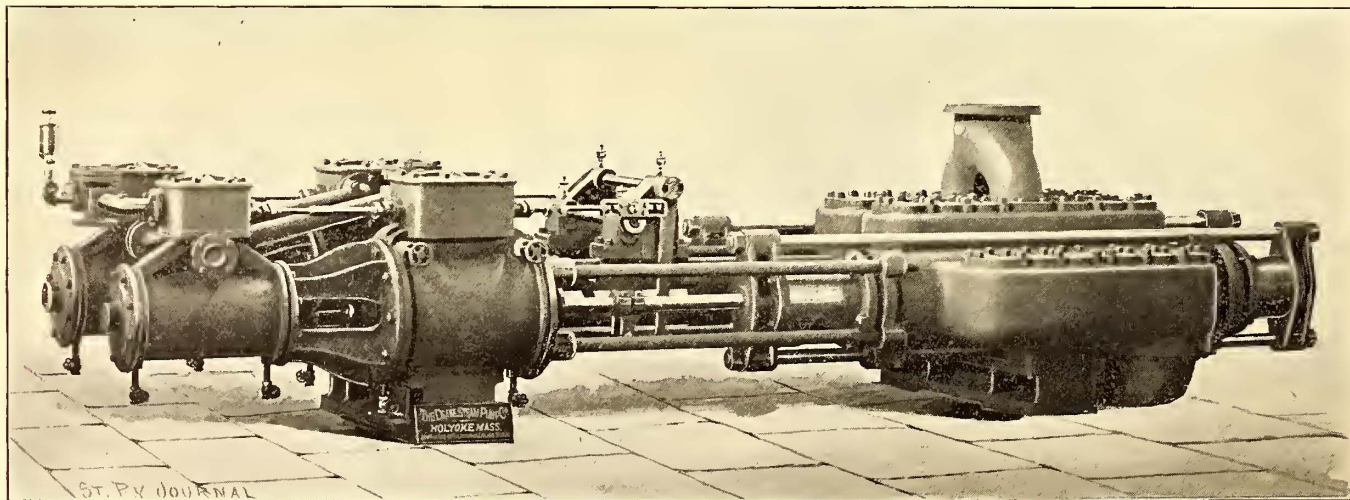
FIG. 2.—SIDE ELEVATION OF PECKHAM'S FENDER.

the Deane Steam Pump Company, of Holyoke, Mass., and which differs in a number of particulars from the standard type of that company. It is of the compound, duplex, double plunger pattern, with eleven inch, high pressure steam cylinders, twenty-four inch low pressure steam cylinders, eleven inch water plungers and eighteen inch stroke. The general arrangement of the parts of the machine is of the well known duplex style. There are two plain slide valve steam engines and two double acting pumps, each pump and its engine so arranged by the side of and connected with the other that the steam valve of each is operated by the steam piston of the other. In this way great certainty of action and a remarkably uniform delivery from the pump is secured.

The machine has water cylinders of special design, each being cast in one solid piece very thick and heavy. The valves are of rubber of special composition for heavy pressure, and are arranged in separate chambers, each having its individual cover, thus affording the greatest strength and most convenience. The plungers have outside stuffing boxes, so that any leak can readily be detected and instantly adjusted. This machine

is especially recommended to work against a heavy pressure. The pump at the station of the West End Street Railway Company is feeding boilers of 6,000 H. P. capacity with 200 lbs. pressure.

"Deane" independent condensers and boiler feed pumps are used in the following street railway power stations: Union Railway Com-



COMPOUND, DUPLEX, DOUBLE PLUNGER PUMP FOR BOSTON.

track. It is inclined at a slight forward angle, so that in striking any movable object the springs allow the screen to drop to the track.

The cut, Fig. 1, shows the fender as applied to one of the cars of the Consolidated Traction Company, of New Jersey.

The Manchester (N. H.) Street Railway Company has been granted permission by the City Council to equip its lines with electricity.

pany, New York; Lynn & Boston Railway; Worcester, Leicester & Spencer Street Railway; New Haven, Conn.; Springfield, Mass.; Holyoke, Mass.; Titusville, Pa.; Lowell, Mass.; Brockton, Mass.; Atlanta, Ga.; (Brooklyn) Atlantic Avenue; Nashville, Tenn.; Bethel, Pa.; Toledo, O.; Pittsburgh, Pa.; Cleveland, O.; Galesburg, Ill.; Weston, W. Va.; Hartford, Conn.; Northampton, Mass.; Providence, R. I., and many others.

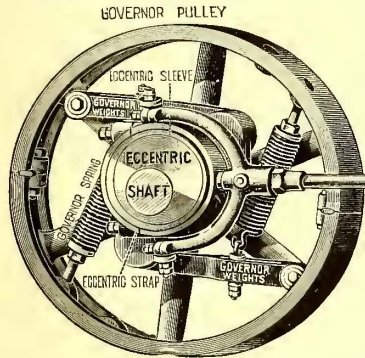
New "American" Engine.

We present to our readers on this page illustrations and description of a high grade automatic engine, built by the American Engine Company, of Raritan Avenue, Bound Brook, N. J., a company organized in 1893 with a capital of \$200,000. This company bought from the American High Speed Engine Company its fine plant, and adopted the name of "American Engine Company."

The claims made by the manufacturers are as follows: This engine possesses the remarkable features of retaining all the simplicity of the single valve engine while distributing the steam as in the Corliss and other complicated engines, which give the highest attainable steam economy.

Fig. 1 is a view looking at crank side of the engine. The foundation is protected from oil and water by a bead which extends around the outer edge of the base and conducts the oil, etc., to a pit under the crank disk, from which it is drawn out through a pipe and saved for filtering to be used again. The bed plate from the cylinder to the main bearing extends above the center line of strains, ensuring perfect rigidity and freedom from springing.

Fig. 2 is a view of the valve gear and single piston valve, hav-



ing the usual annular ports, one at each end, which control the admission of steam to the cylinder, the release and compression being controlled by the ends of the valve. The peculiarities of this valve gear are: First, the eccentric is fixed to the shaft, which makes the reciprocations of the valve invariable, thereby giving a constant admission, constant release, and constant compression. Second, the automatically variably cut-off is produced as follows: In addition to the annular ports, this valve is provided with longitudinal ports, and corresponding ports are cast in the stationary sleeve which is within the steam chest. As the inner ends of the valve are closed, steam, in order

motion is imparted to the eccentric strap and through the eccentric rod and valve rod to the valve.

It will therefore be seen that the valve has two motions; one, an invariable reciprocating motion, the other a twisting motion, which is invariable in degree, but variable relative to the reciprocating motion. This variation is accomplished by the rolling of the sleeve on the eccentric, whenever the governor weights change their position as a result of a change in speed.

The experience of this company with piston valves condemns their use in a horizontal position. For, notwithstanding they are perfectly balanced against steam, their weight produces friction which causes wear, and soon results in leakage. The company will use them in its vertical compound and triple expansion engines, in which the weight will be supported by the valve stem in a vertical position, doing away with friction and consequent wear.

The type of valve used in the horizontal engines, consists of a flat face slide valve bearing upon a flat seat, against which it is held by the steam pressure. The valve travel is invariable; hence the wear upon its seat is uniform, and therefore, the valve always remains tight. This valve controls the admission, release and compression, maintaining them constant; while the cut-off is variably controlled by a small cylinder valve within the slide valve as shown. This valve is provided with longitudinal ports, and corresponding ports are cast through the shell of the slide valve surrounding it; and the cutting off of the steam is

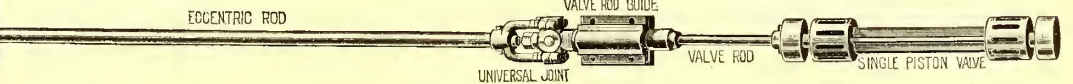


FIG 2—VALVE GEAR—AMERICAN ENGINE.

accomplished by twisting, or rotating the valve which opens and closes the longitudinal ports. No change whatever is required in the valve gear to actuate this valve.

The exhaust steam passes directly to an exhaust pipe cast on the under side of the steam chest, the ends only being joined to the steam chest, so that the exhaust does not come into contact with any live steam surfaces, except the ends of the main valve. The live steam is conveyed by a pipe into the steam chest through the top at the center, and is prevented from passing the ends of the valve to the exhaust by packing strips, one bearing against the steam chest cover, the other against the top of the steam chest, being kept in contact with these surfaces by the steam or by small springs when the steam is turned off

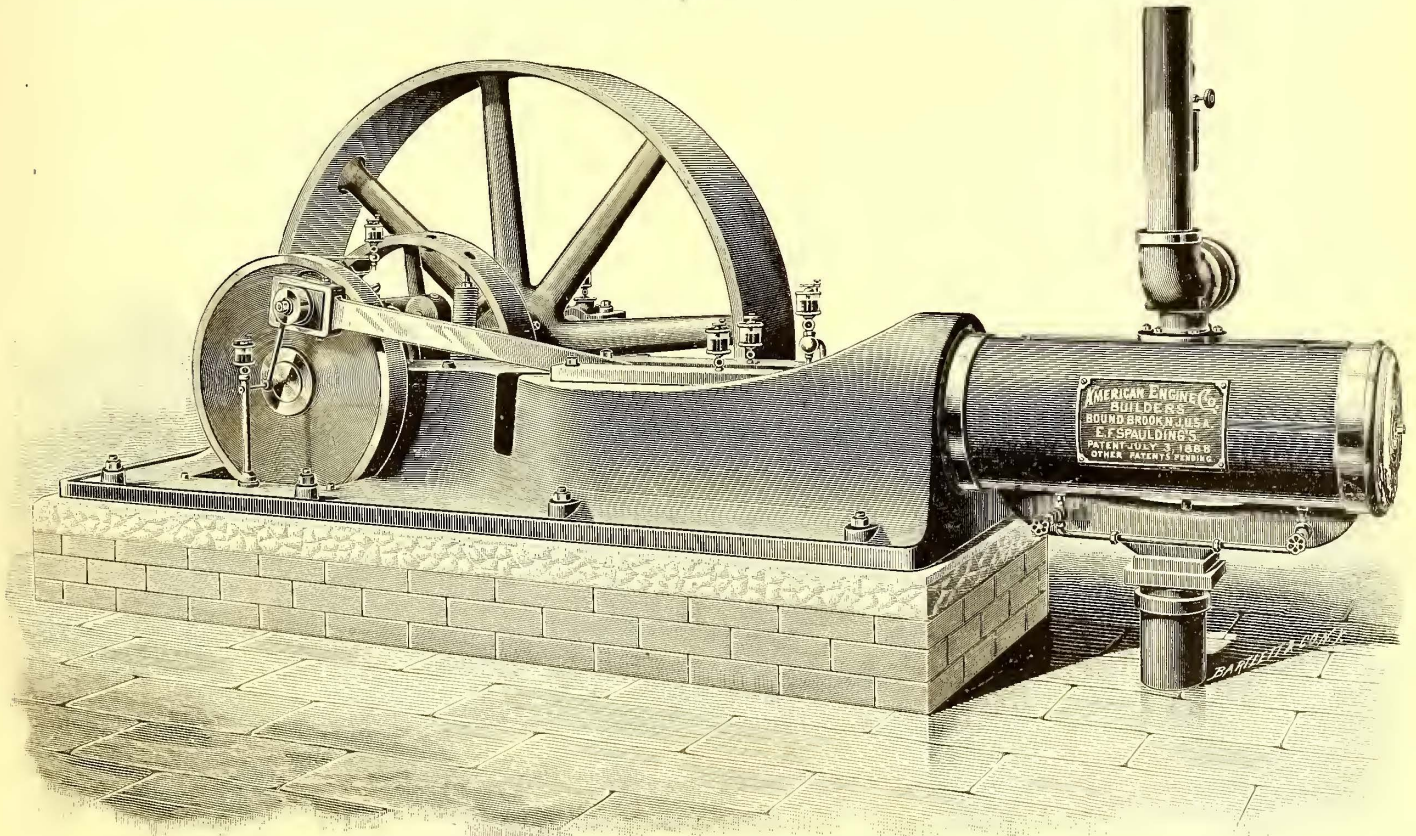


FIG. 1.—NEW AUTOMATIC ENGINE—AMERICAN ENGINE CO.

to get into the cylinder, must pass through these longitudinal ports, and will so pass when the ports in the valve coincide with the ports in the stationary sleeve; and the flow of steam to the cylinder will be cut off when these ports do not coincide.

This opening and closing of these longitudinal ports call for a twisting motion to be imparted to the valve. This is accomplished by the eccentric sleeve, mounted upon the eccentric having a diagonal, V shaped groove turned in its periphery, to which is fitted the eccentric strap. This sleeve is connected with the governor weights by links in the usual way of connecting eccentrics. As the sleeve revolves with the eccentric, being carried around by the governor weights, a twisting

A corner piece is so constructed as to effectually close the joint where the packing strips meet at the corner. These strips are made of the same material as the valve, and are secured from moving away from the valve seat proper by a pin, but are free to move out of the groove in the valve (as wear may occur) against their bearing surfaces.

GOVERNOR FLOWER has signed the New York rapid transit bill referred to in our issue of last month, and the question as to whether the railway will be built by the money advanced by the city will be decided at popular election next fall.

The Arnold System of Electric Power Station Construction.

In building an electric power station the two principal objects to be kept in view are low first cost, consistent with the best economy, and absolute reliability. The system described herewith, which is a radical departure in central station construction, claims to secure both of these requisites, together with less cost in operating expenses; less real estate occupied; absolute flexibility; less depreciation and greater ease in handling than is usual in power plants heretofore installed. We will first describe the system as applied to an electric railway plant having a capacity of 2,000 H. P., such as would have been ample to drive the Intramural Road at the World's Fair.

Referring to Figs. 1 and 2, engines No. 1 and No. 2 are cross compound, condensing engines, having a rated capacity of 1,000 H. P. each. Generators No. 1 and No. 2 have a rated capacity of 750 K. W. each. The armatures of the generators are mounted upon steel quills, Cc, running in independent bearings, Pp, so arranged that they are free to revolve independent of either engine and of each other. Through these quills, and supported at its center bearing, D, extends a steel or wrought iron shaft, carrying upon its ends circular cast steel or iron disks, Ff, securely keyed to the shaft. The engraving shows the engines connected to generators with magnetic clutches which operate as follows: Attached to the end of the engine shafts, Aa, are circular cast iron or cast steel disks, Hh, carrying in recesses copper coils, Oo, which are connected to brushes, Qq, by means of rings, Rr, in such a manner as to permit a current of electricity to be passed through the coil while the disks are in motion. Around the vertical face of disks, Hh, near the peripheries are carried cast steel or iron rings, Ii, which are held in position on disks, Hh, by means of three gudgeons or bolts, equally spaced around the periphery of disks, Hh. Rings, Ii, are normally held against disks, Hh, by small spiral springs surrounding the gudgeons or pins. Attached to quills, Cc, are cast iron or steel disks, Jj, carrying two coils of copper wire, Mm, Nn, which are connected to brushes, Kk, so as to allow a current to be passed through the coils when the disks are in motion. If a current of electricity is passed through the coil, M, a magnetic field will be created around it which will have a tendency to attract disk I, and clasp it securely to disk J, so that power can be transmitted from one disk to the other by friction so long as the current travels through coils, M. Engine No. 1 can now drive generator No. 1 directly connected, and in like manner engine No. 2 generator No. 2, thus forming two direct connected power units. Shaft E lies idle in bearing D, and is not used except in case it becomes necessary to drive either generator from the opposite engine, or both generators from the same engine. It will also be

more power, when the low pressure cylinder is brought up to speed and connected in with the high pressure cylinder without stopping the plant.

In case it becomes necessary to make repairs on the high pressure cylinder of engine No. 2, while the road is demanding full power of engine No. 1, high pressure steam may be admitted to the low pressure cylinder of engine No. 1, which it will be noticed from Fig. 1, is placed next to the generator. By working high pressure steam in the low pressure cylinder of this engine it will give its full power, thus driving its generator.

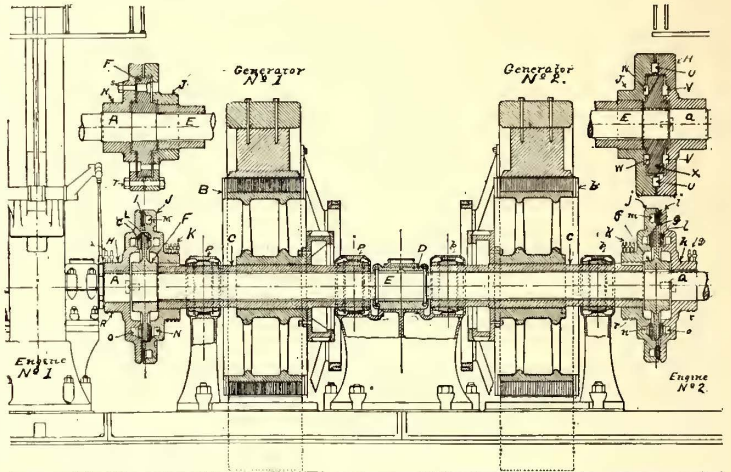


FIG. 2.—SECTION SHOWING CLUTCHES.

In order to prevent wear on the rings of the magnetic clutches above described, the following method of electrically starting the generators is covered under this system: Suppose engine No. 1 and its generator are operating, and engine No. 2 and its generator are standing idle, and it becomes necessary to throw generator No. 2 upon engine No. 1, in order to repair something on generator No. 1. Instead of starting engine No. 2 to bring generator No. 2 up to speed, or allowing the friction of the magnetic clutch to bring the latter up to speed, the following method is adopted: Current being produced from generator No. 1 is passed through the armature and fields of generator No. 2,

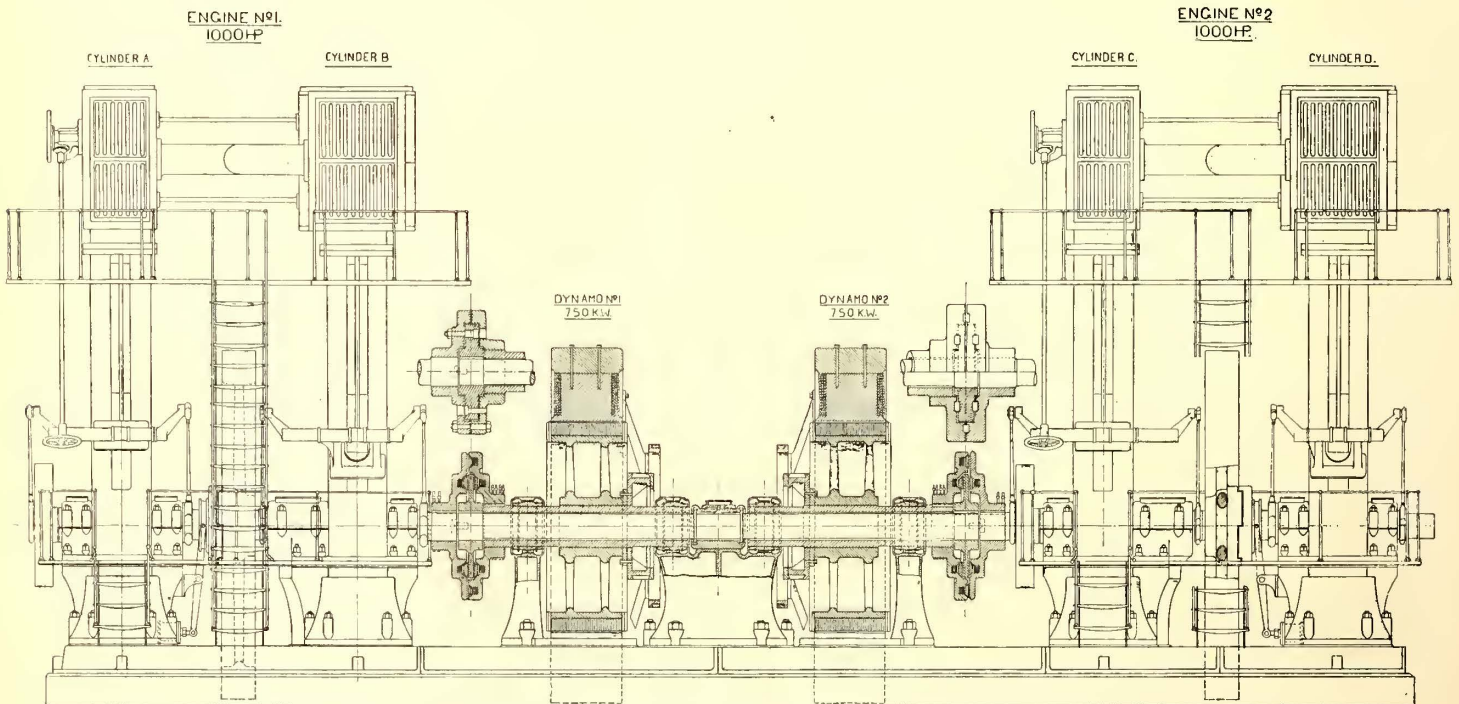


FIG. 1.—LONGITUDINAL SECTION OF ENGINES AND GENERATORS.

seen that either generator or both generators are available from either engine.

By having two engines with the high pressure cylinder of one, and the low pressure of the other direct connected to the work, the plant is arranged to operate economically with any load varying from 500 to 2,000 H. P., and it is practically impossible to shut down the plant on account of any accident that would be liable to happen.

It will be observed from Fig. 1 that the main shaft of both engines is cut in the middle and the two parts joined together by means of positive jaw clutches, operated by steam cylinder. Thus when the load is light, engine and generator No. 1 are shut down. Cylinder D of engine No. 2 is cut off by means of the jaw clutch, and no portion of the plant operates, except the high pressure cylinder of engine No. 2, directly coupled to generator No. 2. This cylinder can be run condensing and the plant operated with economy, until the road requires

in such a manner as to make a motor of it, until the armature attains the same speed as that of generator No. 1, when current is passed through coil, n, clamping disk, f, to disk J, without wear on the clutch mechanism.

In case it ever becomes necessary to increase the capacity of the power station designed under this system, it is done by adding two more generators to the right of engine No. 2, having similar connections to generators Nos. 1 and 2, thus making four generators available from engine No. 2. The third engine is added as the power is required.

The small engravings in the upper right and left hand corners of Fig. 2 show different forms of mechanical clutches which can be substituted for the magnetic clutches above described, if necessary. In a railway plant, the fact of having to stop the station for a few minutes at the time of changing from one engine to another is not so serious as in a lighting plant, and the above clutches have been designed for

substitution for the magnetic clutches in case the conditions were such as not to warrant installing the magnetic clutches.

In the left hand view, H is a disk securely keyed to engine shaft, A, of engine No. 1. J is a circular disk securely keyed to quill, C, of generator No. 1. F is a circular disk keyed to the common shaft, E. If it is desired to drive generator No. 1, three bolts, T, spaced equidistant on the circumference, are used to bolt disks, H and J, rigidly together, the same as cable railway plants are operated. Engine No. 1 is thus driving generator No. 1 directly connected, without any wearing parts, except the bearings of the two machines. In case it becomes necessary to drive generator No. 2 from engine No. 2, bolts, S, are inserted as shown, thus rigidly connecting disk, H, to disk, F, and revolving shaft, E. Bolts, S, can be reversed so that disk, F, will be rigidly bolted to disk, J, permitting shaft, E, to drive generator No. 1 from engine No. 2, thus performing all the functions of the magnetic clutch as described above.

The right hand view is another form of clutch commonly used in cable railway plants. Disks, H and J, are keyed to the engine and generator shafts, respectively, and disk, X, is keyed to shaft, E. If it is desired to drive generator No. 2 from engine No. 2, two steel or wrought iron keys are inserted in recesses, U U, thus rigidly connecting the disk, H, to disk, J. By inserting the wedges, V V, shaft, E, is made to revolve from engine No. 2, and by inserting the edges in recesses, W W, generator No. 2 is caused to revolve from shaft, E, thus making the plant interchangeable in all directions.

The entire plant is mounted upon cast iron bed plate construction, cast in sections and thoroughly anchored, the same as first class cable railway power construction of the present day. An important feature of the system is the fact that any standard make of dynamos and engines can be utilized, thus necessitating no radical departure from the present lines of manufacture. For this reason, many of the present plants can be rebuilt to conform to this system, and utilize a large part of their old equipment. This system, as described, was designed by B. J. Arnold, of Chicago.

Forty Inch Standard Engine Lathe.

A view of a forty inch standard engine lathe designed and built by the Lodge & Davis Machine Tool Company, of Cincinnati, O., is shown herewith. The bed is extra deep, well braced its entire length, and rests direct upon the foundation, securing perfect solidity under a heavy strain. The headstock has a long bearing on the bed; the cone pulley has five steps and is strongly back geared. The spindle is of large diameter, made from a high grade of steel, and is accurately ground to a perfect fit on a Universal grinding machine. The boxes are made from the best phosphor bronze. The end thrust is against hardened steel rings accurately ground, and provision is made for taking up the slightest wear. The carriage is heavy, and has long wearing surfaces both on the bed and cross slide. The apron is secured to it in a manner to lend additional stiffness, and the carriage is securely gibbed both front and back.

All the feeds of the carriage can be thrown in and out, or reversed from the front of the apron. The carriage is also provided with a stop which automatically throws out the feed, and which can be set at any point along the ways. This is very convenient for turning or boring, and also prevents the lathe from being damaged by any carelessness of the operator.

The lead screw is situated on the inside of the bed, where it is protected from dirt and chips. In this position it secures a central pull to the carriage, and obviates that twisting tendency which invari-

New Electric Heater.

We present herewith an engraving of a new type of metal case heater recently put upon the market by the Consolidated Car Heating Company, of Albany, N. Y. This heater comes through the riser, the iron grating of the heater fitting in the panel of the riser. This, as will be seen, keeps the heater under the seat and entirely out of the way of passengers' feet and ladies' dresses.

The first cars to be equipped with this heater are those of the Norwalk Horse Railway Company, of Norwalk, Conn., which is now be-



NEW ELECTRIC HEATER.

ing changed from horse to electric power, and which will use, in connection with the heater, the temperature regulating switch of this company. The heaters are now being put on at the works of J. A. Trimble, of New York, who is manufacturing the cars.

\$250 in Prizes.

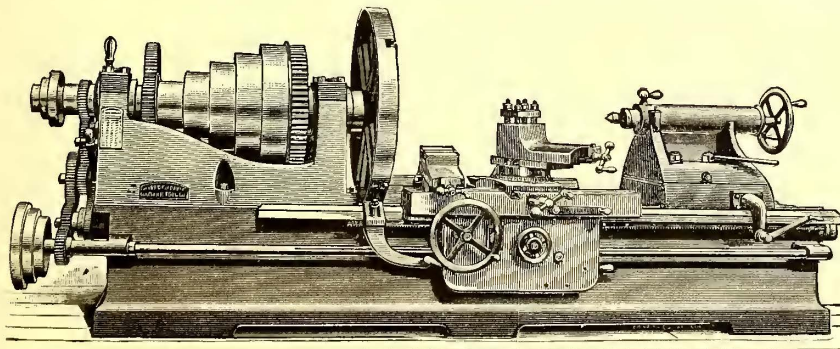
The Chicago General Street Railway Company, having the construction of a permanent plant in operation, writes us that it invites outline drawings and general specifications of a model plant for the immediate use of twenty motor cars and twenty trail cars. The construction should be suitable to permit an increase in capacity to forty motor cars as occasion may require. The lot will have a street frontage on the south of 450 ft., on the east an alley frontage of 550 ft., on the west a street frontage of 300 ft., on the north the diagonal frontage abuts a steam railway from which a switch may be extended to any portion of the lot where convenience or economical operation may require.

The street railway tracks may enter the lot at the northeast corner, and will also extend along the entire south frontage. Water can be extended from a city water main to any portion of the lot. The drawings must show the location of all necessary buildings, the position of Corliss engines, boilers, machinery, coal tracks, pits, and all other desirable features for a model plant.

For the first plan selected \$100 will be paid, \$75 for the second, \$50 for the third and \$25 for the fourth. The company reserves the right to reject any and all plans, and will be the sole judge of the merits of each. All plans should be sent to the vice president, C. L. Bonney, on or before the first day of July, 1894. Each plan should be identified by a special mark or assumed name, the real name and address of the contributor being, as usual, sent on a separate paper, enclosed in an envelope bearing the name appended to the plans.

Wooden Faced Brake Shoes.

The engraving herewith shows a wooden faced brake shoe which has just been put on the market by Wm. Wharton Jr., & Company, of

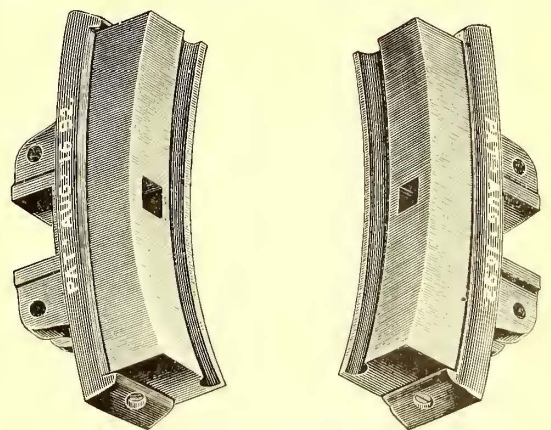


FORTY INCH STANDARD ENGINE LATHE.

bly takes place in lathes where the screw is placed on the outside of the bed. The compound rest is provided with power cross and angular feeds, adapting the lathe to all kinds of taper turning and boring. It is so constructed that the feeds work independently, and cannot be thrown in at the same time.

THE St. Louis County Street Railway Company, of St. Louis, Mo., of which J. B. Greensfelder is president, has opened its new line from Wellston, on the St. Charles Rock Road, to Eden, Lucas, Hunt and Natural Bridge roads to Normandy. Until the traffic justifies operation by electricity the line will be operated by horse power.

The Cleveland (O.) & Akron Electric Railway Company, with a capital stock of \$300,000, has been incorporated.



WOODEN FACED BRAKE SHOES.

Philadelphia, and which is claimed to be superior to metal. The wooden shoe, it is also claimed, brakes better and wears the wheel less than metal, and its use is, therefore, advisable outside of the question of expense. The wood can be put in and taken out readily, and runs no risk of displacement in service. The block is made of oak cut across the grain, thus exposing the ends of the fibres to wear, which prevents the tearing out of the ends and sides, and presents a surface to the wheel which has greater tenacity than any metal.

These shoes are in use on a number of well known street railways, which have become thoroughly satisfied of their high efficiency and economy. The manufacturers have samples which have run 6,000 miles, with average stops and quite heavy grades.

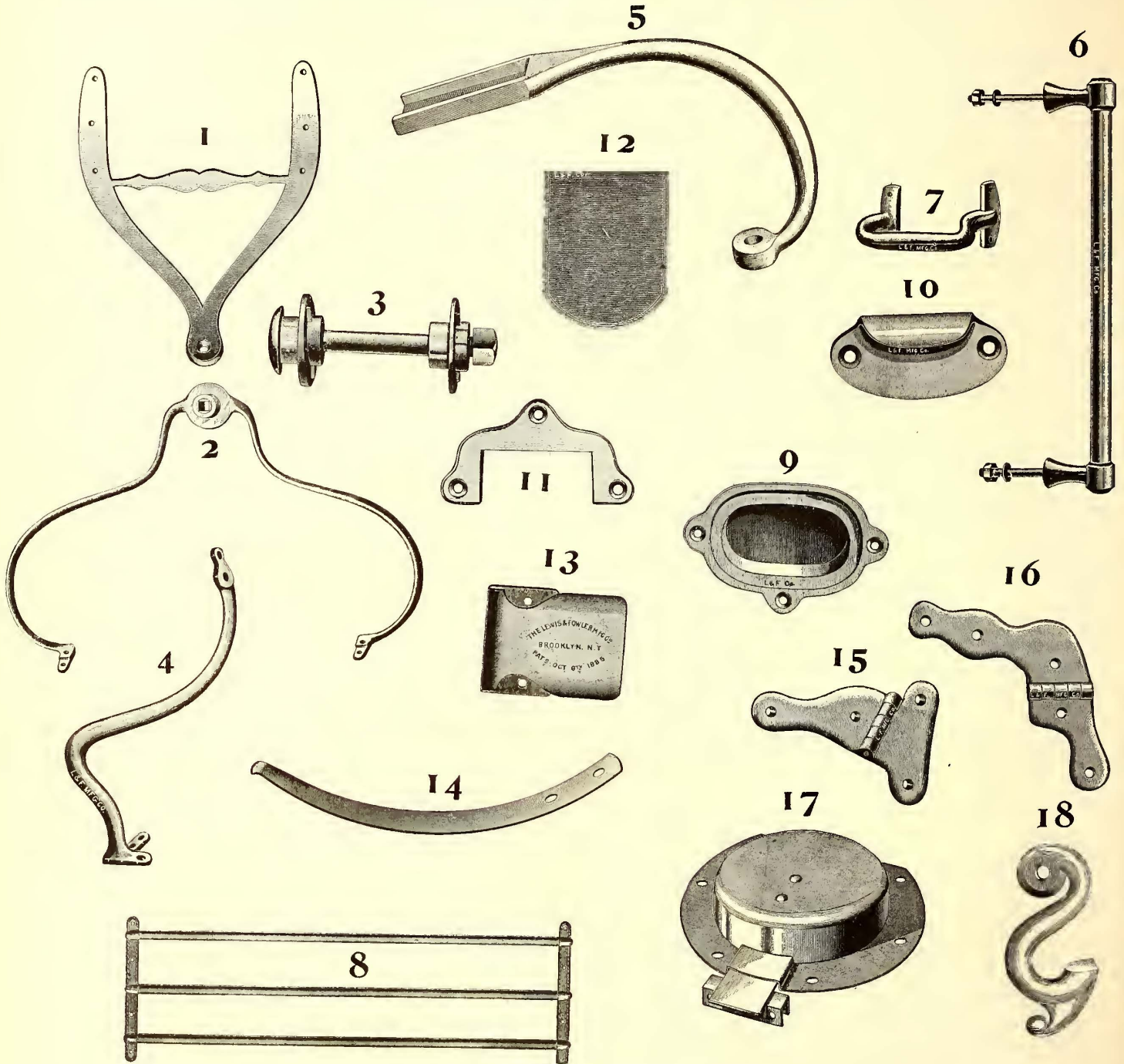
Car Trimmings.

A comparatively small, yet most important, part of a car equipment is the "trim." Car trimmings are now usually made of bronze, and the number required varies naturally with the style of car. We present herewith engravings of all those used on a standard, forty passenger, open car having six reversible and two stationary seats, such as shown on page 395.

The manufacturer of the trimmings shown, the Lewis & Fowler Manufacturing Company, of Brooklyn, N. Y., devotes one special de-

partment in its extensive works, located on Nostrand, Park and Flushing Avenues and Walworth Street, Brooklyn, to the manufacture of car trimmings and supplies large quantities to street railway companies for the repair of cars as well as the great number required in the works themselves in the manufacture of cars. The officials of the company tell us that the trimming department of the company's business has been especially busy recently, indicating that many companies are reconstructing their old cars instead of purchasing new ones.

The process of manufacture of trimmings is most interesting. To insure the excellence of the metal used, the Lewis & Fowler Manufacturing Company makes its own bronze, in the composition of which 1,000 lbs. of copper, and a proportionate quantity of spelter, tin and lead are used a day. The moulding of the trimmings is, of course, the initial process in their manufacture. The moulding is done in iron boxes with a specially prepared moulding sand. In the moulding room of the Lewis & Fowler Manufacturing Company, ten furnaces are required to mould the metal. Each furnace yields three "heats"—as the crucible holding molten metal is called—a day, and each "heat" contains from fifty to sixty pounds. After being cooled the moulded pieces are taken to the filing and drilling departments where twenty-five men are employed in removing from the rough castings burrs, warts and other imperfections to be met with, and in drilling holes for the screws, countersinking, etc. The polishing then follows, and in this department the pieces are ground on graded emery wheels and belts against which they are held by hand. They are then polished on linen buffers which make 2,300 revolutions per minute. In this department of the Lewis & Fowler works, twenty-two men are employed in the operation of twelve



TRIMMINGS FOR A FORTY PASSENGER OPEN CAR.

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emery wheels, two emery belts and ten buffers. The trimmings are then bright and shining and are lacquered and baked.

The cuts on this and the next page show the following parts, the figure in the bracket after the name of the piece showing the number required for the forty passenger, open cars shown: No. 1. Reversible seat arm (twelve). No. 2. Reversible seat handle (twelve). No. 3. Bolt for reversible seat handle (twelve). No. 4. Stationary seat handle (four). No. 5. Dash grab handle (four). No. 6. Pillar handle (sixteen.) No. 7. Motorman's handle for access to roof of car (one). No. 8. Window guard (two). No. 9. Lower sash lift (six). No. 10. Upper sash lift (six). No. 11. Blind lift (six). No. 12. Leather for blind lift (six). No. 13. Sash spring (six). No. 14. Blind spring (six). Nos. 15 and 16. Lamp box hinge (four of each kind). No. 17. Lamp box drip cup (two). No. 18. Lamp box hook (two). No. 19. Match striker (two). No. 20. Reversible seat back casting with rubber (twelve). No. 21. Color signal ring (two). No. 22. Signal bell (two). No. 23. Bell strap hook (two). No. 24. Strap guide (ten). No. 25. Strap bushing or thimble (two). No. 26. Strap fastener (two). No. 27. Bronze tube

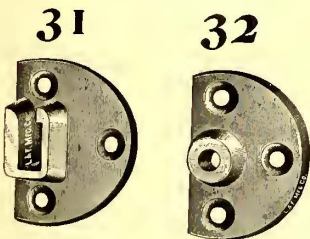
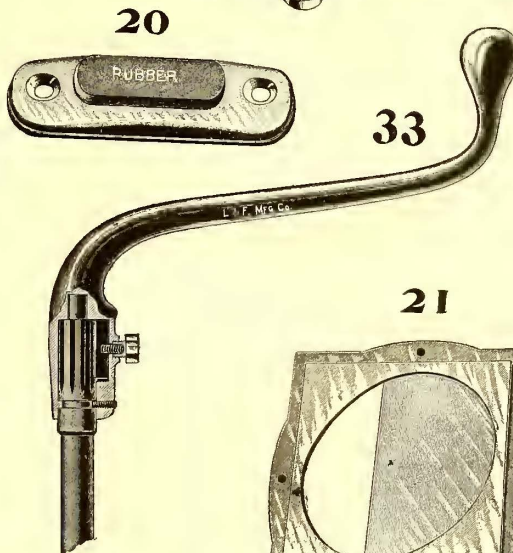
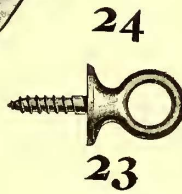
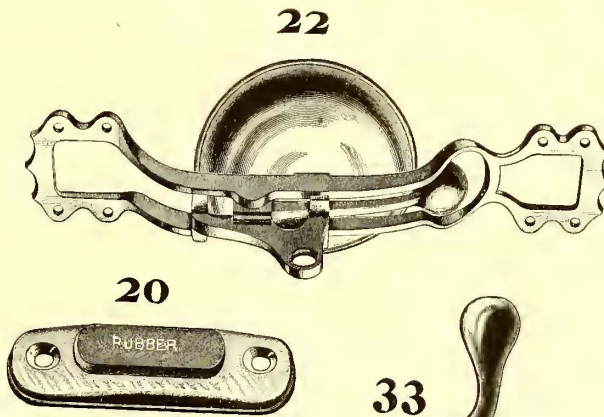
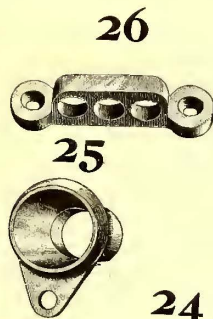
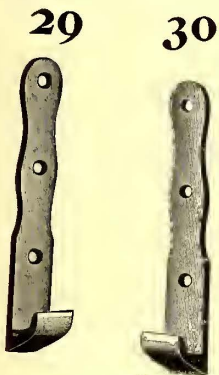
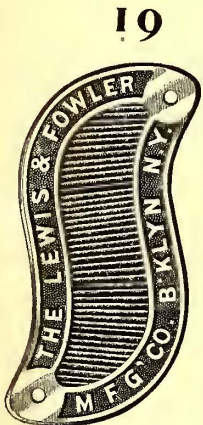
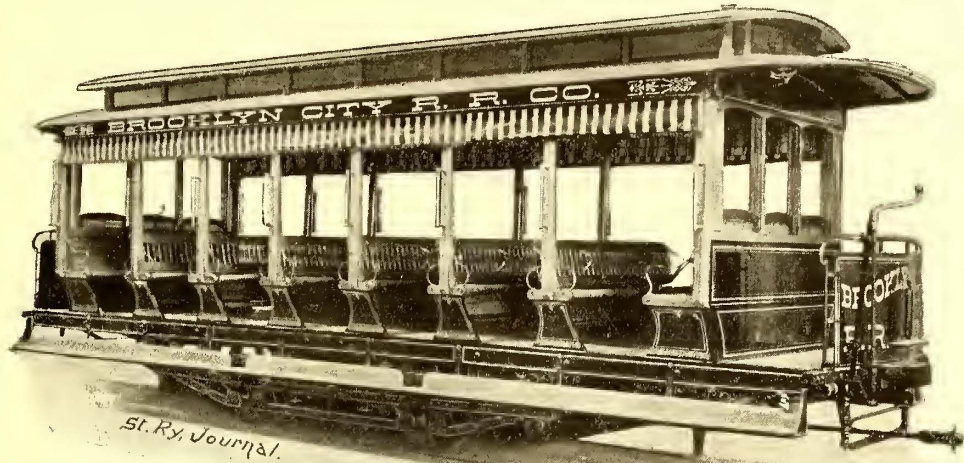
to be set in pillar for operating roller curtain. No. 28. Roller curtain guide. No. 29. Roller curtain stop, left hand. No. 30. Roller curtain stop, right hand. No. 31. Fixture for spring roller curtain. No. 32. Fixture for spring roller curtain (twenty-eight required of each curtain fixture). No. 33. Patent ratchet brake handle (two).

The car trimming department of the Lewis & Fowler Manufacturing Company, which has attained extensive dimensions, is yet only a comparatively small part of the extensive business of this company which manufactures practically every article required for the rolling stock of a street railway company, except motors and other parts of the electrical equipment.

is exceedingly durable, and there are several companies which have been using the registers for sixteen years, and still report them as reliable and perfect as when constructed.

Annual Report of the Westinghouse Electric & Manufacturing Company.

The report of the directors of the Westinghouse Electric & Manufacturing Company was presented at the annual meeting in Pittsburgh



TRIMMINGS FOR FORTY PASSENGER OPEN CAR AND VIEW OF CAR.

The growth of this company presents an example of what business ability can do when the products manufactured are of substantial worth. The first appliance to be manufactured by this company was the Lewis & Fowler car register which has now been adopted on nearly 600 different railways, and of which 19,000 are in use. It is interesting to note that in spite of recent competition the Lewis & Fowler register retains its long enjoyed popularity, and among some recent orders awarded last month was that for the equipment of the cars of the Union Railway Company, of Providence, R. I.

In the Lewis & Fowler Register, the care which this company uses in the manufacture of all its appliances is exemplified. No one has tried harder to beat this register than the manufacturers, and they claim that the device is as perfect in its prevention of fraud as human ingenuity and skill can accomplish. The register, though containing many attachments necessary for securing against dishonest tampering

May 16, and showed that the company's net profits for the fiscal year foot up \$1,640,809.11. This was after charging to operating expenses large sums for alterations and additions to plant, and interest and discount. The company received on its World's Fair lighting contract \$399,000, and \$88,704.47 for extras. Much is expected from its long distance power transmission business when the three 5,000 H. P. generators are in operation at Niagara Falls. The company has \$3,671,965 in preferred stock, \$5,165.481 in assenting stock, and \$179,150 in common stock. There are 20,000 shares in the company's treasury.

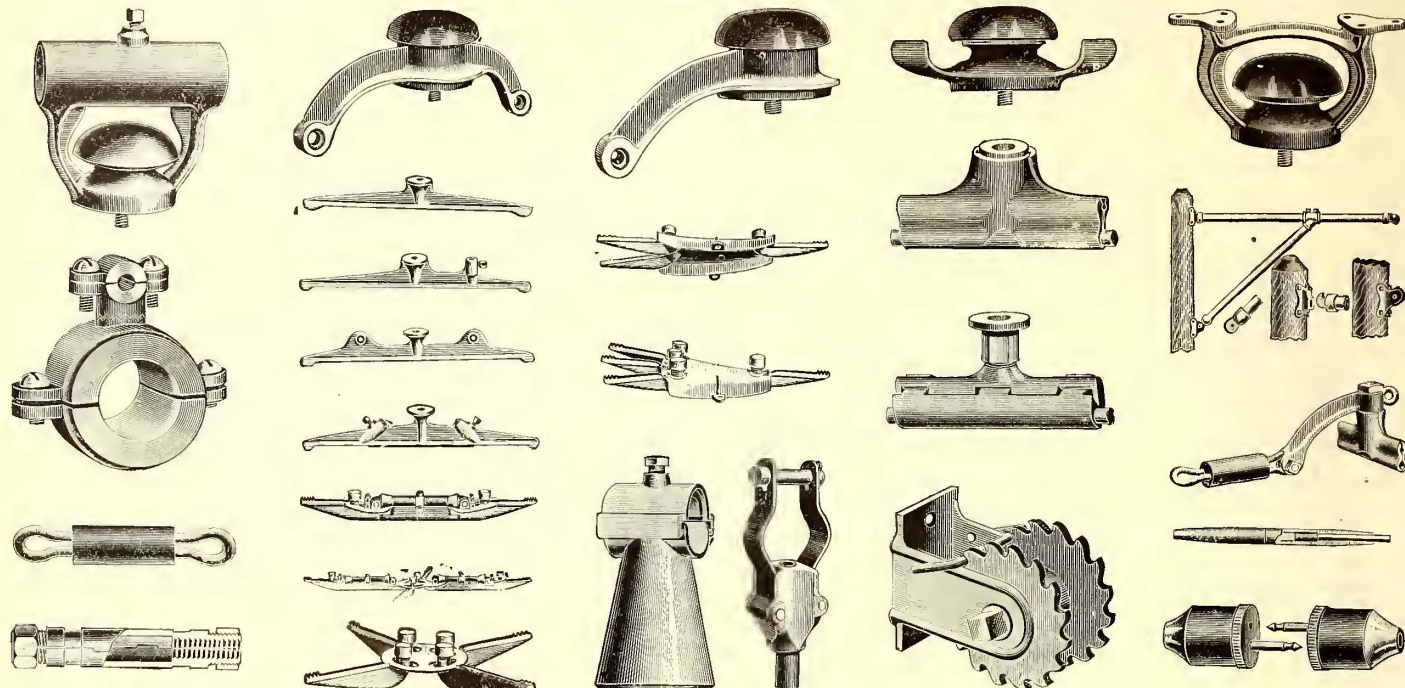
THE New York Board of Aldermen has granted to the Sixth Avenue Railroad Company, which is controlled by the Metropolitan Traction Company, the right to extend its road through Lenox Avenue, from 110th Street to the Harlem River.

A Complete Line of Overhead Construction Material.

The Ohio Brass Company, of Mansfield, O., manufacturer of overhead line material and other devices for electric railways, has recently put upon the market a large number of new trolley appli-

these of necessity being flexible, were liable to spring apart by constant usage, thus impairing the contact and causing the parts to heat. By the method shown the flexibility is maintained, and on account of the reinforcing plates the flexible contacts are always held in proper position; consequently the electrical connection between blade and contact is always kept perfect.

It will also be seen that the carrying capacity of the flexible plates,



SAMPLES OF OVERHEAD MATERIAL—OHIO BRASS CO.

ances, which are meeting with good success. A number of the principal appliances dealt in by this company are presented herewith.

This company, on account of its special facilities for manufacturing and thoroughly testing its goods, is able to furnish the very best material, and its large and rapidly increasing business shows the confidence that the railway companies have in appliances manufactured by it.

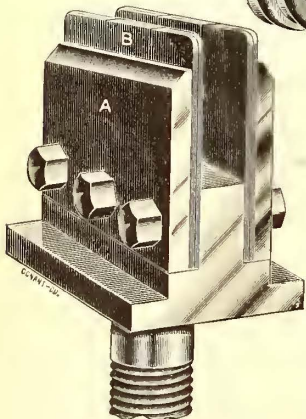
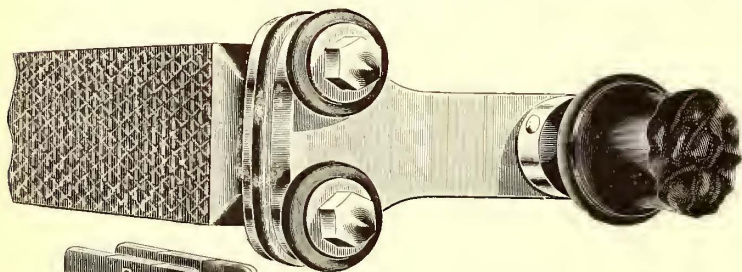
B, are increased by the reinforcing plate, A, to the maximum of any other part of the circuit, preventing loss of current in the switch, and heating and destruction of its contacts.

Hundreds of these switches are now in use, and the value of the above inventions is becoming more and more apparent as the test of time is applied.

New Type of Electric Switch.

We herewith illustrate one of the latest improvements in the switch line by the W. S. Hill Electric Company, letters patent for which have just been issued bearing the date of April 24, 1894.

The first feature of the invention is the manner in which the two



NEW TYPE OF ELECTRIC SWITCH.

or more blades are secured to the yoke so as to obtain rigidity, and keep all of the blades in proper alignment while the switch is being operated. By the old method of securing the blades to the yoke (to which the handle is attached), by a single bolt or screw in each blade, there was nothing to prevent the twisting of the blades, thus allowing one to move in advance of the other, and as the two or more poles would not break in unison, excessive flashing would result.

To overcome this defect and produce a more mechanical and substantial device, the outer ends of the blades and yoke have been broadened, and two screws or bolts inserted, thus securing the parts so rigidly that the blades must at all times move in unison, and all the blades leave the contacts at the same instant.

The second feature consists in backing up the regular flexible contacts, B, by what they term "reinforcing plates," A. It has heretofore been the custom to use nothing but the copper strips, B, and

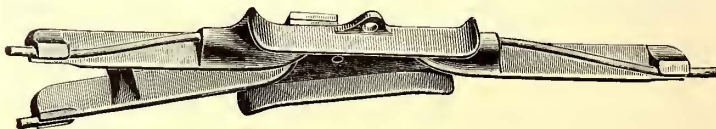
Annual Meeting of the American Institute of Electrical Engineers.

The tenth annual meeting of the American Institute of Electrical Engineers was held at Philadelphia, May 15-18. The officers elected were: President, Professor Edwin J. Houston, Philadelphia; treasurer, George M. Phelps, New York, each for one year. Vice-presidents (for two years), Professor William A. Anthony, Vineland, N. J.; Francis B. Crocker and James Hamblet, New York. Managers (for three years), A. E. Kennelly, Philadelphia; William D. Weaver, Charles S. Bradley and William B. Vansize, New York.

The papers read included one on lightning arresters, by A. Jay Wurts, of the Westinghouse Electric & Manufacturing Company, one on storage batteries, by W. W. Griscom, and others.

New Overhead Switch.

Among a number of specialties lately brought out by the Mason Electric Company is the new overhead switch illustrated. It will be noticed that the running part of this switch is on a line with the trolley



NEW OVERHEAD SWITCH.

wire. There being no depression, cars can be run on full speed without any liability of the trolley wheel leaving the line. The advantages of this switch are recognized by practical men, and it is being adopted by a number of the leading roads.

Open Slot Electric Conduit for the Metropolitan Traction Company.

As mentioned in our last issue, the Metropolitan Traction Company, of New York, will build a section of open slot electric railway conduit on one of the uptown avenues of New York City to give the system a practical test. Sections will be installed both by the General Electric Company and Siemens & Halske Company of America.

Trucks.*

BY JOHN C. GEORGE, *President Raleigh, N. C., Railway Company.*

Possibly no factor necessary to the successful operation of electric traction is so little understood, and so little considered by the average street railway magnate, as that portion of the car which we hardly dignify by the name of truck. And yet upon its proper construction and adaptation to varying conditions of traffic, largely depends the life and efficiency of both motors and track, to say nothing of the car bodies themselves. From the public point of view a road's success is in no small measure dependent upon the efficient construction of this vital component. Apart from all questions of good service as to time, speed, regularity and the numerous other necessities of a well conducted road, it is a recognized fact in all large cities, that there are two classes of citizens to whose wishes any road must cater for purely financial reasons, and incidentally for æsthetic ones: First, to its actual patrons, who demand that they shall be carried smoothly and comfortably, and the number of whom varies almost directly in accordance with the degree of comfort afforded. Second, to its prospective patrons, to which class belong that great array of dwellers along the route, where the incessant din of rocking, pounding cars raises in the minds of the hearers a feeling of such intense antagonism to the road that its receipts are really seriously affected. The patronage of this class probably varies inversely as the square of the noise. While I do not pretend to maintain that a bad truck is responsible for all the ills to which a motor car is subject, I am firmly convinced that too little attention is paid to it, and still more convinced that if street car companies would show more consideration for the comfort, safety and convenience of their passengers and the public generally, it would redound very greatly to their advantage.

To take its construction in detail, the important features of a good truck may be summarized in a discussion of frame, journal boxes and bearings, wheels, axles, brakes and guards.

Frame.—Of frames, while there is an endless variety of construction, there are really but two types; one where the entire structure of the truck is self-contained, all provision against teetering either end or side, being made in the truck itself, the body simply resting upon it; the other, where the sills of the car body form practically an integral part of the complete car, neither body nor truck being a complete entity. As is natural, both types have their adherents, and while it is still a somewhat open question as to which is superior, the trend of modern practice is in favor of the self-contained truck, and it is specially to be recommended that the fastening of the body to the truck be effected by the least possible number of bolts and nuts, so as to afford the greatest ease in removal. The frame should be so hung upon the axle or journal boxes as to afford ample play for perpendicular motion, while at the same time be supported by springs so arranged and proportioned as to reduce the rapidity and strain of such motion to a minimum. As far as possible, the top and side bars should be in one piece, and steel has been found more efficient for these parts than iron. Under all circumstances it is most important to prevent oscillation as far as possible, as apart from the question of comfort, it is amply demonstrated that where this is prevented, the motors suffer less deterioration, the wheels have a longer life, the track joints stand up better, and the car operates on a slippery track and through snow with much better results. While these remarks apply more especially to the four wheel, rigid truck generally used on cars from sixteen to twenty-two feet in length for urban traffic, the salient features are equally applicable to the double truck and radial type used for larger cars, and specially in suburban traffic. There seems to be little question that for fast work, *i. e.*, above ten miles per hour, either a double truck or a radial is superior to any type of rigid, short wheel base truck.

Journal Boxes and Bearings.—This question has been practically settled by the adoption, by the leading makers and managers of the general type now recognized as "Standard" by the Master Car Builders' Association, and the form is too well known to require any special description. It is only necessary to insist upon an adequate thickness of the brasses, and upon lubricating boxes easy of access and capable of carrying sufficient grease to avoid the necessity of frequent refilling.

Wheels.—The question of wheels, which is really of the utmost importance, is still a vexed one; and again no standard exists either as to size or material, but the tendency on the better class of roads is more towards the thirty inch wheel, which is amply high to give a clearance of three and seven-eighths inches even on the M. P. 50 type of the G. E. motor, probably the lowest hanging motor on the market, and, of course, more on the other types. The thirty-three and thirty-six inch wheels are open to two serious objections. First, the car body is raised to too great a height from the ground; second, the weight is very considerably increased, and as the hammer blow varies directly as the weight, at a constant speed, the wear upon both wheel and truck is materially increased; moreover, there is no question but that the noise is greatly intensified, so that these objections are considered more than sufficient to offset the possibly greater tractive power of the larger wheel. As to the material to be used, if ordinary practice is followed, the chilled cast iron wheels are largely in the majority, chiefly on account of the low first cost, and "because everybody uses them." It has been found by actual test that chilled cast iron wheels wear out steel rails much more rapidly than any other kinds, owing to the fact that the rims, whether hardened by the usual method of pouring against a metallic mould, or "chill," or oil tempered, are much harder than the steel of the rail. Again, it is extremely difficult to produce a homogeneous rim, and even under the most rigid specifications a wide margin is allowed for defects. This, of course, increases

the liability to flatten, and certainly causes considerable variation in the points of greatest wear and shortens the life of the wheel, which, owing to the continuous braking, is not more than one-fourth that of its brother in steam railroad service.

The paper wheel, steel tired, for which so much was claimed and expected, does not stand the test, and the experts now bend their energies to obtain a wheel either of solid steel or of iron steel tired, which shall approach as nearly as possible to the structure of the steel in the rail upon which it runs. This is the true solution of the problem; and when we have a Bessemer wheel rolling upon a Bessemer rail, jointless, be it hoped, then we may look for some relief from some of the present troubles incident to the use of those now in service. Several successful attempts have been made in this direction, as the Paige wheel and Vaulchain wheel; and where the extra expense can be borne by the road there is no question as to the advisability of their use from the standpoint of both road and patron. Another very usual and dangerous habit has come into practice in respect to the depth of flange. In paved streets with the usual rail head, it is seldom practicable to use a greater depth than three-quarters of an inch, and the majority of wheels either start out with or soon come down to half an inch or five-eighths of an inch. While this affords, perhaps, sufficient margin of safety at a low rate of speed, too many cars are sent out at high speeds over suburban lines, and risks are taken by management and public, which no ignorance or carelessness can excuse. No less than a one and one-eighth inch flange should ever be used where the speed exceeds twelve miles per hour.

Axles.—Again no standard: But there seems no question that the best material is steel, and they should be practical duplicates, in shape, of those in use on steam roads, and of size doubly sufficient to stand any anticipated strain. Anyone who has seen the result of a broken axle will readily appreciate the necessity for an extra allowance of strength in this particular.

Brakes.—In this point of construction lies mostly, not only the danger to human life, but to property in its largest sense. Here faulty construction or failure of operation may wreck the fortunes of any road, not only by destroying its property and those of others, but by mulcting it in exhaustive damages for injuries inflicted upon passengers and public. Even should such extreme penalty not fall to its lot, the average of wear and tear upon the wheels and indeed upon the whole structure of the car, may be greatly reduced by proper braking appliances. This fact has been only too well recognized, and some important improvements have recently been made in this line. It is only necessary, therefore, to call attention to the necessity for having all parts of the braking apparatus of far beyond the really necessary strength. Upon one point, however, the average street car brake shoe is far from satisfactory, both in material and method of attachment, and I strongly recommend the adoption of the soft iron brake-shoe, prescribed by the Master Car Builders' Association, which has proven, not only its efficiency as a brake, but insures a uniform wearing of the wheel rim, and the greatest facility of removal and renewal.

Guards.—As a last resort for the safety of the unwary public, a proper guard should always be provided to prevent the mangling of the unfortunate victim of his own or the motorman's carelessness. Here the proper policy is to discard all makeshifts, and either have a good one or none at all. Among those in the market the one adopted by the Railway Commission of Massachusetts, the outcome of a series of over 200 designs experimented upon, presents undoubted advantages. In conclusion, it need only be said that a good truck is as necessary as a good motor; that every engineer knows it, and that very few directors know a truck when they see one.

Street Railway News.

Extensions and Improvements.

Baltimore, Md.—The Baltimore & Randellstown Railway Company, whose offices are at 451 Equitable Building, Baltimore, is proposing to equip four and a half miles with the Barrowes electric system.

Bloomfield, N. J.—The Suburban Traction Company proposes to equip its lines in Bloomfield with electricity.

Bridgeport, Conn.—The Traction Company has given out nearly all its contracts, and in a short time everything will be in readiness to begin the construction of the road. The Washburn & Moen Company, of Worcester, Mass., will furnish part of the wire. The J. G. Brill Company, of Philadelphia, will furnish the trucks, with which all the cars will be equipped. The John Stephenson Company, of New York, will furnish open cars. The firm of Barney & Smith, of Dayton, O., has received the contract for closed cars and also for a number of open cars. Contracts have been signed with the General Electric Company for generators, motors and other parts of the electrical equipment.

Brooklyn, N. Y.—The Brighton Beach Railroad has received from the Board of Aldermen the right it has sought for some years, to extend its road from Atlantic Avenue so as to connect with the elevated railway in Fulton Street.

Cleveland, O.—A short time ago the residents of Linndale began the agitation of an extension of the Cleveland Electric Railway to Linndale. The project is in a fair way to be consummated.

Columbus, O.—The Columbus Central Railroad Company, of Columbus, O., is pushing the construction of its new road. The line will be forty-two miles in length, and the capital \$1,500,000. The officers are J. J. Shipherd, president, and Moses V. Neil, vice-president.

*Abstract of a paper read at Johns' Hopkins University.

Cortland, N. Y.—A franchise has been granted the Cortland & Homer Horse Railroad Company to change its motive power to electricity, and electric cars will soon be used.

Dayton, O.—It is reported that L. D. Smith, representing a street railroad company in Cincinnati, is endeavoring to purchase the Wayne Avenue horse car line, which will then be changed to an electric road.

Freeport, Ill.—An Eastern syndicate composed of Speaker Crisp, Congressmen Haynes and Ryer, of New York, and Mutchler, of Pennsylvania, has recently purchased the Freeport horse railway, which they will convert into an electric system. They have also purchased from L. Z. Farwell his arc and incandescent electric light plant, which they will operate in connection with the electric railway.

Fort Wayne, Ind.—The Centlivre Brothers will greatly improve their street car line this summer. It will be double tracked with T rails, and the cars will be run by electricity.

Green Island, N. Y.—At a recent meeting of the Village Trustees of Green Island the Troy City Railroad Company was granted the privilege of running its cars through the village by electricity instead of horse power.

Hartford, Conn.—The Hartford Horse Railroad Company has awarded a contract to construct twenty-two miles of road running to Windsor, Pequonnock, Rainbow and perhaps to South Windsor.

Kansas City, Mo.—W. J. Smith, formerly president of the Kansas City Cable Railway, has decided to rebuild the old East Fifth Street Railway, equip it with electricity and build extensions.

Nashville, Tenn.—The reorganization of the United Electric Railway Company has been effected. A new charter has been applied for, and under this the name will be the Nashville Electric Railway. W. H. Jackson will be president.

Natick, Mass.—The Natick Electric Street Railway Company is planning an extension of its line through Ashland to Hopkinton.

New Britain, Conn.—Superintendent Breed, of the Central Railway & Electric Company, is contemplating a number of important changes and extensions.

New Glasgow, N. S.—The New Glasgow Electric Company is preparing to build an electric railway this spring or summer, connecting New Glasgow with Trenton on the one side and Stellerton on the other.

New Haven, Conn.—The residents of West Chapel and other streets have petitioned the Fair Haven & Westville Railroad Company, asking that the West Chapel Street branch be extended from Norton Street to Nott Street, or the Boulevard.

New Orleans, La.—The Orleans Railway Company writes us that it is contemplating important improvements.

Niagara Falls, N. Y.—Application has been made to the City Council by the street railroad company for a franchise from the city to build a line on Main Street, from the Falls north to Niagara Street, and west on Niagara Street, to the river way.

Poughkeepsie, N. Y.—The Poughkeepsie City & Wappinger Falls Railway, of Poughkeepsie, N. Y., has ordered ten closed cars from James A. Trimble, of New York, and eight open and two closed cars from the American Car Company. All the cars will be mounted on Peckham trucks and will use Sterling registers.

Springfield, Mass.—The Board of Directors of the Springfield Street Railway Company has authorized President Olmsted to apply for a location for the new Thompsonville and Liberty Street extensions; also to petition the Aldermen for permission to extend the line from the junction of Locust Street through Longmeadow to the state line.

Stillwater, Minn.—The bondholders who have purchased the street railway will organize a company with \$75,000 capital stock, to be known as the Stillwater Electric Railway Company.

Westerly, R. I.—Business men here are agitating the scheme of having the electric road extended north, to connect with White Rock, Potter Hill and Ashaway with Westerly.

New Roads.

Akron, O.—The Akron & Cuyahoga Falls Rapid Transit Company, of Akron, filed its certificate of incorporation on May 11. The capital stock is \$300,000. The company will build an electric street railway from Ravenna, through Kent and Akron and to the village of Barberton. The incorporators are Robert J. Randolph, Thomas F. Walsh, W. E. Hall, Edwin F. Voris, E. L. Babcock.

Boyertown, Pa.—It is expected that the work of constructing the electric road from Black Bear and Reading to Boyertown will be commenced in the near future. The line from Boyertown to Black Bear will be about fourteen miles long.

Buffalo, N. Y.—The scheme for belting Grand Island with an electric railway was ratified lately by a large meeting of Grand Island property owners, and work is to be commenced at once.

Butler, Pa.—The Butler Traction Company was incorporated on May 10, 1894, for the purpose of constructing and operating an electric street railway in Butler County, with a capital stock of \$75,000. The president of the company is Joseph Hartman, of Butler, Pa., and others interested are J. G. Smith, John V. Ritts, Chas. Duffy and John Berg.

Calais, Me.—The Worcester Construction Company, of Worcester, Mass., has taken the contract to build about eight miles of street railway here. This place will be connected with St. Stephen, across the river.

Cincinnati, O.—Work has been commenced on the electric railroad between this city and Dayton. The company has been organized as the Cincinnati & Dayton Traction Company.

De Pere, Wis.—Edward Morton, the projector of the street railway company at Green Bay, has applied to the Common Council for a franchise allowing his company to operate within the limits of the city.

Elwood, Ind.—A company has been organized at Elwood looking to an electric line connecting Elwood, Alexandria, Anderson and Frankton.

Elyria, O.—An effort is being made to secure an electric road between here and Cleveland, by way of Dover and North Ridgeville. The right of way has been secured.

Hamilton, Ont.—The Hamilton, Grimsby & Beamsville Railway Company has applied to the Barton Township Council for the privilege of laying its tracks on Main Street, from Sherman Avenue to the bicycle grounds.

Homesdale, Pa.—The Homesdale Electric Railway Company was incorporated on May 21, with a capital stock of \$100,000, for the purpose of constructing and operating an electric street railway in the borough of Homesdale, Wayne County, Pa. The president of the company is Lorenzo Grambs, of Homesdale, and others interested are Eben H. Clark, W. N. Alberty and M. M. Treadwell.

Indianapolis, Ind.—According to present appearances, the Indianapolis & Broad Ripple Rapid Transit Company, will not commence the construction of its road.

Jamaica, N. Y.—At a recent meeting of the Board of Highway Commissioners, A. W. Hart, president of the Long Island Electric Railway Company, presented a petition, asking permission to build and operate a double trolley line on Liberty Avenue, from the Brooklyn city line to Jamaica, and on the Jamaica and Merrick road, from Jamaica to the township line at Foster's Meadow.

Johnstown, N. Y.—There is talk here of building an electric railroad from Amsterdam to Johnstown and back to Amsterdam again by way of Gloversville, Mayfield, Broadalbin and Hagaman's.

Kansas City, Kan.—Application has been made for a charter for the Quindaro Park Electric Street Railway Company. The incorporators are C. C. Dail, Isaac P. Moore, W. J. Huffaker, J. C. Klamm, L. F. Bird, A. F. Smith and C. B. Forword. The capital stock of the company is placed at \$200,000.

The Eighteenth Street Railway Company, which is said to represent the Metropolitan Street Railway Company, has applied to the City Council for a franchise to operate a single track electric line from the present terminus of the 5th street line in Kansas City, Kan., north on 18th Street to Chelsea Park.

The County Court has granted a franchise to the Westport & Waldo Electric Railway Company for a double track electric railway from the southern limits of Westport, on Oak Street, to 75th Street and thence west to Broadway. The road is to be finished within a year.

Lock Haven, Pa.—The contract for constructing the Lock Haven Street Railway has been awarded. The line will be six miles long and will connect the towns of Castenea, Millhall and Flemington with this city.

Marion, O.—The Electric Street Railroad has been incorporated, with a capital of \$100,000. The officers consist of Edward Durfee, president and treasurer; Gottfrey Leffler, vice president, and George Turney, secretary.

Media, Pa.—The directors of the Media, Middletown, Aston & Chester Electric Railway Company recently held a meeting here. A strong move will be made to get ready to build the line.

Nashville, Tenn.—Gilbert F. Brown, Thomas Taylor, F. M. Cruzen, Frederick W. Hunter and L. G. Noel have applied for a charter of the East Nashville Electric Railway. The charter is an amendment of the old Maplewood charter, and is simply to build a line of road out the Granny White Turnpike, to connect in Waverly Place with the Overland Railway.

New Haven, Conn.—There is a project on hand for an electric road to lead from the terminus of the Fair Haven & Westville road at Grand Avenue to the village of Montowese. During the last legislature a charter was granted to certain citizens of Montowese to construct a road from Grand Avenue to Montowese Avenue on North Quinnipiac Street. The charter was granted under the condition that unless the Fair Haven & Westville Horse Railroad Company construct a line from Grand Avenue on North Quinnipiac Street to Davenport Street before July 1, 1894, then the aforesaid citizens of Montowese may construct a road on North Quinnipiac Street to Montowese Avenue. The capital stock of the company is \$75,000, and they have power to increase it to \$150,000. The officers of the corporation are as follows: President, Theophilus Eaton; secretary and attorney, C. T. Driscoll.

Newark, N. Y.—A proposed ordinance has been received by the Village Trustees from the Newark & Wayne County Traction Company, asking for a franchise to lay tracks and erect poles and wires for the operation of a street railway.

Newburgh, N. Y.—The Newburgh & Orange Lake Railroad Company has been incorporated for the purpose of constructing a street railway four and a half miles long, from Broadway and Haines cross roads, in Newburgh, to Orange Lake, for the purpose of carrying passengers, freight, baggage and mail; capital \$100,000. Some of the directors are Joseph M. Dickey, William C. Dickey and C. M. Huyett of Newburgh, and Benjamin Norton and Henry Newkirk of Brooklyn.

Oshkosh, Wis.—An extensive street railway franchise, covering a number of the principal streets of the city, has been granted to J. K. Tillotson by the city authorities.

Philadelphia, Pa.—The Buttonwood Street & Fairmount Park Street Railway Company was incorporated May 9 with a capital stock of \$30,000. Henry L. Everett, of 2,222 Locust Street, Philadelphia, is the president of the company. Other stockholders are Robert Everett, Jr., Charles C. Highley and M. J. Reynolds, all of Malvern, Pa.

THE Central Electric Railway Company, of Philadelphia and Delaware County, was incorporated May 9, with a capital stock of \$60,000, to construct and operate an electric street railway in the counties of Philadelphia and Delaware, Pa. William J. Pollock, of Philadelphia, is president of the company. Other stockholders are Lewis G. Dutton, Wm. Bradley and Thomas Bradley, all of Philadelphia.

THE Northern Electric Street Railway Company was incorporated May 11, with a capital stock of \$150,000. Walter N. Boyer, of Philadelphia, is president of the company. Others interested are Radcliffe B. Mills, Wm. H. Hirst and John R. Bannan, all of Philadelphia.

THE Citizens' Clearfield & Cambria Street Railway Company was incorporated on May 10, with a capital stock of \$6,000, for the purpose of constructing and operating an electric railway. The president of the company is J. J. Sullivan, of 1705 Spring Garden Street, Philadelphia, Pa., and others interested are F. Weckerby, of St. Davids, Pa., Robert C. Brewster and George S. Gandy.

THE Citizens' East End Street Railway Company was incorporated on May 10, with a capital stock of \$15,000. The president is J. J. Sullivan, of 1705 Spring Garden Street, Philadelphia, Pa., and others interested are G. S. Gandy, Robert C. Brewster and Wm. Henry Lex.

THE Citizens' North End Street Railway Co. was incorporated on May 10, with a capital stock of \$36,000. The president of the company is J. J. Sullivan, of 1705 Spring Garden Street, Philadelphia, Pa., and others interested are F. Weckerby, Robert C. Brewster and Wm. Henry Lex.

THE Brown & Parrish Street Railway Company was incorporated on May 10, with a capital stock of \$15,000. The president of the company is J. J. Sullivan, of 1705 Spring Garden Street, Philadelphia, Pa., and others interested are Jas. F. Sullivan, Geo. S. Gandy and Robert C. Brewster.

THE Diamond Street Passenger Railway Company was incorporated May 16, with a capital stock of 6,000. Henry C. Moore, of 624 North 22d Street, Philadelphia, is the president of the company. Other stockholders are McClelland Hirsh, D. C. Golden and Thos. B. Foot, all of Philadelphia.

THE Montgomery Avenue & Berks Street Railway Company was incorporated May 17, with a capital stock of \$15,000. Frank L. Lyle, of 1833 Master Street, Philadelphia, is the president of the company. Other stockholders are H. R. Shultz, F. A. Lee and J. C. Hughes, all of Philadelphia.

THE Girard Avenue Passenger Railway Company was incorporated May 17, with a capital stock of \$9,000. Henry C. Moore, of 624 North 22d Street, Philadelphia, is the president of the company. Others interested are D. C. Golden, H. C. Murphy and Jos. L. Lugar, all of Philadelphia.

THE Brown Street Railway Company was incorporated May 17, with a capital of \$18,000. Frank L. Lyle is the president of the company. Other stockholders are H. R. Shultz, F. A. Lee and Edward D. Cook, all of Philadelphia.

THE Northeastern Railway Company was incorporated May 17, with a capital of \$250,000. Frank L. Lyle, of Philadelphia, is the president of the company. Others interested are H. R. Shultz, J. C. Hughes, F. A. Lee, and E. D. Cook, all of Philadelphia.

Pittsburgh, Pa.—The Sylvan Avenue Passenger Railway Company was incorporated May 14, with a capital stock of \$12,000. James D. Callery, of Pittsburgh, is the president of the company, and others interested are John C. Reilly, W. M. Keech and Wm. V. Callery, all of Pittsburgh.

Rahway, N. J.—The New Jersey Traction Company has made application to the City Council for privilege to lay tracks on Westville Avenue as far as St. George Avenue.

St. Louis, Mo.—The St. Louis & Kirkwood Railway Company, better known as the Houseman Air Line, has awarded to the Suburban Construction Company the contract for its proposed line, from the southwest corner of Forest Park to Meramec Highlands.

It is reported that preparations are being made by the Forest Park & Clayton Electric Railway Company to equip and operate the line shortly; and that arrangements have been made with a city street railway to lease and operate the line as a branch of its system.

Skowhegan, Me.—There are said to be good prospects of an electric railroad from Skowhegan to Norridgewock. Amos F. Gerald, I. C. Libby and S. A. Dinsmore are interested in the project.

Tamaqua, Pa.—The Inter-County Street Railway Company was incorporated April 27 with a capital stock of \$200,000, to construct and operate an electric street railway from Tamaqua to Summit Hill, Carbon Co., Pa. Charles F. Hogue, of Philadelphia, is the president of the company. Other stockholders are S. Friedberger, G. H. Lang and J. C. Dedier, all of Philadelphia.

Toledo, O.—J. H. Ainsworth, J. Ellery Eaton and J. A. Dawson, promoters of the Monroe Electric Railroad, recently appeared before the County Commissioners and asked for a franchise allowing them to lay their tracks to the Michigan state line.

Troy, N. Y.—The long talked of plan to construct an electric railroad between Sandlake and Albia is again revived, and is now in a fair way of construction. The Troy & New England Company, which holds the charter, has virtually decided to begin work soon. The plans are to run passenger and freight cars from River Street, in Troy, to Sandlake.

Truro, N. S.—A project is on foot to construct an electric railway from Hazel Hill to Camso, a distance of three miles. There is also talk of establishing a similar line between the pulp mill at Milton and Liverpool Town, a distance of six miles.

Waldo, Me.—There is a good prospect that the proposed electric railroad between Bangor and Stockton Springs will be constructed as far as Frankfort this year.

Westerly R. I.—A petition of the Pawcatuck Valley Street Railway Company has been presented to the Town Council, asking permission to use the public highways for an electric railway, from the railway station in this town to Watch Hill.

White Plains, N. Y.—The citizens of White Plains are discussing the question of an electric street railroad which will connect the Hudson with the Sound.

Crawford Fenders.

The popular interest in fenders seems to be constantly increasing as the number of patents constantly being taken out for different kinds of fenders, and the increased space devoted to the fender question in the daily and technical press, testify. An interesting visit was recently paid by a representative of the STREET RAILWAY JOURNAL to the factory of the R. A. Crawford Manufacturing Company, 35 Water Street, Pittsburgh. These works have a capacity of 1,500 safety appliances per month, and are being run to their full capacity filling orders to meet the requirements of the company's rapidly growing trade. A large addition is now in progress of construction, and the company is turning out a large number of appliances monthly.

As is well known, the Crawford safety appliances are of two types: The fender proper, suitable for all suburban roads and those city lines running upon streets where the vehicular traffic is not very heavy, and the wheel guard carried on the truck directly before the wheels, and which does not take up any additional room on the street. If deemed desirable, companies can equip their cars with both safety appliances, insuring the greatest degree of safety.

Among the recent orders closed by this company is one with the Rochester (N. Y.) Railway Company, for 300 pick-up fenders. This company made a full investigation of the subject of fenders before adopting that of the Crawford Company, so that the latter concern feels justified in regarding this order as a most flattering testimonial to the value of its devices. Other companies which have adopted the Crawford pick-up fenders for their entire equipment are: The Pittsburgh & West End Passenger Railway Company, of Pittsburgh, Pa.; the New Orleans Traction Company, of New Orleans, La.; the Citizens' Street Railway Company, of Indianapolis, Ind.; the Williamsport Passenger Railway Company, of Williamsport, Pa.; the Pittsburgh Traction Company, of Pittsburgh, Pa.; the Central Traction Company, of Pittsburgh, Pa.; the Duquesne Traction Company, of Pittsburgh, Pa.; the Citizens' Electric Traction Company, of Pittsburgh, Pa. and the Philadelphia Traction Company. Over 800 wheel guards have been delivered to the latter company.

These fenders have made a most excellent record in saving life, and in most of the cities where they are in use have already proved their practical value in this way.

New Sperry Electric Equipments.

The Sperry Electric Railway Company, of Cleveland, O., has sold twenty equipments for the Price Hill line of Cincinnati. The company also reports, among recent orders, one to the Chicago General Electric Railway Company of fifteen equipments, and among recent shipments seventeen equipments to the Waterbury Traction Company, of Waterbury, Conn., and the first installment of 125 equipments for the People's Traction Company, of Philadelphia.

The motor equipment of this company was described by Mr. Sperry at the last meeting of the American Street Railway Association, at Milwaukee, and possesses a number of novel and interesting features.

National School of Electricity,

The National School of Electricity has been organized in Chicago with Thomas A. Edison as dean. The object of the school is to give instruction in electrical engineering, and is the outcome of a demand for a school of this description made upon the chief of the electrical department during the World's Fair at Chicago. The president of the school corporation is J. P. Barrett; vice president, J. L. Little, and treasurer, E. L. Powers.

Rapid Transit Situation in Detroit.

The municipal authorities of Detroit have for some time been endeavoring, through the courts, to compel the Citizens' Street Railway Company of that city to cease running its cars, and to remove its tracks from the streets, on the technical ground that the franchise under which the road is operating, and which was conveyed to it by its predecessors, was improperly extended to the year 1909 by the Com-

mon Council of 1879. Judge Taft, of the United States Circuit Court, recently decided the point against the railway company, and made the giving of a \$10,000 bond a condition of a stay. The Baker Street and Cass Avenue lines are not affected by this decision. In rendering his decision, Judge Taft expressed the hope that the city would not take advantage of the railway company on technical grounds, and advised a compromise for the city's benefit and reputation. His decision has been appealed from by the Street Railway Company.

The trouble began as far back as 1891, when the validity of the extension of the contract by the Common Council, in 1879, was called into question by the city authorities. The point raised seems to be a purely technical one, and the city authorities, and particularly Mayor Pingree, manifest an unaccountable hostility toward the railway company. The citizens of Detroit, being keenly alive to the benefits of rapid transit, and realizing that the Citizens' Street Railway Company is in a position to give them the best possible service if unhampered by the local authorities, favor the cause of the railway company.

Pending the hearing of the appeal that has been taken from Judge Taft's decision, the city authorities prepared an ordinance granting to the railway company the right to maintain and operate its plant. This ordinance was submitted to the railway company, but rejected because of the onerous and unfair conditions it imposed, such, for instance, as requiring the sale of eight tickets for twenty-five cents, the tickets to be sold on the cars and to entitle the holder to a transfer to any of the company's lines, or, in the event of one of its cars not appearing within fifteen minutes, to the first car of any other company that starts on the track to which the transfer was issued. The railway company would also be required, under the proposed ordinance, to pave and keep in repair the streets through which it runs its cars. The Common Council reserved the right to establish a road on any street or streets, and in the event of the refusal of the Citizens' Street Railway Company to operate such road, the right to operate it could be granted to any other company, and would carry with it the privilege for such other company to run to the center of the city over the tracks of the Citizens' Street Railway Company.

This matter is still in a most unsatisfactory condition. It is expected, however, that the Common Council will be prevailed upon to accept an amended ordinance, which is being prepared by the Citizens' Company, and under the conditions of which the interests of all concerned will be conserved without injustice to either side.

Fenders Adopted in Paterson and Hoboken.

After prolonged and severe tests, in competition with other life saving devices, the Foster fender has been ordered for all of their cars by the Paterson (N. J.) Railway Company and the North Hudson County Railway Company, of Hoboken, N. J.

In our April issue we published an illustrated article describing this fender and the practical tests to which it was subjected on the North Hudson County road. It is therefore familiar to our readers. The Paterson tests were equally as severe and successful, and were conducted under the direct supervision of the officials of the road. The superintendent and the master mechanic expressed themselves as highly pleased with the apparatus, and Mr. McAdoo, the general manager, said before the tests were commenced: "This company desires to get the best fender obtainable, and for that reason has been making a test of those on the market. Our opinion as to which of these fenders is the best will be indicated by our order."

The Foster fender can be attached to either the truck or the car body. One of its special features is that when ready for action it is only three inches from the track. When the guard is struck by a human body it releases a cradle which runs forward before the body can fall to the ground, and receives it as it drops. This cradle runs on wheels on the crown of the track, and when in action is consequently at an elevation of not more than two inches from the roadbed. The guard is so constructed that should there be danger of a collision with a vehicle, the motorman can by means of a small rod, which is attached to the dashboard, lock the guard and prevent it being thrown into action. In the Paterson tests the car was run at its maximum speed over the roughest portions of the road and through poorly paved streets, but no trouble whatever was experienced from the oscillation or jarring of the car.

The Foster Automatic Safety Guard Company, which manufactures this fender, reports that negotiations are pending with other large railway companies that are desirous of equipping their cars with the device.

A Well Known Detective Service.

Thiel's Detective Service is one of the oldest, best known and most efficient concerns of its kind in the country. It was established in St. Louis in 1873. The care, skill and energy with which it accomplished the work entrusted to it soon won for Thiel's service a national reputation, and resulted in so great an increase in its business that it became necessary to establish branch offices in various parts of the United States. The New York office was opened in 1875, and was quickly followed by the establishment of offices in Chicago, St. Paul, Portland and Kansas City. The most important of these branch offices is of course the one located in New York. It is in charge of T. E. Lonegan, whose experience and sound judgment eminently fit him for the responsibilities of his position.

The operations of Thiel's Detective Service are largely confined to corporations, such as steam and street railway companies; and of this particular class of work it probably has more than any other detective agency in the United States. It has successfully handled some of the

largest and most troublesome strikes that have occurred, notably, in 1877, those on the New York Central, the Lehigh Valley and the Erie railroad companies, and, more recently, the labor troubles on the Great Northern Railroad. It has also been conspicuously successful in street railway work, not only in breaking up strikes and protecting the property and interests of the companies, but also in checking conductors' returns, investigating damage claims and rendering other valuable and confidential aid in the detection or prevention of fraud of any description.

"We believe," said Mr. Lonegan, "that 'prevention is better than cure' All strikes are brought about by a few disgruntled individuals, who talk their fellows into believing that their employers are imposing on them, and that a strike is the only thing that will right their wrongs. Our method is to detect these mischief makers and weed them out before they can accomplish much harm. In this way we prevented trouble on the Broadway road, the Baltimore Traction Company, and the Citizens' Railway Company of Indianapolis."

Personal.

Mr. Harry De Steese, of the Milwaukee Street Railway, was in New York last month.

Mr. W. F. Carleton, of Carleton & Kissam, sailed for Europe on the "Teutonic" May 2, for his health.

Messrs. C. L. Black, A. L. Hough and J. R. Prentiss of the Brush Electric Company were in New York last month.

Mr. C. K. King, of the Ohio Brass Company, of Mansfield, O., was East last month, and spent some time in New York.

Mr. Frank X. Cicott, manager of the railway department of the Pettingell-Andrews Company, was in New York last month.

Mr. W. S. Rogers, special agent of the Sperry Electric Railway Company, of Cleveland, O., was a visitor in New York last month.

Mr. O. T. Crosby, late general manager of the railway department of the General Electric Company, and now of the Crosby-White Company, sailed for Europe last month.

Mr. Malcom D. Peckham, brother of Mr. Edgar Peckham, of the Peckham Motor Truck & Wheel Company, died last month from injuries received from an assault by a former employe.

Mr. G. J. Melms, formerly general manager of the Milwaukee Electric Railway Company, has been appointed technical director of the municipal light and railway plant of Frankfort, Germany.

Mr. R. C. Brown, electrical engineer of the West End Street Railway Company, of Boston, has resigned that office to accept a similar position with the Montreal Electric Railway Company.

Mr. John MacCormack has severed his relations as agent of the Heine Safety Boiler Company, of New York, and has been appointed general sales agent of the Stirling Company, with offices at 126 Liberty Street, New York.

Mr. Wm. Sharpe, M. E., of the Yeats Engineering Company, of Chicago, was in the East during May, introducing the Chicago trolley base, manufactured by his company. Mr. Sharpe reports that this device is meeting with excellent success.

Mr. A. W. Field, of the Peckham Motor Truck & Wheel Company, has resigned his position as vice-president of that company to take charge of the Boston office of the company. Mr. H. C. Soop, of Kingston, N. Y., has been elected in his place.

Mr. J. R. Chapman, general manager of the Grand Rapids Electric Railway Company, of Grand Rapids, Mich., has been appointed manager of the proposed and constructing electric lines on the North and West Sides, Chicago, belonging to the Yerkes syndicate.

Mr. Daniel J. Dowdney opened an office, May 1, at 171 Broadway, as New York agent of the McGuire Manufacturing Company, of Chicago. Mr. Dowdney was formerly engaged in active railway construction on the Broadway and Third Avenue lines, in New York City.

Mr. A. K. Baylor, of the General Electric Company, has been appointed assistant engineer of the railway department of that company, with headquarters at 44 Broad Street, New York. Mr. Baylor was for many years engaged in the technical departments of the Lynn works of the Thomson-Houston and General Electric Companies where he won a deserved reputation as an electrical engineer.

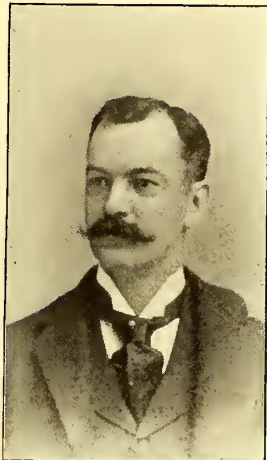
Mr. Joel Hurt, president of the Atlanta Consolidated Street Railway Company, has been spending some time in New York and Boston. Mr. Hurt is a thorough believer in the future of the South, and spoke most encouragingly of street railway prospects of Atlanta. He is looking forward with pleasure to the Convention next October, in his city, and will have much of interest for all the visiting street railway men.

Mr. Chas. H. Wilson, who has been connected with the General Electric Company since its organization, and who was previously identified with the Thomson-Houston Company, has been appointed assistant general manager of the railway department of the General Electric Company, with headquarters at Schenectady. Mr. Wilson's long experience in the electric railway field, and his extended acquaintance with street railway men throughout the country, eminently fit him for his new position.

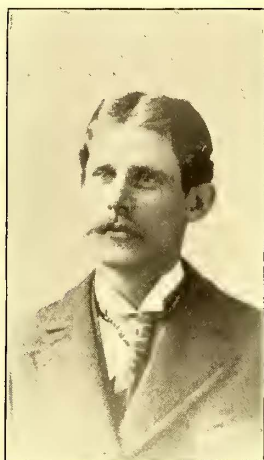
Mr. Franklin C. Randall, who for the past two years has been connected with the J. G. Brill Company, of Philadelphia, Pa., as representative for the New England States, New York and Canada, has been appointed Chicago representative of that company. He was born at Taunton, Mass., September 5, 1857, and is well known and popular with street railway managers. He attended the Boston

public schools and was graduated from the Boston English high school in 1875.

Mr. Randall had a natural fondness for the railway business, and after his graduation entered into the motive and car department of the New York & New England Railroad. He afterwards became connected with the car department of the Boston & Lowell and Boston & Maine Railroads. Mr. Randall later devoted his attention to cars for street railway service, and was appointed, at first, foreman, and later superintendent of the Tripp Manufacturing Company, manufacturers of electric motor trucks and metallic packing. He left this position several years ago to connect himself with J. G. Brill Company. His successor in the New England territory as representative of the J. G. Brill Company, is Mr. George M. Haskell. Mr. Randall's Chicago office will be in the Monadnock Block.



F. C. RANDALL.



G. M. HASKELL.

Mr. G. M. Haskell, who is to be Mr. Randall's successor, will have headquarters in New Haven. He was born at Wakefield, Mass., July 15, 1867. He entered the employ, about five years ago, of the Thomson-Houston Electric Company, with whom he was continuously connected until his connection with the Brill Company. He was sent some time ago to Central America in the interests of the Thomson-Houston Company and remained one year in San Salvador. He was later located in New York, at the main office of the General Electric Company. He has had wide experience in the street railway work and a large acquaintance especially in the East, where he is to represent the Brill Company.

Mr. James E. Grist, mechanical engineer of the Philadelphia Traction Company, whose portrait we take pleasure in presenting to our readers on this page, was born in Boston, England, October 10, 1864. He is the son of B. W. Grist, vice-president and general manager of the Pennsylvania Iron Works Company, and came to this country with his parents at the age of seven years. He inherited a fondness for mechanical and engineering pursuits from his father, and entered, when



JAMES E. GRIST.

twelve years old, as an apprentice, the works of the latter, who was then the head of B. W. Grist & Company, Ltd., of Reading, Pa. James Grist served in this apprenticeship until the age of twenty-one, then worked two years as a journeyman, after which he was appointed foreman of the shop. This position he held until the time of the absorption of B. W. Grist & Company, Ltd., by the Pennsylvania Iron Works Company, when he was appointed to the same position in the latter company. Several years later he was appointed superintendent of the Pennsylvania Iron Works Company.

Mr. Grist remained in this capacity until Jan. 1, 1894, when he resigned his position to open an office,

as consulting engineer, in the Betz Building, Philadelphia. Soon afterwards, however, Mr. Grist was offered, and accepted, the position which he now holds, that of mechanical engineer of the Philadelphia Traction Company. His duties are complete charge of all the motive power and mechanical equipment of the Philadelphia Traction Company, including the general direction of all the machine shops and car shops of the company. He is thoroughly versed in mechanical engineering, and a most assiduous worker in his chosen profession. His successive appointments to posts of increasing responsibility and trust are a fitting testimonial to his ability and worth.

New Publications.

Directory of Electric Light Central Stations and Electric Railways in North America. Issued quarterly by *Electrical Industries*, Chicago.

Directories of the electric light central stations and electric rail ways were formerly published in each issue of *Electrical Industries*, but the publishers of this paper have decided to make it a separate publication. The Directory is convenient in form and should prove most valuable to all who have occasion to refer to these lists.

A Few Plain Facts Concerning Water Tube Boilers. Published by Abendroth & Root Manufacturing Company, of New York.

This handsome circular gives, in detail, views of the well known Root water tube boiler, methods of construction and theory. Some excellent records made in tests are shown, and one special chapter is devoted to showing the circulation, and another on the facilities for cleaning. The pamphlet is handsomely printed and bound and is written in an attractive and, at the same time, technical style.

Catalogue of the Curtis Railway Motor, Manufactured by the Curtis Electric Manufacturing Company, of Jersey City, N. J.

This catalogue contains full description, with general detailed illustrations, of the railway motor of the Curtis Electric Manufacturing Company, which has been adopted on a number of roads, as mentioned in this issue. Views of the series-multiple platform controller, with and without casing, waterproof rheostat and other parts of the equipment, are given. The frontispiece is a handsome view of the exterior of the Curtis factory in Jersey City, to which intending purchasers are invited to inspect the works and the quality of the material and workmanship put into the company's apparatus. The catalogue is from the press of Bartlett & Company.

Permanent Pan-American Exhibit.

The Pan-American Company, of New York, is the outcome of the Pan-American Congress held in this country several years ago, and which was attended by delegates from all three Americas. The object of the company is to be of benefit to manufacturers and promote trade between this country and the South American and Central American republics. To this end the company has secured the Industrial Building corner of 43d Street and Lexington Avenue, where it will maintain a permanent exhibit of manufacturers' samples, and which will be conducted on the same lines as the foreign commercial museums of Brussels and Liverpool, which are important factors in the development of European export trade. The exhibit occupies the six floors of the Industrial Building, comprising 270,000 sq. ft. of floor space, and the revenue of the company is derived solely from the leasing of this to manufacturers for exhibition purposes.

In addition to this branch of its work, the company will act for subscribers in the capacity of a traveling salesman, and to collect all information through its foreign correspondents and traveling representatives that may be of value to the interest that the manufacturer represents. Officers and agents of the company having a knowledge of the Spanish language will make trips through the various portions of Spanish America solely in the interests of American manufacturers who are subscribers to this enterprise, introducing their goods and collecting information for them. The company has resident agents in each of the larger cities of Spanish America, South Africa and Australia, with whom the subscribers are at liberty to correspond at all times. The company also issues a monthly foreign trade review and weekly bulletin.

The personnel of the company is an exceptionally strong one, and its directors include gentlemen who have been conspicuously identified with the Latin-American commerce and the needs of these countries. Among the street railway manufacturers who have already availed themselves of the advantages offered by this company are the J. G. Brill Company, the Baltimore Locomotive Works and others.

Electric Launches for Street Railways.

Everybody who visited the World's Fair will bear testimony to the good service done by the electric launches on the lagoons. It was one of the most delightful features of the fair to ride in them. At night, when illuminated by their own electric lights, they made one of the most beautiful features of the famous South Basin, or Court of Honor. Since the fair closed these boats have been sought after, not only in this country, but in various other parts of Europe. One is now running on the canals of Venice; another is in use in Germany; another is owned by Lord Aberdeen, and is now running on Rideau River, at Ottawa; one has been purchased by Cornelius Vanderbilt for use at Newport; nine were purchased by the Park Commissioners at Chicago, and may now be seen in daily use there; some were purchased by Mr. Plant, and were in use all winter at Tampa Bay; two have been secured by A. Meinecke, Jr., of Milwaukee; one has been secured by the Hartman General Electric Company, Duluth, Minn.; another is in use at Salem, Ill., the property of Dr. Wellman; and so on.

The Electric Launch & Navigation Company recommends them for water termini of street railway companies. They may be readily charged from any source, including the trolley. They are about thirty-six feet long, and have a comfortable seating capacity for thirty people. The weight being evenly distributed they are very seaworthy. They ought to be a great attraction on summer nights, for they can be illuminated by varied colored electric lights, furnished from their own batteries. They are almost noiseless in their action, and are, of course, free from the noisomeness of oil, steam, and the like.

Obituary.

H. W. TALLANT, vice-president and general manager of the Fort Worth (Tex.) & Arlington Heights Railway Company, died in Denver on May 15. Mr. Tallant was born of English parents in the city of Baltimore. He moved to Denver, and became acquainted there with H. P. Chamberlin, resulting in his going to Fort Worth, and taking full charge of the Chamberlin Investment Company's extensive interests in that locality. His energy and enterprise soon made him one of the leading citizens of Fort Worth, and he became prominently identified with many improvements that added to the prosperity and importance of that thriving community. Among the important enterprises which, under his skilled management, were crowned with success were the Fort Worth & Arlington Heights Hotel Company, the Fort Worth & Arlington Heights Street Railway Company, the Arlington Heights Electric Light Company and the Arlington Heights Water Company. Mr. Tallant was well known in street railway circles, and his death is mourned by hosts of friends throughout the country.

Electric Signals for Street Cars.

When the motive power for operating a street car is electricity, it seems as if the same power ought to be used to ring the electric signal bells and alarm gongs used on the cars. Such, at least, is the opinion of the Dewey Electric Signal Company, of 26 Cortlandt Street, New York, whose system consists of a signal bell at each end of the car under the hood, and an alarm gong on the roof of the car, both of which are operated by current taken from the main line or trolley.

The signal bells used by the conductor for signaling the motorman to start or stop the car are operated by simple push buttons, conveniently located at different points throughout the inside of the car, and under the hood at each end, which enable the conductor to communicate easily and instantly with the motorman. The unsightly strap or cord, which is usually employed to operate the signals, or the use of primary or secondary batteries, which are inconvenient, unreliable and expensive, is avoided.

By another push button operated by the motorman's foot, a continuous ringing alarm gong is operated. The gong is arranged to continue ringing until the foot is removed, thus doing away with the continual up and down movement of the foot, and enabling the motorman to devote his entire attention to the controller and brake.

The amount of current necessary to operate the signals is scarcely noticeable, and their operation is entirely independent of the conditions of the motor circuit. The system has been subjected to rigid tests on cars in actual service and has fulfilled all requirements.

Equipment Notes.

The New York Electrical Works, of New York, have been appointed exclusive Eastern agents for the Yeats Engineering Company.

J. Bradford Sargent, of Boston, Mass., agent for the Stirling water tube boiler, has secured new offices at 8 Oliver Street, having moved from his old quarters at 620 Atlantic Avenue.

M. T. Davidson, of Brooklyn, the prominent steam pump builder, finds a good demand for the Davidson pumps, and his large works at 43-53 Keap Street are running full time with full number of hands.

The Gleason & Bailey Manufacturing Company, of New York, has sold the town of Key West, Fla., two handsome, four wheel, horse, hose carriages. This company has also sold an improved hose wagon to the town of Braintree, Mass.

The Worcester Construction Company, of Worcester, Mass., has secured a large contract for street railway construction in Calais, Me. About eight miles of road will be built. The city will be connected with St. Stephens across the river.

The J. G. Brill Company, of Philadelphia, Pa., has moved its Chicago office from Phoenix Building to the Monadnock Block. The company has appointed as its Western representative, F. C. Randall, as mentioned elsewhere in this issue.

The Ellis Car Company, of Amesbury, Mass., whose factory was recently burned, writes us that it has moved its heavy wagon business to another factory on Friend Street. The company will continue the manufacture of its well known electric snow plows.

The Wales Manufacturing Company, of Syracuse, N. Y., manufactures a fare box which retains its popularity among street railway companies without trouble. The other specialties of the company, such as its self oiling trolley wheel, electric headlights, punches, etc., are seen on many roads of the country, and are everywhere giving satisfaction.

The W. S. Hill Electric Company, of Boston, Mass., has shipped during the present month two orders for switches to one company, that weighed over eleven tons, and notwithstanding the unprecedented hard times the company's gross sales for the past nine months average nearly 75 per cent. more than for the corresponding months of a year ago.

Edwin Harrington, Son & Company, manufacturers of machine tools, portable hoists, etc., have published a little book entitled "A Few Words on the Handling of Dynamos, Generators and Motors." The object of this is to present to the users of these the advantages of the Harrington cranes, and illustrations are given of the different types of cranes manufactured, appliances, etc.

The Steam Gauge & Lantern Company, of Syracuse, N. Y., has won its suit against the C. T. Ham Manufacturing Company for infringing letters patent granted to Charles J. Higgins, and owned by the Steam Gauge & Lantern Company, of New York City. The patent covers the lantern now in general use, and known as the tubular hinged or tilting lantern, and the decision is an important one.

James A. Trimble, of New York, the well known manufacturer of cars, has closed a number of orders recently, among which Mr. Packer, who has charge of this department of the James A. Trimble business, mentions one with the Poughkeepsie City & Wappinger Falls Railway Company, of Poughkeepsie, N. Y. This company will use ten closed cars mounted on Peckham trucks. The company is building some cars also for the Norwalk Traction Company.

W. H. Beatty, who has been connected with the sales department of the Novelty Electric Company, of Philadelphia, for the past five years, is now with the Hubley Manufacturing Company, of Lancaster, Pa. The Hubley Company supplies electrical specialties of all kinds, and in the interests of this company Mr. Beatty has gone on an extensive Western trip. He will stop at all the principal cities, and, with the excellent electric railroad specialties which this company manufactures, will, no doubt, receive many orders.

A. Groetzinger & Sons, of Allegheny, Pa., write us: "Our trade continues to be first class, as it has been since the first of the year; orders are plenty, and we have our hands full in filling the same promptly. Our customers and friends, old and new, have many kind words of praise to say regarding the excellent qualities of "Dermaglutine" pinions, and their continued patronage speaks for itself. Present indications are that our 1894 trade will far exceed any previous year's business." This firm deserves the success which it has attained.

The Central Electric Heating Company, of New York, has sent us, just as our last form is on the press, some interesting figures showing the results of the company's heaters in the electric heating of cars. These show that the cost of operating the American electric heaters depends largely on the cost of current, and this varies greatly in different localities. The average cost, however, is estimated at about twenty-five cents per car day. Taking into consideration the many advantages derived from their use, the railroad manager will consider this a very reasonable figure.

F. W. Webster and R. H. Beach have lately formed a co-partnership, under the firm name of Webster & Beach, and have opened handsome offices in the Edison Building, 44 Broad Street, New York. They are prepared to supply practically all kinds of material and supplies used in the construction of electric railways, excepting dynamos, motors and cars. Both Mr. Webster and Mr. Beach are well known in street railway circles, as well as in the electrical field, having been up to a recent date prominently identified with the General Electric Company. They are well fitted by long practical experience for the enterprise in which they are embarked, and we predict for them a large and profitable business.

The Southwark Foundry & Machine Company, of Philadelphia, Pa., reports through its St. Louis agents, Messrs. Boyce, 22 Laclede Building, that city, that it is at present installing three 750 H. P. Porter-Allen automatic engines in the new power station being erected for the Compton Heights, Union Depot, & Merchants' Terminal Railway Company, of St. Louis. These are to be operated in connection with three Westinghouse generators of 750 H. P. capacity each. This company has some time ago filled an order for the Lindell Railway Company, of the same city, for the Porter-Allen automatic engine, and the above order is the result of the unqualified success attained with and approval of this type.

The Sterling Supply & Manufacturing Company, of New York, since its reorganization in February last, has been doing a very satisfactory business, and among its orders may be named the following: The entire equipment of registers for the Third Avenue cable system, of New York; the Atlanta Traction Company, Atlanta, Ga.; the White Line Street Railway Company, Dayton, O.; the Poughkeepsie City & Wappinger Falls Street Railway Company, Poughkeepsie, N. Y.; the further order from the Citizens' Street Railway Company, of Indianapolis, Ind., the sand box equipment for the Consolidated Traction Company, of Jersey City, N. J., and the City & Suburban Railway Company, of Baltimore, Md.

The Carpenter Enamel Rheostat Company is moving its factory from Bridgeport, Conn. to Hoboken, N. J., in the new factory building erected by John C. Crevier, at the 14th Street Ferry terminal. This company is continually improving the design and construction of its apparatus, and, on account of its rapidly increasing business and improvements in methods of manufacture, is making a great decrease in the cost of production, the benefit of which it is giving to its customers by very marked reductions in the prices. A sweeping reduction in the cost of the standard rheostats is announced this week, the reduction running as high as 45 per cent. in some instances. The officers of the company are H. Ward Leonard, president; L. B. Gawtry, vice-president; Charles E. Carpenter, secretary and treasurer.

Wm. Wharton, Jr., & Company, of Philadelphia, Pa., report, through their St. Louis agent, A. W. Slee, 500 American Central Building, that city, that their "Integral" crossings, switches, frogs, and other special work, are meeting with great success in the St. Louis territory. Many orders for these have been received lately, among them a number of crossings for electric lines over cable lines. The Wharton Company is now supplying seventy-eight pound, standard girder rails and fishplates plugged for six bolts to the new 18th Street and Cherokee Street lines of the Union Depot Railroad Company, of St. Louis. Rails and special work were also supplied to the Missouri Railroad Company, for its new loop in the downtown district of St.

Louis. The Wharton patent chair, with movable plug, was used in the latter work.

The Fishkill Landing Machine Company, of Fishkill, N. Y., builders of the improved Fishkill-Corliss horizontal and vertical engines, has been established since 1853. The works of the company at Fishkill-on-the-Hudson, N. Y., are large and finely equipped, and but three minutes walk north of the Fishkill station of the New York Central & Hudson River Railroad, a track of which runs through the yards. The company has admirable facilities for receiving and shipping, both by rail and by water, having in addition to extensive dock frontage, connection with the West Shore; New York, Lake Erie & Western; New York, Ontario & Western; New York & New England, and the Newburgh, Dutchess and Connecticut railroads. Business is good with the company.

The Johnson Company, of Johnstown, Pa., with St. Louis agents, Messrs. Littlefield & Meysenburg, Bank of Commerce Building, that city, is laying three miles of electrically welded rails for the Baden & St. Louis Railroad. One of the company's electric welding cars and tender were shipped on from Johnstown during the winter, and have been steadily at work, night and day, since their arrival. It is reported that since the work began here it has been proven that the electric welding of rails is no more of an experimental nature, but has come up to the most sanguine expectations of the rail company. The rails used weigh seventy-eight pounds to the yard. A large number of eighty-one pound girder rails are being supplied by the company to the Lindell Railway Company, of St. Louis, for the new extension of its Taylor Avenue line.

William Sellers & Company, of Philadelphia, Pa., the large manufacturers of cranes, shafting, machine tools, etc., are doing an extensive business with street railway companies. The cranes built by this firm for the Philadelphia Traction Company, whose Market Street station is illustrated in this issue, are described in that connection. Wm. Sellers & Company have also supplied to the 13th and Mt. Vernon Streets station an electric traveling crane, of twenty tons capacity, similar to that in the Market Street station. Wm. Sellers & Co. have also furnished the Philadelphia Traction Company a twenty ton traveling crane for its Sutherland Avenue station, and are now building for the company still another of same capacity for its Ridge Avenue station. They are also building a twenty ton traveling crane for the Delaware Avenue power station of the Electric Traction Company, of Philadelphia.

Carleton & Kissam, of New York, have lately leased the advertising privileges of the Pittsburgh & Birmingham Traction Company's cars at Pittsburgh, Pa., and now control six lines in this city. In this connection it is worthy of note that Carleton & Kissam were among the pioneers of high class street railway advertising in the Pittsburgh cars, and until lately only controlled two lines there. The excellent satisfaction given by this firm to both advertising patrons and street railway companies has had its natural success, and its field is rapidly extending. Carleton & Kissam have kept on the even tenor of their way in spite of a certain competition, and have easily maintained their supremacy of appearance (as they always do), and their landlords have had no trouble or annoyance. Carleton & Kissam will probably secure in the end other Pittsburgh lines, as the railroad officials have ascertained that it does not pay to rent their advertising privileges at figures so exorbitant as to practically prohibit a profit on the investment.

The General Electric Company, of New York, reports the following orders for railway apparatus taken during one week last month from the New York office alone: Brooklyn, Queens County & Suburban Company, 450 motors; Bridgeport (Conn.) Traction Company, 60 motors and generators; Danbury (Conn.) Street Railway Company, 20 motors; New Haven (Conn.) Street Railway Company, 20 motors and generators; Hartford (Conn.) Street Railway Company, 8 motors; Allegheny Traction Company, Pittsburgh, Pa., 30 motors and generators; Jacob Rich, San José Company, 2 equipments and generators; W. B. Ferguson, of Boston, 1 generator; Franklin, Pa., 6 motors; Electric Traction Company and People's Traction Company, Philadelphia, Pa., large marble switchboards. The General Electric Company has also closed the contract for the Poughkeepsie & Wappinger Falls Railway, of Poughkeepsie, covering two 200 k. w., direct connected generators, forty G. E. 800 motors and type K controllers.

The R. A. Crawford Manufacturing Company, of Pittsburgh, Pa., is constantly adding to the number of companies which have adopted its safety appliances, either the wheel guards, pick-up fenders or both. The latest company to show its appreciation of the merits of the Crawford appliances is the Rochester Railway Company, of Rochester, N. Y. A list of the companies which have adopted the Crawford appliances for all of their cars will not be without interest, and is as follows: Wheel guards: Philadelphia Traction Company, Pittsburgh Traction Company, Duquesne Traction Company, of Pittsburgh, Pa., Central Traction Company, of Pittsburgh, Pa., Citizens' Traction Company, of Pittsburgh, Pa., the Terre Haute (Ind.) Street Railway Company. Pick-up fenders: Rochester (N. Y.) Railway Company, Citizens' Street Railway Company, of Indianapolis, New Orleans (La.) Traction Company, Birmingham Traction Company, Pittsburgh & West End Passenger Railway Company, Second Avenue Passenger Railway Company, of Pittsburgh, and the Tarentum (Pa.) Street Railway Company. The capacity of the company's works is now 1,000 appliances, and the company is working full time.

The Hubley Manufacturing Company, of Lancaster, Pa., manufacturer of electric railway and lighting supplies, is manufacturing an entirely new trolley harp which has a number of points which recommend it for street railway service. The harp is constructed of malleable iron and the wheel of bronze, so that both can be made very light, relieving the wear on the overhead line. We understand that

the trolley head has been in use on a number of roads with great success, and that it has given special satisfaction on lines where there are a number of low bridges, and where the range of movement of the trolley pole is specially wide. Another specialty which the company manufactures, and which fills a long felt want, is a trolley wire splicing sleeve. By this, in the event of breakage of the trolley wire, the ends of the wire can be spliced in a brief space of time without the aid of any auxiliary appliances. The company also manufactures commutators, axle gear case linings, armature and motor axle linings of either anti-friction or bronze metal, and is rapidly completing a number of specialties in the electric railway trade. W. H. Beatty, formerly of the Novelty Electric Company, of Philadelphia, is now connected with this company.

The Babcock & Wilcox Company, of New York, numbers among its recent orders the following from leading street railway companies: The Nassau Electric Railroad, Brooklyn, N. Y., 1,500 H. P. The Hestonville Passenger Street Railway, Philadelphia, Pa., 1,500 H. P. The Philadelphia Traction Company, Philadelphia, Pa., 2,675 H. P. The order from the Philadelphia Traction Company is the second the Babcock & Wilcox Company has received from that company, the previous order being for 6,000 H. P. The Babcock & Wilcox Company has now equipped with boilers all the trolley lines of Boston and Philadelphia, and all but one in Brooklyn. The Babcock & Wilcox Company reports through its St. Louis agent, Mr. Ashburner, Security Building, that city, the completion of the installation of the Babcock & Wilcox boilers in the power plant of the new Union Passenger Station, St. Louis. This order was received by the company after the hottest kind of competition, and solely on the merits of its product. Patent endless grates are used in connection with the boilers, operated by small upright engines, and simultaneously feed the furnaces with small anthracite coal and haul away the ashes, dumping the latter into the pits in front of the boilers. This is one of the few successful ones of the kind.

The Buffalo Forge Company, of Buffalo, N. Y., writes us that its steam fans are growing in popular favor, and that a number of prominent street railway companies are using these now in their stations. As a result, the owners of such plants can use anthracite coal screenings in the place of soft or hard coal. The apparatus required consists of a blower and engine with accessories. If hard coal, at about \$4.85 per ton, is being burned, it is possible to reduce this expenditure to \$1.40 per ton, with, it is claimed, just the same results as from the \$4.85 expenditure. If soft coal, at about \$2.10 per ton, is used, the Buffalo Forge Company claims that hard coal screenings, at \$1.40 per ton, can be substituted, and that three-quarters of a ton of hard coal screenings more than equals a full ton of soft coal. These may be considered pretty strong claims, but the company claims they can be substantiated by an investigation of its plants in Messrs. Barnes, Hengerer & Company's Genesee Hotel, "Gold Dollar," and elsewhere in Buffalo. Another thing to consider is, with this system, burning hard coal screenings, the smoke nuisance is abated, as can be seen by an examination of the smoke flues of the plants mentioned. The company also furnishes regulators which can be set for any steam pressure it is desired to carry, and the speed of the fan will be regulated perfectly to produce that steam pressure.

Charles A. Schieren & Company, of New York City, seem to be doing an excellent business, and we notice that their belts are as popular as ever. They have received recently, among other orders, one for seventy-five feet of thirty-four inch, double, perforated electric belting from the Metropolitan Street Railway Company, of San Francisco. The latter company has tried different kinds of belting, and gives the electric perforated a decided preference over all other makes. Chas. A. Schieren & Company have also taken an order for an extra belt, ninety-one feet long and sixty inches wide, from the Brooklyn City Railroad Company. The letter given below from the Electric Railway Company, of Savannah, Ga., and dated May 18, is a sample of the kind of letters received by this company from street railway companies: "Please ship one double, perforated electric belt, sixteen inches, for high speed generator work, diameter of driver seventy-nine inches, diameter of driven thirty inches, distance from center of driver to center of driven nineteen feet six inches; want the belt made endless ready to put on. We are giving you the order for this belt at a much higher price than we can buy for, but we have two of your belts in use in our power house that were bought by the Edison General Electric Company three or four years ago, and they are so far ahead of others we have in use we prefer to pay you more for yours. Please get the belt to us as soon as possible, and see that it is up to your best quality. Your price as per letter is \$2.36 per running foot. Ship per steamer. Yours truly, J. S. Collins, President."

The Berlin Iron Bridge Company, of East Berlin, Conn., writes us that the new terminal facilities for the New York, New Haven & Hartford Railroad, at Providence, R. I., will necessitate two large bridges, which will be furnished by that company. These bridges will carry sixteen tracks over Gaspee Street, Promenade Street and Woonasquatucket River. The bridges will be plate girders, resting on abutments at the street line and columns at the curb line. There will be no floor beams or stringers used, but in the place of these will be a metal floor supporting ballast, in which the ties and rails will be bedded. The work will require about 4,500 tons of open hearth steel material. The Berlin Company is to be allowed six months in which to complete the work. This company is putting up a new transfer station for the Washington & Georgetown Railroad Company, at Washington, D. C., also an iron and steel building, seven stories high, for James Pettit, of New York City. The Berlin Iron Bridge Company paid on April 14 its regular quarterly dividend of 1½ per cent. Considering the hard times in all branches of business, especially among manufacturers of structural iron, we think this shows pretty good management,

not to put it any stronger, and is a refreshing change in reports coming from so many quarters of closed factories and "passed" dividends. The Electrical Association, Incorporated, of Waterbury, Conn., has placed the contract for its new power station with the Berlin Iron Bridge Company. The building will be 66 ft. in width, and 183 ft. in length, the side walls of brick, and the roof covered with the Berlin Iron Bridge Company's patent anti-condensation, corrugated iron roof covering.

WESTERN NOTES.

The Lodge & Davis Machine Tool Company, of Cincinnati, O., has secured an order for four large lathes to be used in the new machine shops being built by the Addiston Pipe & Steel Company, of Addiston, O.

Kohler Brothers, of Chicago, have been appointed Western agents of the Walker Manufacturing Company. This firm has represented the Eddy Electric Company for two years and is well known in the street railway electrical field.

L. K. Hirsch, of Chicago, who purchased the Pier Movable Sidewalk, installed at the World's Fair, Chicago, as mentioned in a recent issue, is now taking the sidewalk apart, and is meeting with quite a good sale for the material.

The Wallace Electric Company, of Chicago, has secured a number of large contracts within the last month for its improved railway devices. These appliances are rapidly becoming standard with a large number of roads. They are made of the very best material, and are guaranteed both for strength and insulation.

The Electric Improvement Company, of San Francisco, has recently been appointed general agent for the Fort Wayne Electric Company, on the Pacific slope. This company writes us that it is prepared to execute orders for all kinds of electrical supplies, including that required for electric railways, electric lighting and steam plants.

The Wallace Electric Company, of Chicago, has sent us a handsome nickel plated model of the improved combination pole bracket described in our last issue. The model shows the peculiar advantages of this bracket for electric railway work, and is at the same time a handsome office ornament.

The Wrought Iron Bridge Company, of Canton, O., whose works are described in this issue, is the sole manufacturer of the L. S. Pfouts patent flexible trolley bracket and street railway and lighting pole. These brackets and poles, although only recently put on the market, are attracting a great deal of attention and seem to meet with popular approval.

The Wadhams Oil & Grease Company, of Milwaukee, Wis., is the manufacturer of, perhaps, the best and most economical curve grease to be had in the market. It is made soft, of high grade grease and flake graphite, and so soft that it can be easily applied with a stiff brush or a paddle. Cars seem to round the curves easier and with less friction by the use of this, and the many users in this country are most emphatic in their praise of it.

The C. & G. Cooper & Company, of Mt. Vernon O., write us that they have just shipped an 800 H. P., cross compound Corliss engine to the Nocke Cotton Mills, Fitchburg, Mass., and that they have received an order for two 750 H. P. engines, for the Allentown & Bethlehem Traction Company, Allentown, Pa.; another order received by this company is for three 750 H. P., cross compound engines, arranged for direct attached generators, for the Nassau Electric Railway, of Brooklyn, N. Y. The ultimate power for this road will be about 10,000 H. P.

The Purdue University, at Lafayette, Ind., is now fortunate in having the promise of the most complete engineering laboratory. The former laboratory of this institution was destroyed by fire on the night of January 23, but owing to the untiring efforts of the president and the co-operation of the Board of Trustees, a large amount of money has been secured for its restoration. The university will now have two complete locomotives, with facilities for testing same, and a completely equipped machine shop and forge room, new traction dynamometer, Riehle testing machine, etc.

The Steel Motor Company, of Cleveland, O., has just secured the contract for sixty double car equipments of the celebrated "Steel Clad" motor from the Nassau Electric Railway Company, of Brooklyn, N. Y. These motors have been on the market but a comparatively short time, yet are meeting with much merited success, and the above order was secured on the strength of the splendid record which they have made at Allentown, Pa., under very adverse conditions. The Steel Motor Company is also building its fourth order for the Allentown & Lehigh Valley Traction Company.

The Scarritt Furniture Company, of St. Louis, maker of the Scarritt street railway car seats, reports the car business, as far as street railways are concerned, as very encouraging. The company recently filled an order for the Lindell Railway Company, of St. Louis, which makes over 1,500 Scarritt rattan seats in use on the cars of that railway. The crowning features of the Scarritt street railway car seats are the absence of arms—giving the maximum space—and the neat and inviting appearance they give to the car. Another good point in their favor is that they are reversible, and the backs tilting.

The Buckeye Engine Company, of Salem, O., maker of the famous automatic cut-off engines bearing that name, has established a branch office at St. Louis, in the Security Building. This company has heretofore filled the St. Louis orders from another office, but it has found business so brisk and profitable in St. Louis and vicinity, that it decided to locate a branch office there. There is a large number of Buckeye engines of various speeds in use in St. Louis, not only in

street railway and electric lighting power plants, but in a large number of industrial establishments in the city proper and the surrounding territory.

The Heine Safety Boiler Company, Bank of Commerce Building, St. Louis, reports the boiler business as unexpectedly good, considering the hard times. Many orders are at present being filled by the company, among the larger being one for the Washburn-Crosby Milling Company, of Minneapolis, Minn., which calls for 1,000 H. P. of safety water tube boilers, of the Heine type. Heine boilers have achieved great success at the Midwinter Exposition, San Francisco, Cal., where oil fuel has been employed, with the installation of 3,000 H. P. This steam plant supplies all the necessary steam to the entire exposition.

The Mason Electric Company, Pullman Building, Chicago, reports contracts made during the last month for new roads and extensions in Norfolk, Va.; Washington, D. C.; Hammond, Ind.; Galesburg, Ill.; Hazleton, Pa.; Oil City, Pa.; Sioux City, Ia.; Clinton, Ia.; Memphis, Tenn.; Green Bay, Wis.; Omaha, Neb.; San Antonio, Tex.; also an order for some of its line material from Switzerland. The company carries in stock everything needed for complete equipment and maintenance of electric roads, and owing to its long and practical experience in the street railway field, occupies a most commanding position in the trade.

Arthur S. Partridge, Bank of Commerce Building, St. Louis, dealer in electric street railway supplies, reports business in his line as very brisk as far as he is concerned. He recently received a large order from the North and West Chicago Street Railroad Companies, of Chicago, Ill., one of the largest orders ever given. He informs us that his prices on bare copper wire and steel and iron poles cannot be approached. He is also supplying the Baden & St. Louis Railroad with all necessary wire for that company's new line. Mr. Partridge's territory is not confined to the locality round about St. Louis, as the above order for Chicago will readily indicate.

The Charles Munson Belting Company, of Chicago, reports trade as very much improved during the past six weeks. The company has received orders for a number of large belts, and contracts have been awarded it from quite a number of large manufacturing establishments for the entire equipment of belting. The Munson Company has also just completed arrangements with the L. M. Rumsey Manufacturing Company, of St. Louis, to handle the different brands of Munson belts in the Southern territory, and arrangements have also been made with the Revere Rubber Company to have a full line of different brands of Munson belt in stock at its San Francisco and Minneapolis houses.

George Cradock & Company, of Wakefield, Eng., have appointed T. A. Wigham, of the Granier Economic Cupola Company, 714 Bort Building, 17 to 21 Quincy Street, Chicago, Ill., as their agent for the United States. Mr. Wigham intends to make the Cradock cables even better known on this side of the Atlantic than ever before, and the demand for these well known ropes should increase rapidly with the establishment of this American agency. This company has supplied a cable for the section of the North Chicago Street Railway Company, which extends through LaSalle Street. This cable was installed February 11, 1894, and removed May 9, 1894, having worked eighty-eight days—an excellent record.

The St. Louis Register Company, 217 N. 3d Street, St. Louis, maker of the famous Security register, informs us that business is very brisk at the company's present time. The company has a large number of small orders on hand and several large ones, among which may be mentioned that for the West End Street Railway Company, of Boston, Mass., calling for 134 standard Security registers. The company has also completed a large order received from Philadelphia. The street railways of St. Louis have recently contracted with the company for large numbers of its machines, notably the Union Depot Railroad and Lindell Railway Companies. This register has become standard on a number of the principal street railroads of St. Louis.

The Creaghead Engineering Company, of Cincinnati, reports numerous inquiries for its flexible bracket, as well as a number of orders, showing that this device is growing in popularity. The South Covington & Cincinnati Street Railway Company has ordered over a mile of double flexible brackets for double track work for its extension from Newport, Ky., to the Evergreen Cemetery. The Capital Railway of Frankfort, Ky., described in this journal, is equipped with this bracket. The flexibility of this bracket makes it peculiarly suited to high speed suburban roads, and reduces the cost of maintenance as well as the first cost of construction. The Creaghead Engineering Company's 1894 catalogue of electric railway overhead parts, is now ready for distribution, and the company writes us that it will be pleased to mail copies to parties interested in the construction and maintenance of electric roads.

The Brownell & Company, of Dayton, O., well known manufacturers of boilers and engines, have bought the exclusive right to manufacture under the patents of C. M. Giddings, formerly of the Sioux City Engine Works, and have established a department of engineering under the supervision of Mr. Giddings as superintendent. This company will make a specialty of high grade automatic engines, both simple and compound, and has purchased the entire stock of drawings, patterns, finished and unfinished automatic engines of the Sioux City Engine Works. These engines are well known in the trade as the Russell single valve automatic. The highest possible grade of workmanship and finish will be maintained in these engines which have already obtained such a high standing for their close regulation. The Brownell & Company have recently added to its boiler shop equipment a set of twenty foot rolls eighteen inches diameter, capable of rolling the heaviest plate and making twenty foot boilers in two

sheets. This, with the special machinery of the company's own design and make, will put it in the front rank of well equipped boiler manufacturers.

The Bates Machine Company, of Joliet, Ill., has sent us a copy of the award granted to the Bates-Corliss engine at the World's Fair, Chicago, last year. The engine was in Group 69, Class 415. The award reads as follows: "Corliss engine differing in construction in the motion of the valve, which is novel in its construction. Quite a reduction is shown in the number of parts over other Corliss designs. The release is quite light and does not affect the governor. It is free from all springs, and is simple and easily operated. The governor is furnished with safety stop. The bridle rods come from the same pin and pass to the arm with roller attached, but from opposite sides of the pin, doing away with the variation of the movement of the governor and giving positive motion to the valve. The girder is of box type with bulkheads. Corliss engine with novel wristplate valve motion, excellent arrangement of the bridle rods and automatic stop, general construction, design and workmanship." The report is signed by O. Emerson Smith, individual judge, and approved by John A. Roche, president Departmental Committee, and John Boyd Thacher, chairman Executive Committee on Awards.

The Brownell Car Company, of 2200 North Broadway, St. Louis, is very busy at the present time building "Accelerator" cars for a number of points, among them Baltimore. The durability, lightness, and superior finish of the Brownell cars have pleased the Baltimore street railway companies, and the result is that orders for new cars are awarded to this firm. In almost all cases the "Accelerator" type of car is specified, showing the great popularity it has gained among the traveling public. Where cars are continually crowded, and the maximum number of cars is operated, a large amount of time has been saved on account of the minimum time consumed by a passenger getting on or off a car. The company has recently put upon the market a patent car seat. The sales of the same have already been most encouraging. This seat is illustrated and its merits and good points shown up elsewhere in this issue. The Brownell patent electric motor truck is being continually called for, and its good qualities need but to be mentioned to be appreciated, as they have been known to the street railway fraternity of the country since its first appearance. The Brownell Company writes us that in addition to the recent orders for Accelerators, mentioned elsewhere, the company has received two from Chicago, one for the North Chicago Street Railway Company, and one for the Chicago Electric Transit Company. This makes the fifth order for Accelerator cars from Chicago, showing that the companies there think well of the design.

The St. Louis Car Company, 3023 North Broadway, St. Louis, informs us that its shops are full of work at the present time. This company recently found it necessary to increase its capital stock from \$100,000 to \$500,000, in view of the large business it is now doing and contemplates doing in the near future. Most of the orders now on hand are for the Eastern states, particularly Philadelphia, Pa., Brooklyn, N. Y., and New York City. The Philadelphia order is from the Electric Traction Company of that city, and calls for 400 cars. These cars are twenty feet long, and each is equipped with two twenty-five horse power General Electric motors. A large order has recently been obtained from the Union Depot Railroad Company, of St. Louis, for twenty-four foot cars to be operated on its new 18th Street and Cherokee Street lines. These will be each mounted on Robinson radial trucks and equipped with two twenty-five horse power General Electric motors. The car company is sending a large number of its extended spring base trucks to various points throughout the country. The general manager for the company, P. M. Kling, is at present trying a new bogie truck after his own designs, which is intended to do away with the necessity for double steps where bogie trucks are used. Forty sixteen foot car bodies are now being spliced, in order to make twenty long cars, for the St. Louis & Suburban Railway Company. These cars are mounted on two four wheel trucks, and some are equipped with four fifteen horse power, others with two twenty-five horse power General Electric motors. They will each seat fifty-two passengers.

The Hoppes Manufacturing Company, of Springfield, O., reports some recent sales of Hoppes live steam feedwater purifiers and exhaust steam feedwater heaters as follows: To the Edison Illuminating Company, Monmouth, Ill., 625 H. P. live steam purifier. Columbus (O.), Electric Light & Power Company, 2,000 H. P. exhaust steam heater. Delaware (O.) Electric Light & Power Company, 500 H. P. live steam purifier. Bay City (Mich.), Union Railway Company, 400 H. P. live steam purifier, also 400 H. P. exhaust steam heater. Oconomowoc (Wis.), Electric Light Company, 200 H. P. exhaust steam heater. Freeport (Ill.), Gas Light & Coke Company, 300 H. P. exhaust steam heater. Citizens' Street Railway Company, Muncie, Ind., 350 H. P. exhaust steam heater. Heat, Light & Power Company, Muncie, Ind., 300 H. P. exhaust steam heater. Muscatine (Ia.) Electric Railway Company, 400 H. P. exhaust steam heater. Columbus (O.), Street Railway Company, 1,000 H. P. live steam purifier. Omaha (Neb.), Gas Manufacturing Company, 2,000 H. P. live steam purifier. Elmira (N. Y.) Illuminating Company, 1,000 H. P. live steam purifier. Citizens' Gas & Electric Company, Jacksonville, Fla., 80 H. P. live steam purifier. East River Gas Company, Long Island City, N. Y., 625 H. P. live steam purifier. Edison Electric Light Company, Dayton, O., 750 H. P. live steam purifier. Calumet Electric Street Railway Company, Burnside Crossing, Ill., 1,000 H. P. live steam purifier. Shreveport (La.), Gas, Electric Light & Power Company, 300 H. P. exhaust steam heater. Waco (Tex.) Electric Railway & Light Company, 800 H. P. exhaust steam heater. People's Traction Company, Philadelphia, (two) 3,000 H. P. exhaust steam heaters. Public Lighting Commission, Detroit, Mich., (seven) 300 H. P. live steam purifiers.

List of Street Railway Patents.

U. S. STREET RAILWAY PATENTS ISSUED MAY 1, 1894, TO MAY 22, 1894, INCLUSIVE.

MAY 1.

ELECTRIC CONDUCTOR FOR UNDERGROUND CONDUITS—Daniel E. Conner, Covington, Ky., assignor of one-half to James William Gallup, Cleveland, O. No. 518,939.

An electric conduit, a live wire or conductor, in combination with the contact pieces or links loosely supported below said conductor in a slot in insulating material and exposed below to direct contact of a trolley.

TROLLEY FOR ELECTRIC RAILWAYS—George W. Hooper, Rochester, N. Y., assignor, by direct and mesne assignments, to James S. Baker, same place. No. 518,952.

A trolley comprising a wheel and axle adapted to turn together, a yoke frame provided with lubricant receptacles closed at their outer ends, bushings fixed in the receptacles and filling openings in the said receptacles, the interior of said bushings communicating freely with said receptacles, and the bushings abutting against the wheel about the axle.

SAFETY GUARD FOR STREET CARS—Stephen Norton, Rochester, N. Y., assignor of one-half to William H. Rice, same place. No. 519,046.

A safety guard for street cars, the combination, with the car, of of springs attached to the end of the car, and a cross bar attached to the springs.

PLATFORM GATE FOR CARS—John Krehbiel, Cleveland, O. No. 519,066.

The combination with a platform and gate, a movable step, a spring for normally closing the gate, and means actuated by the step to forcibly open the gate against the tension of the spring.

SWITCH ACTUATOR FOR STREET CARS—Fletcher Sparling, Boston, Mass. No. 518,972.

A switch actuator for street cars, a yielding support connected to the car, and normally elevated, combined with an actuator connected to said support and adapted to be swung laterally and provided with an operating handle, and independent means to positively depress the support and the actuator.

RAILWAY SWITCH—Christopher Froelich, Brooklyn, N. Y. No. 519,082.

An actuating rail, arranged alongside of the track rail, of a full-crusted counterbalancing lever below the actuating rail, a pivoted switch tongue and mechanism interposed between the actuating rail and its counterbalancing lever and connected with said switch tongue.

ELECTRIC RAILWAY CONDUCTOR SUPPORT—John C. Henry, Westfield, N. J. No. 519,115.

The supports or hangers for the working conductors of an electric railway, of spring material made weaker or less tense on the extreme ends than at other parts, so as to automatically adjust themselves to the varying bends of the working conductors.

CAR FENDER—Samuel C. Kindig, Baltimore, Md., assignor of one-half to Lee Biden, same place. No. 519,128.

A car fender having a frame consisting of side bars and forward end bar, the side bars being pivoted to brackets pendent from the car, provided with a horizontal bolt passing through said brackets and engaging the top of said frame to hold it normally down, and springs for raising it when released by the withdrawal of the bolt.

WHEEL GUARD OR FENDER FOR CARS—James F. Morton, Baltimore, Md., assignor, by direct and mesne assignments, of one-half to William H. H. Anderson and Nicholas S. Hill, Jr., same place. No. 519,289.

A wheel fender having supporting bars secured at their upper ends to the car platform, a cradle hinged near its lower end to the lower ends of the said supporting bars and springs to yieldingly hold the upper part of the cradle from or away from the said supporting bars.

ELECTRIC RAILWAY—William B. Purvis, Philadelphia, Pa., assignor of one-half to Halsey J. Tibbals, same place. No. 519,291.

A tube composed of insulated sections, inside and outside tubes formed of non-conducting material and slotted, and a loose electric wire within said inside tube, said parts being combined.

MAY 8.

CONDUIT ELECTRIC RAILWAY—James F. Cook, Mansfield, Pa. No. 519,380.

An underground conductor street railway system having a trolley arm having a horizontal upper arm or arms journaled in bearings secured to the framework of the car, a downwardly extending middle portion made narrower than the arms for passage through a slot, and a lower horizontal arm provided with a wheel, the entire trolley arm being made of two halves secured together, and inclosing a wire in the center.

LIFE GUARD FOR STREET CARS—James Campbell, Brooklyn, N. Y. No. 519,402.

In a life guard for street cars, etc., a V shaped fender suspended on links, a lifting rod formed with a shoulder, and a spring latch, upon the body of the car, for engaging said shoulder on the rod and holding it and said fender in an elevated position.

ELECTRO-HYDRAULIC CAR MOTOR—Charles E. Emery, Brooklyn, N. Y. No. 519,469.

In combination with an electric motor, a series of pumps of different sizes operated thereby, a hydraulic motor operated by the fluid

delivered by such pumps, and suitable valves and connections all operable at will to transmit fluid from the pumps to the hydraulic motor and operate the same at different relative velocities proportioned to the size and number of pumps at the time in use.

FENDER FOR CARS—Arthur H. Jelly, Cambridge, Mass. No. 519,472.

A fender pivotally secured to the car and traveling on the rails whereby it is held radial to the curvature of the track, a curved track against which the supporting swinging arm of the fender bears, said track being supported below and secured to the car step, brake support and car.

TROLLEY WIRE CROSSING—Edward H. Allen, Cramer's Hill, N. J. No. 519,519.

A crossing device for electric railways, a central block or plate of insulating material having a series of projecting arms forming continuations of the conductors and provided with clamping devices for engaging said conductors.

TROLLEY WIRE HANGER—Charles F. Strasburg, Lincoln, Neb. No. 519,621.

A trolley wire clamp having a rectangular groove or seat for the trolley wire, substantially coextensive with the body portion of the clamp and continuous.

SAFETY CAR FENDER—George C. Schmidt, Baltimore, Md., assignor of one-half to Araham Harman, same place. No. 519,648.

The combination of a car body, a frame movable up and down, that is, to and from the car body; a fender attached to the said frame and comprising a number of resilient spring fingers each rigidly secured at its upper end, but having its lower end free, and means for operating the said frame and fender up and down.

MAY 15.

CAR PROVIDED WITH FENDERS—Arthur H. Jelly, Cambridge, Mass. No. 519,714.

A car fender comprising a unitary or rigid frame vertically hinged at its rear end to a car, and with its front end held normally in a slightly raised position from the roadbed or track, a mechanism within control of the motorman for the release of the fender from said position, and a spring acting at all times as a constantly downwardly forcing spring upon the front end of the fender whereby said front end is held down to its slightly raised position and when tipped is held firmly and constantly on the roadbed.

ELECTRIC RAILWAY SYSTEM—David Mason, Schenectady, N. Y. No. 519,794.

A current main or lead having branch conductors operatively connected with switching levers pivotally secured in alignment with the rails of the track and adapted to be actuated by the wheels of the vehicle, in combination with short sectional conductors or contacts provided with circuit connections for connecting them to the aforesaid branch conductors.

FENDER FOR STREET RAILWAY CARS—John B. Bailey, Baltimore, Md. No. 519,803.

In a car a fender comprising side bars which are connected with the car by shackles so as to move both vertically and laterally, springs between the fender and car for supporting the front portion of said fender, and a lever under control of the grip or motorman to be operated at will to shift the said fender laterally, substantially as set forth.

TROLLEY WHEEL—Van Dyke Crusier, Flatbush, N. Y. No. 519,837.

A trolley wheel formed of two parts mounted for movement in the same direction at different rates of speed, as set forth.

MAY 22.

CAR STARTER AND BRAKE—Ralph Clegg, Longsight, England. No. 520,134.

A brake drum and a brake applied thereto, a spring contained in said drum to be charged with power by the application of the brake to said drum, a toothed wheel secured to the said drum and gearing into suitable gearing by which, when the drum aforesaid ceases to be retarded by the brake, the rotation of such drum is transmitted to the axle upon which the said drum is mounted.

ELECTRIC RAILWAY TROLLEY—Thomas M. Brown, Cleveland, O. No. 520,156.

In a trolley device, in combination, a base plate, a plate, a contact device carried by said plate, two parallel trolley poles, and universal joint connections between said poles and the two plates.

SAFETY ATTACHMENT FOR STREET CARS—Henry A. Howe, Albion, assignor to himself, and Joseph Norwood, Brooklyn, N. Y. No. 520,233.

The combination with the car platform, of a guard extending forward of the car, pivotal connections on which the guard is free to be swung up or down, springs for holding the guard against rising or falling from a normal position, a connection to the guard and a lever extending above the platform and adapted to being acted upon by the leg of the driver in opposite directions from either raising the guard or for depressing the front edge against the action of the springs.

SAFETY CAR FENDER—Frank I. Clark, Baltimore, Md. No. 520,255.

Consists of suitable hangers attached to the car; a fender frame or platform which is normally raised above the street surface; two links pivotally connected by one end to each hanger and by the other end to the fender frame or platform, the pivotal points of attachment to one of said parts being of a greater distance apart than the pivotal points of attachment to the other part—the said links serving to swing the fender backward and incline the front edge thereof downward when an object is encountered; and a spring to automatically raise said fender from the lowered inclined position and maintain it so that its front edge will be elevated.

ELECTRIC RAILWAY—Ernst W. von Siemens, Berlin, Germany, assignor to Siemens & Halske, same place. No. 520,274.

In an electric railway system, an overhead tubular conductor extending along the line of railway and having a longitudinal slot, a traveling contact within said tubular conductor, said contact having a yielding or flexible connection extending through the longitudinal slot to an electrically propelled car.

CONDUIT ELECTRIC RAILWAY—William R. DeVoe, Shreveport, La. No. 520,304.

In an electric railway conduit, the combination with the cross ties of the metallic plates secured to said ties, and carrying post projections near each end, the metallic lining having upward flanges fitted to said posts, and an integral upward flange near one side substantially dividing said conduit into two parts, and cover plates rigidly secured to said posts and supported thereby.

BLOCK SYSTEM FOR TROLLEY RAILWAYS—Willard F. Lewis, Swampscott, Mass. No. 520,323.

In a block system for trolley railways, the combination with the trolley wire, and a contact maker arranged at one end of a track section and comprising a pivoted angled arm, D, suspended normally below the line of the trolley wire and arranged to be operated by the trolley and an electrical contact piece against which the arm is swung when operated, of an electro-magnetic releasing device arranged at the other end of the section and controlled by the contact maker, and a circuit closing device arranged to close a signal circuit when released by the electro-magnetic device.

CAR FENDER—Bernhard Cron and Werner von Münchhausen, New York. No. 520,354.

The combination of a car with a catch, a movable yielding buffer engaged by the catch, propelling springs and a spring actuated rod put in action by the rearward movement of the buffer and to open the catch and liberate the buffer when pressed backward.

CONDUIT ELECTRIC RAILWAY—Guarantee Trust & Safe Deposit Company, administrator of Charles Wm. Siemens, deceased, Philadelphia, Pa. No. 520,356.

In an electric railway system, a continuous underground chamber having a slot at its upper side, channel irons located at intervals within said chamber, chairs carried by said channel irons, a continuous slotted tubular conductor extending through the chamber and insulated from and supported by said chairs, and an electrically propelled vehicle having traveling connection with said conductor.

TRANSFERRING CABLE CARS AT INTERSECTING POINTS—John Kratz, Baltimore, Md., assignor of one-half to Joseph H. Pfister, same place. No. 520,364.

In a cable transfer system, the combination of the main cable having a laterally extending loop; a transverse cable; a canted pulley at one end of the loop and an upright pulley at the other end of the loop; a device at one end of the loop for shifting the main cable, and a similar device at the other end of the loop for shifting the transverse cable, as described.

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.

The Lake Shore Route.

The Lake Shore Route, between Buffalo and Chicago, is celebrated all over the world as affording the embodiment of luxury in travel. Its new Day Coaches are sixty feet in length, and will seat fifty-eight people, comfortably. They are fitted with the Gould platform and automatic coupler, Westinghouse air brakes and signal, heated with steam taken from the locomotive, and at night are brilliantly lighted with Pintsch gas, for which purpose five elegant bronze chandeliers depend from the roof of the car.

The interior of the coaches is finished in mahogany, highly polished and paneled. Each coach has a nice lavatory and toilet. The latest models contain separate toilet rooms—one for ladies and one for gentlemen. The car seats are of the style known as the Mason tilting, with high, spring backs and broad seats. They are richly upholstered in crimson plush. The windows, which are of plate glass, are large, and each is fitted with a spring-roller curtain, in shade to blend with the interior finish, and every feature is of the best.

The dining cars in service on the trains of the Lake Shore & Michigan Southern Railway are operated by the company. The cars are neat and tasty in all their appointments. Great care is exercised to provide the patrons of the Lake Shore Route with a service which shall prove satisfactory. As a result, dining on the trains of the road is accomplished in a very satisfactory and comfortable way.

The sleeping cars in service on the Lake Shore Route are of Wagner build. Ordinarily, they contain twelve sections, a state-room, a smoking apartment, and toilets for ladies and gentlemen. In some instances, however, there are cars containing sixteen sections, the state-room being omitted. Every valuable device is embodied in their construction.

The Lake Shore operates a most perfect sleeping car service between the cities of Chicago, Cleveland, Buffalo, New York and Boston, in connection with the New York Central and Boston & Albany Railways. This is not only the direct, best and only double track route between the cities mentioned, but the Lake Shore is the only line from Chicago conveying passengers into New York City without a ferry transfer.* * *

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., May 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Albany R. R. Co.	100	750,000	Q Feb.	1½	1890	113½	115
Watervliet Turnpike & R. R. Co.	100	240,000	.....	.....	1863	3	.....
BONDS.							
Albany R. R. Co., 1st Mort.	1865	40,000	J. & J.	5	1905	101½	.....
" " " 2d Mort.	1873	20,000	M. & N.	.....	1893	101½	.....
" " " 3d Mort.	1875	28,500	J. & J.	7	1895	101½	.....
" " " 4th Mort.	1880	11,500	M. & S.	6	1905	100	.....
" " " 5th Mort.	1888	50,000	M. & S.	5	1913	101	.....
" " " Consol Mtg Debenture.	1890	350,000	J. & J.	5	1930	102½	.....
Watervliet Turnpike & R. R., 1st Mort.	1889	350,000	M. & N.	6	1919	111	112
Watervliet Turnpike & R. R., 2d Mort.	1889	150,000	M. & N.	6	1919	110	113

BALTIMORE STOCKS AND BONDS.—Corrected by HAMBLETON & Co., Bankers, 9 South Street, Baltimore, Md., May 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Balto. City Pass. Ry. Co.	25	1,000,000	Quart.	3	.....	85	95
City & Suburban Ry. Co.	50	3,000,000	.....	1	.....	30	33
Central Pass. Ry. Co.	50	300,000	.....	.....	.....	60	65
Balto. Traction Co. (Cable)	25	5,000,000	Quart.	1	.....	15½	16
BONDS.							
Central Pass. Ry.	1882	250,000	J. & J.	6	1912	110	112
" " " cons. mort.	1892	500,000	J. & J.	5	.....	107½	108
City & Sub. Ry. Co. gen. mort.	.....	2,000,000	J. & D.	5	1922	106½	107
Balto. Traction Co. (Cable)	1889	1,500,000	M. & N.	5	1929	106	106½
Balt. Trac. Co., No. Balt. Div.	1892	1,750,000	J. & D.	5	1942	101½	102
" " " "	1891	1,250,000	M. & S.	6	1901	101½	102½
City Pass. R. R. Co.	1891	2,000,000	" "	5	1911	111½	112

BOSTON STOCKS.—Corrected by R. L. DAY & Co., 40 Water Street, Members of Boston Stock Exchange, May 19. Stock quotations are prices per share

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
BONDS.							
West End Pref.	50	\$6,400,000	J. & J.	4	1887	75	77
West End Com'n.	50	9,085,000	J. & J.	3	1890-1892	48½	49½

BROOKLYN STOCKS AND BONDS.—Corrected by C. E. STAPLES & Co., 215 Montague Street, Brooklyn, May 19. Stock quotations are per cent. values.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Brooklyn City R. R. Co.	10	6,000,000	Q.—J.	2	.....	.....	167
Brooklyn Traction Co., pref.	100	3,000,000	.....	.....	1893	67	.....
" " " common.	100	6,000,000	.....	.....	1893	15	.....
Coney Island & Brooklyn R. R. Co.	100	500,000	Oct. 1.	4	.....	.....	144
Long Island Traction Co.	100	30,000,000	.....	.....	1893	16	.....
BONDS.							
Broadway R. R. Co.	.....	350,000	J. & J.	5	6 m. notice	100	.....
Brooklyn Traction Co.	1893	3,000,000	.....	.....	.....	.....	.....
Coney Island & Brooklyn R. R. Co., 1st bonds	.....	300,000	J. & J.	5	Jan. 1909	102	.....
Coney Island & Brooklyn R. R. Co., certificates	.....	300,000	J. & J.	6	July, 1894	.....	.....
South Brooklyn Central R. R. Co., 1st	.....	125,000	F. & A.	7	Aug. 1897	104	.....
South Brooklyn Central R. R. Co., 2d	.....	150,000	F. & A.	6	July, 1941	100	.....
Brooklyn City R. R. Co., 1st.	.....	3,000,000	J. & J.	5	July, 1916	.....	110

CHARLESTON STOCKS AND BONDS.—Corrected by A. C. KAUFMAN, Charleston, S. C., May 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Charleston City Ry. Co.	50	\$100,000	J. & J.	.....	.....	.....	65
Enterprise Ry. Co.	25	250,000	.....	.....	.....	.....	5
BONDS.							
Charleston City Ry. Co.	.....	100,000	J. & J.	6	1915	.....	.....
Enterprise Ry. Co.	.....	50,000	J. & J.	5	1906	.....	.....

CHICAGO STOCKS AND BONDS.—Corrected by WILLIAM B. WRENN, 167 Dearborn Street, Chicago, Ill., May 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Chicago City	100	\$9,000,000	Q.—J.	3	.....	300	.....
Chicago Passenger	100	1,000,000	A. & O.	2½	.....	160	.....
North Chicago City	100	500,000	Q.—J.	7½	.....	500	.....
North Chicago Street	100	5,500,000	J. & J.	4	.....	211½	242
West Division City	100	1,250,000	Q.—J.	8½	.....	625	.....
West Chicago Street	100	13,189,000	Q.—F.	1½	.....	141	141½
BONDS.							
Chicago City	.....	4,619,500	J. & J.	4½	.....	100½	101½
Chicago Passenger	1883	400,000	F. & A.	6	1903	105	110
North Chicago City, 1st mort.	.....	500,000	M. & N.	6	1900	106	.....
" " "	.....	1,850,000	M. & N.	4½	1927	.....	100
North Chicago Street 1st mort	.....	2,950,000	J. & J.	5	1906	.....	103½
West Chicago Street	.....	4,100,000	M. & N.	5	.....	103	103½
West Chicago Street, Tunnel	.....	1,500,000	F. & A.	5	.....	.....	98
" " " Deb. 6's	.....	2,000,000	J. & D.	6	.....	103½	103½

CINCINNATI STOCKS AND BONDS.—Corrected by GEO. EUSTIS & Co., Bankers and Brokers, 26 West Third Street, Cincinnati, May 19. Stock quotations are per cent. values.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Cincinnati	50	\$7,500,000	Q.—J.	5	.....	105½	105½
Mt. Adams & Eden Park	50	1,600,000	Q.—J.	5	.....	106	106½
Mt. Auburn Cable	100	300,000	.....	.....	.....	.....	.....
Cin. Inclined Plane Ry.	100	500,000	.....	.....	.....	59½	60½
" " " Pref.	100	100,000	.....	.....	.....	96½	98
Cin. Newport & Cov. St. Ry.	100	3,000,000	.....	.....	.....	19	19½
BONDS.							
Cincinnati Street	.....	50,000	J. & J.	7	July, 1891	100	.....
" " "	.....	50,000	J. & J.	7	July, 1895	101½	104
" " "	.....	50,000	J. & J.	7	July, 1896	104	106
" " " extended	.....	100,000	J. & J.	4	.....	98	99½
" " " "	.....	150,000	J. & J.	5	.....	100½	101½
Mt. Adams & Eden Park	.....	50,000	A. & O.	6	July, 1895	101	103
" " " "	.....	50,000	A. & O.	6	July, 1900	107½	110
" " " "	.....	100,000	A. & O.	6	July, 1905	110½	111½
" " " 10-20's	.....	200,000	J. & D.	6	Je. '94-1924	102½	105
" " " Cable.	.....	280,000	M. & S.	5	Mar. 1906	104½	105½
Cin. Inclined Plane Ry.	.....	125,000	J. & J.	7	July, 1899	107	108
" " " "	.....	300,000	J. & J.	7	Jan. 1914	103½	104½
Mt. Auburn Cable	.....	200,000	J. & D.	5	June, 1907	.....	.....
" " " 5-20's 2d.	.....	100,000	A. & O.	7	Ap. '93-1908	.....	.....
S. Covington & Cincinnati	.....	250,000	M. & S.	6	Mar. 1912	113	115
S. Cov. & Cin. 2d Mort. gold 6's	.....	250,000	J. & J.	.....	1932	113	115

CLEVELAND STOCKS AND BONDS.—Corrected by W. J. HAVES & SONS, Bankers, Cleveland, O., May 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
The Cleveland Electric Ry. Co.	100	12,000,000	.....	.....	1893	48½	49½
The Cleveland City Ry. Co.	100	8,000,000	.....	.....	1893	57	60
BONDS.							
The Cleveland Electric Ry. Co.	1893	2,000,000	M.—S.	5	1910	101	102½
" " " City	1893	2,349,000	.....	.....	.....	95	96

DETROIT STOCKS.—Corrected by CAMERON CURRIE & Co., Bankers and Brokers, 82 Griswold Street, Detroit, May 19.

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., May 19.

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, 610 West Main Street, Louisville, Ky., May 19.

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., May 19. 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, 188 Common Street, New Orleans, La., May 19. 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. 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., N. O. City & Lake R. R. Co., 1st Mort., St. Charles Street R. R. Co.

MONTREAL STOCKS AND BONDS.—Corrected by GORDON STRATHY & Co., Members Montreal Stock Exchange, 9 St. Sacramento Street, May 19. 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. (old stock), Montreal St. Ry. (new stock), Montreal St. Ry. bonds.

NEW YORK STOCKS AND BONDS.—Corrected by JAMES MCGOVERN & Co., 6 Wall St., New York, May 20.

Table with columns: Company, Par., Capital, Period, % last div., Date of Issue, Bid., Ask'd. Includes Bleecker St. & Fulton Ferry, Broadway & Seventh Avenue, Cen'l Park, North & East River, Central Crosstown, 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., Bleecker St. & Fulton Ferry, B'way & 7th Ave., 1st mort., 2d mort., Broadway Guaranteed 1sts., 2ds interest as rental, Broadway Consolidated, Cen'l Park, North & East River, Central Crosstown—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 mort., Second Avenue, 1st mort., Third Avenue, Union Railway Co.

PHILADELPHIA SECURITIES.—Corrected by HUNN & GLENDINNING, 143 South Fourth st. (Bullitt Building), Philadelphia, May 19. 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., May 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Omaha St. Ry. Co.....	100	5,000,000	M. & N.	....	Jan. 1, '89	60	.....
BONDS.							
Omaha St. Ry. Co.....	1889	2,250,000	M. & N.	5	M'y 1, 1914	95	98

PITTSBURGH STOCKS AND BONDS.—Corrected by JOHN B. BARBOUR, JR., 306 Times Bldg., Pittsburgh, Pa., May 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Central Traction R. R. Co ...	50	1,500,000	.....	.....	.....	20	20 1/2
Citizens' Traction R. R. Co ...	50	3,000,000	J. & J.	3	.....	60	60 1/2
Pitts. & Birmingham R. R. Co	50	3,000,000	.....	.....	.....	12 1/2	12 1/2
Pittsburgh Traction R. R. Co	50	2,500,000	.....	.....	.....	.....	65
Federal St. & Pleasant Valley	25	1,400,000	J. & J.	3	.....	19 1/2	20
Pittsburgh, Allegheny & Man	50	3,000,000	.....	1 1/2	.....	41	41 1/2
West End R. R. Co.....	50	200,000	J. & J.	.....	.....	.....	.....
Second Avenue R. R. Co.....	50	300,000	J. & J.	3	.....	.....	.....
Penn Incline Plane Co.....	50	250,000	.....	.....	.....	.....	.....
Monongahela Incline Plane Co	50	140,000	F. & A.	.....	.....	.....	.....
Fort Pitt Incline Plane Co....	50	60,000	.....	.....	.....	.....	.....
Mount Oliver Incline Plane Co	50	100,000	J. & J.	3	.....	.....	.....
Pittsburgh Incline Co.....	100	150,000	J. & J.	5	.....	.....	.....
Duquesne Traction Co.....	50	3,000,000	.....	.....	.....	26	27
BONDS.							
Citizens' Traction R. R. Co...	1887	1,250,000	A. & O	5	1927	107	110
Pittsburgh Traction R. R. Co...	1887	750,000	A. & O.	5	1927	105 1/2	.....
Pitts. & Birmingham Traction Co.	1892	.....	.....	5	.....	93	94 1/2
Pleasant Valley Ry.....	1892	1,250,000	J. & J.	5	1919	100	.....
P., A. & M. R. R. Co.....	1891	1,500,000	J. & J.	5	1931	102 1/2	103 1/2
Duquesne Traction Co.....	1890	1,500,000	J. & J.	5	1930	101 1/2	102
Second Ave. Electric R. R. Co	1889	1,500,000	J. & J.	5	1909	101	103
Central Traction Co.....	1889	375,000	J. & J.	5	1919	102	103
Union R. R. Co.....	1881	100,000	A. & O.	5	1901	.....	.....
West End R. R. Co.....	1887	75,000	J. & J.	5	1922	.....	.....
Birmingham, Knoxville & Allentown Tract. Co.....	.....	.....	.....	6	.....	.....	.....
Suburban Rapid Transit.....	.....	.....	.....	6	.....	.....	.....
Fort Pitt Incline Plane Co....	1881	30,000	.....	6	1901	.....	.....
Mount Oliver Incline Plane Co	1871	44,500	M. & N.	6	1901	.....	.....
Penn Incline Plane Co. 1st Mort	1883	125,000	.....	6	1903	.....	.....
Monongahela Incline Plane Co.	1887	50,000	A. & O.	5	1897	.....	.....
Pittsburgh Incline Co.....	1889	250,000	J. & J.	6	1919	.....	.....
Manchester.....	.....	.....	.....	.....	.....	103	103 1/2

PROVIDENCE STOCKS AND BONDS.—Corrected by CHACE & BUTTS Bankers, Providence, May 19.

Company	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
United Traction & Electric Co.	100	.....	.....	.....	.....	.....	.....
BONDS.							
United Traction & Electric Co.	1893	8,000,000	M & S	5	1993	97 1/2	100
Newport St. Ry. Co.....	.....	50,000	J & D	5	1910	100	.....

ROCHESTER, BUFFALO, PATERSON, COLUMBUS, WORCESTER AND BOSTON STOCKS AND BONDS.—Corrected by E. W. CLARK & Co., 139 So. Fourth St. (Bullitt Building), Philadelphia, May 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Rochester (N.Y.) Ry.....	100	5,000,000	.....	.....	1890	30	35
Buffalo (N.Y.) Ry.....	100	6,000,000	.....	.....	1891	59	61
Paterson (N. J.) Ry.....	100	1,250,000	.....	.....	1891	13	20
Columbus (O.) St. Ry.....	100	3,000,000	Q.—F.	1	1892	39	40
North Shore Traction Co. (Boston) Pref.....	100	2,000,000	A.—O.	6	1892	60	80
do do Common.....	100	4,000,000	.....	.....	1892	15	18
Worcester Traction Co. Pref	100	2,000,000	F.—A.	6	1892	68	80
do do Common.....	100	3,000,000	.....	.....	1892	15	20
Consol. Trac. Co. (N. J.)....	100	.....	.....	.....	1893	35	36
BONDS.							
Rochester (N.Y.) Ry.....	1890	3,000,000	A & O	5	1930	93	95
Buffalo (N.Y.) Ry.....	1891	5,000,000	F & A	5	1931	99	99 1/2
Paterson (N. J.) Ry.....	1891	850,000	J & D	6	1931	85	95
Newark (N. J.) Pass. Ry.....	1890	6,000,000	J & J	5	1930	94	96
Columbus (O.) St. Ry.....	1892	2,600,000	J & J	5	1932	90	95
Consol. Trac. Co. (N. J.)....	1893	.....	J & D	5	1933	87	90

SAN FRANCISCO STOCKS AND BONDS.—Corrected by PHILIP BARTH, Broker, 440 California Street, San Francisco, Cal., May 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
California St. Cable Co.....	100	1,000,000	Monthly	5	.....	98	.....
Geary St., Park & Ocean R.R. Co	100	1,000,000	.....	1	.....	105	.....
Market Street Cable Co.....	.....	17,892,000	.....	.....	.....	39	39 1/2
Metropolitan Electric.....	.....	.....	.....	.....	.....	30	.....
Presidio & Ferries R. R. Co....	100	1,000,000	.....	.....	.....	13 1/2	14
Sutter St. R. R. Co.....	.....	.....	.....	.....	.....	90	.....
BONDS.							
Cal. St. Cable R. R.....	.....	.....	.....	5	.....	104	.....
Ferries & Cliff House.....	.....	650,000	M. & S.	6	1914	106 1/2	107 1/2
Geary St., Park & Ocean.....	.....	.....	.....	.....	.....	102	.....
Market Street Cable Co.....	3,000,000	.....	J. & J.	6	.....	913	121
Omnibus Cable Co.....	2,000,000	.....	A. & O.	6	.....	1918	114
Park & Ocean R. R.....	250,000	.....	J. & J.	6	1914	113 1/2	116 1/2
Park & Cliff House R. R.....	350,000	.....	J. & J.	6	.....	103 1/2	.....
Powell Street R. R.....	700,000	.....	M. & S.	6	1912	107 1/2	111
Sutter St. Cable Co.....	90,000	.....	M. & N.	5	.....	102	.....

ST. LOUIS STOCKS AND BONDS.—Corrected by JAMES CAMPBELL, Banker & Broker, Rialto Building, 218 N. 4th St., May 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Cass Ave. & Fair Grounds.....	100	2,500,000	.....	.....	1876	50	65
Citizens'.....	100	1,500,000	Oct. '93	4	1887	80	85
Jefferson Avenue.....	100	112,000	Dec. '88	2	1885	125	150
Lindell.....	100	2,500,000	.....	.....	1890	85	86
Missouri.....	100	2,000,000	Q.—J.	2	1891	190	210
People's.....	50	1,000,000	Dec. '89	50c	1889	20	25
St. Louis.....	100	2,000,000	J. & J.	3 1/2	1890	145	150
Fourth Street & Arsenal.....	50	150,000	.....	.....	1872	5	10
Union Depot.....	100	4,000,000	Jan. '94	8	1890	150	200
St. Louis & Suburban.....	100	2,500,000	.....	.....	1891	10	20
Southern, Pfd.....	.....	800,000	Jan. '94	3	.....	80	85
Com.....	.....	700,000	.....	.....	.....	15	25
BONDS.							
Cass Avenue & Fair Ground... 1892	1,800,000	J. & J.	5	1912	98 1/2	100	.....
Citizens' Cable..... 1887	1,500,000	J. & J.	6	1907	104	106	.....
Fourth St. & Arsenal..... 1888	50,000	J. & J.	6	1898-1903	99	100	.....
Lindell..... 1890	1,500,000	J. & J.	5	1895-1910	102	103	.....
Missouri Cable..... 1887	500,000	M. & S.	6	1907	100	102	.....
People's 1st mort..... 1882	125,000	J. & D.	6	1902	99	100	.....
2d mort..... 1886	75,000	M. & N.	7	1902	100	102	.....
People's Cable..... 1889	800,000	J. & J.	6	1889-1914	90	95	.....
St. Louis Cable..... 1890	1,500,000	M. & N.	5	1900-1910	100	102	.....
Union Depot..... 1890	4,000,000	A. & O.	6	1900-1910	104	105	.....
Southern..... 1884	200,000	M. & N.	6	1904	103	105	.....
Southern..... 1889	300,000	M. & N.	6	1909	100	104	.....
St. Louis & Suburban..... 1891	1,400,000	F. & A.	5	1921	84	86	.....
St. Louis & Suburban (Incomes) 1891	300,000	.....	6	.....	70	80	.....

WASHINGTON STOCKS AND BONDS.—Corrected by CRANE, PARRIS & Co., Bankers, 1344 F Street, N.W., Washington, D C., May 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Wash'ton & Georgetown R.R.	50	500,000	Q. F.	5	1863	290	320
Metropolitan R. R.....	50	750,000	Q. J.	2	1864	90	91
Columbia R. R.....	50	400,000	Q. M.	1	1870	67	72
Belt R.R.....	50	500,000	Q. J.	.....	1875	23	.....
Eckington & Soldiers' Home.	50	352,000	.....	.....	.....	28	.....
Georgetown & Penallytown..	50	200,000	.....	.....	.....	.....	.....
Rock Creek R. R.....	100	401,700	.....	.....	.....	.....	.....
Glen Echo R. R.....	50	100,000	.....	.....	.....	.....	.....
BONDS.							
Wash'tn & Geo'tn conv't. 1st.	'83-'99	3,000,000	J. & J.	6	1899-1929	130	134
do do 2d.....	.....	500,000	J. & J.	6	1903-1943	130	134
Eckington & Soldiers' Home.	.....	150,000	J. & D.	6	1896-1911	95	.....
Belt.....	1921	240,000	J. & J.	6	1921	85	100
Metropolitan R. R. convert....	1901	200,000	J. & J.	5	1901	103	108
Anacostia R. R.....	.....	200,000	A. & O.	6	1901-1931	.....	.....

New York Street Railway Stock Market.

May 28, 1894.

With railroad mortgages and municipal bonds ruling at figures that allow of but poor returns on the money invested, with many of the prominent steam railways in receivers' hands, with interest and dividend defaults threatened by the score, it is no wonder that investors have within the last few months been forced to turn their attention to new fields of investment, and it is due to this desire of people to put the present large amounts of capital now lying idle at this and other centers of finance, into profitable opportunities that the stocks and bonds

of street railway companies have occupied of late such prominence in the financial world.

Leaving aside the operations in the Philadelphia market in the stock of the big \$30,000,000 Metropolitan Traction Company, most of the dealings are on the orders of New York trades. A good deal of the local specialist's attention has been given to Third Avenue Railroad stock. Ever since the introduction of the cable system Wall Street has been filled with story after story as to the road's big earning capacity now that the cable has superseded the horses as a motive power, and, while figures of quarterly earnings recently put forth give but slight indications as to how much earnings have improved as a result of the change of motive power, it is claimed that they do not fairly represent the road's present money making abilities in that the cable machinery was not yet in perfect working order, and operating expenses consumed a larger proportion of gross receipts than they are likely to now that everything is running smoothly. It is undoubtedly true that the earnings of the Third Avenue line of the Manhattan Elevated Railroad Company have been seriously encroached upon by the competition of the Third Avenue cable road, which, with its transfers from 125th Street at Grand and Canal Streets, offers special inducements to the laboring man to patronize this system. Of recent days there has been some little slackening in the quotation for the stock (it is now around 181) on the report that the company is soon to issue \$1,000,000 debenture bonds, in addition to the present indebtedness, the proceeds of which are to be used in purchasing new equipment and in other newly contemplated improvements.

Other locally active Traction stocks are the shares of the Second Avenue Railroad Company, concerning which some mysterious rumors regarding a change in control continue in circulation, and Dry Dock, East Broadway & Battery stock which recently had a sudden rise of ten points to 131. There is no real reason known for this big jump, but it is probably an appreciation, on the part of investors, of the work that the new management is doing.

Naturally, for the reasons adduced in the opening paragraph, Traction bonds are most in demand. The New York City street railway bonds of the roads embodied in the Metropolitan Traction Company's local system, like Broadway first 5s and Broadway & Seventh Avenue new consolidated 5s, are in especial favor, the prices bid for them fully demonstrating the eagerness of investors to put their money in what is well considered a "gilt edged" security. For instance, the new Broadway 5s were put out at 98½; now they sell at 107 and are hard to get at that, investors still seeking them with alacrity. Were it not for the slight setback given to the market by the default on the bond issue of the Syracuse Street Railway Company, quotations would still be on the upward tack.

Stocks of the street railway companies in Long Island have not participated in the strength characterizing New York issues. Long Island Traction, which is one of the few Traction stocks listed on the New York Stock Exchange, has been particularly weak on sales for the account of inside interests. There is seemingly a determination on the part of some prominent stockholder to get rid of his holdings regardless of price, and, do what the bull operators can to stem the tide, the quotation has been steadily declining. Brooklyn City Railroad stock, which is controlled by the Long Island Traction Company, and on which 10 per cent. dividends are guaranteed, has reacted sympathetically and has slumped several points to 162. Brooklyn Traction stock is held rather steady; the company suffered no material loss from the recent strike of its motormen and conductors, but there is no demand for the stuff, and it is rather inclined to go down than up. It is quoted at 14.

The New Orleans Traction Company, the shares of which are mostly dealt in in New York, has successfully carried through its financial undertakings involving a change in control and the acquisition of new capital. The New York syndicate, headed by H. B. Hollins & Company, that is now interested in the property, has agreed to loan the New Orleans Traction Company \$5,500,000 in cash for two years, in consideration of which the syndicate is to have an option on the road's first mortgage bonds. The money is also subscribed. It will be used in pushing the work of converting all the roads in the combination into electric trolley lines. The common stock is now offered at sixteen; it has sold at eighteen. The preferred is 58 bid, and is offered at 60.

Financial.

THE Dallas (Tex.) Rapid Transit Railroad, it is reported, has been sold to Henry C. Scott, of St. Louis, for \$90,000.

THE Port Richmond & Prohibition Park Electric Railroad, of Staten Island, N. Y., has been purchased by the New Haven Traction Company, of which Ex-Governor Waller is president.

THE Cincinnati (O.) Street Railway Company on May 17 issued to stockholders of record of May 14, \$500,000 stock at par. The company has now outstanding about \$7,500,000, and authorized \$10,000,000.

CLAY MOORE & COMPANY, of Philadelphia, have secured control of the Centerville Horse Railway Company, of New Haven, Conn., for which they have been negotiating for many months. The purchase price is said to have been \$225,000. The deed was recorded May 10.

THE Bridgeport Traction Company, of Bridgeport, Conn., which operates the entire street railway system of that city has sold to Redmond, Kerr & Company, bankers, of New York, its whole issue of

\$1,300,000 first mortgage bonds. The contracts have all been let and work will be immediately begun.

COL. WM. N. SINCLAIR, president of the Galveston City Railway Company, of Galveston, Tex., during his recent visit North, was successful in placing the issue of \$1,000,000 consolidated bonds of the street railway company, intended to pay off the company's outstanding bonds and all of the floating debt.

The following is a comparative statement of the operations of the Scranton (Pa.) Traction Company, for the month of April: Gross earnings, 1894, \$18,813.69; 1893, \$15,316.91; increase, \$3,496.78. Operating expenses, 1894, \$11,442.16; 1893, \$9,784.76; increase, \$1,657.40. Net earnings, 1894, \$7,371.53; 1893, \$5,532.15; increase, \$1,839.38.

THE Raleigh Street Railway Company, of Raleigh, N. C., has been sold under foreclosure proceedings for \$4,000, to John H. McAdam, of Charlotte, N. C., R. S. Tucker, A. B. Andrews, Julius S. Carr, the General Electric Company and others, who will re-equip the road and operate it in connection with incandescent electric lighting.

THE following is a comparative statement of the operations of the Columbus (O.) Street Railway Company for the month of April: Gross earnings, 1894, \$43,216.55; 1893, \$44,720.03; decrease, \$1,503.48. Operating expenses, 1894, \$20,087.47; 1893, \$26,960.96; decrease, \$6,873.49. Net earnings, 1894, \$23,129.08; 1893, \$17,759.07; increase, \$5,370.01.

THE Brooklyn (N. Y.) Traction Company submits the following comparative statement of its operations for April: Gross earnings, 1894, \$75,095.64; 1893, \$64,032.56; increase, \$11,063.08, or 17 per cent. Operating expenses, 1894, \$50,431.46. From operation, 1894, \$24,664.18. Miscellaneous earnings, \$3,375. Net earnings, \$28,039.18. We have no data showing the operating expenses and net earnings for the corresponding month of 1893.

THE following is a comparative statement of the operations of the Buffalo Railway Company for the month of April:

	1894.	1893.	Inc. or Dec.
Gross earnings.....	\$120,592.13	\$117,082.49	Inc. \$3,509.64
Operating expenses.....	67,175.53	73,220.44	Dec. 6,044.91
Net earnings.....	\$53,416.60	\$43,862.05	Inc. \$9,554.55

EARNINGS of the West End Street Railway Company, of Boston, for the first six months of the present fiscal year, October, 1893, to March 31, 1894, are given as follows:

	1894.	1893.	Increase.
Gross.....	\$3,126,899	3,124,543	2,356
Operating expenses.....	2,166,716	2,325,055	*158,339
Net.....	960,183	799,488	160,695

*Decrease.

THE North Shore Traction Company, of Lynn and Boston, Mass., submits the following comparative statements of its operations for March: Gross earnings, 1894, \$84,956.99; 1893, \$79,459.11; increase, \$5,497.88. Operating expenses, 1894, \$62,767.26; 1893, \$74,144.58; decrease, \$11,377.32. Net earnings, 1894, \$22,189.73; 1893, \$5,314.53; increase, \$16,875.20. For the six months ending March 31, the following showing is made: Gross earnings, 1894, \$480,891; 1893, \$462,118; increase, \$18,773. Operating expenses, 1894, \$361,182; 1893, \$423,233; decrease, \$62,051. Net earnings, 1894, \$119,709; 1893, \$38,885; increase, \$80,824.

THE Buffalo (N. Y.) Ry. Co. and the Crosstown Ry. Co., of Buffalo, present the following consolidated report of operations for the year ending Mar. 31,

	1893.	1894.
Receipts from passengers.....	\$1,280,361	\$1,480,661
" other sources.....	25,292	25,833
" total.....	1,305,653	1,506,494
Operating expenses.....	825,294	886,261
Earnings from operation.....	480,359	620,233
Deductions from earnings.		
Interest.....	320,598	356,460
Taxes.....	60,444	87,377
Surplus.....	99,317	176,396

Total surplus account..... 242,112 418,507
Per cent. O. E. to total receipts..... 64.46 59.85
Balance Sheet of the Buffalo Railway Company, Mar. 31, 1894.

Assets.		Liabilities.	
Cost of road.....	\$8,607,354	Capital stock.....	\$5,370,500
" equipment.....	2,533,669	Funded debt.....	5,020,257
Current assets.....	52,399	Bills payable.....	524,492
Other assets.....	355,000	Other liabilities.....	274,129
		Profit and loss (surplus)	359,044
Total.....	\$11,548,422	Total.....	\$11,548,422

At the regular monthly meeting of the directors of the Baltimore Traction Company held on Wednesday, May 9, T. Edward Hambleton presented his resignation as president of the company, and Governor Frank Brown was elected to the position. The new president is a man of great executive ability and energy, and his other duties

will not interfere with the devotion of the greater part of his time to the interests of the company. Mr. Hambleton, the retiring president, was elected to the position upon the organization of the company, and the credit of inaugurating rapid transit in Baltimore is largely due to him. Mr. Hambleton found that his duties as president of the Traction Company consumed the greater portion of his time, to the detriment of his own business; hence his determination to ask the directors of the Traction Company to accept his resignation.

	\$	\$	\$
THE Louisville (Ky.) Railway Company has submitted the following statement of its operations for the year ending December 31, 1893.			
Receipts from passengers.....		\$1,265,201.80	
“ other sources.....		16,791.08	
“ total.....		1,281,992.88	
Operating expenses (including taxes and rentals).....		807,055.54	
Earnings from operation.....		474,937.34	
Deductions from earnings.			
Interest on bonds.....		314,000.00	
Net income.....		160,937.34	
Dividends paid.....		87,500.00	
To surplus account.....		73,437.34	

The balance sheet is as follows:

Assets.		Liabilities.	
Cost of road.....	\$11,559,177	Capital stock.....	\$6,000,000
“ equipment.....	1,376,175	Funded debt.....	6,000,000
Cash assets.....	163,106	Bills payable.....	10,000
Other assets.....	220,124	Other liabilities.....	333,347
		Profit and loss.....	975,235
Total.....	\$13,318,582	Total.....	\$13,318,582

THE gross earnings of the Baltimore (Md.) Traction Company for the last eight months and corresponding months in the previous year are shown below:

	1892.	1893.	Dec.
September.....	\$107,301	\$80,642	\$26,659
October.....	103,163	81,442	21,721
November.....	91,735	77,345	14,390
December.....	95,814	79,472	16,342
	1893.	1894.	
January.....	\$80,646	\$72,376	\$8,270
February.....	74,339	64,955	9,384
March.....	88,858	77,647	11,211
April.....	94,307	79,351	14,956

Hambleton & Co., of Baltimore, express themselves as follows in regard to this report:

“While the gross earnings of the Traction Company do not at present compare favorably with the same dates last year, it must be remembered that then there was practically no competition. The gross receipts now are not only not decreasing, but have, since full competition was met with, largely increased. Further, we are informed that the expenses of the company have so greatly decreased that the net earnings are, since the first of the year, larger than they were for the same months last year. The red, white and blue lines of the City Passenger Company were all in active operation for the first time in September,

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—GENERAL—

RAILWAY CONTRACTORS,

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General Street Railway Contractors,

80 BROADWAY, NEW YORK.

1893, and, naturally, the Traction Company's earnings fell off largely. The Traction Company has in process of construction, and now nearing completion, several electric lines which cover most valuable territory, and must add largely to the earning capacity of the company. The comparatively small difference in January and February is explained by the fact that there were frequent delays caused by the severe winter of 1893, and the comparatively greater decrease in April by the unusual weather, a heavy snowstorm and winter weather during the greater part of the month, against spring weather and bright skies in April last year.”

	\$	\$	\$
THE Binghamton (N. Y.) Railroad Co. has submitted the following statement for the years ending Mar. 31, 1893 and 1894.			
		1893.	1894.
Receipts from passengers.....		\$76,402.11	\$106,138.54
Operating expenses.....		45,069.26	59,198.95
Earnings from operation.....		31,332.85	46,939.95
Deductions from earnings.			
Interest on bonds, paid and accrued..	12,000		17,577.43
Taxes.....	3,072.20		3,088.64
Net income.....		16,260.65	26,273.88
Per cent. O. E. to total receipts.....		59	56

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Rails of all weights, with
Chairs, Joints, Spikes, &c.

LINE CONSTRUCTION
MATERIAL.

The balance sheet shows:

Assets.	
Cost of road and equipment.....	\$917,529.48
Payment on purchase of East and West Side Railroads...	58,700.00
Due by open accounts and East End & West Side Railroad Companies.....	37,305.05
Cash assets.....	19,243.86
Supplies on hand.....	3,235.87
Total.....	\$1,036,014.26
Liabilities.	
Capital stock.....	\$324,290.00
Funded debt.....	545,000.00
Bills payable.....	127,150.48
Loans and accrued interest.....	4,312.50
Due on open accounts.....	25,155.23
Profit and loss.....	10,106.05
Total.....	\$1,036,014.26

Map of the United States.

A large handsome Map of the United States, mounted and suitable for office or home use, is issued by the Burlington Route. Copies will be mailed to all address on receipt of fifteen cents in postage by P. S. EUSTIS, General Passenger Agent, C., B. & Q. R. R., Chicago, Ill. **

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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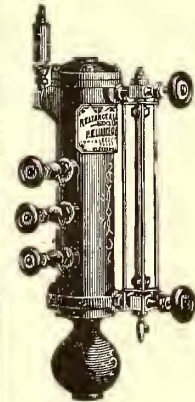
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