THE STREET RAILWAY JOURNAL

Vol. X. NEW YORK & CHICAGO, AUGUST. No. 8.

A Model Car House.

In the engraving on this page is presented a view of the capacious car house recently completed by the Union Railway Company, of New York. The engravings on the following page are from photographs of the first and second floors.

The house is located at the junction of Boston and Woodruff Avenues, and has a frontage of about 150 ft. on Boston Avenue, and extends back on Woodruff Avenue a distance of about 260 ft. As shown in the exterior view, the building is of brick with stone trimmings, and presents a very handsome appearance. The architectural feature of the structure is the square tower of attractive design eighty-two feet in height and twenty-five feet square, located over the central doorway.

Woodruff Avenue descends gradually from Boston Avenue, so that the building is one story higher in the rear than in the front.

On the ground floor are fourteen tracks, each with a storage capacity of nine closed or seven open cars. All tracks are provided with pits for the inspection of motors, running gear, etc. The trolley wires which lead into the building are carried under wooden troughs, which are attached to the floor beams. The floors here are laid with cement. An electric elevator carrying a platform, 11 × 35 ft., and operated by the railway current, is provided for quickly transferring cars to the basement or the upper floor. This elevator is shown at the left of Fig. 3.

On the second floor, shown in Fig. 2, there are thirteen tracks with a total storage capacity of seventy-five cars. An especially interesting feature of this floor is a flush transfer table of special design which was built for the Union Railway Company by the White Manufacturing Company, of New York. With it the cars can be quickly and easily moved to any part of the room by one man.

This transfer table, which is shown in the engraving and which was fully described in the May, 1894, number of the STREET RAILWAY JOURNAL, runs on rails laid on the floor itself, and avoids the necessity of cutting the floor. The transverse rails upon which the car rests when on the table are slightly bent down at the ends, so as to make connection with the floor rails.

FIG. 1—EXTERIOR OF CAR HOUSE—UNION RAILWAY COMPANY, NEW YORK CITY.

The company will perform its own armature winding, and a space of about 40 × 50 ft. in the Boston Avenue end of the second story is set apart for this purpose. Twelve large windows furnish abundant light for this work.

Adjoining the armature room, directly in the center of the front of the house and within easy call of the dispatcher's office, is a large room for the use of conductors and motormen. It is well lighted and heated, and furnished with an ample number of comfortable seats.

The machine and blacksmith shops are located in the basement in the rear end of the building, and will be fully equipped with the most approved machinery for making all necessary repairs. Power will be supplied entirely by electric motors operated by the railway current. The paint shop of the company is also located in the basement.

The tracks are so arranged that a car can be taken

from the street or any part of the building to the elevator, lowered to the basement and run directly to the repair shop, facilitating the work of repairs. A large stock room adjoins the machine and blacksmith shops.

The house is well lighted by large windows on all sides.

The Indianapolis Franchise Case.

An interesting case involving the right of a city to transfer certain franchises, claimed to have expired, from one corporation to another, was argued last month in Indianapolis in the case of "The Citizens' Street Railroad Company *vs.* The City Railway Company." The final arguments for the former, the one now in the field, was presented by Hon. Benjamin Harrison who claimed, among other points, that an extension of an existing franchise did not require any special consideration, the consideration for the original grant being sufficient to cover the extension, also that the termination of the right to operate cars over certain streets was tantamount to a confiscation of the tracks of the company in those streets when no provision had been made originally to cover this point. Also that a grant from the legislature could not be terminated by a city, even though it had been provided in the act of the legislature that it should not take away the "exclusive power exercised by the city over the streets," the term "exclusive power" merely identifying the powers then exercised over location, survey and construction. Mr. Harrison claimed that under the State charter the franchises were perpetual. The case was presented before Judges Woods and Baker of the United States Circuit Court. No decision will probably be given for some time.

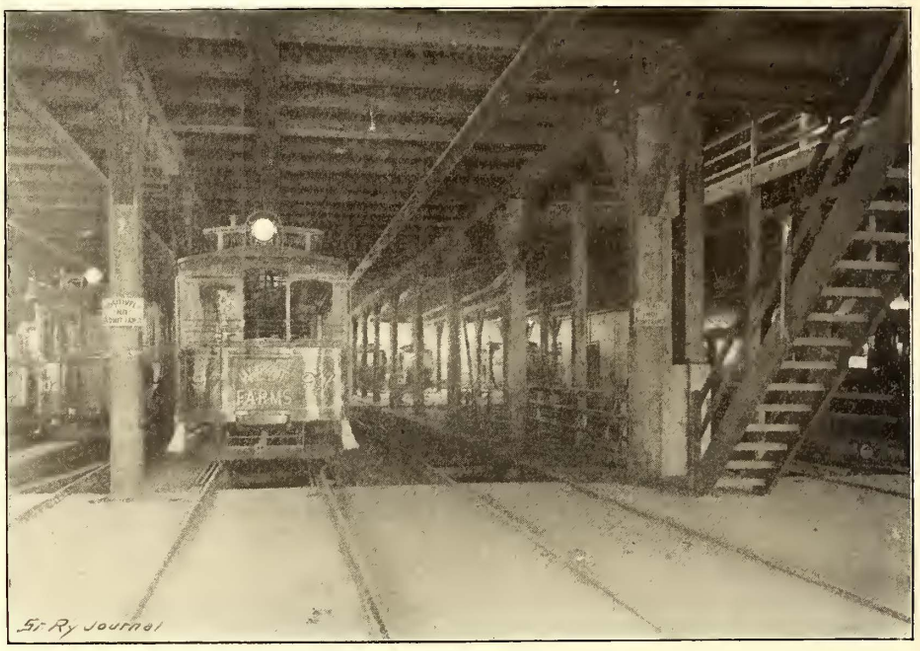


FIG. 3.—VIEW OF GROUND FLOOR OF CAR HOUSE—UNION RAILWAY COMPANY, NEW YORK CITY.

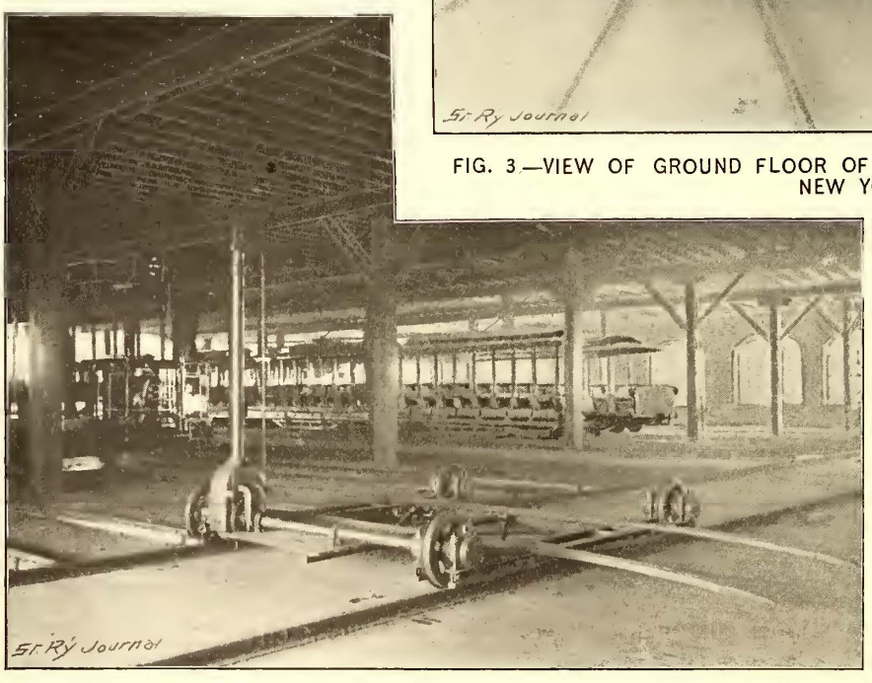


FIG. 2.—VIEW OF SECOND FLOOR OF CAR HOUSE—UNION RAILWAY COMPANY, NEW YORK CITY.

Fenders in Washington.

A bill has been introduced in Congress to compel all the street railway companies in the District of Columbia to equip all electric and cable cars with fenders. The District Commissioners are examining different types.

Railway Lines in Detroit Sold.

Thomas Nevins, of Orange, N. J., the contractor who has been mentioned on several previous occasions as the purchaser of the Detroit Street Railway lines, concluded the purchase July 3. It is said Mr. Nevins had an option on this scheme, which expired on July 9. It was coupled with a condition that the franchise be obtained from the Common Council of Detroit. A company of capitalists, anxious to secure the roads, succeeded in delaying the granting of the franchise beyond the time named in the option, with the hope of defeating Mr. Nevins. The latter went to Detroit, however, and closed the deal, paying, it is said, par for the $1,250,000 of stock and $3,000,000 bonds.

Mr. Nevins will at once go to work and organize a stock company, in which he will hold a controlling interest, and equip the remaining fifty miles of trackage with the trolley system. He will take possession of the newly acquired property in a few weeks.

Mr. Nevins in a recent interview said: "I was treated in a very fair manner by the municipal authorities of Detroit. My company will be exempt from taxes, and free from any expense for street paving or improvements of any kind. For these considerations I agreed to give the city a workingman's rate of fare, which is three cents, between the hours of 5:30 and 7 A. M., and 5:15 and 6:15 P. M."

An Electric Railway Between Columbus and Cincinnati.

The prediction that Cincinnati and Columbus are to be connected by an electric railroad has become a very strong probability. Application has been made to the Franklin County Commissioners for a right of way for an electric railway on the national pike from Columbus to the Madison County line, and a franchise has been granted on condition that the road is begun by September 1, 1895, and completed by September 1, 1896. The applicants are L. D. Hagerty, H. B. Morehead, Dennis Dwyer, of Dayton, and Orin Brown.

The Hobart Electric Street Railway.

The second electrical street railway in Australasia, and, perhaps, the finest in the Southern Hemisphere, is that opened for traffic September 1, 1893, at Hobart, the chief city of Tasmania, that island which lies due south of the great continent of Australia, and which is looked upon by its inhabitants as the gem of the Southern seas. A feeling of discontent with antiquated methods of traction had been rising ever since the success of electric traction in America had been reported there. And this feeling speedily impelled them to investigate and be more forward with the times. From the beginning the cars have been great favorites, and not a stop or a hitch has occurred since the line was opened. The system adopted is the overhead, and is similar in most respects to those installed here and in Europe.

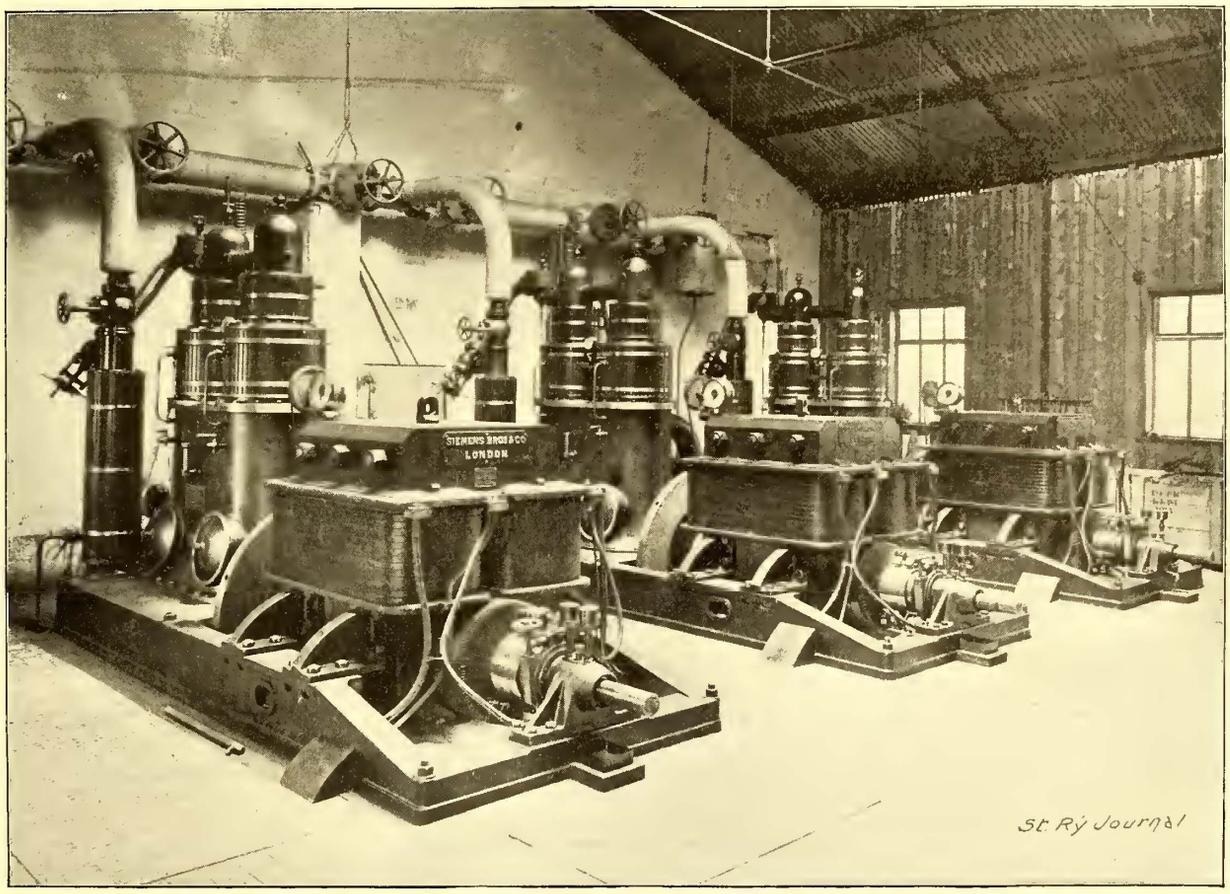


FIG. 1.—INTERIOR OF POWER STATION—HOBART ELECTRIC STREET RAILWAY, TASMANIA.

Some years ago a body of local capitalists secured a concession from the city, granting them a perpetual lease of all the roadways necessary to the operation of a car service. A horse car service was effected for some time, but the claims of improved traction became urgent, and a more utilitarian and satisfactory method was contemplated. An offer being made to the syndicate by the Hobart Electrical Tramway Company to take over the concession and build an electrical road, it was accepted at once. A contract was made shortly afterwards with Siemens Brothers & Company, of London, to undertake the entire equipment of the line from the foundations of the power house to the last fuse on the last car, that is, the steam and electrical plant, track, line and rolling stock.

The total length of the tracks is ten miles, the system being divided into three sections, each about three miles long, running to the suburbs of New Town, Sandy Bay and Cascades. The first two start from the telegraph office at the corner of Macquarie and Elizabeth Streets, while that running to the Cascades starts from the railway station in Lower Park Street, and continues along Macquarie Street to its terminus at the Cascades.

The power station and car house have been erected at the lower end of Macquarie Street, near the Hobart rivulet, and so much difficulty was experienced in finding suitable foundations for the house itself and the engines, boilers, stack, etc., that piles were driven and a firm concrete foundation laid upon them. Upon this structure the house was erected. It was designed in England, and sent out all ready to be set up. It consists of a galvanized iron shell with wrought iron principals and girders, the various portions being separated by wooden and brick partitions.

The boilers (Fig. 2) are four in number, and are of the Marshall locomotive, multitubular type. They have a capacity of sixty horse power each, and generate steam at a working pressure of 160 lbs to the square inch. The mountings are complete and include double gauge glasses, steam gauge, patent draughts, etc. The boilers are covered with Bell's asbestos composition, as are the steam pipes, to lessen the waste of heat. The ash pits are built beneath the surface of the boiler room floor. The flues are connected with the stack, which rises ninety feet skyward. This is of wrought iron riveted throughout, is five feet in diameter and securely anchored with stranded steel stays. A water tank is provided for the feedwater, which is pumped by two No. 5 Worthington steam pumps through two Marshall 100 H. P. water heaters into the boilers. The steam passes from the boilers through a ring main so arranged that any engine or any boiler may be worked separately or together.

Passing from the boiler house into the engine and dynamo room, the visitor sees an installation which for neatness and compactness need fear no rival anywhere. The engines are three in number and are of the Willans & Robinson well known vertical, patent central valve, high speed, compound type. They are provided with steam separator and fitted with sensitive governors of special design. They operate at a speed of 350 revolutions per minute, and are directly connected to three generators—engine and dynamo being fitted to one bed plate. The rate of speed is shown on a tachometer.

The three generators are of the Siemens H. B. $\frac{36}{21}$,

bipolar, compound wound type, the armatures being set near the floor and making the same number of revolutions as the engine. The capacity of each dynamo is 250 amperes at 500 volts. The engine shaft, directly coupled to the armature shaft, carries a flywheel of massive construction four feet two inches in diameter, weighing with the shaft about two tons. The working parts of the engines run in oil baths carefully covered in, and each engine will work up to 200 H. P.

The generated current is led from the dynamo terminals to a switchboard arranged on the wall of the room. Upon this are mounted the necessary switches, cutouts, resistances and measuring instruments. The engine room, boiler house, car barn, offices, etc., are all lighted by sixteen candle power incandescent lamps arranged five in series between the lines.

The construction of the overhead line is extremely substantial. The poles are erected along the edge of the sidewalk, some being of wood and some of iron. Owing to the position of the poles and wires of the telegraph and telephone departments, which follow the route taken by the cars along almost the entire length of the line, it was found necessary to crank the poles of the street railway, to throw the top some three feet from the line of the base, in order that they should not run into contact with the other wires. The interruption to the telephone service has been so slight as to have evoked no complaint.

The feeders, of which there are fifteen miles, are of nineteen strand copper wire. The trolley conductors, of which there are ten miles, are of seven M. M. diameter, galvanized steel wire. These are suspended from span wires of galvanized iron, there being eight miles of this, stretched between 800 side poles carrying 1,000 insulators.

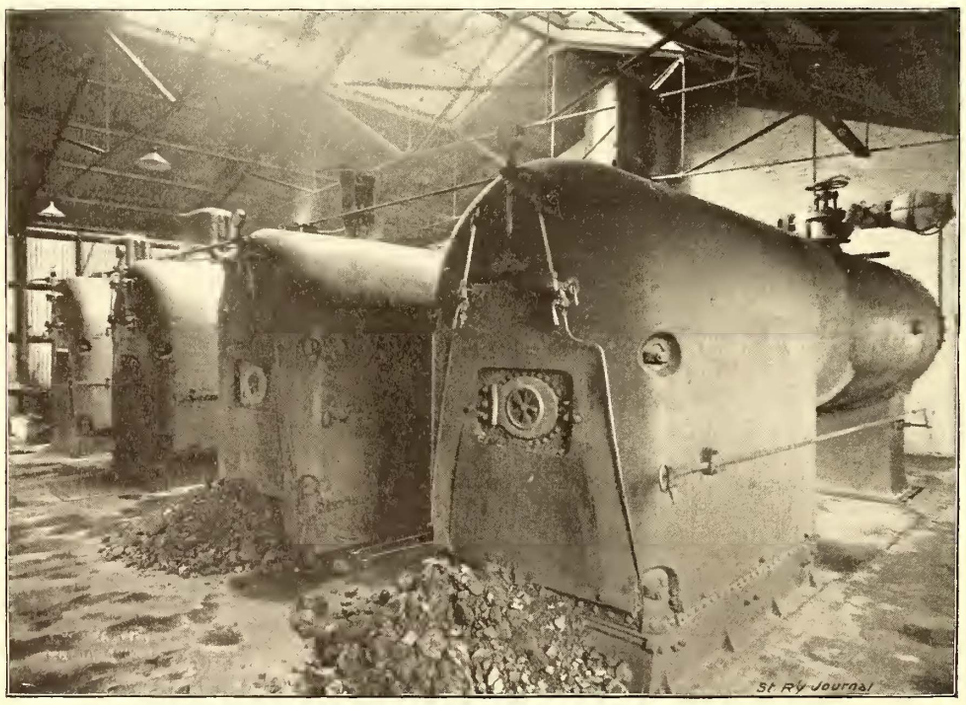


FIG. 2.—BOILER ROOM—HOBART ELECTRIC RAILWAY, TASMANIA.

The track is constructed of forty pound T, or Vignole, steel rails spiked to wooden ties, and guard rails are used along the whole length of service track. The rails are bonded with solid copper strips securely riveted. There are fourteen turnouts arranged for a fifteen minute service along the lines. In some places the curves and gradients are rather severe, the steepest grade being on the New Town line, where for about fifteen chains the rise is about 6 per cent.

The cars are twenty in number, and are neat examples of the car building art, built for Siemens Brothers & Company by the Lancaster Waggon Company. They are

FIG. 3.—DOUBLE DECKED CAR—HOBART ELECTRIC RAILWAY, TASMANIA.

principally of teak and ash, the window frames being of mahogany, and are double decked, the upper deck being roofed over, but not closed in, and the seats arranged across the top of the car. There is room for twenty-four passengers inside and twenty-four on the upper deck, which is reached by a winding staircase at each end of the car. While they are constructed to carry only forty-eight passengers, rush of traffic has frequently loaded them with as many as 106. This speaks well for both motors and cars. The cars are supported on the trucks by spiral springs, and each car and truck complete weighs about six tons.

Each car is provided with two motors of twelve and a half horse power each, geared to the axles through single reduction gears working in oil. The motors and gearing are enclosed in suitable casings which render them both water and dust proof. One motor has been found sufficient to operate a car in case of breakdown of the other. Current is taken from the overhead wire by Siemens friction contact arrangements, two of which are mounted upon supports running up from the roof proper of the car. They are light steel frames of rectangular shape, pivoted at the lower part of each side and kept in contact with the trolley wire by means of two strong spiral springs. While this system may seem to American eyes inferior to the trolley pole with its revolving contact, it is said to be very efficient and less liable to break down, while the wear on the overhead conductor is very slightly, if at all, in excess. The controlling switches are placed one on each platform, and are of the well known Siemens type. The resistance, consisting of a

series of coils, is set beneath the platform. The maximum speed allowed is twelve miles per hour, but this is exceeded on down grades and in the less frequented neighborhoods.

The cost of the installation complete amounted to about £34,000 or $170,000. The cars began to run on September 21, and up to October 20 had covered 25,000 miles, and carried 115,000 passengers, the highest number in one day being 7,500 with fifteen cars. The population of Tasmania in 1891, when the last census was taken, was 146,667, and that of Hobart and its suburbs 29,593. Since the road was opened, up to June 1, date of our latest advices, the cars had carried 1,092,491 passengers, the number of car miles run being 243,165. The ordinary service consists of twelve cars, but eighteen have been used on certain occasions, and even twenty, without any special effort on the part of the steam or electric plant.

The fares are fixed at four cents for travel within the city limits, while another two cents procures a further ride for three miles in any one of the three directions in which the cars run. Numbered tickets are given to the passengers, and these must run consecutively and correspond to the conductor's series. The passengers are requested to destroy their tickets on leaving the cars, a request pretty generally complied with, as they are made aware that responsibility for mistakes falls upon the conductor. The cars run every quarter of an hour, or, as a taciturn London 'bus driver once replied to an enquiring passenger: "They leaves at quarter past, half past, quarter to and at!" Passengers are transferred from any one line to any other without increase of fare.

The cars have been an unqualified success in Hobart, and the road stands at present as an object lesson to the other Australian colonies. It has attracted considerable attention, and has been visited by the engineers of most of the street railways in the Australian colonies, not to speak of the big political magnates.

The question of lighting business premises in the city from the station has also been mooted, and as by Act the Tramway Company's charter allows it to do anything in that way, it is probable that it may also undertake the city lighting.

To A. C. Parker, engineer in charge, under whose expert supervision the entire installation of this model road was effected, we desire to acknowledge our indebtedness, for his kindness in providing us with the facts upon which the foregoing article was based, as well as the interesting photographs from which the cuts were made.

The Glasgow Subway.

The Glasgow subway, which has been under process of construction during the last two and a half years, and which will be a valuable addition to the rapid transit facilities of that city, is now nearly completed. This subway consists of two independent tunnels eleven feet in diameter and in the form of a loop six and a half miles in length. The tunnels are constructed on an average of

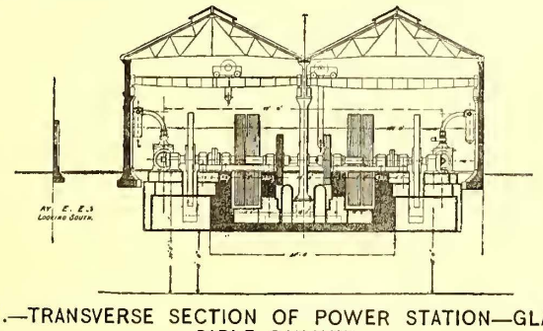


FIG. 1.—TRANSVERSE SECTION OF POWER STATION—GLASGOW CABLE RAILWAY.

thirty feet below the surface and close together except at the stations, where they widen to admit of a ten foot platform which is reached by stairs leading down from the surface. There are in all fourteen stations, the distance between any two being about half a mile. The system of compressed air chambers was employed in the tunnel construction, and the total cost of the subway has been about $3,600,000 exclusive of equipment and property franchises, the company being obliged to purchase all property along the line.

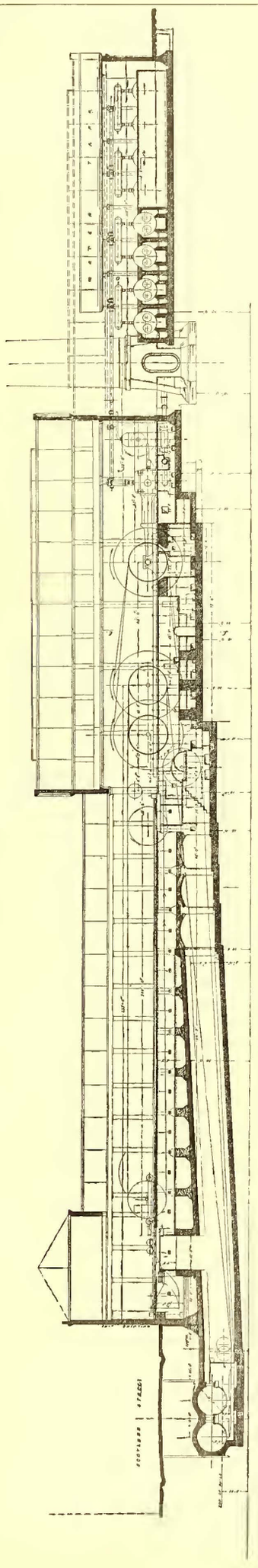


FIG. 2.—LONGITUDINAL SECTION OF POWER STATION—GLASGOW CABLE RAILWAY.

The question of the best motive power to introduce was decided in the early part of this year, the choice being practically confined to electric and cable power. The engineers of the subway, as some of our readers may remember, visited this country last November on a tour of investigation to learn the recent advances made in rapid transit methods in America. As a result, the cable system was selected. Through the kindness of David Home Morton, engineer of the subway, we are enabled to present the accompanying plans of the cable machinery and arrangement recently decided upon.

The power station measures 463 ft. 7 ins. × 100 ft. in its greatest dimensions. The boiler room will contain eight Lancashire boilers in four batteries of two boilers each, connected with the engine room by a duplicate set of steam mains. It is located close to a railroad siding, so as to admit of the greatest facility in the receipt of fuel. The engine room proper measures 138 ft. 4 ins. × 100 ft., and will contain two engines with cylinders 42 × 48 ins., operating under 100 lbs. steam pressure, and running at fifty-five revolutions per minute. One of these is directly connected with each end of a shaft seventy-seven feet six inches long, extending entirely across the engine room, and divided into sections, connected by plate couplings. Small auxiliary engines are provided for turning the shaft for inspection purposes, etc., without the necessity of operating the larger engine. The steam pipe system in the engine room is also duplicate throughout.

The engines are so arranged that either can operate either set of driving drums of the duplex cable system used. Upon the main shaft are mounted four driving

drums, fourteen feet in diameter, each of which is connected to the driven drum on the cable shafts, each twenty-five feet in diameter. The rope drive is used. The cable drivers are fourteen feet in diameter each, and are provided with Walker differential rings. The cable will be operated at a speed of fifteen miles per hour. The tension run has a length of 149 ft., and the course of the ropes is clearly shown in the elevation of the station (Fig. 2).

The main guide sheaves are located below a completed section of the tunnel, and as the conditions for driving foundations at this point are not good, shallow foundations were adopted, the sheave brackets being spread over a large area.

The new cables will arrive at the railway siding, located in the rear of the power room, and will be carried coiled in long loops on several platform cars. The end of the cable will then be taken up over a sheave high above the middle car, thence on over the roof of the boiler house, and down through the roof of the power house, onto the cable storage drums. From these the new cables are to be led overhead on the guide sheaves carried by the middle roof columns onto the tension tracks and spliced to the old cable. The tail of the old cable will be brought down over the second cable driving drums back through the foundation below the floor, and out through the wall of the power house to a drum for old cables, which will probably be placed under the water tanks just south of the chimney shaft.

The cars to be used in the subway will have double trucks, and will be fifty feet in length, each car being provided with a grip. The estimated weight of the trains when loaded is twenty tons each. The greatest possible number of trains which can be put on the lines would be thirty, fifteen on each track. A universal fare of one penny for second class, and two pence for first class, regardless of distance, will be made, and the cars and stations will be lighted by electricity. The tunnel will not be lighted except by the headlights.

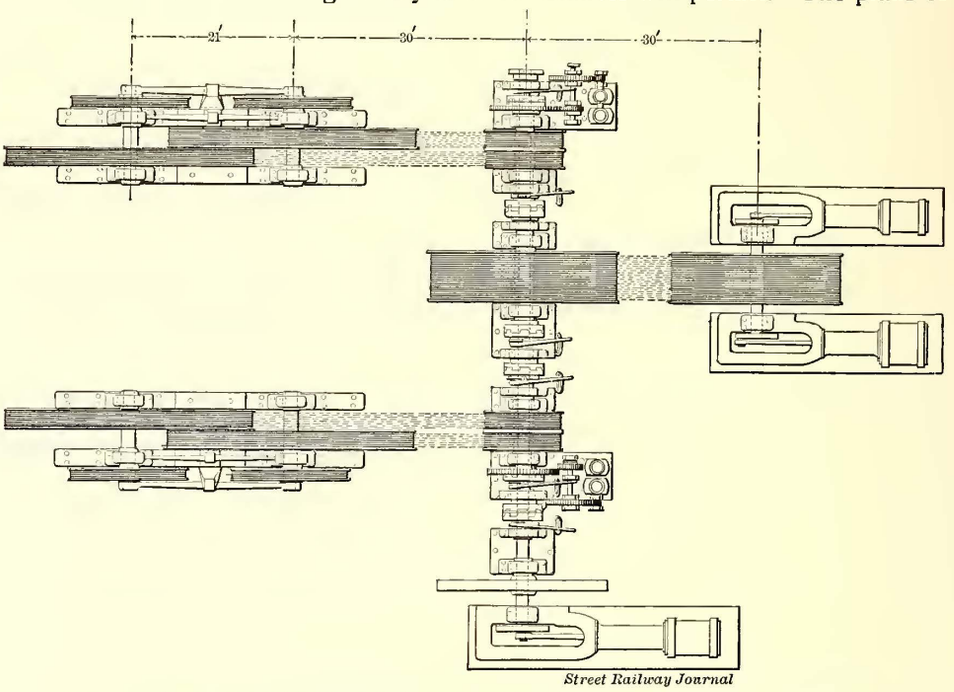


FIG. 1.—PLAN OF MACHINERY—LEXINGTON AVENUE CABLE POWER STATION, NEW YORK CITY.

Electric Railways in Europe.

A European electrical journal states that the total number of electric railways in Europe on January 1, 1894, was 43, with a total estimated mileage of 185, and total power station capacity of 10,650 K. W. The aggregate number of motor cars was 538. Germany stands first, with 61 miles in operation; England second, with 43, and France next, with 25. The other countries are credited as follows: Austria-Hungary, 19 miles; Switzerland, 13 miles; Spain, 8 miles; Italy, 7 miles; Russia and Belgium, each 2 miles.

The Lexington Avenue Cable Power Station of the Metropolitan Traction Company.

The work of introducing a substitute for animal power upon its various lines in New York City is being prosecuted by the Metropolitan Street Railway Company as vigorously as circumstances will permit. The plans of the company to install an underground electric system on one of its uptown lines have already been published in these columns. While awaiting the results of this trial the company is completing its projected cable railways on Columbus and Lexington Avenues.

The Lexington Avenue railway will be operated from a power station 130 ft. east of Lexington Avenue, and extending from 25th Street to 26th Street. This part of the city is devoted to residences, and owing to the high value of real estate, the cable machinery will all be located in the basement of the building. The floor of the engine room will be seventeen feet below the street, and its height will be forty-one feet in the clear. An apartment house similar to those in the neighborhood will be erected over the machinery, and upon separate foundations, as in the Houston Street station of the Broadway railway, so that the vibrations of the machinery will not be communicated to the rest of the building.

The plan adopted for the arrangement of the machinery to be installed at present is shown in Fig 1. A longitudinal section of the station looking west is given in Fig. 2. The outside dimensions of the building are 188 ft. on 25th Street, and 179 ft. on 26th Street by 197 ft. 6 ins. in length, giving a seven foot passageway from 26th Street on the west side.

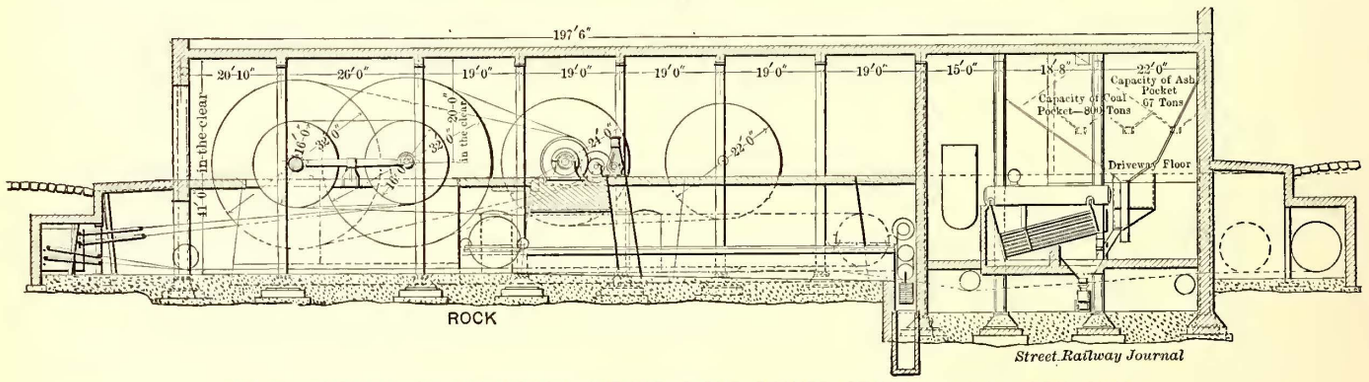


FIG. 2.—SECTION OF LEXINGTON AVENUE CABLE POWER STATION—NEW YORK CITY.

The station is constructed throughout so as to be readily converted into an electric power plant should future developments be such as to make such a change desirable, and it is designed for an ultimate capacity of four sets of duplex cable apparatus, or four sets of electric generators and engines.

As shown in Fig. 1, the present cable driving engines are two in number. One is a cross compound Allis engine with cylinders 30½ and 48 ins. × 48 ins. stroke, and operates at seventy-five revolutions per minute, a twenty-two foot driving drum which is connected to a similar drum on the jackshaft by twenty-two two and a quarter inch cotton ropes. The second engine, which is located at the end of the jackshaft, is a single expansion Allis engine with cylinder dimensions 30×60 ins. The flywheel of this engine is twenty-two feet in diameter.

The jackshaft is eighteen inches in diameter in the journals and twenty-one inches in the swell. In its present length of seventy-two feet, it is divided into seven sections connected by plate couplings sixty inches in diameter. Two sets of upright auxiliary engines are installed for turning the jackshaft slowly for inspection or other purposes, without employing the larger engines. The driving drums on the jackshaft are ten feet in diameter, and two in number. Each has twice the face of each of the thirty-two foot drums on the cable driver shafts, to which it is connected by nine two and a quarter inch cotton ropes.

The cable drivers are sixteen feet in diameter, and are provided with equalizing struts as in the other stations of the Traction Company. They are of the solid type and designed to operate the cable at a speed of from eleven to twelve miles per hour. The arrangement of the pit sheaves as well as of the tension run is shown in the longitudinal section. The Pennsylvania Iron Works Company was awarded the contract for all of the cable machinery employed as well as for its erection. This company was also awarded the contract for all sheaves, movable iron, etc., employed in the conduit construction.

The steam generating equipment is located at the 26th Street end of the building, and consists at present of two batteries each containing two Babcock & Wilcox boilers. The station will also contain, besides other station equipment, a 500 light, incandescent dynamo with switchboard and other appliances.

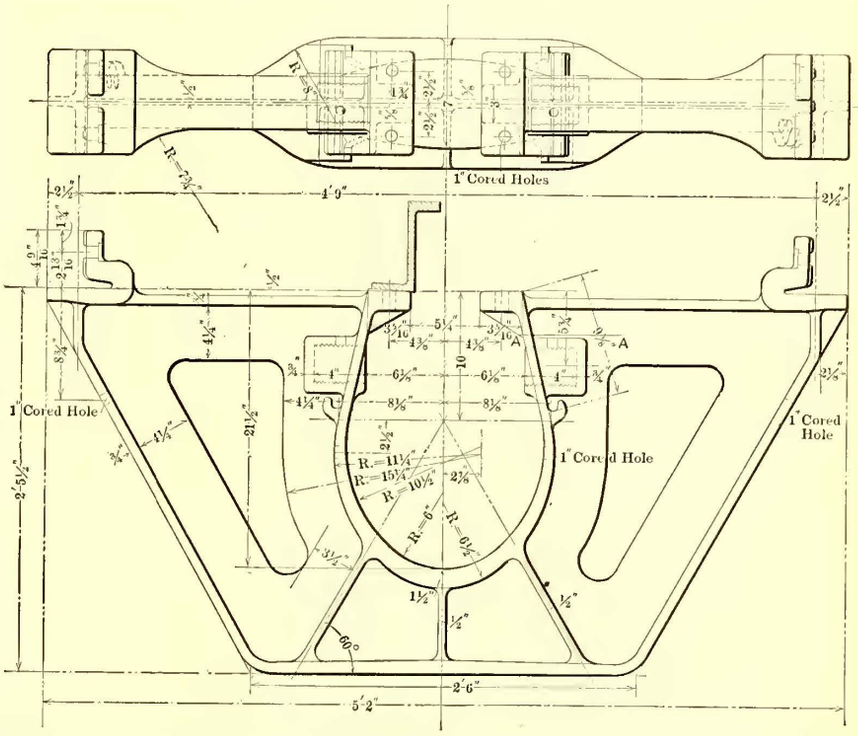


FIG. 3.—ELEVATION AND SECTION OF STANDARD YOKE FOR ELECTRIC OR CABLE CONDUIT CONSTRUCTION—METROPOLITAN TRACTION CO.

FIG. 4.—VIEW OF CABLE CONDUIT CONSTRUCTION ON LEXINGTON AVENUE LOOKING NORTH FROM 76TH STREET—NEW YORK CITY.

In the track construction, the contract for which was awarded to John D. Crimmins, a yoke is being used which is similar to that employed on the Columbus Avenue construction, except that it is so arranged that the conduit can be changed over to adapt it for electrical operation if desired. We present in Fig. 3 elevation and plan of this yoke, the pockets for the electrical insulators being clearly shown.

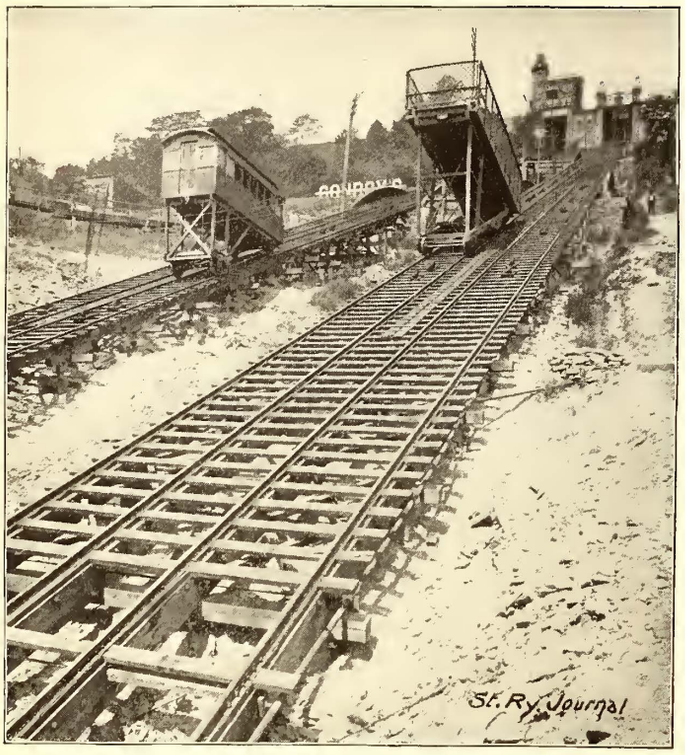
A portion of the work under construction is shown in Fig. 4, which presents a view on Lexington Avenue looking north from 76th Street. An enterance to the crossover vault at this point is shown at the lower right hand corner of the engraving.

Gas Lights in Electric Cars.

A contract has just been closed with the Columbus Central Railway Company, of Columbus, O., for the construction of a Pintsch works, and the company will proceed with the equipment of its street cars for this illumination. This road is an electric line, and the installation will be particularly interesting as being the first in which gas has been employed on electric cars. The decision to use Pintch gas was made on account of its economy, as well as its being a more steady and reliable illumination.

Price Hill Inclined Plane Railway of Cincinnati.

The operation of inclined planes forms a very important part of the street railway system of Cincinnati. The business portion of the city is located on a plateau



PRICE HILL INCLINED PLANE RAILWAY—CINCINNATI.

which rises abruptly from the river to an average elevation of about seventy-five feet, and which is backed by an irregular line of bluffs, having an average altitude of from 300 to 350 ft. above the river, over and beyond which the city has already spread.

The principal hills are named, respectively, Price Hill, Mt. Adams and Walnut Hills. Walnut Hills is on the north, and extends almost to the bank of the river. The heights are all reached by inclined planes, cable roads and, in some instances, by the electric lines, so that the rapid transit facilities of the city embrace almost every known method of traction, including horse car lines, cable and electric roads, inclined planes and one dummy line. There are four inclined planes, on three of which the electric cars are transferred from one level to the other and continue their course. The planes are provided with triangular shaped trucks, with platforms on the level, so that the electric cars are readily run on or off at the terminals. All the inclines are provided with the latest types of safety devices, and are operated in a very safe and satisfactory manner.

The Price Hill incline is designed for both passenger and freight traffic. The two lines are located near to each other, but are operated from separate stations. The passenger traffic is transferred from the street cars to the cab of the incline, and at the top of the hill a second transfer is made to connect with the lines on the upper plane. The freight section is designed for vehicle traffic, and the cars are capable of taking three or four heavily loaded wagons with teams at a trip. This is the only one of the Cincinnati inclines that has not been before described in these columns. The tracks are 800 ft. in length, and are laid on an average of 44.6 per cent., making a total rise of 350 ft. During the morning and evening hours, or when traffic is heavy, trips are made every three minutes. The incline carried about 1,000,000 passengers in 1893. The fare is five cents, except where the trip is to be continued, when five cents includes the street car fare into the city. On the other line the round trip for ordinary vehicles is twenty-five cents, and for heavily loaded trucks eighty-five cents.

The freight incline is operated by a 200 H. P., poppet valve, duplicate engine, manufactured by Frisbie of Cincinnati. The winding drums are thirteen feet in diameter. The passenger engines are 100 H. P., manufactured by John Cooper & Company, Mt. Vernon, O. They have been in service since 1875, and are still in good condition. The power station is located at the top of the incline, and adjoining it is a park and summer garden, well shaded and provided with rustic seats and with a railing along the edge of the bluff. From this location one of the most interesting views is had of the city and surroundings. All the bridges which cross the river, also Covington and Newport, are embraced in the outlook.

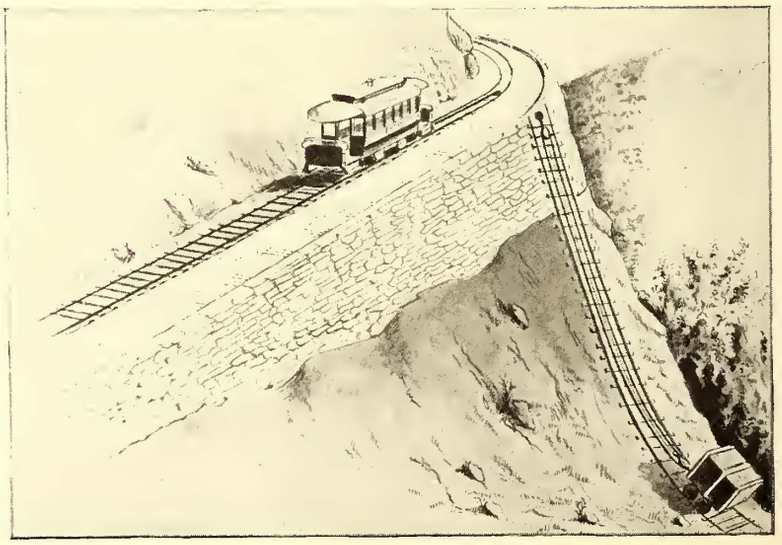
The inclines are operated under the management of Messrs. McDuffie Brothers.

Climbing Grades at Easton, Pa.

Easton, Pa., which lies at the entrance of the beautiful Lehigh Valley, is situated upon a high bluff located between the Delaware and Lehigh Rivers. The lines of the railway company, in consequence, lie nearly all on heavy grades, and special provisions have to be taken to control the cars at these points.

The Easton Transit Company now operates all the lines in the city. This company is a consolidation of the Pennsylvania Motor Company, the Easton & Bethlehem Transit Company, the Easton Transit Company, and the Phillipsburg Street Railway Company. Power is taken from the station of the local Edison Illuminating Company at the corner of Washington and 16th Streets. The company has forty motor cars, all from the works of the J. G. Brill Company, and about twenty miles of track.

All of the cars are equipped with a double set of brakes operated by two brake levers, one lever setting the four inside shoes, and the other the four outside shoes. The cars are all provided with extra long platforms, and contain a special compartment for the motorman, so that he may be unimpeded in controlling the car and operating the brake levers. The closed cars are equipped with Brill sand boxes, and seashore sand is used. The company is employing a cast iron brake shoe with



BALANCE WEIGHT SYSTEM FORMERLY USED FOR CLIMBING GRADES AT EASTON, PA.

wrought iron plugs. Westinghouse motors are used throughout.

An interesting experiment with a balance weight system for electric cars was made on the College Hill branch of this road. The system was abandoned some time ago, as in the company's opinion no particular benefit was obtained from its use. The apparatus, however, is still in place, and is the only example of its kind, so far as we know, outside of the somewhat similar system at Portland, Ore., and described in our issue for May, 1893. The

engraving on this page will give a very good idea of the arrangement of the balance weight.

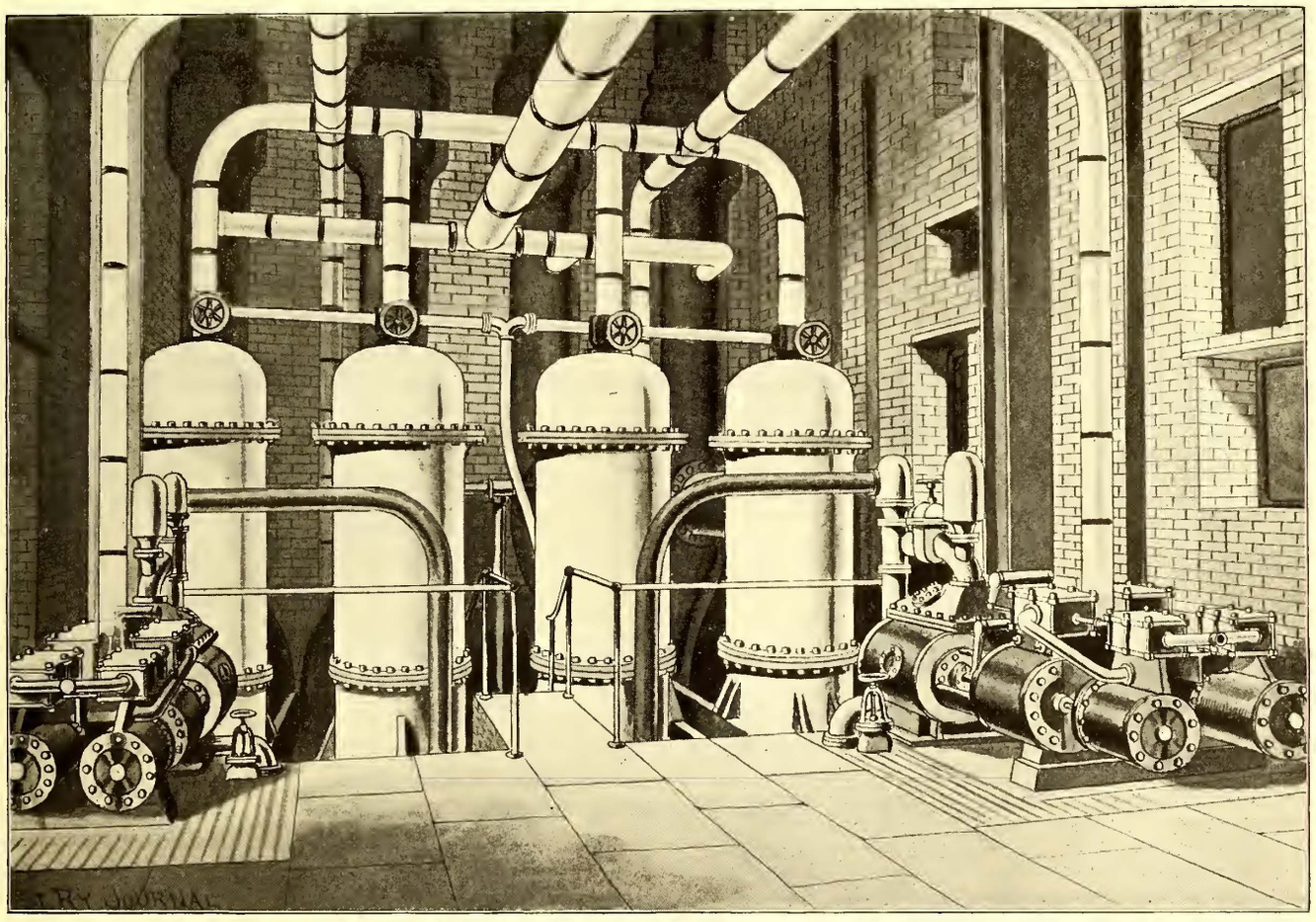
The grade operated is a continuous one of about 9 per cent. for a distance of about 1,500 ft., and the tracks are laid at the outside of the highway along the side of a steep hill. From the top of the grade the hill slopes to the base at an angle of about 60 degs., and on this incline a narrow gauge track was laid at right angles to the direction of the track. This track extends from the roadway to the base of the hill, a distance of about 120 ft. A four wheel truck, heavily loaded with pig iron, traveled up and down this track. This truck was attached to the cars by means of a steel cable which was carried around a block with several sheaves located at the top of the incline, and also on the balance weight car, so as to multiply the travel of the cable. From the counterweight the cable was carried through a conduit underneath the roadway and up between the two tracks, passing round a fixed sheave to change the direction of the motion. It terminated in a forged eye, to which was attached a few links of chain. Bolted to the ties was an anchor bar provided with a hole, through which the cable passed freely. When not attached to the car, the cable eye was drawn against the anchor bar by the counterweight. At the lower end of the grade was located another anchorage, to which was attached a short length of chain.

The operation of the weight was then as follows: The first car passing down the grade stopped at the top long enough for the conductor to attach the cable to the rear drawbar of the car. The weight of the counterbalance was such that it would be overbalanced by that of the car, and the latter would then pass down the grade at a moderate speed, without the use of a brake. At the foot of the hill the car was brought to a standstill, and the conductor fastened the stationary chain to the cable eye. The car was then backed up sufficiently to take the strain off the cable which was then unhooked, leaving the car to pass on its journey. The reverse of this action took place when another car reached the foot of the grade to make the ascent. Of course, the cars were obliged to run alternately in opposite directions, and some current was required to propel the cars up the grade, but not so much as if there had been no weight to assist the motors.

As the line was perfectly straight on the grade, no curve sheaves were necessary, supporting sheaves under the center of the track alone being required, and as the track was laid at the side of the highway, the operation of the cable did not interfere with the ordinary vehicular traffic on the highway. To show more clearly the arrangement used, the poles and overhead wires are omitted in the engraving.

A Large Heater Equipment.

A description of the new power station of the Philadelphia Traction Company, on Market Street near 33d Street, was published in our June issue. Reference was made to the heater equipment of the station, which will consist of four Goubert heaters. We present on this page an engraving showing the arrangement of the heaters, two of which are now in place, and two of which it is proposed to install later. The heaters are designed for high pressure, and are of 2,000 H. P. capacity each. Heaters of the same make are now in use in the power station of the Philadelphia Traction Company at the corner of 13th and Mount Vernon Streets, and have given excellent satisfaction.



VIEW OF FEEDWATER HEATERS AND PUMPS AT POWER STATION OF THE PHILADELPHIA TRACTION CO., ON MARKET STREET, NEAR 33D STREET, PHILADELPHIA.

The arrangement of heaters in the station under discussion is rather a novel one. The boilers are located in two rows, a space being left in the middle of the row for the heaters and pumps. The former will be placed in pits.

THE Market Street Railway Company, of San Francisco, expects to start its Mission Street line by electric power on September 1.

The Electric Plant of the New Haven Street Railway Company.

The New Haven Street Railway Company, which was the second in that city to commence operation electrically, is a recent corporation, consolidating the State Street Horse Railway, the Whitney Avenue Railway and the New Haven and the Morris Cove Railway. The Lake Saltonstall Railway has also just been made part of this company's system which now comprises twenty-three miles of completed track. The lines of the company lie largely within the city limits, and upon well populated streets, the terminus of the road being at the business center of the city, the Green. They are admirably located for traffic, serving exclusively the well known East Rock Park, Fort Hale Park, the old and new Government Lighthouses and Lighthouse Point, the suburban village of Morris Cove, Whitney Lake, etc.

The Lake Saltonstall line, which is the latest to be equipped, serves directly the suburban village of East Haven, and, in connection with a stage line, the village of Brandford which contained in 1890 a population of 4,600 A large summer population at Short Beach, Double Beach, Brandford Point, etc., also reaches the cars regularly by stage lines. As the towns of Brandford and East Haven have an aggregate all-the-year population of 8,000 or 9,000, and as this is practically doubled during the summer, it will be seen that this branch will do an exceptionally good out-of-town business.

The company is planning a number of very important extensions within the city, and by the end of the year will have from thirty-five to forty miles of track in operation.

The power station of this company is especially interesting, as it employs the rope drive method of operating the generators, being, we believe, the only example of an electric railway station east of Chicago using this method of transmitting power.

The plant was contracted for and furnished by the New England Engineering Company, and was personally supervised by the Hoadley Brothers, of Chicago, who were the engineers for the 52d Street power station of the Chicago City Railway Company, described elsewhere in this issue, and other stations. As will be seen by a comparison of the two plants, the method of drive is similar in many respects. The sectional view of the plant on the opposite page shows clearly the method in use at New Haven.

The power station, with the car house of the company, is located on the Quinnipiac River, and by means of a pier which has been built in the river, can receive its fuel directly from barges. A special form of foundation was required on account of the nature of the land on which the power house was erected. First, nearly 4,000 piles were driven, and upon these were placed heavy timbers, covered with three inch planking. This part of the foundation is so low that it is covered by water at high tide. Upon this, concrete foundations for the building, and piers for the engines and generators were built.

The car house and power station adjoin each other, and measure 80 × 250 ft. They are of brick, with an iron girder roof supplied by the Berlin Iron Bridge Company, of East Berlin, Conn. The car house is provided with an extensive repair shop, storage for over thirty cars, inspection pits, etc. The company has also other car houses at other points within the city.

The engine room is designed for a capacity of 2,300 H. P., consisting of two 650 H. P. and one 1,000 H. P., cross compound engines and three pairs of generators. The present installation is the two smaller units and two pairs of M. P., 200 General Electric generators.

The engines are of the improved Greene type with cylinder dimensions sixteen and thirty-six inches by forty-eight inches stroke. They are intended to run at 110 revolutions per minute, and at this speed will develop the full capacity under 130 lbs. steam pressure. They are fitted with E. K. Hill's valve gear, and assume somewhat the form of the well known Wheelock type, but several new features in the valve gear have been introduced by the builders, and it is said they are competent to regulate within one revolution when operating from zero load to the maximum power of the engine. They are able to take steam the full length of the stroke less the lap of the valve, which allows a minimum diameter of cylinder, thereby securing the greatest economy.

The flywheel, which was supplied by the Dodge Manufacturing Company, of Mishawaka, Wis., is nine feet in diameter, and is built in halves with two sets of arms and an iron sectional ring bolted together and lagged with well seasoned maple. It is grooved for twelve one and one eighth inch cotton ropes, the ropes of W. E. Hooper & Son, of Baltimore, Md., being used.

The course of the rope, commencing at the top of the flywheel on the side nearest the observer, is first around the generator pulley, over the idler, around the generator pulley again and then back around the flywheel, then from the generator pulley alternately around the flywheel and the idler, twelve times. From the last wrap on the flywheel it passes around the generator pulley, and then is carried through the floor around the lower deflection pulley mounted on timbers between the foundation piers, then around the sheave on the tension carriage, back under the upper deflection pulley to the first groove of

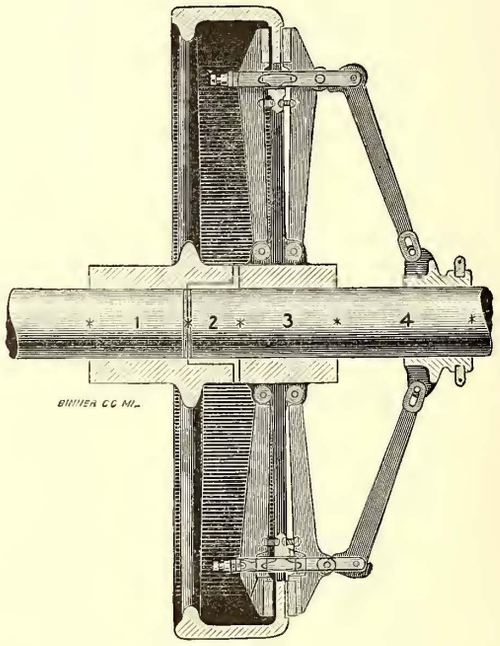


FIG 1.—GENERATOR FRICTION CLUTCH—NEW HAVEN STREET RAILWAY CO.

the idler. As will be seen, there are twice as many wraps around the generator pulley as around the flywheel, equalizing to a certain degree the difference in surface of contact which would otherwise exist between the two. The diameters of the sheaves and pulleys are as follows: the generator pulley is fifty-nine inches, the sheave on the tension carriage sixty-six inches, the idler pulley and the two deflecting sheaves, sixty inches each.

Connection between the generator pulley and generators is made by Filer & Stowell friction clutches. A section of the clutch which is giving good satisfaction is shown in Fig. 1. The friction surface is on the inwardly entending flange of a spoked wheel. Against this is made to bear the double set of friction arms, one set being pressed against the outside of the flange, the other being drawn against the inside of the flange upon the operation of the clutch.

The boiler room is designed for a capacity of 2,000 H. P., using four batteries of boilers, of 500 H. P. each. The boilers installed are of the Scotch compound tubular and other types, and were supplied by the Bigelow Company, of New Haven, Conn. The boilers belong to the progressive heating class, the first mentioned type containing really three boilers, through which the water passes while being converted to steam. One complete boiler comprises one shell, 60 ins. 6 ft., with ninety-six three inch tubes, sixteen feet long; above this is another shell 60 ins.

× 11 ft., having 114 three inch tubes eleven feet long, and above this is a steam superheater which is 60 ins. × 5 ft., and which contains 112 three inch tubes five feet long. The heat traverses the under surface of the larger shell, thence through the sixteen foot tubes to the upper water compartment. It passes through the tubes of this compartment and thence through the five foot tubes to the stack. The special claims made for these boilers are economy of fuel, dry steam and safety. The last boiler equipments has been of the ordinary return tubular type.

The operation of the plant has been carefully watched by electrical and mechanical engineers, owing to the novel features in use, especially that of rope driving for this class of work. The results have been very satisfactory both on account of the flexibility of the connection and the economy secured. During a test of the plant recently concluded and extending over a period of thirty days, an average of 4.1 tons of coal was used per day of eighteen hours, including the amount required in banking the fires at night. The number of cars run during this time was at no time less than sixteen, and on Saturdays, Sundays and holidays as many as twenty-six cars were run. As the period included July 4 and first ten days in July, the traffic was exceptionally large.

The roadbed is laid with fifty, fifty-six and seventy pound rails, and the cars are mostly from the works of J. M. Jones' Sons, of West Troy, N. Y., some of the Newburyport Car Manufacturing Company's cars being also used.

The officers of the company are: President, D. Correy; vice-president, C. A. Warren; secretary and treasurer, G. A. W. Dodge. Some of the officers and directors have been connected with it or its predecessors for over twenty years.

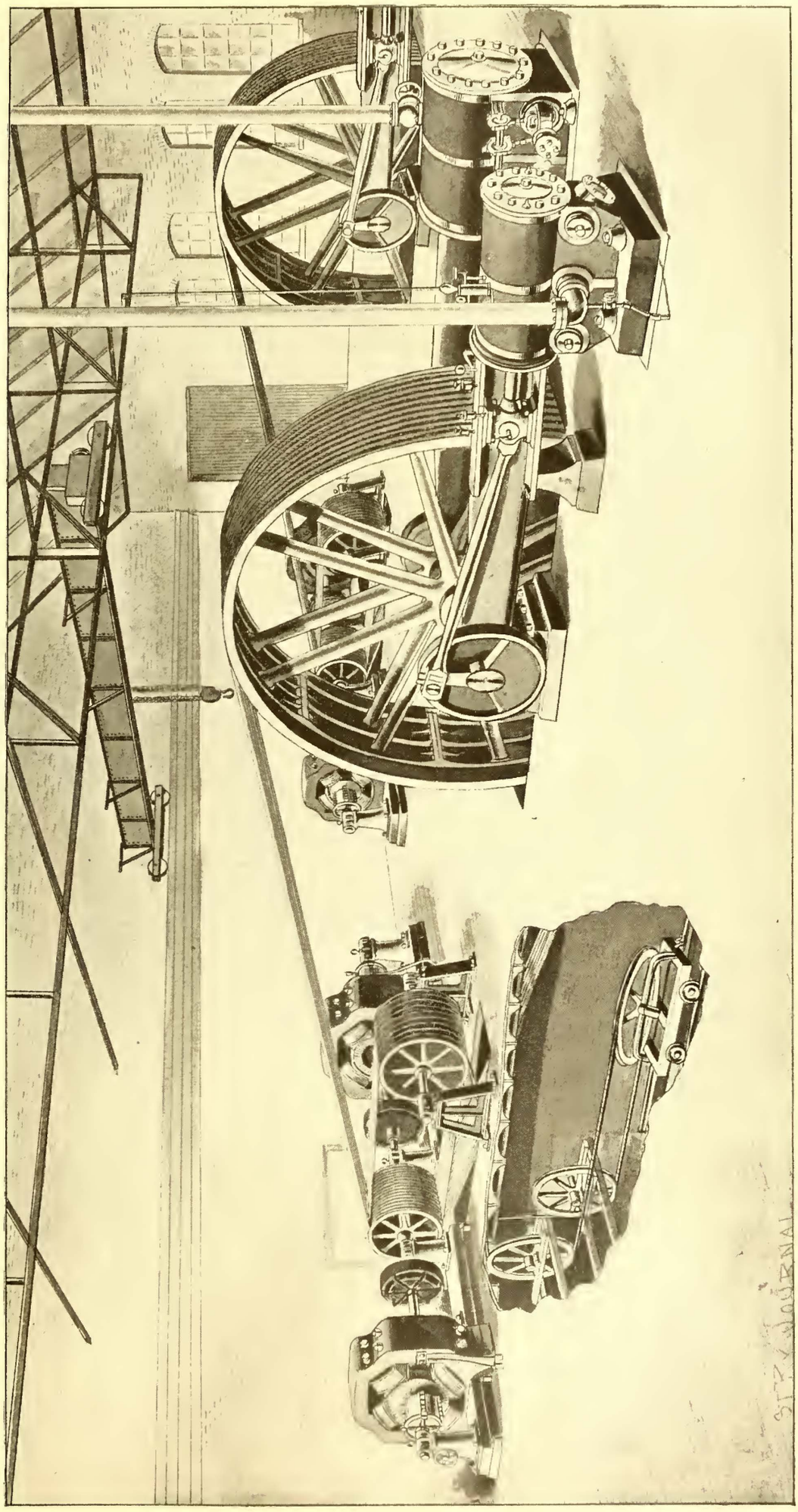


FIG. 2.—INTERIOR OF POWER STATION OF THE NEW HAVEN STREET RAILWAY CO., SHOWING METHOD OF ROPE DRIVING EMPLOYED.

The System of Cable Handling in Use by the Chicago City Railway Company.

By F. H. Fitch, C. E., Chicago City Ry. Co.

Not one person in fifty of the general public knows anything of the intricate working of the underground cable system. Most people see the gripman work his lever, but know nothing of the grip itself which is hidden underneath the car and in the tunnel. It is a daily occurrence, when a grip is exposed, to hear exclamations of surprise at its size, some people evidently expecting to see a machine about the size of a large man's hand.

But less still is known of the work done behind the scenes, of the anxiety of the chief engineer as he watches over a well worn and dangerous cable as a cat watches a mouse, of the nightly inspection for a single loose or broken wire, of the rapid yet systematic work of replacing an old by a new cable, which is done in the four hours between one o'clock and five o'clock in the morning. The handling of a single long piece of cable is by no means an easy task; hence a description of the methods and means used is not without interest.

The two methods of handling cable are in bights and reels. The former consists in coiling the cable upon the car or upon a floor, and its advantages are that the weight, while upon a car, can be more equally distributed, and in coiling, it is done with greater ease, since only a small portion of the cable is handled at a time. The other method, however, that of reeling the cable upon spools, possesses many advantages over the method of bighting, and if the proper appliances are arranged, reduces to a minimum the difficulties. Among the advantages of the reel system are compactness, less liability of the cable kinking as it passes into the street, and economy. The manner in which the difficulties of the reel system, the excessive weight and clumsiness, are overcome are best illustrated by a reference to, and description of the system used by the Chicago City Railway Company. Robt. J. Hill, chief engineer, is outspoken in favor of the reel system, and finds that he can reel all his cables, both old and new, to the best advantage, and with the least expense.

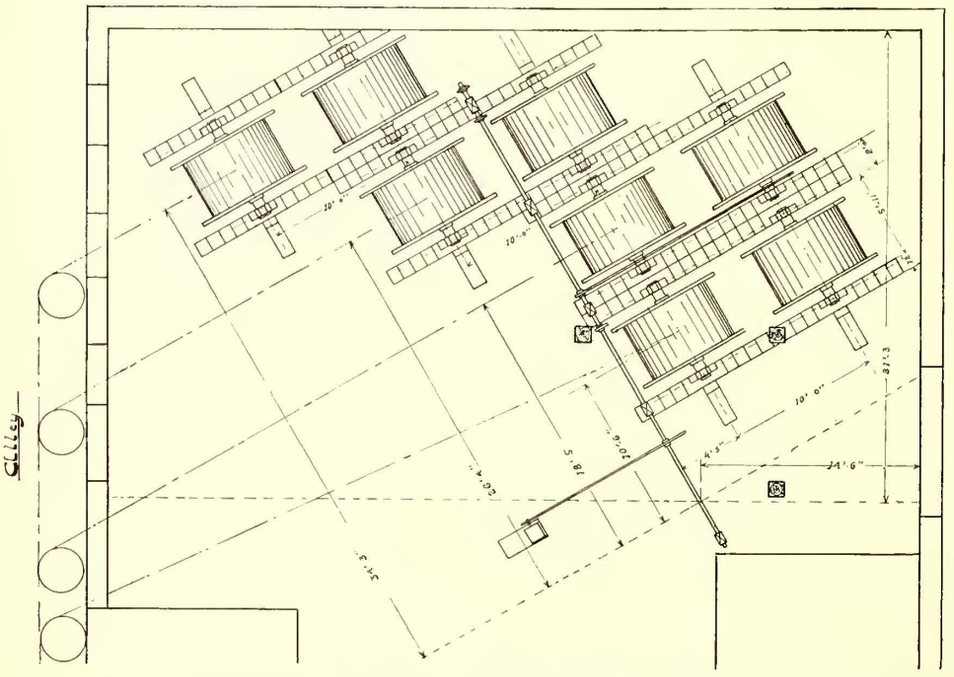


FIG. 1.—PLAN OF CABLE SPOOL ROOM—CHICAGO CITY RAILWAY CO.

There are in use on the lines of the Chicago City Railway Company ten cables, having a total length of 203,751 ft., and a total weight, when new, of 300 tons. It is necessary to handle every foot of this cable four times: From the cars to the place from which the cables are put into service; from this place into service; removing from service; and lastly, the final disposition to the junk dealers.

The average length of the cables used is about 20,000 ft., weighing thirty tons. To facilitate handling, as well as to distribute the weight upon the car on which it is shipped, the cable comes in two pieces, and each piece is reeled on two spools, making four spools in all, weighing about seven and one half tons each. One of the two spools upon which are reeled a half length of cable is just large enough for a quarter length, the other being capable of holding the full half length. From the cars to the power station each spool is placed on a separate truck, the intermediate length of cable, about 200 ft., being carried by men walking between the two wagons.

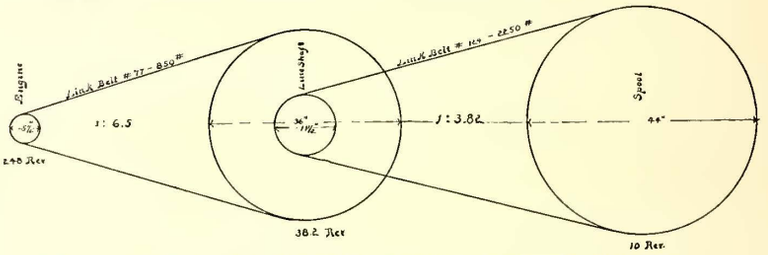


FIG. 2.—SECTION OF PULLEYS—SPOOL ROOM OF CHICAGO CITY RAILWAY CO.

The place in which the cables are mounted ready to be put into service, called the spool room, is shown in Fig. 1, which is a plan of the spool room at the 21st and State Streets power station. Four of the ten cables in use are here reeled and kept in readiness to replace a wornout predecessor. The manner of working is as follows: The larger of the two spools, upon which are wound one half of an entire cable, is mounted upon a six inch square shaft, the turned ends resting in the permanent bearings shown in the cut. The smaller spool is now mounted into temporary bearings, and its cable reeled off upon the larger spool previously mounted. It will be observed that to do this the two free ends of the cable are necessarily buried or next the spool cores.

The reeling from the smaller to the larger spool was formerly done by hand, twelve men being required to turn the larger spool near the finish, and even then it was slow work, one whole day being consumed for each half length of cable or actually reeling only 5,000 ft. By the present system the reeling is done by link belt from a line shaft, which is driven by a six horse power engine, which will be spoken of again. It may be well to give a few details of this work and the difficulties encountered, as a great deal in it was found to be experimental.

It is a very essential feature in reeling a cable to be careful in hammering it snugly and tightly into place. To accomplish this, the cable must wind at a uniform speed, which implies that the spool must turn fewer revolutions per minute as the coil becomes larger. This is done by reducing the speed of the engine. With a power arm of twenty-two inches, it is found that a spool holding 10,000 ft. of cable requires 2,250 lbs. stress to turn it. To hammer the cable well into place the spool should turn about ten revolutions per minute at the core and about four revolutions at the finish. Considering these points and that the engine used has a maximum speed of 250 revolutions per minute, the proportion of pulleys and number of link belt used are as shown in Fig. 2. The forty-four inch pulley attached to the spool shaft is a split pulley, and is moved from one shaft to another as required.

The engine used is perhaps the most interesting feature of all, and is shown in Fig. 3. It combines the features of a cable winding engine and a cable cutter, and was designed and constructed by E. A. Hovey, master mechanic of the company. The cutting machine and

engine are mounted upon a single pedestal, and the whole weighs 4,000 lbs. It is with ease taken from one power station to another, where it performs the double function of cable winding engine and cable cutter. The engine is a Westinghouse type, six horse power, having two cylinders. The growing tendency of junk dealers all over the country to refuse to handle old cable in a single piece, throws upon cable railway companies the necessity of cutting up their old cables into short lengths. However, even when the old cables may be marketed in one piece, it is found more profitable to cut them up, for a cable in ten foot lengths brings from $1.00 to $1.50 more per ton than a single piece cable. The Chicago City Railway Company, with its improved cutter, finds that the cost

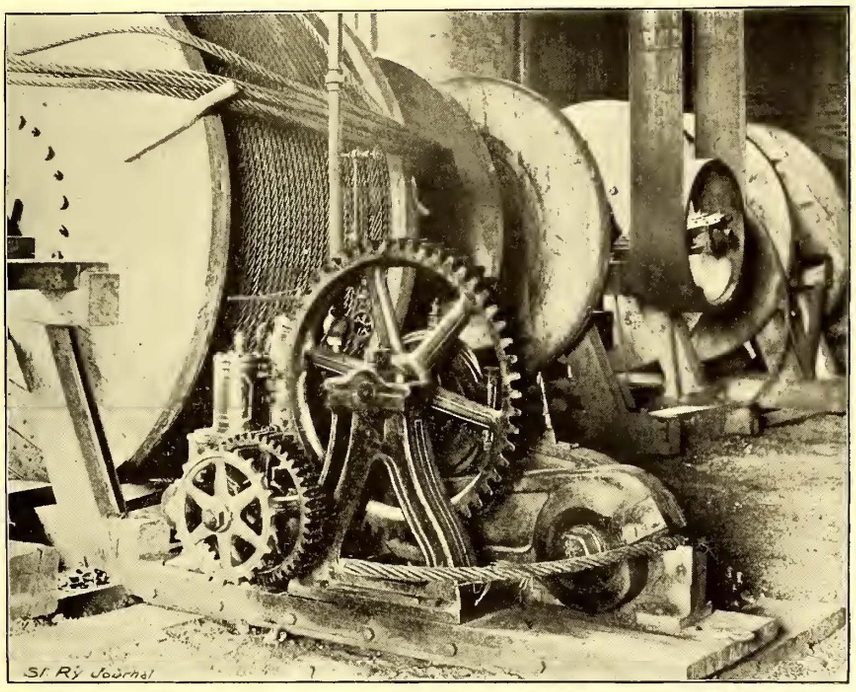


FIG. 3.—CABLE CUTTER AND WINDING ENGINE—CHICAGO CITY RAILWAY CO.

per ton of cutting up old cable is from forty-five cents to fifty cents per ton, so that in a very short space of time the machine will pay for itself.

Coal Consumption on the Chicago City Railway.

We present below some interesting data in detail upon the consumption and cost of coal per ton mile on the Chicago City Railway electric system for a period of three months ending November 30, 1893.

The total coal consumption was 3,185 tons or 6,370,000 lbs. at a total cost of $5,000.43. The total number of car miles run was 732,550.

The proportion of work performed by single motor cars was one-fifth, each weighing with load 17,005 lbs. The proportion of work performed by double motor cars was two-fifths, each weighing with load 39,940 lbs., and the proportion of work performed by box trailer was two-fifths, each weighing with load 23,048 lbs.

The average load of a car with passengers was therefore 17,005+39,940+23,048=79,993 lbs.; divided by 5 or 15,998 6 lbs., equal to 7.99 tons of 2,000 lbs. each.

The number of car miles (732,550), multiplied by 7.99 (the load in tons), equals 5,853,074.5 ton miles. The pounds of coal used (6,370,000), divided by the ton miles (5,853,074.5), equals 1.08 lbs. of coal per ton mile.

The cost of coal ($5,000.43), divided by pounds of coal (6,370,000) gives .000784 cent, the cost of one pound of coal. The pounds of coal per ton mile (1.08) multiplied by the cost of one pound of coal, .000784 cent, gives .000 846 cent, or the cost of coal per ton mile.

THE Philadelphia, Cheltenham & Willow Grove Electric Railway Company is the the title of a new company, which will build a line from Rising Sun to Jenkintown.

Practical Notes on Rope Driving—Part III.

BY M. E.

Weight and Speed of Ropes—Centrifugal Tension.—The weight of the rope employed for power transmission indirectly exercises an important influence upon the efficiency of the system at high speeds, owing to the centrifugal tension developed. Until within the last few years, this important effect has generally been ignored in planning rope transmissions, and, in some cases, with unfortunate results as to durability. It is not a little strange that the consideration which imposes a limit to the speed of rope wheels and belt pulleys, should have been totally ignored in the case of the ropes or belts which run upon them, and which, while so doing, are subjected to precisely similar influences.

The tension induced in a rope or belt running at a lineal speed of v feet per minute is

$$\frac{w\ v^2}{115200} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

w being the weight of one foot length of rope. This tension is quite additional to that which the transmission of power involves, and as it increases as the *square* of the velocity, it is easily seen that it will become a potent factor at high speeds. If, as hitherto assumed, we allow a given maximum working tension for a rope of given diameter, it will be evident that at high speeds the power transmitting capabilities of the rope will be much less than it might otherwise be considered, by reason of the need for correspondingly diminishing the "power" tension as the centrifugal tension increases. An example will better elucidate this point:

The weight of one foot length of well made manilla rope, one inch in diameter, is .32 lbs., and, at a velocity of 1,000 ft. per minute, the centrifugal tension would be $\frac{.32\times 1{,}000{,}000}{115200}=2.77$ lbs. If we allow a maximum working tension on this rope of, say, 160 lbs., the centrifugal tension represents less than 2 per cent. of the allowable tension, and its influence may therefore be disregarded. But at a speed of 6,600 ft. per minute, the centrifugal tension is $2.77 \times (6.6)^2=120$ lbs.; so that at this speed, 75 per cent. of the available tension is neutralized by the effect of centrifugal force, and if the maximum tension of 160 lbs. is, as assumed, not to be exceeded, the power transmitted, instead of being 6.6 times as great as that transmitted at 1,000 ft., will only be about $\frac{6.6}{4}=1.65$ times that amount, thus showing the enormous loss of efficiency at high speeds.

The weight of the rope, although of much less *direct* importance in this connection than the speed, is nevertheless not to be left out of consideration, for from (3) it is seen that any reduction in the weight of the rope, while maintaining the same strength, would diminish the loss due to centrifugal tension in direct proportion. The actual weights of ropes differ somewhat, according to the construction adopted and material used, but for good

TABLE IV.

WEIGHT PER LINEAL FOOT OF TRANSMISSION ROPES.

Diam. in ins.	Weight in lbs.		Diam. in ins.	Weight in lbs.		Diam. in ins.	Weight in lbs.	
	Manilla	Cotton.		Manilla	Cotton.		Manilla	Cotton.
½	.08	.07	1	.32	.28	1½	.72	.66
⅝	.13	.11	1⅛	.40	.36	1⅝	.85	.74
¾	.18	.16	1¼	.50	.44	1¾	.98	.86
⅞	.24	.21	1⅜	.60	.56	2	1.28	1.12

manilla rope, the weight per foot may be taken at $0.32d^2$, d being the diameter in inches. As seen from Table IV, the weight of cotton rope is somewhat less, thus compensating for its slightly lower strength.

It will be understood from what has been said that it is important to fully appreciate the amount of centrifugal tension in a rope, in order to correctly estimate the amount of power it will transmit without exceeding the maximum working limit. Table V, which the writer has calculated for manilla rope of the weights given in Table IV, will be of service in this connection.

TABLE V.

CENTRIFUGAL TENSION IN MANILLA ROPES—POUNDS.

Velocity of Rope in ft. per min.	Nominal Diameter of Rope in Inches.											
	½	⅝	¾	⅞	1	1⅛	1¼	1⅜	1½	1⅝	1¾	2
1,000	0.7	1.1	1.5	2.1	2.7	3.4	4.3	5.1	6.2	7.2	8.3	11
1,500	1.5	2.4	3.4	4.7	6.2	7.6	9.7	11	13	16	18	25
2,000	2.7	4.3	6.1	8.2	11	13	17	20	24	28	33	44
2,500	4.3	6.7	9.6	13	17	21	27	32	38	45	52	69
3,000	6.2	9.7	13	18	24	30	39	45	55	64	74	100
3,500	8.4	13	19	25	34	42	53	63	75	89	102	136
4,000	11	17	24	33	44	54	69	82	98	116	133	177
4,500	14	22	31	42	55	69	87	103	125	146	168	223
5,000	17	27	39	52	69	86	109	129	156	183	210	275
5,500	21	33	47	63	83	104	132	156	189	221	254	332
6,000	24	39	56	75	99	125	157	188	225	257	303	396
6,500	39	45	65	88	116	145	183	217	261	307	353	462

As centrifugal tension is induced in both the tight and slack sides of the rope, it exercises a very complicated influence upon the rational determination of the horse power of ropes. The investigation becomes involved in the higher mathematics, and the resulting rules are too intricate and cumbersome to be of any practical utility. It becomes necessary, therefore, to employ some rule which, while taking full cognizance of the effect of centrifugal tension, will also be simple and easily applicable in practice. A good rule of this kind is

$$\text{H. P.} = \frac{(T_0 - C)\,V}{33000} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

in which H. P. is the horse power transmitted by one rope; V the velocity in feet per minute; T_0 the maximum working stress and C, the centrifugal tension, so that (T—C) is the *net* tension available for the transmission of power. We have previously taken the total maximum stress at $200d^2$ and if we allow 20 per cent. of this for slack side tension, we shall have $T_0 = 160\,d^2$, so that $\text{H. P.} = \frac{(160\,d^2 - C)\,V}{33{,}000}$. By this rule the writer has calculated Table VI, giving the horse power per rope transmitted at various speeds of from 2,000 to 6,500 ft. per minute. It will be seen from the table, that at a speed of about 4,400 ft. per minute, the power transmitted, under the conditions named, reaches its maximum. If T_0 is taken at a higher value or the weight of the rope reduced, for the same strength, the speed of the maximum efficiency will be higher than that given in the table and *vice versa*. As previously stated, this is not a mathematically correct method of taking centrifugal tension into account, but it is quite sufficiently accurate for all practical requirements. From the table it will be seen that at the lower speeds the power transmitted increases much more rapidly with an increase of speed than at the higher velocities. As the speed is increased beyond about 3,000 ft. per minute, however, the power transmitted increases much more slowly and between speeds of about 3,000 and 5,500 ft. per minute no great difference exists. At speeds above 5,500 ft. per minute, the power transmitted rapidly falls off, and at 6,500 ft. it is less than at 2,000 ft. under the particular conditions assumed.

Under these circumstances it will be apparent that the rope speed adopted may be varied within fairly wide limits to suit circumstances. The factors which usually decide the speed are the size of the rope, the number of

TABLE VI—HORSE POWER OF MANILLA ROPES.

Velocity of Rope. Feet per min.	Nominal Diameter of Rope in Inches.											
	½	⅝	¾	⅞	1	1⅛	1¼	1⅜	1½	1⅝	1¾	2
2,000	2.25	3.51	5.14	6.84	9.08	11.5	14.0	17.0	20.3	23.8	27.5	36.1
2,100	2.35	3.67	5.27	7.15	9.40	11.8	14.7	17.8	21.1	24.8	28.8	37.6
2,200	2.45	3.82	5.48	7.45	9.80	12.3	15.3	18.5	22.0	25.9	30.0	39.2
2,300	2.55	3.98	5.71	7.75	10.2	12.8	15.9	19.3	22.9	26.9	31.2	40.8
2,400	2.62	4.10	5.89	7.98	10.5	13.2	16.4	19.8	23.6	27.7	32.2	42.0
2,500	2.70	4.21	6.05	8.21	10.8	13.6	16.8	20.4	24.3	28.5	33.1	43.2
2,600	2.78	4.33	6.21	8.43	11.1	14.0	17.3	21.0	25.0	29.3	34.0	44.4
2,700	2.85	4.45	6.39	8.67	11.4	14.4	17.8	21.5	25.6	30.5	35.0	45.6
2,800	2.94	4.59	6.59	8.93	11.75	14.8	18.3	22.2	26.4	31.0	36.0	47.0
2,900	3.00	4.68	6.73	9.13	12.0	15.1	18.7	22.7	27.0	31.6	36.8	48.0
3,000	3.06	4.78	6.87	9.32	12.3	15.4	19.1	23.2	27.6	32.3	37.6	49.1
3,100	3.12	4.87	7.01	9.50	12.5	15.7	19.5	23.6	28.2	33.0	38.3	50.0
3,200	3.18	4.97	7.14	9.70	12.7	16.0	19.9	24.0	28.7	33.7	39.0	51.0
3,300	3.25	5.07	7.27	9.89	13.0	16.3	20.3	24.5	29.2	34.3	39.8	52.0
3,400	3.30	5.15	7.39	10.0	13.2	16.6	20.6	25.0	29.7	34.8	40.4	52.8
3,500	3.35	5.22	7.50	10.2	13.4	16.9	20.9	25.3	30.1	35.4	41.0	53.6
3,600	3.40	5.30	7.61	10.3	13.6	17.1	21.2	25.7	30.6	35.9	41.6	54.4
3,700	3.44	5.36	7.70	10.4	13.7	17.3	21.5	26.0	30.0	36.3	42.1	55.0
3,800	3.46	5.40	7.76	10.5	13.8	17.4	21.6	26.2	31.1	36.6	42.4	55.4
3,900	3.49	5.45	7.81	10.6	13.9	17.6	21.8	26.4	31.4	36.9	42.7	55.8
4,000	3.51	5.49	7.86	10.6	14.0	17.7	21.9	26.5	31.6	37.1	43.0	56.1
4,100	3.53	5.52	7.92	10.7	14.1	17.8	22.0	26.7	31.8	37.3	43.2	56.4
4,200	3.55	5.54	7.95	10.8	14.2	17.9	22.1	26.8	31.9	37.5	43.4	56.8
4,300	3.56	5.55	7.98	10.8	14.2	17.9	22.2	26.9	32.0	37.6	43.6	56.9
4,400	3.57	5.56	7.99	10.8	14.2	18.0	22.2	27.0	32.1	37.6	43.6	57.0
4,500	3.56	5.55	7.96	10.8	14.2	17.9	22.2	26.9	32.0	37.6	43.5	56.9
4,600	3.55	5.54	7.95	10.8	14.2	17.9	22.1	26.8	31.9	37.5	43.4	56.8
4,700	3.53	5.50	7.90	10.7	14.1	17.8	22.0	26.6	31.7	37.2	43.1	56.4
4,800	3.51	5.48	7.86	10.7	14.0	17.7	21.9	26.5	31.6	37.1	43.0	56.2
4,900	3.49	5.45	7.81	10.6	13.9	17.6	21.8	26.4	31.4	36.9	42.7	55.8
5,000	3.45	5.38	7.73	10.5	13.8	17.4	21.5	26.1	31.0	36.4	42.2	55.2
5,100	3.43	5.35	7.67	10.4	13.7	17.2	21.3	25.9	30.8	36.2	41.9	54.8
5,200	3.38	5.26	7.56	10.2	13.5	17.0	21.0	25.5	30.4	35.6	41.3	54.0
5,300	3.34	5.20	7.47	10.1	13.3	16.8	20.8	25.2	30.0	35.2	40.8	53.4
5,400	3.28	5.11	7.34	9.95	13.1	16.5	20.4	24.8	29.4	34.6	40.1	52.5
5,500	3.21	5.00	7.20	9.75	12.8	16.2	20.0	24.2	28.9	33.9	39.3	51.4
6,000	2.78	4.33	6.21	8.43	11.1	14.0	17.3	21.0	25.0	29.3	34.0	44.4
6,500	2.17	3.38	4.85	6.60	8.6	10.9	13.5	16.4	19.5	22.9	26.5	34.7

revolutions per minute and the diameter of the smaller pulley. If, for example, it is required to drive a dynamo at 450 revolutions per minute and to use one and a quarter inch ropes for the purpose, the diameter of the dynamo pulley, for satisfactory working, should not be less than thirty times the rope diameter or about thirty-six inches, presuming cotton rope is used. For manilla forty rope diameter should be the minimum pulley diameter employed. Taking a three foot pulley as above, we should have a rope speed of 4,240 ft. per minute, a very suitable speed as seen from the table. If, further, it is assumed that we are dealing with an unit of 200 H. P., ten one and a quarter inch ropes would fulfill every requirement and give very satisfactory results. If, on the other hand, it is proposed to use larger ropes—two inch for example—only four would be needed, if running at the same speed. But this would imply running two inch ropes over a three foot pulley, which means a rapid deterioration of the rope, owing to bending over a pulley very much too small in diameter. By the thirty rope diameter rule, a five foot dynamo pulley would be required, and thus would entail a rope speed of over 7,000 ft. per minute, at which speed the ropes would transmit less than one-half the required power unless the working stress was materially exceeded. The size and speed of the rope therefore depend directly upon the number of revolutions which the smaller pulley is required to make—at least this is so until the revolutions of the smaller pulley are under 250 per minute for manilla and 300 per minute for cotton. The largest sizes of rope advisable for any given number of revolutions of the small pulley are given in Table VII, a rope speed of about 5,000 ft. per minute being taken as the maximum allowable and the pulleys being taken at thirty times the rope diameter for cotton and forty times for manilla.

TABLE VII.

MAXIMUM ROPE DIAMETERS.

No. of revolutions of small pulley per min.	Largest diam. of rope advisable. Inches.		No. of revolutions of small pulley per min.	Largest diam. of rope advisable. Inches.	
	Manilla.	Cotton.		Manilla.	Cotton.
250	2	.....	625	¾	1
275	1¾	.....	650	¾	1
300	1⅝	2	675	¾	1
325	1½	2	700	⅝	⅞
350	1⅜	1¾	725	⅝	⅞
375	1¼	1⅝	750	⅝	⅞
400	1¼	1½	775	⅝	⅞
425	1⅛	1½	800	⅝	¾
450	1⅛	1⅜	825	⅝	¾
475	1	1⅜	850	⅝	¾
500	1	1¼	875	⅝	¾
525	1	1¼	900	½	⅝
550	⅞	1⅛	925	½	⅝
575	⅞	1⅛	950	½	⅝
600	¾	1	1,000	½	⅝

With a dynamo speeded sufficiently low to enable the larger ropes to be used, the most suitable size is determined by other considerations. In the independent rope transmission system—with which we are at present chiefly concerned—a larger number of small ropes entails the use of somewhat wider pulleys on both engine and dynamo, while there are more splices to make and probably a greater frictional loss, due to the differential driving effect, to which reference will be hereafter made. On the other hand, it is possible to use pulleys of smaller diameter, thus more than offsetting the cost of increasing the width. Moreover, should any one of the ropes fail, the increase of load upon the others will only be slight. In practice one and a quarter inch ropes are found to give good satisfaction for driving dynamos of moderate size when the conditions are favorable to their use, but one inch ropes are also largely used. For larger units one and a half to one and three-quarters inch ropes are more generally adopted, the latter being the largest size which it is advisable to use in any case. In mill driving practice at the present time, there is exhibited a noticeable tendency towards the use of smaller ropes, and one

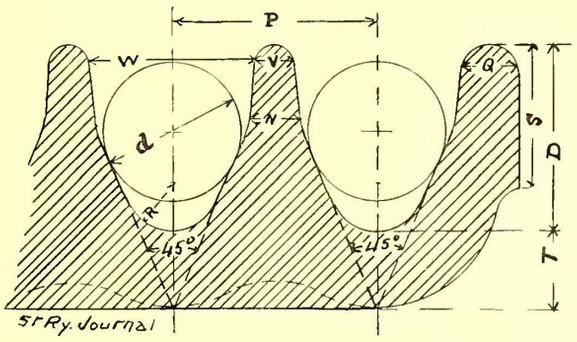


FIG. 1.

and five-eighths inch is now probably the most usual size adopted, while a decade ago two inch was most favored.

Pulley Diameter—The rules for the least pulley diameter given in the foregoing, viz., thirty rope diameters for cotton and forty rope diameters for manilla, cannot be disregarded without impairing the durability of the rope. If in any case the use of a smaller pulley becomes imperative, the load on the rope should be correspondingly reduced; the use of "hard," or tightly twisted rope should in this case be carefully avoided. As in belt driving, the slack side of the rope should, if possible, always be uppermost. With a fair length of drive the slack of of the rope will increase the arc of contact with both pulleys, thus augmenting the resistance to slipping, while necessitating less initial tension and its corresponding disadvantages. If the slack side is below, the reverse action takes place, each arc of contact being lessened and the risk of slipping correspondingly increased. For dynamo driving 10 per cent. should be deducted from the power of the ropes to allow for this effect.

Length of Drive—In mill driving no difficulty is usually experienced in obtaining an ample length of drive, but in the dynamo room economy of space is usually a much more important consideration. To ensure satisfactory results, the distance between the centers of the driving and driven shafts should not be less than one and a quarter times the sum of the diameters of the two pulleys. Thus for pulleys of twelve feet and four feet diameters, respectively, the distance between the shaft centers should not be less than twenty feet. This rule is a somewhat elastic one, but for all ordinary ratios of pulley diameters likely to occur in dynamo driving, it may be followed. As the difference in the diameters of the pulleys becomes less, the length of drive may be reduced if desired, but if the pulleys differ greatly in size a lesser length of drive than given by the rule should not be used unless the load on the ropes is correspondingly reduced.

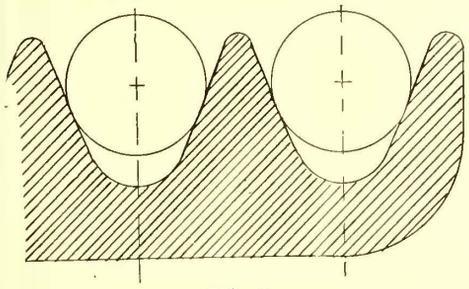


FIG 2.

Pulley Grooves.—With regard to the pitch and angle of the pulley grooves, practice differs to some extent. A groove angle of 45 degs. may, however, be relied upon to give good results, and is that most commonly employed. More obtuse angles have been tried, and they, no doubt, diminish the wear of the rope, owing to the consequent reduction of the wedging action, but this also implies loss of driving power, and a tendency for slipping to occur in the grooves, thus possibly doing more harm to the rope than would result from the employment of the more acute groove. Under otherwise similar conditions the power transmitted should be less with grooves with an angle of 60 degs., as sometimes advocated; for if the same power is transmitted it will be at the expense of increased back tension, strain on the bearings and fricitonal and other losses. With grooves so acute as 30 degs., on the other hand, the wedging of the rope into the groove, and consequently the power absorbed in releasing it is very much increased. With the smaller sizes of cotton rope, such as used for driving traveling cranes, this angle has frequently been used; but from the experience gained it is found that it considerably shortens the life of the rope. It is not to be recommended for dynamo driving, and for manilla rope it should certainly not be used.

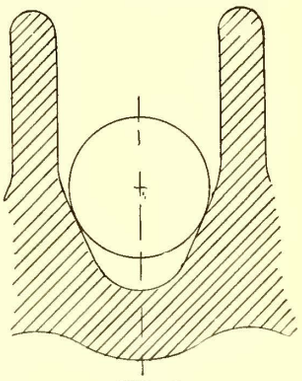


FIG. 3.

There is some difference in the pitch and also in the other proportions of pulley grooves adopted by various makers of rope driving plant, but the dimensions given in Table VIII, which have been calculated by formulæ established by the writer, may be taken as representative of the best leading practice.

To accurately turn a set of pulley grooves to the form shown in Fig. 1. is a somewhat costly process, and this has led to the use of plain or flangeless grooves, as shown in Fig. 2. The pitch and most of the other proportions used for Fig. 1, are applicable to this form of groove. The chief objection to this form is that the rope has a tendency to leave the groove if the speed is high and a rapid fluctuation of load occurs. Some makers go to the other extreme and adopt a groove such as is shown in Fig. 3. They are, however, now seldom met with; they are expensive in the first place, and experience has conclusively demonstrated that there is no risk of the rope leaving the pulley with the ordinary depth of groove, as in

Fig. 1. A liberal clearance should be allowed on each side of the pulleys—four or five rope diameters at least—in order that the ropes may be readily removed or replaced without being damaged.

TABLE VIII.

DIMENSIONS OF ROPE PULLEY GROOVES.

Diameter of Rope=d.	P	D	R	W	T	Q	V	S	N
in.	in.	in.	in.	in.	in.	in.	in.	in.	
½	⅞	¾	3/16	11/16	5/16	¼	3/16	½	
5/8	1 1/16	⅞	¼	⅞	5/16	5/16	3/16	5/8	
¾	1 3/16	1	9/32	15/16	⅜	⅜	¼	¾	
⅞	1 5/16	1 3/16	5/16	1 1/16	7/16	⅜	¼	⅞	
1	1½	1⅜	⅜	1 3/16	½	7/16	5/16	1	N = ¼ V
1⅛	1⅝	1½	7/16	1⅜	9/16	7/16	5/16	1⅛	
1¼	1 13/16	1 11/16	15/32	1 7/16	5/8	½	⅜	1¼	
1⅜	2	1⅞	½	1 9/16	11/16	9/16	7/16	1⅜	
1½	2⅛	2	9/16	1 11/16	¾	9/16	7/16	1½	
1⅝	2¼	2⅛	5/8	1 13/16	13/16	5/8	7/16	1⅝	
1¾	2½	2⅜	21/32	2	⅞	5/8	½	1¾	
2	2¾	2⅝	¾	2 3/16	1	¾	9/16	2	

Small wheels, with few grooves, have usually a plain inner rim surface, as shown in Fig. 1, but with larger and wider wheels the rim may be corrugated, as indicated by the dotted lines in the figure. This plan adds somewhat to the first cost of the pulleys, but it frequently lessens the weight to a very material extent. It is of the utmost importance that all the grooves are of precisely the same diameter; that they are of exactly similar shape and carefully finished, so that the surface will not unnecessarily abrade the rope. The latter should never be allowed to touch the bottom of the groove; and finally, only the correct size of rope, for which the grooves are intended, should be used. It might be thought unnecessary to make this remark, but the writer has found on more than one occasion trouble arising from ropes being used in grooves which were intended for smaller sizes.

(*To be Continued.*)

Meeting of the Tramways Institute of Great Britain and Ireland.

A meeting of the Tramways Institute of Great Britain and Ireland was held at Holborn Restaurant, High Holborn, London, on July 5, for the election of officers and other business. The meeting was well attended, and Mr. Carruthers-Wain, the former president, was re-elected to that office. J. G. B. Elliot, secretary for the last year, was also re-elected. The annual dinner of the Institute was held at Holborn Restaurant at 7 P. M., and on July, 6, a visit was made to the Croydon tramways to inspect the Lührig gas motor.

Tho principal paper was read by T. Arnull, C. E., of the Birmingham tramways, and was on "Permanent Way Repairs." It was in part as follows:

Tramway Permanent Way.

By T. Arnull, Assoc. M. I. C. E.

It has been just two years ago since I had the honor of reading a paper on this subject before the Institute. In that paper* was given some account of the three varieties of rail that had been used on the Birmingham tramways, and of the effect of wear and tear upon them. The present short paper may be considered as a continuation of the former one, its object being principally to deal with a few of the points too lightly passed over on previous occasions.

Discussion of this subject naturally divides itself into a consideration of the rails on the one hand, and, on the other, a consideration of the joints. As to the rails, I exhibited several sections that had been taken from worn rails, showing the effects of wear and tear upon them; the conclusion suggested was that a rail was worn out and required replacing on a straight line of tramway after the passage over it of about 750,000 steam cars. After two years' further experience in the matter I am inclined to think this number rather too high, and that the rails should be renewed after a traffic of about 700,000 cars. No hard and fast line can be drawn as the rails vary in hardness. If the rails are on a curve the wear is, of course, greater, and proportionately in some way to the degree of curvature. On a curve of 40 degs. radius the rail has often to be renewed before it has carried the traffic of 250,000 cars. On the sharp curves we also have a rapid wearing away of the sides of the groove, which, of course, reduces in some degree the upper surface available for withstanding the wear.

Another influential factor in the life of a rail is the state of the road in which it is laid. If the road has macadamized margins there will always be a supply of grinding material in the shape of dust for spreading over the surface of the rail; in dry, dusty weather this supply will be increased, and the destruction of the rails correspondingly assisted; where the road is paved all across and the dust reduced to a minimum, we have these conditions at their best. I know of a case now near Birmingham where the granite margin to the tramway is only seven inches wide; the line has been in use about nine and a half years and has had over it about 300,000 cars, and the outer rails are quite worn out; the inner rails are in a much better condition because being further from the macadam margin they have kept cleaner. Inside the city boundary the granite margin has always been twenty-five inches wide, and a couple of years ago the street was paved all across. I expect the effect of this to be that we shall be able to get a life of 500,000 or 600,000 cars out of the rails, though they came from the same works and were laid at the same time as the rails which have been worn out by 300,000 cars.

There is a rather awkward question arises here, viz., When is a rail *worn out?* A rail has two functions to perform: The one is to carry the tram cars in the same way as a railway rail carries its traffic; the other is to form part of the surface of a road made for ordinary vehicles. In many cases the trouble does not arise from the wearing away of the tram of the rail, but from the part that does *not* wear away. All the danger arises from the projecting flange of the groove. On a horse line this trouble does not arise, since the ordinary traffic (and the effects of corrosion perhaps assisting) causes the projecting flange to wear away about as fast as the head which carries the load. On a steam tramway the case is different, and on tramways where the excessive traffic of the Birmingham lines has to be contended with the case is altogether different. Here the wear and tear on the head is so rapid that the corrosion has no chance, and the number of cars is so great that the ordinary traffic is in a great degree driven off the lines, so that this also has no chance to wear down the flange and assist in keeping it level with the top of the rail.

It is facts like these which bring into prominent relief the enormous advantages we should have in Birmingham by the adoption of a rail with a central groove, such as the Liverpool rail. Twelve years or so ago, when the Birmingham corporation was going to commence the construction of an extensive system of tramways, there was a desperate attempt made to induce it to adopt this rail; the Board of Trade held an enquiry at the Council House, but the corporation had had enough of compound rails, and insisted upon using the girder section, shown in Fig. 1, in spite of the advantages which the central groove offered. Subsequent experience has fully justified the decision

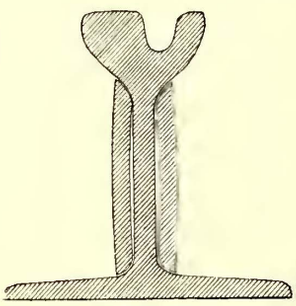


FIG. 1.

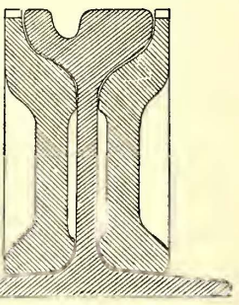


FIG. 2.

then arrived at, seeing that the central groove then meant a compound rail, which compound rail was certainly unsuitable for the steam traction that was going to be used on the tramways. I know of but one case where the Liverpool rail was used on steam tramways, and that was the line from Dudley to Wolverhampton. Looking at the question solely from the point of view of the public interests, I am strongly of opinion that the girder rail, similar to that now in use in Birmingham, but with a central groove, is the only form of rail which is suitable for use on a steam tramway in a public street.

To turn now to the question of joints, it may be remembered that in my former paper I described two or three forms of joints, of which trial had been made. The original form, as shown in Fig. 1, was painfully wanting in all elements of permanence. Assisted by a soleplate it was vastly improved, but still a long way from perfection. I also described a form of cast iron fishplates (Fig. 2), so designed as to largely increase the area available for wear on the top and bottom of the plates. At the date of that paper they had had over them about 250,000 cars, and were still in a fairly satisfactory condition; when the traffic had reached about 500,000 cars, however, they began to get very troublesome; their tops, which were brought up level with the surface of the rail, did not wear down with it, so that in passing, the load of an engine was often brought directly to bear upon them, and some of them were broken. The general conclusion arrived at was that they formed a very good joint, and, with a soleplate, the best we had ever tried. They were, however, expensive in first cost, and did not last as long as the rail, and were therefore unsatisfactory. An obvious improvement was before us, either to make them of cast steel, or of malleable cast iron, but this would have largely increased the cost, and so the suggested improvements were not adopted. Their excessive rigidity was another objection, we could not bend them on a curve, and special curved castings meant more expense and trouble than could have been undertaken.

It is, of course, common knowledge to all using girder rails, that the joint always works loose. Now, if the joint in a rail were a permanently supported point, it is not easy to see how the tendency for it

*Published in the Street Railway Journal for August, 1892.

to work loose can arise. Since it *does* work loose, it is quite certain that if it be properly supported in the first instance, it does not remain so. If it is not supported it then has to act in some sort of a way under the passing traffic as a girder, the bearing places of which are irregular and shifting points at unknown distances from the actual joint. The problem awaiting solution is, therefore, altogether different from that of designing a joint in an ordinary girder. It differs from an ordinary girder in many ways. Its points of support, besides being irregular and shifting, will not in general be symmetrically arranged; its actual bearing points being perhaps usually on different sides of the flange on opposite sides of the joint. The consequence of this is important; the passing loads, besides producing a bending action, cause also a twisting or rocking action, which perhaps has the most powerful influence in pulling the joint to pieces.

It may be, therefore, safely concluded that no form of joint is likely to give permanent satisfaction unless these various disintegrating actions are properly resisted; the twisting and racking tendency as well as the bending. The most hopeful joint I have yet seen is one having the fishplates two feet long and seven-eighths of an inch thick, with a thinner horizontal projection to clip the bottom flange of the rail; underneath is a sole plate half an inch thick. There are, of course, six bolts through the web of the rail and four on each side through the horizontal flanges of the rail, and through both sole plate and horizontal flanges of the fishplates also. We only commenced laying these joints at the beginning of the present year, and it is yet too soon to report upon their merits. Considering our section of rail, however, it appears to be a joint well adapted to withstand vertical flexure, and also that twisting, racking action which is caused by unsymmetrical bearing joints, and which I believe to be even more influential in pulling a joint to pieces than the plain bending action.

Other papers read were "Ardagh's Prismatic Wood Paving Block for Roadways," by John Millington; "Patent Food for Horses," by F. Stiel; "Shoeing and the Proper Treatment of the Horse's Feet," by Charles Sheather, F. R. C. V. S.; "The Soulerin Brake," by Lugien Serrailier; "Ball Bearing for Tram Cars without Lubricants," by F. Purdon, C. E.

Statistics of Railways in the United States.

The Sixth Statistical Report of the Interstate Commerce Commission has just been submitted, and contains the following facts:

The total mileage of railways in the United States on June 30, 1893, was 176,461.07, being an increase during the year of 4,897.55 miles. The corresponding increase during the previous year was 3,160.78, from which it appears that there was some revival in railway construction during the year covered by the report. The tendency toward some form of consolidation during the year has been quite marked. A classification of railways according to length of line operated shows that there are 42 companies in the United States having a mileage of 98,385.54, being equal to 55.78 per cent. of the total mileage of the country. Twenty-six other roads control 11.20 per cent of total mileage, from which it appears that 68 companies controlled 76.98 per cent of the total railway mileage. The total number of employes in the service of railways on June 30, 1893, was 873,602, being an increase of 52,187.

The aggregate of property properly classified as railway capital was on June 30, 1893, $10,506,235,410, equal to $63,421 per mile of line. The amount of stock outstanding was $4,668,935,418, of which $3,982,009,602 was common stock, and $686,925,816 preferred. The amount of stock paying no dividends during the year was $2,859,334,572, being 61.24 per cent. of the total stock outstanding. Of stocks paying dividends, 5.25 per cent. of the aggregate stock paid from 4 to 5 per cent., 11.62 per cent. paid from 5 to 6 per cent., 5.24 per cent. paid from 6 to 7 per cent., and 5.33 per cent. paid from 7 to 8 per cent. The total dividends paid was $100,929,885. The amount of mortgage bonds paying no interest was $492,276,999, or 10.93 per cent. of the total of mortgage bonds, and the amount of income bonds paying no interest was $204,864,269, or 82.56 per cent. of the total of income bonds.

The total number of passengers carried during the year ending June 30, 1893, was 593,560,612. Passenger mileage during the same year was 14,229,101,084. The average journey per passenger was 23.97 miles. The number of tons of freight reported by the railways for the year was 745,119,482. Ton mileage was 93,588,111,833. The average number of tons in a train was 183.97, and the average haul per ton for the entire country was 125.60 miles. Passenger train mileage was 375,618,770, and freight train mileage 508,719,506.

The number of railway employes killed during the year was 2,727, and injured 31,729. The number of passengers killed during the year was 299, and injured 3,229. One passenger was killed for each 1,985,153 passengers carried, or for each 47,588,966 passenger miles accomplished, and one passenger injured for each 183,822 passengers carried, or for each 4,406,659 passenger miles accomplished.

THERE were filed, at Trenton, N. J., on July 13, articles of incorporation of a large electric railway corporation, having for its object the connection of New York and New Jersey by electric railways. The capital stock is $10,000,000. This enterprise is to be managed by two corporations, the Central Jersey Traction Company, with a capital of $500,000, and headquarters at No. 2 Wall Street, New York, and the New York & Philadelphia Traction Company, with a capital of $10,000,000, and general offices at Trenton, N. J. The officers and directors of the first named company are: President, Frank A. McGowan; vice-president, ex-Sheriff E. W Hime, of Newark; secretary, J. H. Baldwin, of Newark; treasurer, J. H. Darrall, of Trenton.

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.

Bursting Flywheels.

EDITORS STREET RAILWAY JOURNAL:

The bursting of large flywheels in electric tramway power stations, is becoming frequent enough to deserve more than a passing thought from the officials of these companies. Those who have been through an unpleasant and expensive experience, such as the flywheel accident at Ben Venue power station, Pittsburgh, on April 19 last, and described in your last issue, would probably prefer taking chances with having the building struck by lightning or by a cyclone, the next time their "turn" comes; because they would have knowledge of an approaching storm some seconds, if not minutes, before the "performance" begins, and they could possibly take some precautions.

In most all, if not all such cases, the history of the circumstances attending the accident shows that the engine received an overload or was relieved of its load, more or less suddenly and unexpectedly, from short circuit or an open circuit. If it is a short circuit, the dynamo pulley or the belt or both give way and do some damage. The engine starts to race, and the flywheel "does the rest." If it is an open circuit, the racing is apt to begin then and there, and the flywheel then does it all. It is said that lightning will not strike twice in the same place; but this accident may occur any number of times in the same station. The question is, as the station is or can be protected against lightning can it not also be protected against something equally bad, if not worse? I think it can.

In various articles which I have contributed to this journal, and also in my paper read at Milwaukee, last October, on the use of storage batteries in connection with tramway power stations, I have tried to point out that their use would increase the efficiency of the power plant, and reduce the cost of power production, by equalizing and steadying the load, or in other words by making it practically constant independently of the rate of consumption on the trolley line.

I now wish to point out that the storage battery is the best possible preventive of flywheel accidents. With such an arrangement racing is impossible. The 450 H. P. engine at the Ben Venue station would then have developed 450 H. P. and no more, even though the short circuit raised the current to a load of 1,000 H. P. or *more*, and it would probably not have reached 500 H. P. even if the circuit had been suddenly broken, and the engine had started to "race," for the battery would have absorbed the surplus the instant the outside load began to diminish. There would have been no occasion to strain the dynamo pulley, or to break the belt; *and the accident would not have happened.*

The great obstacle and objection that storage batteries have had to contend with has been their heavy depreciation. But the cost of the "depreciation" which a bursting flywheel can cause inside of a few seconds will pay for the depreciation of the storage battery for several years. It would sometimes pay for a new battery besides.

The storage battery, costly as it may seem to be, is the best and cheapest preventive known, in the present state of the art, not only for bursting flywheels, but for "breakdowns" generally, in tramway power stations. It will be recognized and adopted as such in due time. However, it will probably take a few more flywheel accidents and dozens of "breakdowns" to make the tramway engineers realize that this is so.

C. O. MAILLOUX.

THE Union Depot Railway Company, of St. Louis, has just completed the construction of ten miles of new track, the entire construction of which occupied but six weeks. This is a remarkable record.

Established 1884.

THE STREET RAILWAY JOURNAL

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H. W. Pool, Advertising Department. H. W. Blake, Associate Editor.

PUBLISHED BY THE
STREET RAILWAY PUBLISHING COMPANY,
Havemeyer Building, 26 Cortlandt Street, New York,
James H. McGraw.....President
Curtis E. Whittlesey.....Treasurer

Western Office, Monadnock Block, Chicago, Ill.
W. H. Taylor, Manager.
New England Office, 620 Atlantic Avenue, Boston, Mass.
W. R. Watters, Manager.
European Office, 39 Victoria Street, Westminster, London, England.
Robert W. Blackwell, Representative.
Subscription, $4.00 per year. To Foreign Countries, $6.00 per year. Postage Prepaid.

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.

The Outlook for a Large Attendance from the South at the Atlanta Convention is very flattering. We have the personal assurance from the representatives of all the street railways except two that we have visited in Southern cities, that their roads will be represented at the convention. The trip to the convention, from present indications, will be an enjoyable one. As announced elsewhere in our columns, arrangements have been made to run a special train from New York City to Atlanta for the convenience and comfort of the Northern delegates who desire to avail themselves of its advantages. The trip as planned will be through the finest scenery in the South as well as through the most historic and prosperous sections of the Southern country. This arrangement will be appreciated by those who intend to be present at the convention, many of whom are already planning for a pleasant October trip.

"I Always Get Valuable Suggestions when I talk with you," said one of the most progressive superintendents recently to another equally progressive, whom he was entertaining. "And I was just thinking the same of you," said his guest. As we have often said, there is no way of adding to one's stock of practical information about his particular calling so efficient as personal intercourse with others who are working along the same lines. He becomes the best superintendent who visits the street railways of other cities or entertains the representatives of other lines who visit him. Next to a personal visit of this kind, the convention of the American Street Railway Association offers the best opportunity for a personal exchange of views on street railway subjects, and any person who attends the Atlanta convention may be absolutely sure that he will gain valuable suggestions from his conversation with other delegates, as well as from the proceedings.

The Question of Fire Insurance is an important one in street railway practice. With the general introduction of electric lighting from central power stations, the subject of electrical risks was carefully considered by the leading fire insurance companies, most of whom were disposed to take a liberal view of the matter. As a result many of the early lighting and street railway power stations were insured at a comparatively low figure. During the last few years, however, and especially during the last year, conditions have changed materially. Several disastrous fires, which have occurred, have been made the excuse for the adoption of an entirely different policy in respect to electrical stations and electric railway property generally. Rates have been arbitrarily raised in all sections of the country, and on all classes of railway buildings and property until now they have reached an almost prohibitive price. The builders of well constructed stations have been obliged to suffer for the faults of some of the early builders, and at present the most carefully built and designed plants seem to carry no recommendation to the underwriters for their safety against fire. A case to the point, of which there are many, is that of a street railway company in one of the central Western cities which has, besides a well constructed station, its own water supply and engineers and firemen on duty every hour of the twenty-four, with steam up to run the pumps should it be necessary. Notwithstanding these facts and that insurance has been carried for many years without loss, the rate on this station has just been doubled without evidence of any special reason. It would seem as if there were sufficient valuable property belonging to street railway companies in all sections of the country, to warrant some insurance company in making a specialty of taking such risks. If not there should certainly be some concerted action on the part of the railway companies, looking toward some organization which should protect them for a reasonable figure against possible loss by fire.

The Great Railroad Strike, into which at one time it seemed as if the street railway employes in Chicago would be drawn, is over, but it has left its lessons. These, if learned and acted upon, will be worth more to this country than the entire loss and damage to business occasioned by the strike, vast though it has been, and amounting as it has to millions of dollars. The strike has shown that transportation has become an integral part of our social and economic system, and that any serious interference with its free exercise would soon have the effect of producing business chaos. Transportation, both urban and interurban, has become in our present complex social order almost, if not quite as much of a necessity to individuals as food, clothing or the maintenance of peace and order by the process of law. One hundred years ago the cessation for a few days of communication between New York and Boston, or the withdrawal from service of the public conveyances within the limits of a city like New York would not have occasioned much inconvenience. To-day, the stoppage of all surface and elevated methods of transit in any large city would paralyze business. In other words, such quasi-public functions as are exercised by our street railway companies or steam railway companies, and upon the proper exercise of

which the prosperity of such a large proportion of our community depends, should not be dependent upon the action of irresponsible individuals. That there are or are not differences of opinion as to details of operation between the owners and employes of such enterprises, or the amount of wages paid to secure their continuance, concerns the public only in a very indirect way, and if any employe has been wronged, the law courts offer means of satisfaction. But for either owner or employes to attempt to coerce the other by stopping traffic, and thus inflict greater loss on others who are in no way connected with the dispute, is like mutiny at sea by which the safety of passengers is imperiled, or a strike of the police force of a city, through which protection to lives and property would be withdrawn. Any limitation of the privilege of employes to stop work at their option may seem to some inconsistent with the American idea of individual liberty, but it is a question whether, on the contrary, the liberty of others, *i. e.*, their privilege to use certain created avenues of communication, be not more imperiled. We are familiar with the extension of the right of enforced obedience under certain conditions, from military life to the field of private enterprise as on shipboard. And so long as under present social conditions it should seem desirable to continue the use of private for municipal or governmental direction in the transportation business, it is a question whether some similar safeguard should not be adopted to insure its faithful execution.

Franchise Valuations are subjects which seem to be foremost in the minds of mayors and other officials in most of our large cities at the present time, especially where arrangements are being made for equipping the remaining horse car lines for mechanical traction or for making extensions to existing lines. If it is right and desirable that street railway companies should pay into a city treasury certain sums as compensation for the use of streets, or for the supposed value of a franchise, then such action on the part of city officials as will defend the rights of the city and produce a revenue from this source is to be commended in every quarter, and if it is right in one city, it is right in all, and a standard of taxation for this purpose should be established in every locality. If the practice is wrong and unjust, it is wrong everywhere, and a united effort should be made in every quarter to have the injustice righted. It is held by street railway companies, and justly we think, that the service rendered by an operating company is in all cases sufficient compensation for the use of streets, and that no money returns should be demanded other than the ordinary real estate taxes, and possibly a small car license, the same as may be imposed on other vehicles employed in passenger transportation, or it may not be unreasonable to require that an operating company keep the streets between the tracks and rails in repair. But beyond this limit, there can be no justifiable reasons for demanding greater compensation, and if it is required, it will work to the detriment of the service and to the injury of the public, who are supposed to be benefited by the revenue. In certain cases, it will doubtless benefit officials or political parties, but this is the only class that can possibly be a gainer. An argument in favor of taxing street railway corporations is derived from the fact that street railways, after being operated for a period of years, sometimes change hands, and the original owners receive what is claimed to be a very large sum above the first cost of the plant, or for what may be termed its earning power. In cases of this kind, the city can have no more right to claim a portion of such increased valuation than it could for a portion received for the sale of a valuable corner lot, which formerly may have been the property of the city. When the lot was sold, the city doubtless received whatever it was worth, and if it was bought as a speculation by the holder, he is clearly entitled to all the increase over the original cost. The same is true of street railway franchises. New cities are frequently anxious to have street railways established, and offer very liberal inducements for capital to undertake their construction and operation. Property holders not infrequently pay a bonus to the operating company to induce the building of a line along certain streets. The same thing may be true of suburban districts in older cities. The corporation undertaking the construction of a line takes its chances as to the growth or decadence of the city. If a city should deteriorate, the authorities would never think of paying anything to the contracting companies, no matter how much may have been lost, neither does it feel obliged to help the company, though it may struggle for years to get earning power; and clearly the city has no more claim on the increased valuation of the line than it could have upon the increased valuation of private property. As a general thing the money received for the sale of a street railway by the individual owners is expended in the city in other business lines, either in the erection of business blocks, dwellings, or in manufacturing or business enterprises, so that really the city does derive benefit from the sale and in a more direct way than if certain amounts were paid annually into the city treasury, and were disbursed by the representatives of political parties. A case in point is that of a large city where the question of granting an extension of franchise, and the introduction of electric traction were being considered. The mayor insisted upon the insertion of burdensome conditions in the franchise which the company refused to accept; and in a personal appeal made to him by the representatives of the company, he stated that he did not care a blank whether the city received any returns for the franchise or not, but that he was working in the interests of his party, which required a certain amount of money, and that he should insist upon the conditions.

* * * *

Another reason given for placing a price upon a franchise grows out of the fact that competing companies in asking for franchises, offer to pay a certain sum on the gross receipts, or a stated sum in case they can secure the franchise. This is often done by persons with the hope of inducing their competitors to buy out the franchise after it is obtained, under fear of ruinous competition to both, or with the expectation of floating the securities that may be issued on the new concessions, and then getting out without any expectation that the road can ever be operated with any financial success. Or the bidders may agree to the conditions with the hope of some way avoiding the payment of the amounts named in the franchise. There are doubtless lines operating in certain cities which enjoy a liberal patronage, and which could well afford to pay a portion of their receipts into the city treasury, but such lines are usually a part of an extensive system which, as a whole, is operated at a loss or with a very limited income, and where the receipts of the favored line must apply towards the expense of oper-

ating the other lines. A case in point is that of one of the largest, and what is considered as one of the best paying street railway propositions in the country, in which twenty-nine separate lines are operated. Four of these pay a good return all the year. Fourteen of them pay expenses only during six months of the year. Three or four pay expenses for nine months in the year. The others are operated at a loss during the entire year, and we know from personal observation that the securities of the company and the dividends are kept up by the practice of the most rigid economy in all the departments.

* * * *

It is a recognized fact, by all those who have given the subject careful thought and are unbiased in their opinions, that the interests of the local authorities, the patrons of a street railway line, and the managers are one, and that any undue advantage taken by one class against another results in a direct injury to each of the others. If a tax is demanded, then the operating company must necessarily economize in some way to meet it. The wages of employes must be reduced, and kept at a minimum. What may be termed the luxuries of traffic cannot be provided, for the sum that would go to giving a gilt edged service would be dissipated in other directions. Less expensive and luxurious cars will necessarily be provided, a less number of cars employed, and it will be impossible to keep the equipment up to a healthy and first class condition. Even if expenses can be met, and a small dividend rendered on the investment, there will not usually be sufficient net income to provide a sinking fund with which to renew the track and equipments when worn out. Again, burdensome conditions are things that tend to render the securities uncertain, prevent the investment of capital in this particular industry, and work to the great injury of the business at large. Unfair treatment of capital always reacts upon the section where it is practised. A feeling of distrust once awakened, such investments, not only in railway, but other lines, as can be withdrawn will be transferred to other points, and it will be very difficult to attract new investors.

* * * *

On the other hand, particularly in a growing city, everything should be done to render street railway securities a favorite investment for capitalists. They should be issued for a long period, and not subject to depreciation by unfair or unjust legislation. Vast amounts of property, many millions, have been invested in this industry under the inducements of liberal franchises, with almost equally large investments in manufacturing establishments (car works, for instance), and in many and various interests connected with and dependent on the street railway business, and it cannot be expected that investors will willingly consent to any measures destructive or threatening to such investments. The duty of city officials at the present time would seem to be to preserve, not to destroy this comparatively young industry. They should allow it to maintain the position it has assumed, and encourage its development. The credulity of the public has been put to its extreme capacity of false impression relative to its conduct in this particular, but if the benefits which a street railway confers upon a city were carefully considered by those who are clamoring for excessive taxation, they would discover that they could not bestow upon this industry too great a degree of protection. Street railways give increased value to real estate bordering the routes, and especially to suburban property. This increased valuation results in an increased tax assessment, so that the city receives, because of the street railway, a very large increase from tax returns, while the individual owners of property are enriched to an amount beyond estimate. In fact, a large city can only exist in this country because of street railways, as they have a very decided influence on the social conditions of the people. Because of rapid transit facilities, wage earners and people of moderate means are able to own their own homes, or to obtain cheap rent in the outlying districts, where they can live under healthful conditions. The street railways prevent the Continental practice of people herding together in cramped tenements, where they are subject to unwholesome physical and moral conditions, owing to the vitiating influence of city air and life, so that the influence of the street railway as a factor in the social and moral conditions of the people cannot be estimated. The business gives employment, with good wages, to a large number of people embraced in the class of unskilled laborers, and furnishes cheap, safe and rapid communication for all parties between all sections of a city. The fear on the part of city officials that unless they exercise strict police authority over street railway companies, the service will be inferior, is not justified by experience. Street railway managers generally agree that in order to induce traffic they must provide rapid and safe service, and their cars must be reasonably clean, and their employes polite and attentive; in other words, that they must do everything to induce patronage, and this can only be secured by catering to the demands and convenience of the traveling public.

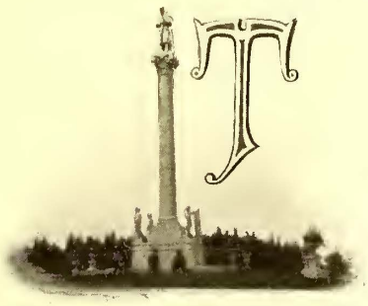
* * * *

The saving in operating expenses by the introduction of mechanical traction over that of animal power is not as large as people generally suppose, but mechanical traction is a necessity of modern life, and notwithstanding the large increase in the cost of first equipment and in operating expenses, it is demanded and must be provided. The history of many roads shows that the equipment, including roadbed and rolling stock and motors has failed much quicker than was supposed, requiring new equipments which have cost large sums, and in the case of electric traction at least no one can yet predict what the life of a plant may be, so that in no case can an operating company feel justified in offering to pay the assessments noted above; for in addition to the wear and tear of the service the best managed roads are subject to accidents and damage by fire or flood, and sometimes by the lawless acts of strikers. Provision must in all cases be made for settling accident cases, and since in the present state of the jury system of our country street railway corporations seldom get justice in the matter of settling accident cases, it is not safe to operate without a large fund to meet such demands. In any event the managers of a street railway must first protect the moneyed investors, and if there is to be extra economy in any direction it will, as noted above, be in the reduction of wages or in directions that will work to the injury of the patrons, so that we are of the opinion that if the people of the city would study carefully the street railway business from the operator's standpoint, and inform themselves regarding its dangers and difficulties, they would come to recognize the benefits they are receiving from the service, and would in no case demand from the corporations a compensation for the use of streets.

EDITORIAL CORRESPONDENCE.

DAYTON, INDIANAPOLIS, CHICAGO, BUFFALO.

Dayton, O.



THIS is a very pretty city, and is known as the "Gem City of the West." Its people are very proud of their city, and never tire of presenting its beauties and attractions to any strangers who may happen to visit the locality. The settlement is now about 100 years old, and was named in honor of Jonathan Dayton who settled here in 1795. The place was incorporated as a village in 1805, and a city charter was granted in 1841. The present population is about 75,000. The original city was embraced by a great bend in the Miami River, just below the mouth of the Mad River, which forms a union with the Miami at this point. The location has the advantage of an abundant water power, which has made the city a large manufacturing center; while it is also a market for the products of a large and rich agricultural region. In 1805, the village was nearly obliterated by a great freshet in the rivers, and it was proposed to change the location to the hills farther east, but it was afterwards decided to establish a system of levees and so protect the location from overflow. These barriers have been increased from time to time so that the streams are now permanently confined to their channels by means of ample levees, which in most sections are strengthened with a growth of large trees, and in the residence portions these have been converted into parks. Through a portion of the city the channel has been narrowed and bordered by heavy retaining walls, while the space behind has been filled with excavations from the river bottom, and in many places this made ground is occupied by substantial dwellings. A striking characteristic of the place is its unusually wide, level and well paved streets, substantial business blocks, public buildings, numerous bridges, and well shaded residence avenues. A peculiar local feature which attracts the attention of the stranger is the public market which is held from day to day, but which is made especially attractive on Tuesdays and Saturdays. The center of the market region is a small market house or city building, which extends through the middle of a block from one street to another, but on market mornings the market wagons, which are mostly one horse, covered vehicles, surround the entire block on both sides of the street as closely as they can be placed together and spread out into neighboring streets, making the largest collection of market wagons in one locality that we ever remember to have found. These wagons stand in front of dry goods stores and other buildings, and from them are sold fruits, vegetables, and in some cases merchandise of various descriptions. The market hours are limited to ten o'clock A. M., when all are driven off and the streets carefully swept.

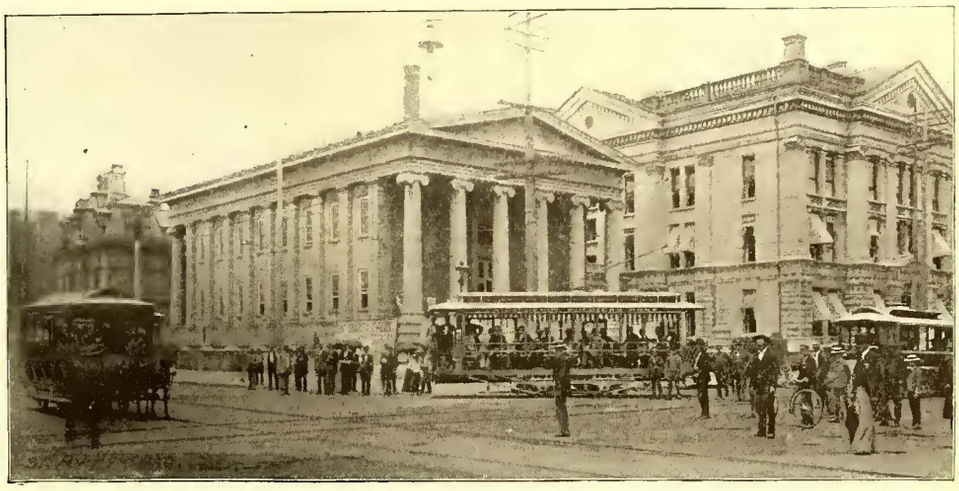


FIG. 2.—CORNER OF 3D AND MAIN STREETS, DAYTON, SHOWING OLD AND NEW COURT HOUSES, WITH THE CARS OF THREE SYSTEMS.

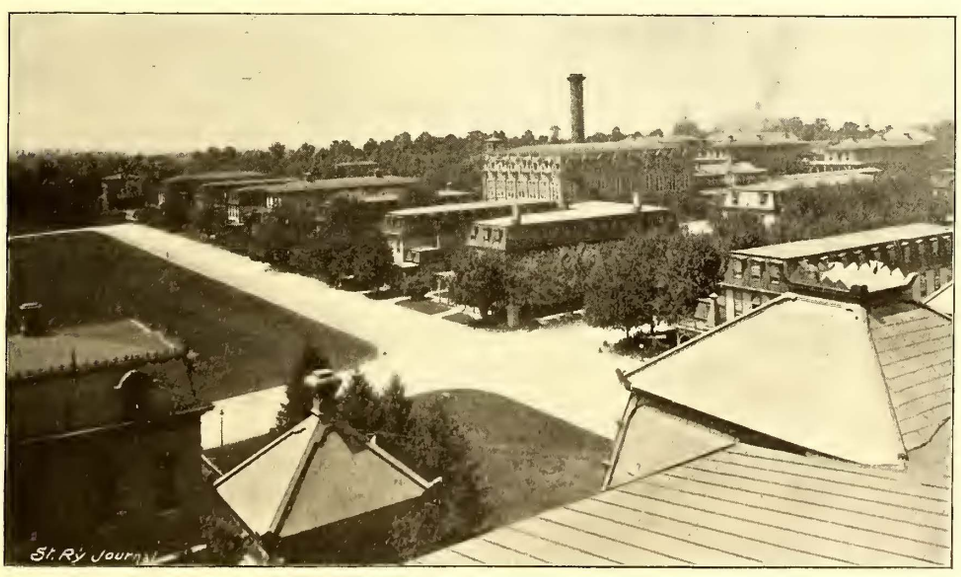


FIG. 1.—VIEW OF BUILDINGS—SOLDIERS' HOME, DAYTON.

The city is probably best known to the general public as the location of the Central National Home for Disabled Soldiers. The home occupies an elevation three miles southwest from the city boundary, overlooking the Miami Valley, and embraces a tract of 640 acres. The buildings are all of noble proportions and are located largely with reference to each other and with a view to provide all the possible home comforts for the inmates. The immediate surroundings of the buildings have been so improved as to make one of the most attractive resorts for pleasure seekers and visitors, who may have occasion to communicate with the inmates, to be found in the country. The main entrance to the grounds, near which two trolley lines from the city terminate in loops, is orna-

mented by a chain of artificial lakes, the main one of which covers eleven acres and around which one of the tracks circles. Back of the lakes are extensive greenhouses surrounded by well kept flower gardens with fountains and a grotto; all of which are designed with rare taste, and present a combination of rustic features rarely met with. There is also an alligator pond and numerous rustic houses, which provide inviting retreats for the maimed and destitute veterans, whose disablilities as a result of army service have incapacitated them from earning a living, but for whose comfort the Government has wisely and generously provided a home. The present number of inmates on the roster of the Home is about 5,500.

STREET RAILWAYS.

The rapid transit facilities of the city embrace about fifty miles of track on which cars are operated by animal, electric and steam power, and which are controlled by five principal companies. The largest mileage is operated by the

City Railway Company,

which has absorbed the lines formerly known as the Dayton Street Railway, Dayton & Soldiers' Home Electric Railway and the Fifth Street Railway. The management of the City Railway is in the hands of D. B. Corwin, president, and A. W. Anderson, superintendent.

The cars of this company are at present operated chiefly by animal power, there being an extension of the 3d and 5th Streets line which connects with the Soldiers' Home, and which is electrically operated. The work of converting the entire system to electric traction is now in progress, and almost all the material has been purchased, while a good portion of the track has been relaid with heavy rails and bonded. In the new construction a ninety pound, side bearing girder rail, eight and a half inches deep, is employed, the joints being connected by heavy twelve bolt fishplates, the bolts being one inch in diameter and set staggered. The rails were manufactured by the Pennsylvania Steel Company and the Johnson Company. The rails are spiked to oak ties, which are 5 × 7 ins. × 7 ft. except at the joints, where a ten inch tie is employed. Rolled tie plates and brace plates are

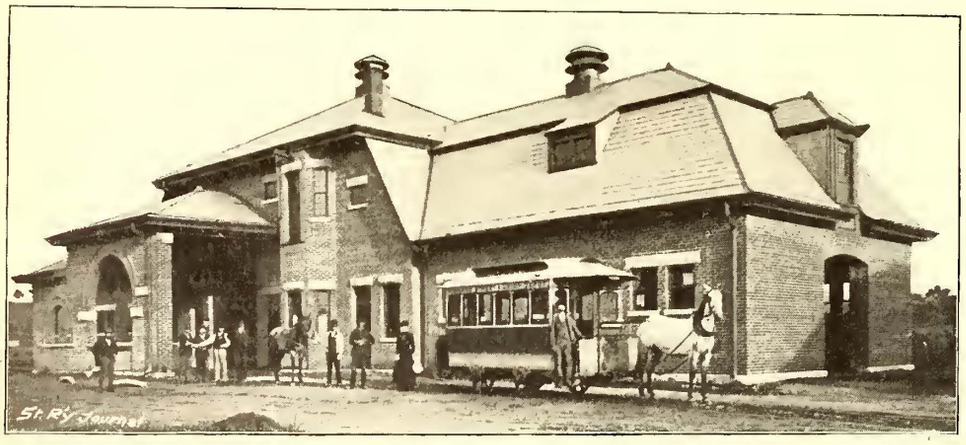


FIG. 4.—ONE OF THE CAR HOUSES—CITY RAILWAY CO, DAYTON.

employed on alternate ties. The ties rest on a gravel foundation from four to six inches in depth, the bottom of the excavation first being tamped solid. Concrete is employed for filling between the ties, and above that is a foundation of sand and the brick paving. The streets of Dayton are paved with asphalt and brick, vitrified brick being employed to a considerable extent. Between the rails and for toothing in the asphalt paving a peculiarly formed brick is employed. This is known as the Haydon block, and is 5½ × 10 ins. on the surface, 5½ ins. deep, and is made with two cavities on the under side, which are 3½ × 3½ ins. and 2½ ins. in depth. In the process of laying, these cavities are first filled with sand which tends to hold the block in place and also deadens the vibration. The surface of the block is roughened with pyramidal shaped indentations to provide a sure footing for animals. The bricks being of a dark brown color, they have the appearance of a double sized petrified waffle. The paving between the rails is laid flush with the tram. Outside the rails the material is the ordinary vitrified brick set edgeways. The work of paving is conducted by the city authorities, but the railway company pays for the cost of paving between the tracks and rails and eighteen inches outside, and also keeps up the repairs on this portion of the street. The principal franchises are for fifty years; that of the extension to the Soldiers' Home is perpetual.

FIG. 3.—OFFICE AND PRINCIPAL CAR HOUSE—CITY RAILWAY CO., DAYTON.

The overhead construction is supported by wooden and iron poles, iron center poles being chiefly employed, and the trolley wire is No. 0.

POWER STATION.

A new brick power station has recently been erected on the west side of the Miami River near the 6th Street bridge. The water for condensation will be drawn from six wells which have been sunk near the bank of the river. These wells are about thirty feet in depth, and the water rises in them to the level of the water in the river. The feedwater will be taken from a well eighty feet in depth, in which the water is found to be soft and pure. The building is constructed with two gables, as shown in the illustration, and is 138 ft. in length, with the boiler room and engine room each forty-eight feet in width which are separated from each other by a brick partition. There is a monitor roof over the engine room, with a large area of glass which gives abundant light. All the windows and doors of the station are unusually large. The roof is supported by a depressed truss, with tie rods extending entirely across each room. The foundations for the engines and generators are continuous and are 76 ft. in length, 14 ft. wide and 13 ft. in depth with pockets for the generators and flywheels. These are constructed with a concrete foundation two feet in thickness, above which is eleven feet of brick finished with a solid capstone fourteen inches in thickness, and for the engine foundations 15 ft. 9 ins. in length. The condensers, which are of the Wheeler type, are placed under the floor between the engines.

The present power equipment consists of three Buck-

eye tandem compound, condensing engines, of 400 H. P. each, which are each coupled direct to a Siemens & Halske 300 K. W. generator. The boilers, which were manufactured by Brownell & Company, of Dayton, are of the return tubular type, 72 ins. × 18 ft., six in number, and of 130 H. P. each. The brick smokestack is cylindrical, 125 ft. in height, with a seven foot flue. Coal is delivered from a steam siding directly into the boiler room, a spur track for this purpose having been laid by the railway company. There is a tower at one corner from which the feed wires will be led to the line. The structure is virtually fireproof, the floors being supported by I beams with concrete arches which are surfaced with hard maple flooring. Cast iron posts are provided for supporting the large doors, the object being to prevent the possibility of the doors settling, as is likely to be the case where the hinges of heavy doors are supported by wooden beams. An overhead traveling crane is provided for the engine room, which was manufactured by Edwin Harrington, Son & Company, of Philadelphia. All the appointments of the station are very complete, and every appliance provided that modern practice can suggest. The station

ployment of ladies in these positions there has been no report of rudeness or incivility on the part of the employes, and the car men obey orders received from them as readily as though men were employed in these positions; and it is remarked that the interest taken by the ladies in their work, and their loyalty to the company is above that usually manifest on the part of male employes.

The power for operating the cars on the Soldiers' Home extension is generated at a small station located near the end of the 3d Street line, in which a generator of forty kilowatts is employed, which was manufactured by the Shawhan-Thresher Company, of Dayton. When the new station is completed this plant will be abandoned, and the entire system operated from the new power house.

The present stables and car barns belonging to the system are of brick and very substantially constructed. Two of these are shown in the accompanying illustrations. These will all be made over for storing the electric cars, and in one of them the repair shop will be installed. One of these station barns is now equipped with a transfer table which operates on a track extending under the porch, upon which the cars are drawn when they are

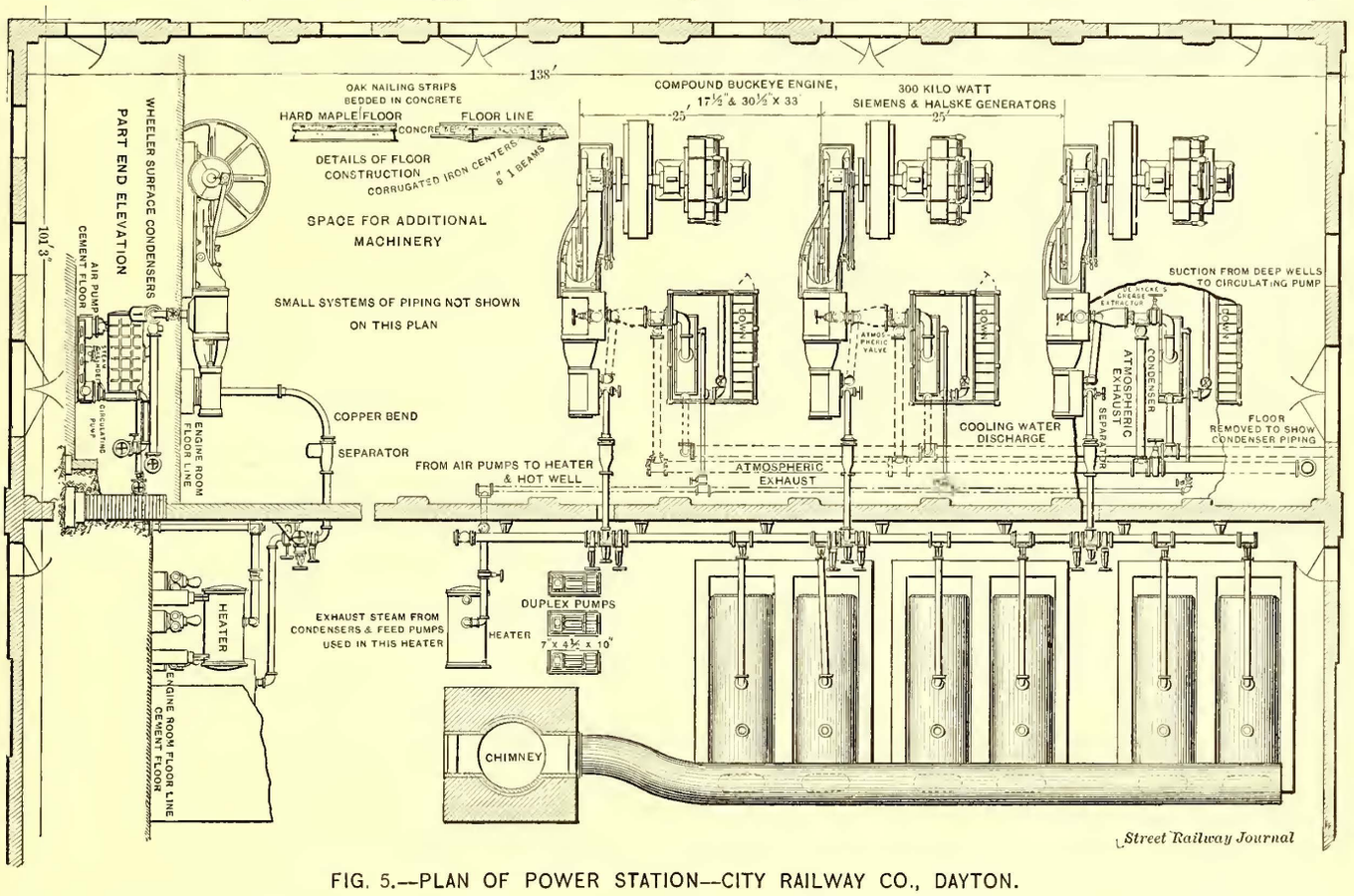


FIG. 5.—PLAN OF POWER STATION—CITY RAILWAY CO., DAYTON.

was designed by Bert L. Baldwin, engineer of the Cincinnati Street Railway Company.

ROLLING STOCK.

The car equipment, with which the lines are to be opened, consists of twenty open cars manufactured by the Barney & Smith Car Company, of Dayton, O. These are furnished with cross seats with a center aisle, and are provided with fare boxes, as they are to be run without conductors. The cars are mounted on the Barney & Smith trucks, and are provided with a double equipment of G. E. 800, twenty-five horse power motors. The wheels are also of the Barney & Smith manufacture.

Motormen are paid twenty cents a trip, or about $1.60 a day for twelve hours' work. On busy days inspectors are placed on the cars to assist in collecting the fares. It is the opinion of the manager that whatever losses may occur from running conductorless cars will not amount to one-quarter the wages of a conductor. It is the practice of this company to employ lady clerks, both at the receiving stations and in the manager's office. Since the employment of ladies in these positions there has been no report of rudeness or incivility on the part of the employes, and the car men obey orders received from them as readily as though men were employed in these positions; and it is remarked that the interest taken by the ladies in their work, and their loyalty to the company is above that usually manifest on the part of male employes.

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White Line Street Railway Company.

The system operated by this company embraces eleven and a half miles of track, and is interesting from the fact that it was among the first roads in the country to be operated by electric power. Electric cars were here put in service August 8, 1888, only six months after the electric road in Richmond, Va., began running regularly, and they have been ever since in continuous service. The line was originally equipped with the Van Depoele system including the generators and motors, and the cars at first were all painted white, hence the name of the company. In 1889, the tracks were extended to the Soldiers' Home, and passengers were carried the entire distance for one fare. The original generators have long since given place to those of more modern type, and recently the General Electric and Westinghouse motors have

been substituted. The original power equipment consisted of two Lane & Bodley straight line engines of 150 H. P. each, which stand side by side and are coupled to the terminals of the same shaft. From the flywheel, which is fourteen feet in diameter with a thirty inch face, the power was formerly transmitted by a belt to a countershaft, from which five Van Depoele eighty horse power generators were operated. In place of the five original generators an M. P. General Electric 200 K. W., generator has been substituted which is driven by a belt direct from the flywheel. This new machine is more efficient and is doing the work better than the five original machines. It is interesting to note that these engines, although in continuous operation for seven years, on an average of nineteen and a half hours, and much of the time heavily overtaxed, have never required any repairs, and in all this time the line has not been shut down on account of the engines but forty minutes. It is also interesting to note that the original cost of the Van Depoele generators was $3,200 each, and that a single armature cost $1,000. The machines are now being broken up, and it is found that the field coils consisted of 2,000 lbs. of copper wire. This is more wire than is now employed in the manufacture of the fields of the 300 K. W. machines which have been substituted.

FIG. 6.—SOLDIERS' MONUMENT AND HIGH SCHOOL BUILDING —DAYTON.

The original steam equipment consisted of five tubular boilers of 100 H. P. each, and more recently two of 125 H. P. each have been installed. The power equipment of the station is now being increased by the addition of two McIntosh & Seymour tandem compound, non-condensing engines, having cylinders 14½—23 × 22 ins., which are to run at 160 revolutions and are rated at 250 H. P. each. The pistons are coupled to the same shaft and are belted direct to an M. P., 300 K. W. General Electric generator. The new boilers were manufactured by Brownell & Company, of Dayton, and are 72 ins. × 16 ft. They are built with a doubt welt seam with three rows of five-eighths inch rivets. The shell, which is of the best flange steel, is seven-sixteenths of an inch in thickness, while the head is one-half inch. The domes are 40 × 40 ins. and the steam main is six inches in diameter.

C. M. Crane is the engineer of the station, and has been in charge of the plant ever since it was built, and with two assistants he keeps the plant going while he superintends the placing of the new machinery. The average number of cars now operated is fourteen, but frequently by the use of trailers as many as thirty-three cars are run. The average coal consumption for operating the line is five tons per day, which costs delivered $1.95 per ton.

ROLLING STOCK.

The summer equipment consists of open cars manufactured by the Barney & Smith Car Company, which are provided with fare boxes and fare conveyors. The fare boxes are placed to one side at the front end of the car, in rear and to the left of the motorman as shown in the accompanying illustration, Fig. 6. Registers are also provided on which the motorman records the receipts. The experience of operating without conductors has been very satisfactory to the company, especially in connection with the use of the registers. McGuire trucks are used. The system is operated under the supervision of A. C. Clark, vice-president, and A. H. Cole, superintendent, who has recently been appointed to the position, to succeed William Beach, the former incumbent.

Oakwood Street Railway Company.

The lines of this system embrace eight miles and are operated by horse power, one horse, bobtailed cars being employed. Charles B. Clegg is president and manager, and the work is already in progress for changing the line to electric traction. A new station has been built near the southern terminus of the road, which runs east and west through the city on Main Street. The new track construction will consist of a ninety pound rail, the same as is being used on the lines of the City Railway Company, except that the rail will be of the Johnson girder type, and will have a base of five and a half inches. The electric system to be employed had not been decided upon at the time of our visit. One of the cars on this line is shown to the right in each of the accompanying illustrations, Figs. 2 and 6.

Wayne & Fifth Street Railway Company.

This system embraces seven miles of track, and is also operated by one horse cars under the management of N. Routzahn, superintendent. The line crosses the city on Jefferson Street, runs east across the Mad River and extends into the manufacturing districts of North Dayton. We were not informed whether a change of motive power is contemplated or not.

Home Avenue Railway Company.

This is a steam dummy line which runs from the Union Depot to the Soldiers' Home. The line, which is under the management of W. P. Callahan, will doubtless soon be electrified.

Indianapolis, Ind.

The Citizens' Street Railway Company,

under the management of T. H. McLean, controls all the lines of the city embracing 100 miles of track, and the service caters to a population of about 125,000. The cars are all electrically operated, except on Kentucky Avenue, where one mule car is run for the purpose of holding a franchise.

Mr. McLean, previous to his connection with the Citizens' Street Railway Company, in August last, was connected with the Twenty-third Street lines of New York for sixteen years, and for a short time was manager of the Metropolitan Street Railway Company's system in New York. The Indianapolis system at the time he assumed the management embraced a trackage of forty-five miles, and the average number of cars operated was forty-five. During the year, it will be noted, the mileage has been more than doubled, and the number of cars operated increased to ninety-six. The average daily motor mileage is 12,994 and the trailer 1,005 miles.

Notwithstanding a falling off in receipts during the prevailing business depression, the expenses for repair and operation have been materially reduced, so that the net receipts show an increase over previous months. The

operating expenses per car mile are less than those of any other electric system that we have found, with one exception. How this showing is obtained will be noted from the following particulars of practice.

The number of car barns and stations have been reduced from seven to three, and a very rigid economy is practised in the repair shops. All of the supplies used are manufactured in the company's own shops. The car wheels are purchased in the rough and are bored and faced in the repair shop. A brass foundry is operated in connection with the shop, and all the brass and bronze supplies are here manufactured, including trolley wheels and harps, gong frames, journal bearings and many of the bronze trimmings, the material for these castings being old wire and scrap which is melted up for the purpose. The journal brasses when worn are turned out and refilled with babbitt, which is also manufactured on the premises, the standard babbitt mixture being employed. By this means the brasses are made to last a long period, as they can be rebabbited many times. Fuse boxes and the diverters used in connection with the controlling stand, are also manufactured in the shops. The repair shops are equipped with a good complement of iron and wood working tools, and include a Gould & Eberhardt automatic gear cutter. There are also a wheel press and axle lathes, also a milling machine for cutting keyways. A larger car axle than formerly is being em ployed. The wheel seat is now four inches, and the balance of the axle is turned down to three and three-fourths inches. In turning the wheel seat it is the practice to make it $\frac{1}{200}$ in. larger than the bore of the wheel in order to insure a close fit.

The trolley wheels as now employed are cast with a U-shaped instead of a V-shaped groove with an unusually thick flange. This, it is claimed, adds materially to the life of the wheel, as it gives a larger wearing surface for contact with the trolley. The trolley harp is made with a ferule which embraces the end of the pole and to which it is held by means of a nut on the end of the pole, so that the harp can be readily removed and replaced. The contact springs are also arranged so that they bend and pass through the sides of the harp, and are fastened to the lower part, which prevents their being worn in two by the trolley wheel. Experiments are being made with adjustable rim gear, which is so constructed that the rim when worn can be removed without removing the core from the axle.

In changing from closed to open cars and *vice versa*, it is the practice to take out the wiring and cables, with the exception of the lamp wires, inspect them carefully, repaint the insulation, and replace them. This practice has been found to add materially to the life of the connections.

The company has also worked a considerable saving in brake shoes, the practice now being to employ shoes of as hard material as possible. The shoes are purchased from a local foundry, and the instructions to the manufacturer are that the material shall be such as to make them very hard. This is contrary to steam practice, but it is found that it works a saving both on the shoe and wheel. This practice was suggested from the condition of the wheel tread, which on examination is found to be honeycombed from the effects of the current due to the flashes caused by poor rail contact. Because of the pitted condition of the tread, a soft shoe causes the wheel to slide, while a hard shoe does not affect it so much.

The power for operating the tools of the repair shop, including the wood working tools, is supplied by a fifteen horse power motor, which is operated from the line current. The shops are operated under the supervision of H. B. Niles, who is also electrician for the company.

POWER STATIONS.

With the increase in mileage and traffic it has been found necessary to erect a new power station, which is now nearly completed. This plant is located on the west side of the river on West Washington Street, in proximity to the river, from which the feed and condensing water will be drawn. The buildings are of ample capacity, and are designed for an ultimate equipment of 5,000 H. P. The engine room is placed in the rear of the boiler room, and the structure consists of a steel frame with corrugated iron sheeting. The ground dimensions of the boiler room are 80×75 ft., and it will be open to the roof which is unusually high. The present steam equipment will consist of two Zell improved safety boilers of 750 H. P. each, manufactured by Campbell & Zell, of Baltimore. These are equipped with Hawley down draft furnaces, and all the steam fittings are unusually heavy. Natural gas is to be employed as fuel, which is purchased at a very cheap rate. The building for the engine room is a brick structure 215×70 ft., and this will be duplicated for additional power. The engine equipment will consist of two cross compound, condensing engines of 750 H. P. each, manufactured by the E. P. Allis Company, of Milwaukee. The auxiliary equipment will consist of Reynolds independent jet condensers. One engine will be coupled direct to a Westinghouse M. P., 500 K. W. generator, the flywheel being located to one side of the armature. The second engine is provided with two flywheels, and will be belted direct to two Short generators having thirty-nine inch and fifty inch armatures respectively. It is proposed to operate eventually a direct connected generator from this second engine, when the flywheel will be removed.

The switchboard will be equipped with the latest improved instruments, and all the station appliances will be first class in every particular. As noted above, the water will be drawn from the river through a system of wells and a brick conduit leading from the station under the bed of the river. The wells will be sunk some distance from the shore, and protected by coffer dam and a triangular breakwater to prevent floating ice from coming in contact with the walls. The brick conduit through which the water will be drawn, is thirty-six inches in diameter, and terminates in a double well in the station, from the outer one of which the condensing water will be drawn, and from the center well, which is driven considerably deeper than the other, the feedwater will be drawn. A gate connection is made between the inner and outer wells, so that in case the feedwater supply should fail it can be drawn from the same source as the condensing water.

The old station, which has been previously described in these columns, is located near the Union Depot in the business portion of the city, and the equipment has been added to from time to time, and now embraces quite a variety of engines and boilers. The original equipment consisted of two 500 H. P. Hazelton boilers, to which were added later two Babcock & Wilcox boilers of 325 H. P. each.

The boiler compound for removing scale is introduced through the feedwater by means of a pipe communicating between a barrel containing the mixture and the suction pipe of the pump, an arrangement that is working very satisfactorily.

The original engine equipment consisted of one Wheelock 250 H. P. machine which was belted to a countershaft, from which three D 62 Thomson-Houston generators are operated. A double Wheelock engine, of 500 H. P., was subsequently added, and later a Westinghouse compound engine, of the Kodak type, which is direct coupled to a Westinghouse M. P., 250 H. P. generator. The additional generator equipment consists of one M. P., 250 K. W. General Electric machine and two D 62 machines. There is also one General Electric thirty light arc machine for lighting the park and groves to which the lines of this company extend.

In addition to the usual equipment of lightning arresters, including a number of non-arcing arresters, the station is protected by a tank arrester which consists of a wooden vat, about two feet in length, one foot wide and one foot in depth, which is kept filled with water, and in which two copper plates are submerged, one connected by a No. 0000 trolley wire to the ground, and the other by wire of the same size through a switch to the bus bar of the switchboard. In case a storm is approaching, a switch is thrown which places the tank arrester in circuit,

and although there is a loss of about six amperes of current while in circuit, it works so satisfactorily to protect the station that it is considered a very essential device. So far as experience goes, this arrester operates very successfully, and no trouble has been had from the atmospheric current since the tank arrester was employed.

ROLLING STOCK.

Among the new cars recently put in service are twenty-five vestibuled, single ended cars with twenty foot bodies manufactured by the Pullman Company, and twenty-five of the same type manufactured by the St. Louis Car Company. These cars have the doors placed to one side, and the back platform has only one step, being closed entirely around by the dash on the opposite side. In addition are twenty eighteen foot, open dash cars manufactured by the St. Louis Car Company, and ten double end, vestibuled cars, and sixteen sixteen foot, open dash cars manufactured by the same company. There are also twenty sixteen foot, open dash cars manufactured by the Brownell Car Company of St. Louis.

The open car equipment consists of seventy-five cars having glass fronts, single ended, with eight seats, manufactured by the St. Louis Car Company. These are operated with a screen on one side to protect the passengers from the center poles which are the prevailing construction. The company also owns seventy-five seven seated and eight seated open trail cars. Trucks of the McGuire type are chiefly employed, there being two of the Peckham and one of the Taylor trucks.

The original motor equipment consisted of the Thomson-Houston double reduction motors. Afterwards a number of S. R. G. motors were introduced. These have been made over in the company's shops and are still in operation. Among the more recent additions to the motor equipment are sixty-five equipments of the Westinghouse thirty horse power motors.

The more recent track construction is made with a ninety-three pound girder rail, and a large amount of this rail is already on hand. In the original construction what is known as electric girder rail was employed to a considerable extent, which was laid on chairs. This will be renewed with heavy rails as soon as the city is ready to improve the streets.

EMPLOYES.

The general manager hires and discharges all the employes. Motormen are required to have some knowledge of machinery and to be of average intelligence. Applicants are obliged to fill out blanks stating their qualifications and previous service, and are also required to be introduced by two business men, residents of the city and known to the management. Married men are preferred and also those living in the city and suburbs. The motormen on being employed are assigned to one of the road officers for instruction, who teaches them to operate the cars over all the lines. They are not required, however, to do any service in the shops before going on duty. The pay of motormen and conductors is fifteen cents an hour and they work twelve hours a day. Three crews are employed for each two cars. The present corps of car employes is a very efficient class of men, who seem to be performing their duties with a view to the best interests of the company, while they are attentive and polite to the public.

The fare is five cents, and a very liberal system of transfers is in vogue. The number of transfer tickets issued daily is about 9,000, while on Sundays and holidays it amounts to 14,000. The cars are equipped with two registers, one for recording cash fares and the other for the transfer tickets. Both the Sterling and Meaker types of registers are employed, there being 160 cars equipped with the former type.

The company owns and controls a large park located about five miles from the city, to which the cars from two connecting lines run. The grounds are well laid out and improved, and a good portion of the park is covered with a large growth of native trees. A handsome station is located near the terminal of the line, and the cars make a loop and receive and discharge the passengers directly into the station. The grounds about the station are ornamented with flower beds and foliage plants. There is a canal passing through one side of the grove connected with the park, beside which a number of pleasure boats are kept for hire. There is the usual attraction of merry-go-rounds and switchback railroads, all of which tend to attract visitors to the location. An old time farmhouse stands in the park in which meals are served in farmer's style to those who wish. A track near the park is provided with buildings, and set apart for the children sent out by one of the Fresh Air Missions of the city. The street railway company provides free tickets for the children sent out by this Mission, which are good on the cars at certain hours.

The first street car line was started in Indianapolis in 1864, and the first electric line June 17, 1890. W. T. Lewis, the present superintendent of the company, began service with the company as a driver in 1875. At that time only twenty-four cars were operated. The line was a single track road with turnouts, and no time tables were provided, each driver being left to make his own time. The driver started out with his team at six o'clock in the morning and ran to eleven, when a second team was substituted and driven till five o'clock, when the first team was again brought out and kept on duty until the cars were run in at eleven or twelve o'clock at night. The average life of the horses was only about two years. This treatment of the animals is in striking contrast with the present prevailing practice which requires the animals to make not more than sixteen or eighteen miles a day.

The franchise of the company does not require it to pay any car license nor anything on the gross receipts. A property tax, however, is required, and this is based on an estimated valuation of $1,600,000, which is supposed to be in lieu of a franchise tax. The company is at present in litigation with the city and with a rival company in regard to the period at which the franchise expires. The company claims there are yet a number of years for the franchise to run. An opposition company has been organized, which is making an effort to undermine the operating company, and has been making wild propositions to the Board of Aldermen for the purpose of securing a franchise, offering as high as from 5 to 14 per cent. on the gross receipts, as a compensation for the use of streets. The operating company, however, is not materially disturbed by these propositions, and is going ahead with improvements as noted above, and is providing in all respects a very acceptable service.

Chicago, Ill.

The trolley has at length gained the day in Chicago. Concessions have been granted to the North and West Chicago Street Railway Companies for operating the trolley on all their existing horse lines, and there is no doubt that the application of the Chicago City Railway Company for the employment of the trolley on the remaining South Side lines will soon be granted. At least there is a willingness on the part of the city authorities to grant the necessary franchises, but there are some questions in regard to the conditions which are not yet settled. All the companies have been required to make certain payments to the city, and on the North and West Sides there are conditions in regard to providing electric lights along streets over which the trolley lines are to operate.

The success with which the electric lines of the Chicago City Railway Company have operated during the past year and a half, especially during the months of the World's Fair, has had much to do in bringing the city authorities to a favorable consideration of the trolley franchises. The peculiar features of the electric plant operated by the Chicago City Railway Company were fully described in the August, 1893, issue of the Street Railway Journal, but the economy and success with which the plant is operated justify us in calling attention to the construction and methods of practice. The power station is located on Wabash Avenue between 52d and 53d Streets, and adjoins the power station of the State Street cable line, the two buildings extending through from one street to the other (Fig. 7).

The management now proposes to install an electric motor in the cable station for the purpose of operating the winding drums, so that all the power may be generated in the electric station, thus saving in the number of station employes. Should this experiment prove successful, all the other cable stations will doubtless be operated by an electric motor from power generated in a central station.

The power equipment of the present electric station consists of four Wheelock engines with Hill valves. These engines have unusually heavy crossheads and crankpins, all the parts being made sufficiently strong for larger cylinders than those now employed, the idea being that when additional power should be required larger cylinders could be substituted. The floor around the engines is covered with tin, from which waste oil can be readily removed, a very desirable feature, and facilitates the labor of keeping the engine room in a cleanly condition, a feature for which this station is noted.

The engines are coupled in pairs to the same shaft, and each pair drives, by means of continuous ropes, two Westinghouse M. P. generators of 700 H. P. capacity, the armature of each generator being coupled to the driving pinion by means of friction clutches of the usual type. The transmission ropes are of cotton, one and a quarter inches in diameter, and a portion of the wraps is led over an idler from the armature pinion, forming a compound wind, in order to equalize the friction contact with that of the driving sheave. The tension sheave is mounted in a horizontal position on a truck which travels back and forth on a track attached to the ceiling, and to which the two strands of the rope are led over perpendicular guide pulleys supported from the ceiling. A tension of only 150 lbs. is employed, and this is suspended next to the wall back of the station, and a railed in platform suspended from the ceiling is provided, so that access is readily had to the tension car and guide pulleys (Fig. 8).

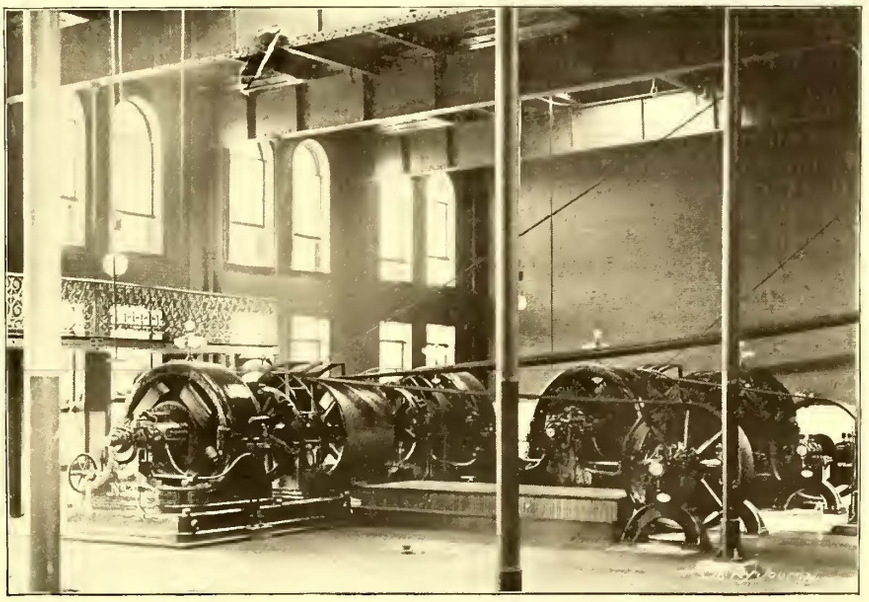


FIG. 8.—INTERIOR OF ELECTRIC POWER STATION—CHICAGO CITY RAILWAY.

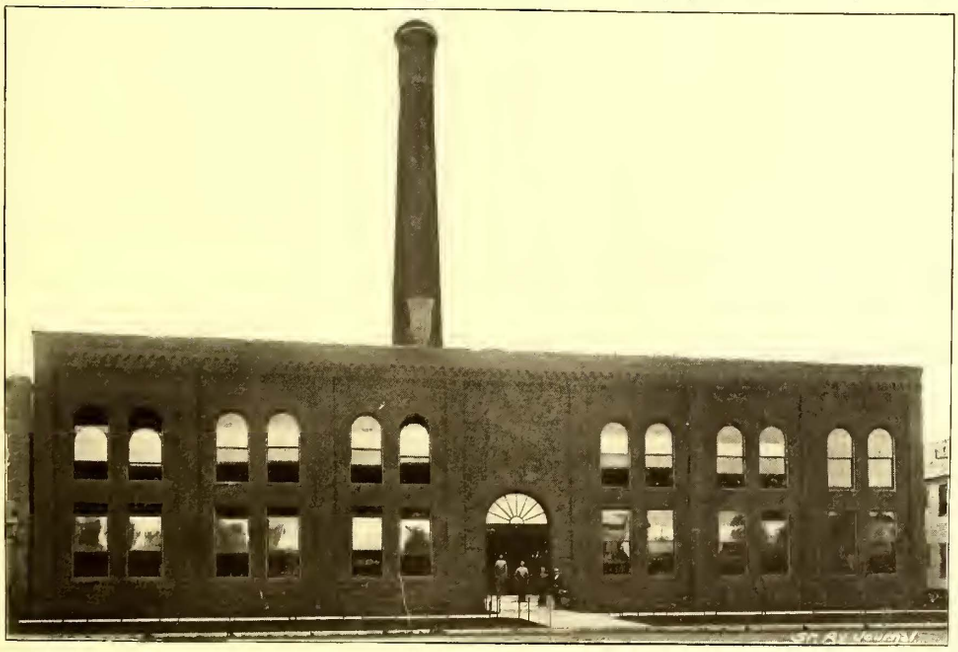


FIG. 7.—ELECTRIC POWER STATION—CHICAGO CITY RAILWAY.

The switchboard is located above the door on the street side of the engine room, and is supported by a balcony on which an attendant is constantly stationed to watch the instruments. The station is of sufficient capacity to accommodate all three additional units which will be added as soon as the new lines are constructed. The steam is generated in seven tubular boilers which are equipped with Murphy stokers. The rear of the boiler settings comes within a few feet of the partition wall between the engine and boiler rooms, and in order to provide for the removal of the mud drums through which the feedwater is led, openings have been provided in the partition wall. These openings on the engine room side are provided with doors, and have been converted into cupboards for the storing of waste, tools and supplies, the shelves of which can be readily taken out when it is necessary to remove the mud drums. To prevent the excessive heating of the rear flue doors, a sheet iron shield is placed inside the door, which is provided with a handle, so that it may be readily removed.

Among the station appliances is a Perfection oil purifier, manufactured by the Perfection Oil Purifying Company, of New York, in which the oil is filtered, and by its use a great saving in oil is effected, one barrel of dynamoline only being sufficient for oiling the engine and other parts, with the exception of the crosshead and crankpin, for twenty-one days, a little new oil being added each day. It requires about two barrels of oil a year for the bearings of the four generators, the self-oiling boxes being of sufficient size to hold a supply for ninety days. The average current for operating the system is from ten to twelve amperes per car. During the excessive traffic incident to the Fair 150 electric cars were run. The average number now operated is forty-five.

Among the interesting features of the electrical equipment of the station are two tank lightning arresters, which are placed in the basement of the station in position to be readily switched into the circuit. The water is contained in wooden tanks which are about two feet in length, one foot in depth and are provided with intake and outlet pipes, so that when in operation a current of water is constantly flowing, which prevents excessive heating. The tanks are thrown into the circuit by means of plug switches, and are readily connected whenever a storm approaches, the loss from leakage while in service being very small. The conductors between the tank and

machinery are provided with choking coils of heavy copper rods. The station has suffered no damage from atmospheric discharges since it has been in operation.

The motor equipment of the cars is chiefly of the Westinghouse type, and so far the armature repairs have been very slight, one man doing all the winding and other work besides. A new device to facilitate repairs is noted at one of the car barns. The hydraulic trucks which operate on tracks in the bottom of the pits and which are employed for removing the armatures, are in some cases provided with a small box which rests on the platform, having on its upper surface parallel wooden rollers about three inches in diameter, which allows the armature to turn as it is being lowered from its bearings, so that the pinion will free itself from the gear. (Fig. 9.) The device is the invention of A. D. Campbell, superintendent of repairs at one of the barns. Another useful appliance, which was also devised by the same person, consists of a tripod, with legs composed of one and a half inch gas pipe, which is employed for lifting the motor in case of a broken axle or wheel. In case of an accident of this

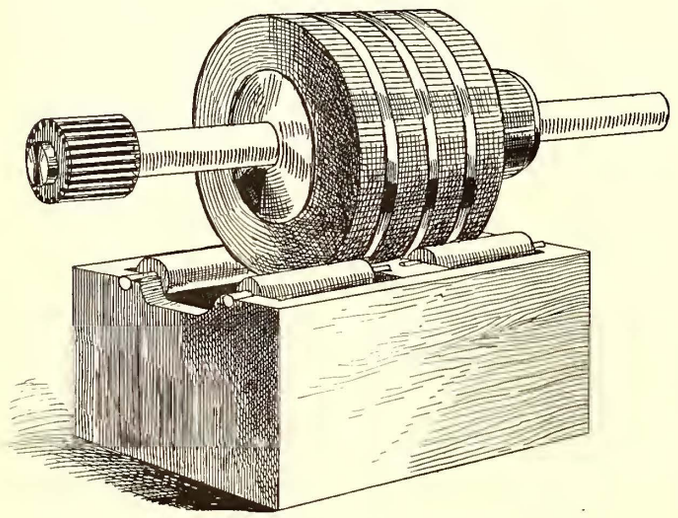


FIG. 9.—ADJUSTABLE ARMATURE REST—CHICAGO

kind, the tripod is placed on the floor of the car, when by means of a block and tackle the motor may be lifted into position, the attachment being made by an eye bolt screwed into the motor field, a hole being drilled and threaded for the purpose. With this device a crippled car can be returned to the barn either by power from its other motor or can be pushed in by another car.

To prevent the pulling down of the overhead construction by the trolley pole a guard has been devised by G. W. Knox, electrician of the company, which consists of horizontal rods, is attached to the base of the trolley harp, and which extend both sides of the wheel. In case the trolley wheel leaves the wire the guard comes into contact with the trolley and prevents the wheel from engaging with the span wires. As a means for holding up the trap door of the car when the motors are to be inspected, a button composed of a metal plate, having an offset and attached to one end by means of a bolt to one of the floor timbers, is provided. This is readily turned up in position when the door is opened, where it holds it firmly.

Trucks of the McGuire type are chiefly employed, and in order to prevent the low hanging truss rods from coming in contact with loose paving blocks or other obstructions, they are supported from above by means of a chain attached to the turnbuckle. This not only supports the rod but also prevents the turnbuckle from turning or becoming loose after being placed in position. The track scrapers, which are operated from a lever from the platform, are attached to the blades of the pilot. Some minor changes have also been made in attaching the parts of the motor; for instance, the axle collars are held in position by a larger set screw than is usually employed, and the commutator guard is attached by means of bolts extending through the frame, which prevents their working loose.

The company is now operating one of Lovejoy's convertible cars, a description of which was given in our last issue. This car was manufactured by the Wells & French Company, of Chicago, under the supervision of Mr. Lovejoy, and is finished in all respects in a very thorough and artistic manner. It is equipped with the G. E. 800 motors, and differs from most types of combination cars. When closed it can hardly be distinguished from the ordinary type of closed cars. All the adjustable parts are made close fitting, and there is apparently no tendency for the joints to become loosened or the parts to settle. When run as an open car the passengers would not ordinarily detect the presence of the sash and panels against the ceilings, the general appearance of the ceiling not being materially changed. The design of the inventor is to obviate the necessity of providing a double equipment for summer and winter use (Fig. 10).

Among the improvements on the cable lines which were introduced just previous to the World's Fair were five signal towers which were erected at different crossing and switching points on the line. These consist of

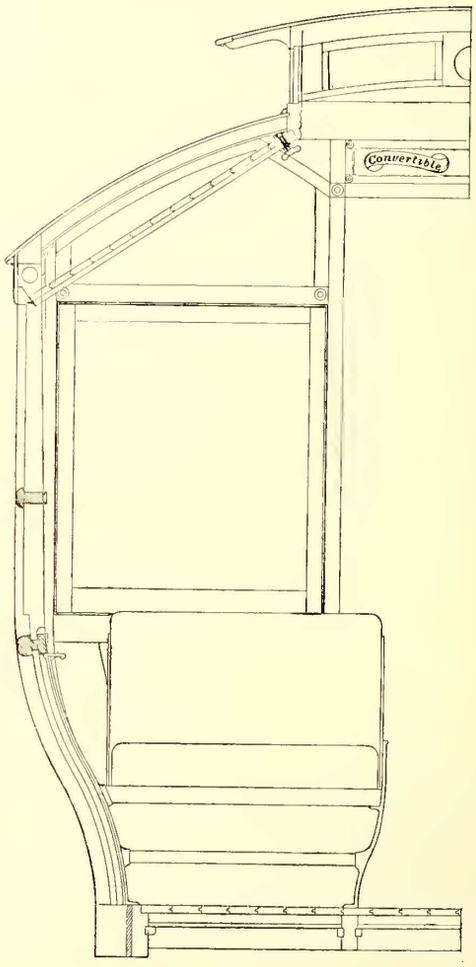


FIG. 10.—SECTION OF LOVEJOY'S CONVERTIBLE CAR—CHICAGO.

small cabs mounted on posts and provided with signals and rod mechanism with which the attendant can operate the switches. One of these is located at the junction of 55th and State Streets, opposite the power station, adjoining the park, and is shown in the accompanying illustration (Fig. 11). The day signals consist of wooden blades of different colors, one of which is labeled "Stop," and at night are provided with colored lights. By means of this station the trains on the main line and the branch line on 55th Street are safely controlled. These towers are operated in a very satisfactory manner, insuring safety and facilitating the movement of trains.

Among the improvements made by the Chicago City Railway Company are the renewing of the rails on the

Cottage Grove and State Street cable lines from 39th Street, south. The new rail is a seventy-four pound, four and three-quarter inch girder, and of a somewhat new design, having a beveled head, from a design shown in our last issue in connection with a paper on wheels and rails by Fred. H. Fitch, and the joints are to be electrically welded. The new form of rail has been adopted to prevent, if possible, the uneven wear on wheels and the wavy condition of the rail surface, which is the principal defect in the old construction, and which is apparently caused at points where one rail is higher than the other by the slipping of one wheel to keep up with the other. The experiment is being tried of cleaning the cable and conduits by means of flushing them from the city hydrants, a peculiar shaped hose nozzle being provided to lead the water through the slot. By this means it is hoped to reduce the expense of keeping the conduit clean, which now requires the services of thirty-three men every day in the year at a cost of $28,000 per year, the work of cleaning being augmented by the peculiar form of yokes with which the conduit is constructed, there being a curved cross brace above the bottom of the yoke, which interferes with the movement of the cleaning tools, it being necessary to lift the hose over the brace every four feet.

MONTHLY MEETINGS.

One of the commendable features of practice introduced by Superintendent Bowen is a monthly meeting of the heads of all the departments with the superintendent, which is usually held on Saturday afternoon from one to five o'clock, to which some of the employes known as the handy men are also admitted, being given a half day off for the purpose. At these meetings papers on different subjects are presented by the foremen of the different departments, the subjects being assigned by the superintendent at previous meetings. Sometimes committees are also appointed to assist in the preparation of these papers. The work of preparing these papers requires considerable study and investigation on the part of the authors and gives them an opportunity to inform themselves on the particular subjects pertaining to their departments and induces them to take more interest in their work. In connection with these meetings the foremen of the different departments are asked to criticize or give their opinions on the practice of the different departments. and to make any suggestions as to how the work may be economized or improved. Sometimes a set of questions, like that below, is sent to the foremen in advance of the meetings, to which they are expected to reply :

Section of rail to use ; weight, shape and size ?
30—60 or 90 foot rails ?
Welded, riveted or bolted joints ?
Kind of paving with details of work ?
Shape of top of roadbed ?
What kind of rail filler to use ?
Which of our lines will it pay to continue to use horses upon ? Why ?
Open or closed car motors ?
What cars should we take for motors ?
Single or double motor equipment ?
What truck to use ?
What electrical equipment ?
What trolleys ?
What controllers ?
What lamps ?
Should we ourselves make trucks and construct work on line and roadbed or let out by contract ? Why ?
What rate of speed should be scheduled ?
Should cars be vestibuled ?
What is the best brake for electric train motor and trailer ?
What fender is best ?
What form of rail joint and bond is best ?
What is best size and weight of wheel ?
What is best form of barn reconstruction as to tracks, doors, elevators, shops and offices, in a general way ?
What is best distribution of lights in cars; position, power and number ?
What is best heating device ?
What oils should be used on wheel journals—(armature—shaft—bearings)—commutators—controllers—trolleys ?
What is best car seat to adopt ?
Should shops be in each barn or central ? How about supply parts, store rooms, etc., as to location and arrangement ?
What is the best method of keeping motor cars washed clean and lamps clean ?
Should elevators, transfer tables and lights be run from main power house for each barn, or steam plant be in each barn ? also
What detail change can you suggest for economy or efficiency in any part of the electric railway as used by us to-day ?

As an auxiliary diagrams are kept in the superintendent's office, which are framed and placed in a position to be inspected by the heads of the departments, on which efficiency curves are drawn each month, being laid out from the reports of the foremen of the different stations and different departments. One of these diagrams shows the relative cost for feeding and caring for the horses at the different stables; the relative cost for track construction and repairs from month to month, and one the general efficiency of the entire system. Since this practice has been introduced the operating expenses of the different stables and car barns have been greatly reduced, in one case amounting to $4,000 per month, the principal saving being made in the amount of feed per horse and in the number of attendants. The cost per animal, however, is not allowed to go below a certain amount. At the end of each month the superintendent sends a statement to the foremen of each department, giving a list and cost of all the supplies that have been ordered for that department for the month, with such comments as may be found necessary, whether too much or too little has been ordered. If too much, they are advised to lessen the amount for the following month. These statements also include the amounts ordered by the heads of all the other departments, so that each is able to compare his work with that of others.

The immediate control of the car men is assigned to a chief supervisor with three assistants, two of whom with the chief constitute a board or commission, which meets every morning to receive and act upon the reports of the inspectors, and the complaints of passengers, and who sit once a week to try such employes as may be ordered before the board for any cause. In case an employe is ordered to report before the board, he is understood to be suspended for that day.

The number of car employes on this system is now 1,700, and out of this number there are on an average about forty punishable offences reported each week. The daily complaints from passengers run from five to eight, and about 250 complaints a week of a more or less serious nature come before the board.

Notwithstanding the falling off of traffic after the close of the Fair, very few of the extra men were discharged. No new car employes, however, are being hired, and the force is being reduced only by discharges for cause, the policy of the management being to give employment to as many extra men as possible to help them to bridge over the hard times, and this notwithstanding the fact that the wages paid by this company are higher than those paid on any other line in the country.

The inspectors, while on duty, are stationed at different points of the line, and are constantly watching the movements of the cars, and for any infringement of the rules on the part of the employes. In case a conductor gives a signal too soon when passengers are boarding or alighting, or in case a gripman, driver or motorman fails to heed the signal of passengers, or if a car comes in ahead of time, the facts are noted and reported to the board and the offender is reprimanded, suspended or fined according to the nature of the offence. The inspectors also superintend the raising of blockades should any occur from accident or the passage of processions in the street. The average headway of the cable trains of the two principal lines being a minute and a half, it is estimated that a blockade of an hour results in the loss to the company of at least $600.

In case an employe is suspended or discharged by the action of the board he has the right of an appeal to the superintendent, who reviews the case and acts accordingly. In only one or two instances has he found it necessary to change the ruling of the board. The work of this commission relieves the superintendent of a large amount of detail work, as only the serious cases are brought to his attention, and a summary of the complaints is presented from day to day. The heads of all the departments are made responsible for the efficiency of the men under their charge, and so complete is the organization of the oper-

ating forces that the actual work of the superintendent is less than that required on many smaller systems.

West Chicago Street Railway Company.

During the last year the Blue Island Avenue cable line of this system, which is under the management of John B. Parsons, has been put in operation, the legal complications which prevented the completion of the street tunnel having been removed. The new cable line is operated from two power stations, one located at Blue Island; the other, which operates the rope through the tunnel and city loop, being on Van Buren Street, both of which stations have been described in these columns. The winding drums of the latter station are independently driven by cotton ropes from the same pinion, while those of the Blue Island station are operated by intermediate gears. The winding drums in both stations are equipped with the Walker differential ring.

The tunnel grades are about 10 per cent., and as a precaution to prevent the running away of cars in case the grip fails to hold, a rack is placed in the surface of the track between the rails, which is designed to engage with a pinion mounted on the grip. The pinions, however, have not been as yet provided. The conduit of the Blue Island system is shallower than is usual in cable construction, being only two feet in depth, and a bottom grip is employed. This grip is working in a fairly satisfactory manner, but longer jaws are to be employed. The first tunnel rope on this system had a life of about seventy days, the traffic not being as heavy as it is through the Washington Street tunnel.

During the last year a duplicate rope has also been put in service through the Washington Street tunnel, which operates around the new loop which extends into State Street. The Milwaukee Avenue cars follow the course of the old loop and the Madison Street cars that of the State Street loop. This arrangement facilitates the movements of trains, gives the opportunity of loading and unloading without the trains interfering with each other, and has added much to the life of the ropes. The average life of the tunnel rope up to the time the duplicate rope was installed was only from twenty to thirty days. Since the two ropes were operated the rope on the State Street loop has a life of about sixty days, and that of the LaSalle Street loop seventy-five days, or an average of seventy days, and this notwithstanding that the rope of the State Street loop is depressed at five points for the purpose of crossing other ropes, once for crossing the other loop and four times for crossing the ropes of the North Side Company. The life of the ropes on the two main branches has also been materially increased, and is being increased from month to month. This result is partly secured because of improvements made in the rope by manufacturers, the purchases being made for the most part from Roebling and Hazard, but the chief factor in adding to the life of the ropes is due to the changes made in the position of deflecting pulleys, extra care on the part of the gripmen, and the employment of a softer metal in the grip dies (dies of rolled steel being employed, which are 25 per cent. softer than those formerly used), and a careful and constant inspection of the ropes.

The average horse power per car required for operating the cable lines of the West Chicago Company, including the friction of engine, machinery and rope, is three and a half horse power. This is for the ordinary size cars which weigh about 8,500 lbs. each. For hauling the combination cars, which weigh about 16,000 lbs., it requires an average horse power of five.

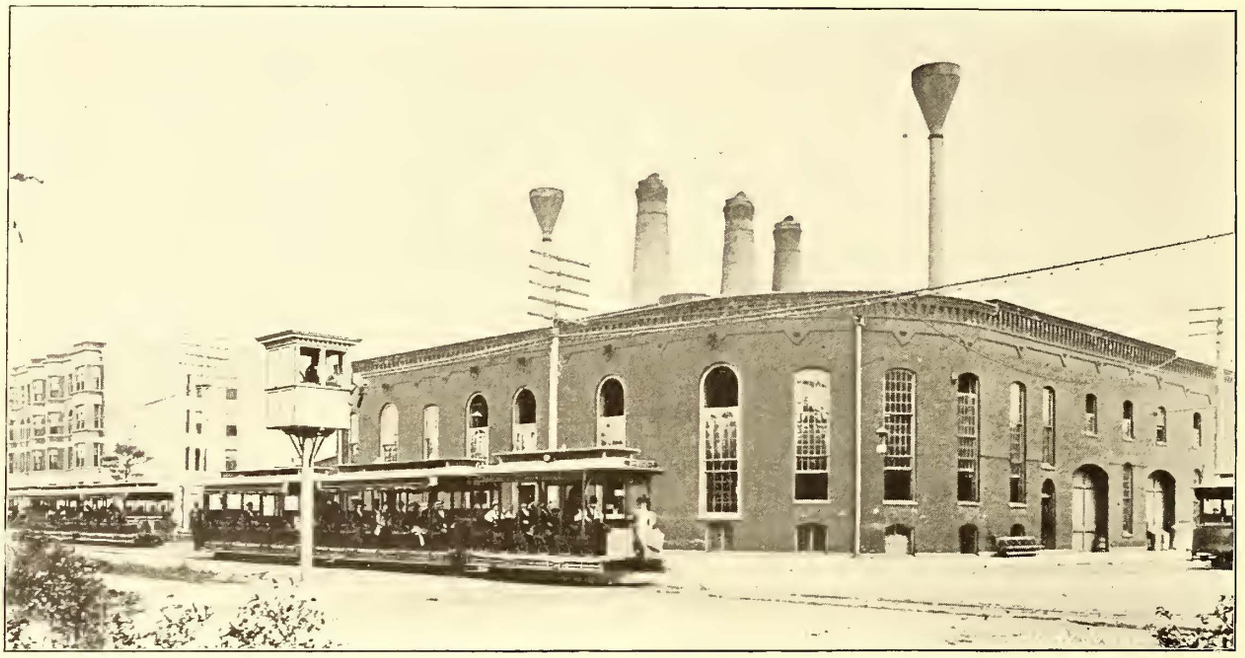


FIG. 11.—55TH STREET CABLE POWER STATION AND SIGNAL CAB—CHICAGO CITY RAILWAY.

ELECTRIC LINES.

Concessions having been secured from the city authorities, as noted above, for the employment of electric cars on the remaining horse lines of the West Chicago system, the work of electrifying a portion of the lines is already well under way, and the central power station will be located at the corner of Western and Washington Avenues on the property now occupied by the horse car barns and repair shops. New buildings will be erected, and the ultimate capacity of the station is to be 6,000 H. P.

North Chicago Street Railway Company.

This company is also making preparations to equip a portion of its lines for electric traction this season. The first lines constructed will be operated by power from the North Chicago Electric Company's plant, but a brick central power station is being built at the corner of California and Roscoe Avenues from which all the lines will be eventually operated. The ultimate capacity of this station will be 8,000 H. P., and the power equipment will consist of four 1,000 H. P. units, the engines being cross compound and manufactured by Fraser & Chalmers. Boilers of the Zell type will be employed. The generators are to be of the Siemens & Halske type of 500 K. W. capacity each. The smokestack is to be 200 ft. in height, with a fourteen foot flue.

The conditions of the new electric franchises for the North Side require the company to pay a license of $50 per car per year to the city. The new tracks are being

laid with an eighty-five pound Johnson girder rail seven inches in depth resting upon tie plates and brace chairs, the ties being two feet centers. A new car equipment is to be provided for the electric lines, and a sample car is now being built by the Wells & French Company, of Chicago. Both the open and closed cars for this system are hereafter to be finished in natural wood, ash being chiefly employed. All the cable cars are being equipped to be lighted by the Pintsch gas system, and improvements in other directions are also being made.

Superintendent Roach, of this system, is giving his special attention to the improvement of the ropes employed on the cable lines. As already noted in these columns, ropes manufactured by Cradock, of Wakefield, England, are employed in the LaSalle Street tunnel, which have had an unusually long life. The erratic life of ropes has suggested that possibly a composition metal can yet be found from which to draw a wire that will insure a longer life. The superintendent is of the opinion that the ropes break up from crystallization due to the effects from the grip chiefly, and that if phosphor can be removed from the metal the tendency to crystallize can be obviated. Experiments are now being conducted by the Roeblings with a view to accomplishing this result Samples of imported ropes are being analyzed by the superintendent, and he is also conducting experiments in. his own shops.

Some change has been recently made in the grips employed on these lines which has strengthened the device materially. In place of four separate plates in the grip shank three are employed. These are six inches in width in place of the four and a half inch plates, and now the grip never fails to hold the rope with heavy trains through the tunnel. The delays on these lines, due to the failure of grips or ropes, which were common in the early history of the road, are a thing of the past, and the lines are now being operated with great satisfaction to the traveling public. The lines are carrying a larger number of people than they did in 1892, but not as many as were carried during 1893, the increase being due to the World's Fair. It is also noted, as is the case with all the cable lines in the city, that the accidents during the year of the Fair were less in proportion to the number of people carried than in previous years.

The regular fare is five cents, and transfers are made over a number of lines. Employes ride on their badges, the number of the badge being reported by the conductor on his trip slip. The tracks of the cable line on Lincoln Avenue are being renewed with a heavy rail, the new construction being a seventy-six pound, six inch rail of special design.

The pay of conductors is $2.50 per day, gripmen and drivers $2.25.

Buffalo, N. Y.

The rapid transit system of the city embraces 128 miles of track, which is controlled by the Buffalo Railway Company, and the lines cater to a population of about 300,000. There are five outside lines operated by other companies, which serve as feeders to the principal system. During the last three years in which the system has been under the management of H. H. Littell, seven additional miles of track have been built, and four of the former car barns have been rebuilt to adapt them to the storage and repairs of electric cars, and five new car houses have been built.

The average number of cars operated is 180, which is often increased by the addition of trailers to 240 or 250. Included in the rolling stock equipment are thirty eight wheel cars.

The power equipment has recently been increased by the addition of two vertical compound engines of 1,250 H. P., manufactured by the Lake Erie Engineering Company. These are each coupled direct to Thomson-Houston 800 K. W. generators. One of these engines was employed last year in operating the Intramural road at the World's Fair grounds. The original equipment of the Buffalo station consisted in six vertical engines of the same type, of 600 H. P. each, and three 300 H. P. Ball engines of the tandem compound type. These operated nine Edison generators of 200 K. W. capacity each, and six M. P generators of the Thomson-Houston type of the same capacity. The boilers are chiefly of the Babcock & Wilcox patterns, there being two of the tubular type, and are all equipped with the Roney stoker. The boiler equipment has recently been increased by the addition of several large boilers of the Babcock & Wilcox type. The ultimate capacity of the station is said to be 3,000 H. P.

The station is located on the bank of the ship canal from which the water for condensing purposes is drawn. The coal is elevated and transferred by worm conveyors to storage bins, the conveyors being operated by an electric motor.

The feedwater pipe is provided with a thermometer which indicates the temperature of the water, the average temperature being 170 degs.

An economical feature of engine room practice is the boiling of the waste rags after being once used, which removes the oil and results in the saving of oil and waste, the rags being used over and over again. Linen rags are used in place of the ordinary waste, and care is exercised in the purchase that the stock does not include bosoms and cuffs, which are not adapted to use as waste.

The company is using a number of trucks which have been designed by the master mechanic of the company and which are built in the company's shops. These are designed for twenty-one foot bodies, and weigh 4,100 lbs. It is also employing a home made fender on many of its cars, which is adjustably attached to the truck, and is changed from end to end by the car men at the end of the routes. The design is simple and has proved very efficient in preventing serious accidents.

The repair shop has recently been equipped with a fair complement of new iron working tools; the wood shop is also provided with a number of wood working tools, which are all operated by electric motors.

Considerable new track is being laid, for which a nine inch rail is employed. This is replacing the rail of the Richardson type, which was formerly laid on chairs, and which is failing under electric traction.

The development of transit facilities is now keeping pace with the needs of this rapidly growing city, and it is the policy of the management to keep up with the demand, the improvements noted above being in this direction.

The Necessity of Good Brakes.

Improved methods of braking over those employing manual power, seem to be a necessity in these days of street railway progress. The old horse car, for which the hand brake was designed, and for which it always proved sufficiently satisfactory, not only ran at a much slower speed, and hence could be more easily stopped, but was much smaller and lighter, carrying, as it did, no heavy equipment. The inertia to be overcome in braking the modern cars has increased directly with the weight, and as the square of the speed at which they are driven. In other words, a twenty-eight foot, closed electric car weighing, say, 20,000 lbs. without passengers, and running at ten miles per hour, has sixteen times the energy to overcome when the brakes are applied than a horse car of one-fourth the weight and running at one-half the speed. At the same time the necessity of quick stops to avoid accidents has, if it has changed at all, been increased, because the horses of the horse car acted as a sort of advance guard, and would turn out of the track in case a person fell in front of a car, thus allowing ten feet extra distance in which to stop the car.

The fact that air brakes have been found superior to all others in steam railway service has naturally suggested the use of compressed air as a desirable agent for braking street cars, and the extensive adoption of them by the Third Avenue Railway Company, of New York, as well as other companies, seems to show that they are proving efficacious.

It has been well said that "half the fender is in the brake," and undoubtedly many of the accidents which have occurred on electric and cable lines could have been avoided had it been possible to stop the cars promptly by a quick application of the brake shoe.

Air Brakes on the Third Avenue Railway, New York.

The use of air brakes for cable cars has been given a thorough trial during the last few months by the officials of the Third Avenue Railway Company, New York. The test has occurred on the 125th Street and Tenth Avenue line of this company, and has been attended with marked success. This line of the Third Avenue Railway Company is operated under circumstances which emphasized the necessity of employing a more efficient brake than one operated by hand power. The routes covered are 125th Street from river to river and Tenth Avenue from 125th to 186th Streets. The first is the business thoroughfare of upper New York, and is always crowded during business hours with vehicles and shoppers, often calling for sudden stops to avoid accidents. Tenth Avenue is a succession of grades (some of which are shown in Fig. 1), and being the direct route to the pleasure resorts, Fort George, High Bridge and Van Cortland Park, is a road of very heavy traffic. Most of the cars run are mounted on double trucks, and all are of large size. These facts made formerly the employment of an extra gripman to help in setting the hand brake, a common occurrence. Such arduous conditions rendered the trial of any brake system particularly severe and made the result correspondingly interesting.

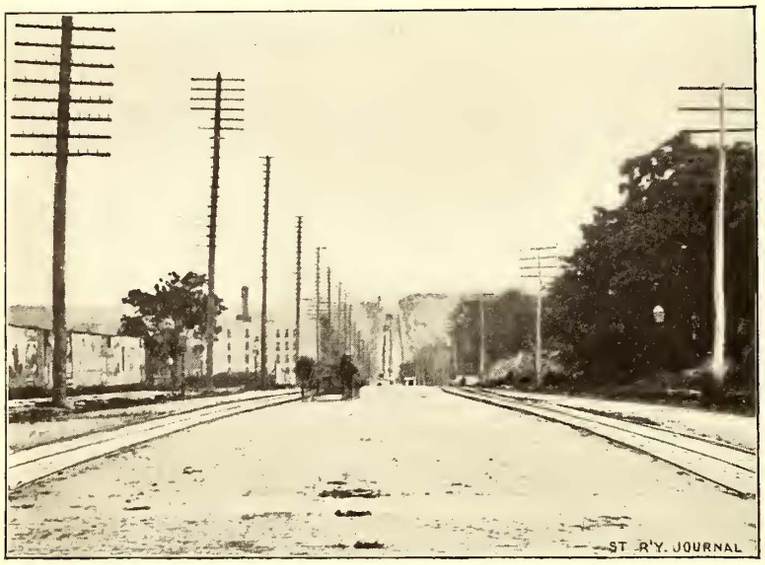


FIG. 1.—GRADE ON 10TH AVENUE LOOKING SOUTH FROM 145TH STREET.

At present there are 120 cars and trailers on the line equipped with the Genett air brake, the construction of which is familiar to our readers through descriptions in our former issues. These cars have been running continuously for a considerable time and cars are now stopped in much shorter time and on grades where formerly no stops could be made. A loaded thirty foot closed car, when descending a 9 per cent. grade at full speed can now easily be brought to a full stop within less than a car length, and in a much shorter distance than that if necessary.

A very good idea of the great inconvenience in operating the brake and grip lever is shown by the fact that hitherto harness has had to be worn by some of the gripmen on the cars operated without air brakes. As the operation of these hand brakes requires the expenditure of a great deal of manual force, the selection of gripmen has been naturally limited to those only who had great physical power and endurance, while on the cars equipped with air brakes any man of sufficient intelligence can act in the capacity.

A new application of air power was also made by the Genett Company on this road last month. This was its employment to operate the grip as well as the brake, both being controlled by the same handle, and one movement only being required to accomplish the results. Car No. 421 equipped in this way was put in operation about June 28, equipped by the Genett Air Brake Company, and up to the time of going to press with this issue had made all its daily runs without accident of any kind. The car is of the thirty foot Brill closed type and weighs, empty, 12,500 lbs. On the front platform are only two handles, the throw-off, which is used only at the termini of the lines in crossing over, and the Genett controller handle. The latter is arranged for three positions, one each for the following conditions: Grip closed with brake off; grip open with brake on; and grip open with brake off; the last being used in descending grades by gravity.

The advantage of having only one handle is to simplify the gripman's duties so as to make mistakes impossible. If in cases of emergency he has suddenly to move two or more heavy levers to avoid collision, the chances are more that a disastrous accident will result than if but one handle has to be moved.

Fig. 2 shows the old style car having different handles which the gripman was obliged to use. Fig. 3 shows platform of 421 car with the levers removed. There is no

FIG. 2.—GRIPMAN OPERATING GRIP AND BRAKE BY HAND POWER—3RD AVENUE RAILWAY.

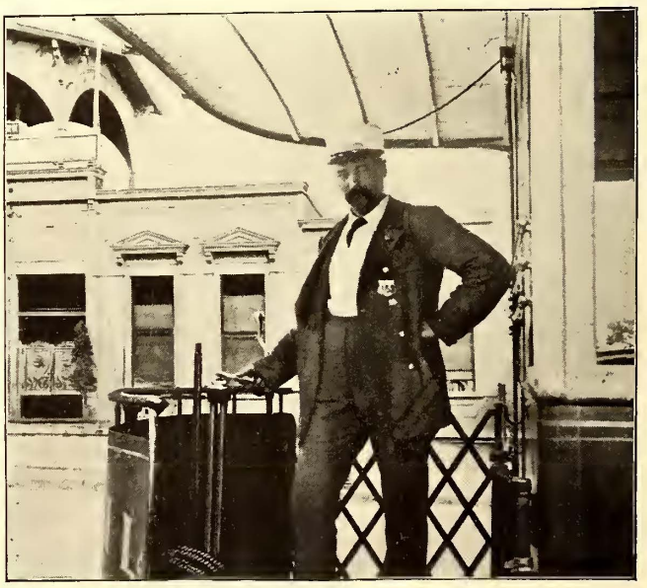


FIG. 3.—GRIPMAN OPERATING GRIP AND BRAKE BY COMPRESSED AIR—3RD AVENUE RAILWAY.

need for levers on cars equipped with the Genett air brake and grip controller, and the absence of these is a boon appreciated no less by the gripmen than by the railway officials. What was formerly a hard thing to do has now been made so easy that a child, if necessary, could work the handle, although, as the Genett Air Brake Company says, "they do not recommend juvenile employes."

This new device marks a new era in the successful handling of heavy cars or trains in street railway practice.

Carrying the Mails in Brooklyn, N. Y.

The Atlantic Avenue Railway Company has recently completed at its shops, 24th Street near Fifth Avenue, an electric postal car. The car was designed by the officials of the railway company, assisted by the postal authorities

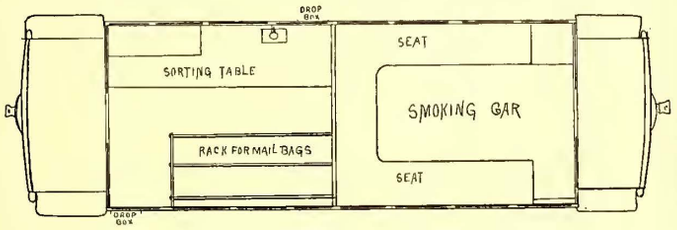


FIG. 1.—PLAN OF POSTAL CAR—BROOKLYN, N. Y.

of Brooklyn, and is patterned after the standard type of postal car used on steam railroad lines.

Only half of the car will be used for postal purposes, the other half being a smoking compartment. A plan of the arrangement of the car is given in Fig. 1. The car is of the Accelerator type, and along the side opposite to that where the door is placed is a shelf, above which are pigeon holes for distributing the mails. The rubber stamps for canceling and post marking are kept on this shelf. On the opposite side of the car are the pouch racks

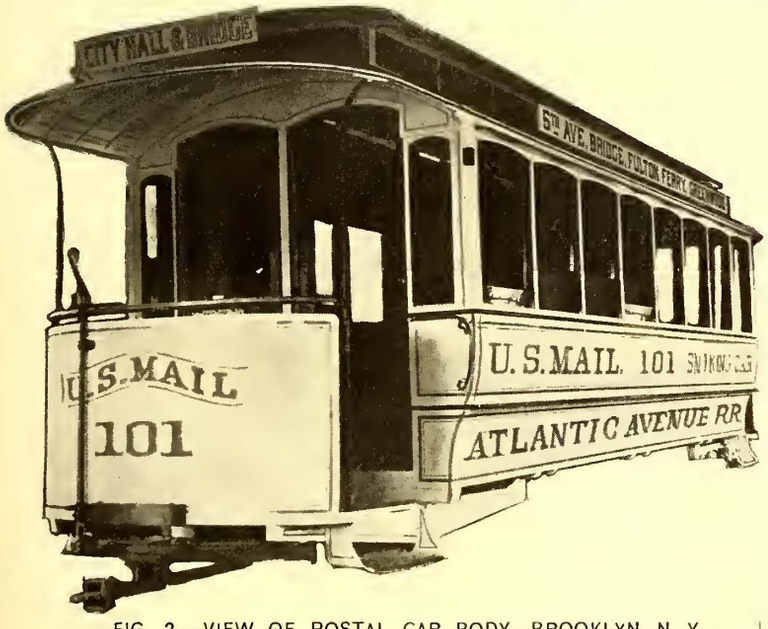


FIG. 2.—VIEW OF POSTAL CAR BODY—BROOKLYN, N. Y.

provided with bars and hooks for holding the mail pouches open. Drop letter boxes are provided at each corner of this compartment, as shown.

The exterior of the car presents a very handsome appearance. It is painted white, like the United States mail cars which are run on steam routes. The mail compartment is lettered in gold leaf, "U. S. Mail," the smoking compartment being lettered "Smoking Car." The windows are covered with wire screens. The car is mounted on a Brownell truck.

It is the present intention of the company to put two of these cars in service immediately. One will run on the following route: Starting from the Post Office, the car will go through Adams Street, Boerum Place, Atlantic Avenue to Fifth Avenue and then to 36th Street. The other car will run on the Brooklyn, Bath & West End division, and will stop at the following stations: West Brooklyn, Blythebourne, Bath Junction, Lessers Park, Van Pelt Manor, Bath Beach, Bensonhurst, Unionville and Coney Island.

Cars put in Operation by the People's Traction Company, Philadelphia.

The first electric cars of the People's Traction Company, of Philadelphia. were put in operation July 9, at 8 P. M. The line on which the cars were run was the 4th and 8th Streets, which is operated by the People's Traction Company. The regular service on this line was commenced July 11. The Girard Avenue line of this company was also put in operation last month. 100 cars will be used on these two lines and on the Germantown line of the company.

The track construction on the other lines of the People's Traction Company has been largely completed, forty miles, out of a total of seventy-five, being now ready for use.

The company has received 300 cars, including both open and closed types, from the builders, the St. Louis Car Company and the Lamokin Car Works. They are extremely tasteful in design, and are said to be as handsome as any in operation in any city. The open cars are of the ten bench type, and the closed cars are twenty feet inside measurement. Each car is lighted by ten incandescent lamps, including one on the back platform.

When the Girard Avenue line was opened a regular ovation was extended to the cars by the residents along the line. The streets were illuminated, and fireworks were set off as the first cars, led by one occupied by a band, were put in operation.

The power station, which is located at Delaware Avenue and Beach Street, contains direct connected Allis engines and G. E.-1,500 K. W. generators.

The Tallest Chimney in Canada.

A stack, which is claimed to be the tallest in Canada, has recently been erected by the Toronto Street Railway for its workshops, at the corner of Frederick and Front Streets.

The foundation for the undertaking was commenced March 3, 1894. When excavating, the solid rock was struck eighteen feet below the surface. Upon this was built the masonry and concrete foundation, forty feet square; this was stepped up to twenty-four feet at the ground line, upon which the large shaft is built. From the ground for fifty feet the chimney is square, and this point is marked by a string course of toothed brick laid on edge. From this the chimney is built circular with a slight batter to the top. A band of yellow brick registers the height of 100 ft. in the Greek key pattern, and another band in a different design shows the 200 ft. mark. The cap, which is 250 ft. above the ground, is three feet six inches high, and eighteen feet three inches in diameter.

The minimum diameter is twelve feet, and for a height of seventy-five feet the stack is lined with firebrick. There are two smoke entrances fifty feet from the ground, 7 × 11 ft. 6 ins., which are built circular top and bottom.

The stack was built by James Hill, of Toronto, from designs furnished by F. S. Pierson, chief engineer of the Broadway & Seventh Avenue Railway Company, New York.

Fenders for Newark Cars.

The Newark Board of Works has ordered that all trolley cars in Newark shall be equipped with life saving fenders before October 1, and has passed a resolution imposing a penalty of $50 a day thereafter for each car unprovided with a fender. The company has made many tests of patent fenders, and, it is said, has decided to accept an automatic one invented by S. A. Darrach, of Newark.

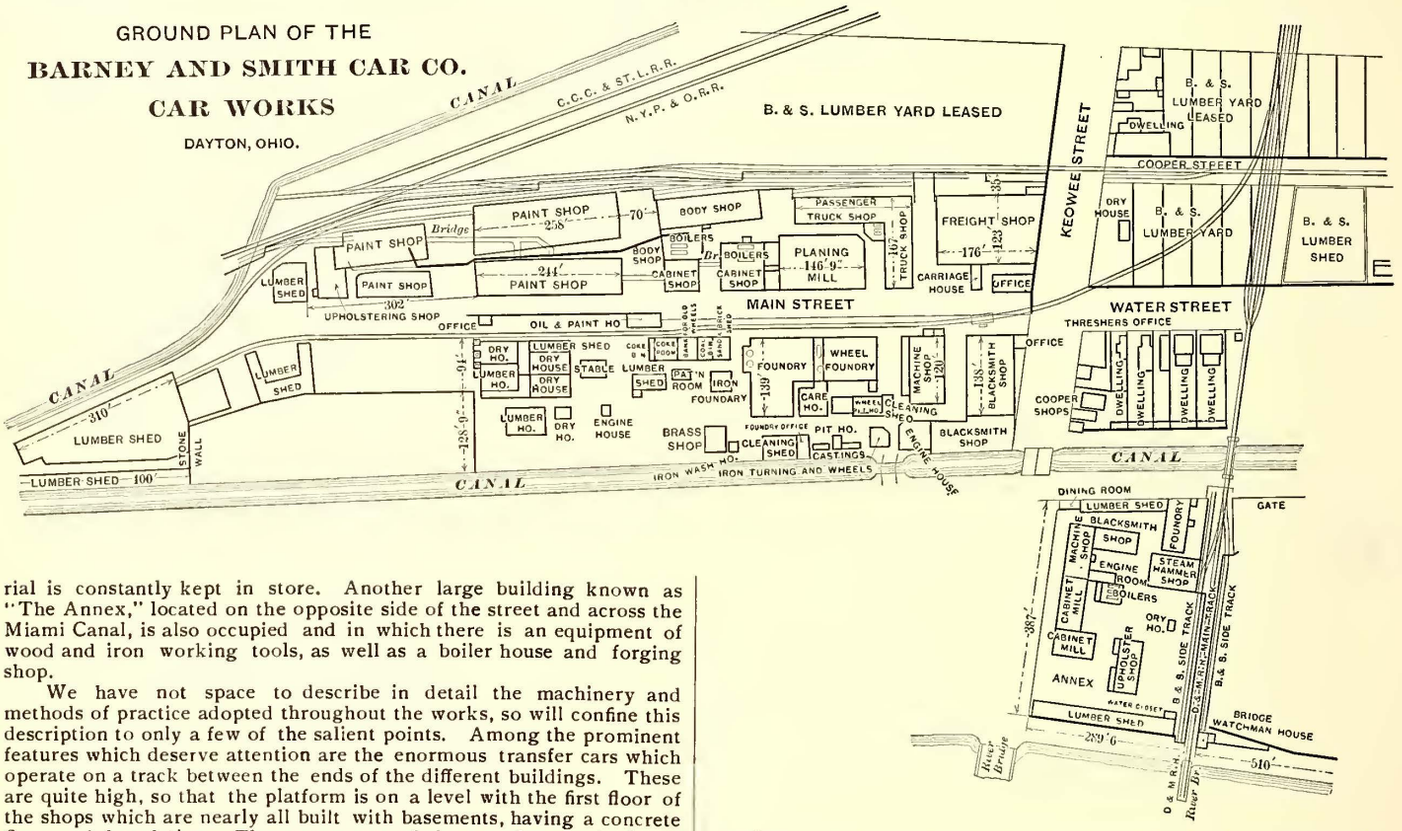
Some of the Principal Industries of Dayton, O.

Works of the Barney & Smith Car Company.

These works were started in 1847, and since have been engaged in the manufacture of steam cars both for freight and passenger service, including sleeping cars, and are now claimed to be only second in extent and capacity to the Pullman Works, at Pullman, Ill. The works employ in ordinary times 2,000 hands, but owing to the present industrial depression only 500 are now employed, and these are chiefly engaged in the manufacture of street cars, a branch of the business which was introduced about a year since, in which time over 200 cars have been turned out for street railway service. In this department the same practice prevails, as in the steam department, of manufacturing all parts of a car in the shops, including trucks and wheels.

Among the first street car equipments turned out were the four window vestibule cars, described and illustrated in our last issue in connection with the lines of the Cincinnati Street Railway Company, and in which the finish is of the same high order as that employed in the manufacture of steam cars, and which has given the company a wide reputation.

The works are located in the northeast part of the city on Keowee Street near the Mad River, and consist of a number of detached buildings conveniently located for the transfer of parts and material from one shop to another, as shown in the accompanying illustration, and in proximity to extensive lumber yards, in which a large stock of material is constantly kept in store. Another large building known as "The Annex," located on the opposite side of the street and across the Miami Canal, is also occupied and in which there is an equipment of wood and iron working tools, as well as a boiler house and forging shop.



We have not space to describe in detail the machinery and methods of practice adopted throughout the works, so will confine this description to only a few of the salient points. Among the prominent features which deserve attention are the enormous transfer cars which operate on a track between the ends of the different buildings. These are quite high, so that the platform is on a level with the first floor of the shops which are nearly all built with basements, having a concrete floor and foundation The movement of the transfer cars back and forth, and the loading and unloading of the new work as it passes from shop to shop is controlled by a large traction engine, which is designed to run on the ground or on a plankway, and which can be moved to any place in the yard, and which is also employed for the shifting of freight cars. The traction engine is provided with a large windlass operated by a small engine upon which a strong rope is wound, and which is employed for hauling the cars out of the shops and onto the transfer table, the rope being deflected round corners and in any direction by means of pulleys anchored at convenient positions. The shops are provided with smaller four wheel trucks on which the bodies in process of construction are moved about, and on which they rest until they leave the paint shop.

In the wood working department the tools are all of the latest designs, and adapted to the production of all possible shapes and parts, the policy being to have good tools, have them kept in good order and run at a high speed in order to produce first class work. The work is classified and finished on the machines particularly adapted for that class of work; for instance, the planers are not employed for dressing heavy oak timbers and then adjusted for the planing of boards, but machines are provided both for the timber and the board work, also separate machines for the freight and passenger work and street car work. This insures a good finish, as the tools are suited to the material in hand.

In the cabinet shop the material for the panels and other inside work is run through a scraping machine after being planed, and before being delivered to the sandpapering machines. The sanding machines are of the Invincible type, with the rollers carrying three grades of sandpaper, so that the parts when leaving the machine are smooth and ready for the finishing coats. The interior finishing for the street cars is hand rubbed and polished, after the practice adopted for finishing the decorations of the high grade steam work, three coats of varnish being sandpapered off in succession and then treated to an oil finish. The company manufactures its own three ply veneers for ceilings, there being a department set apart for this class of work, in which cauls, presses and gluing apparatus are provided. In the manufacture of veneers only the very best stock is employed. When ready for use care is exercised in selecting veneers of about the same color with which to finish the car, so that the light and dark shades are not mixed.

In the manufacture of cove and side panels for car bodies the material is first steamed, then bent to shape over slat forms, when it is transferred to the drying kilns where it remains until thoroughly seasoned. This prevents the panels from checking after being put into service.

In the manufacture of the hoods the individual boards are steamed and bent on a form so that the material does not spring after being put in service and cause the end of the dash to turn up, as is sometimes noticed after cars are put in service. The rim of the hood, when laid on a flat surface, touches at every point. Only simple stencil decorations are employed for ornamenting the ceilings.

A number of carving machines supplement the tool equipment of the cabinet department, which are located on the upper floor of the annex. With these machines many designs are worked out about equal to hand carving, but much less expensive.

Small trucks, with frames and boxes of various shapes, are provided for the convenient transportation of the small parts about the works.

Great care is exercised in the selection of the lumber employed in car building, and a large stock being carried it is allowed to become thoroughly seasoned in the yards before it enters into car construction, being also kiln dried, for which purpose kilns with ample capacity are provided. The yellow pine for sill construction is purchased for the most part from a region south of Birmingham, Ala., the same as is employed for the construction of steam cars. At one time Oregon fir was employed in these works for car sills in place of yellow pine, but was afterwards discarded, as after becoming seasoned it was found to turn brittle, and though having greater tensile strength when green than other timbers, it was found not suitable for this class of work. The oak employed is grown in the vicinity of Dayton, while the ash is purchased for the most part from dealers in West Virginia, and cherry comes from a number of the Western states, but which, as is well known, varies greatly in quality, but only the highest grades are employed in these works. Mahogany lumber is purchased in large quantities, and lots often remain in the yard for ten years before being used, so that it becomes thoroughly seasoned.

The iron shops are also equipped with a high grade of tools, among which are noted heavy punches and bending machines for forging the plates and braces for freight trucks. There are also a number of steam hammers for the manufacture of drop forgings, with a large assortment of dies for the forming of special parts. Numerous gang drills, wheel borers and other special machinery help to make up the equipment.

The foundry department is extensive, and a large number of moulding machines are provided for making the moulds for the smaller parts.

The wheel department of the foundry is provided with a traveling crane operated with wire ropes, and has the capacity for about 150 car wheels per day, the annealing pits being sufficient for the storing of

1,000 wheels. There are also auxiliary machines for cleaning, boring and fitting the wheels.

Among the street cars in process of construction we noted a large number of open cars being built for the Philadelphia Traction Company, and a large number of open cars with center aisles designed to be operated with a fare box, having doors and ends like closed cars with low platforms. One lot of open cars is provided with guards to prevent the passengers getting off on the wrong side. These consist of wooden strips extending the entire length of the car, about three inches in width and feruled to slide up and down on the outrigged bronze handles of the side post. These guards can be readily slid up by two persons against the eaves panel, where they are held by a heavy spring, and can be readily let down when required, the alternate sides being used, depending upon the direction of the c...

The trucks manufactured by this company are of a new design, and have been illustrated in previous issues. The side bars consist of I beams with an inch strip of wood between, and through which the bolts for holding the body pass. They are also provided with flat springs and have long bodies for an adjustable brace or bracket at each end to prevent oscillation.

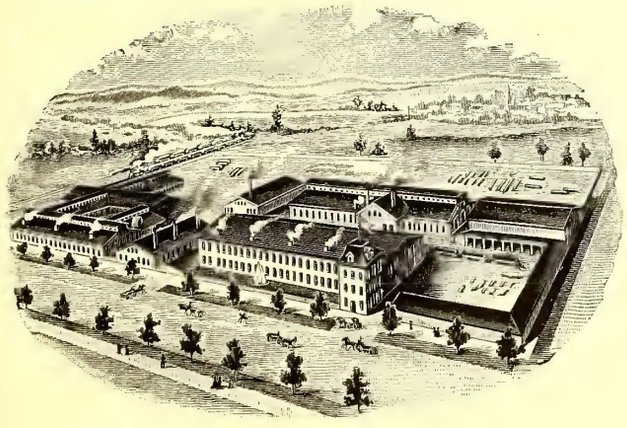
Among the orders in hand were a number of cars which were being manufactured for a road in Texas.

The works are operated under the supervision of A. M. Kittredge, with W. Vose as assistant superintendent. Mr. Vose is well known in the steam railway field as the author of a work on car building which first appeared as a serial in the columns of the *National Car Builder*.

Brownell & Company's Boiler & Engine Works.

As a general thing there is very little of interest connected with a boiler shop. The usual opinion is that it is a noisy place, that most of the work is done by shears, rollers, sledges and hammers, and that seeing one is seeing all. But this is not the case with the works we are about to describe, for it is one of the most interesting plants we ever visited. The machinery employed and the tools and appliances for handling and adjusting the parts are numerous, of novel design, and are evidence of a high order of inventive talent. The employment of labor saving devices in all departments is the secret of the remarkable development of the business, and explains why, even in these dull times, the shops are kept running at their full capacity night and day.

The Brownell boilers have a wide reputation and are generally sold at prices which defy competition. The works also turn out stand pipes for high duty water stations, and high speed engines which are limited to about 150 H. P. The company has recently purchased the valve patents of what has been known as the Sioux City engine, and will manufacture this type of engines, but instead of straight valve automatic mechanism will be employed. The works occupy a large tract on the outskirts of the city to the west, the main structures being of brick and conveniently arranged for the transfer of the material from one shop to another. On approaching the works the principal building in the foreground is the machine shop, two stories in height, with a ground plan of 200×60 ft. The office occupies the first floor of a three-story tower at one corner next the street, the dimensions of each floor being 30×30 ft. The draughting room is above the office, and the third floor is occupied as a store room. The first floor of the main building is known as the machine shop, and the entire space is filled with iron working tools of every description and of the latest patterns, one of the principal machines being a twelve foot wheel borer. The second floor of this building is known as the pattern shop, and is equipped with the necessary wood working machinery. The blacksmith shop is next in order, with a ground space of 60×150 ft.,

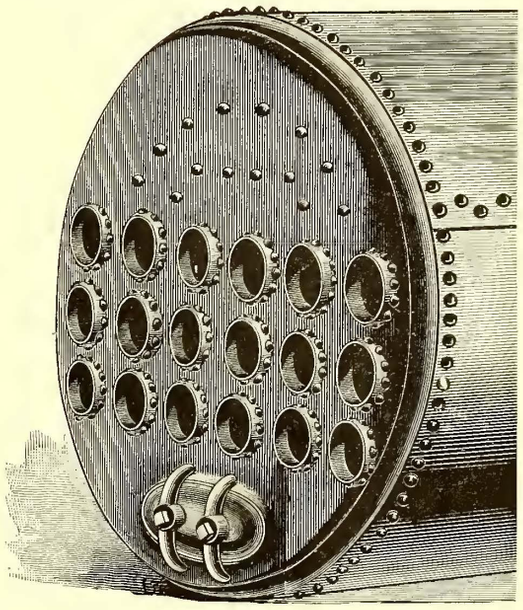


WORKS OF BROWNELL & CO., DAYTON, O.

in which are located nine forges. The boiler shop, which is the principal place of interest, is 200×50 ft., with an L at each end of 50×50 ft., and a wing to one side of 70×240 ft. This includes the sheet iron department and the flanging department.

The first machines which attract attention on entering the boiler shop are the Allen automatic riveting machines. These are operated by compressed air, and consist of a double long lever or shears to which the riveting apparatus is attached, and which will reach well within the boiler shell. A hot rivet being inserted, the first operation is to clamp the plates by pressure, when the hammer is started and the blows continue until the metal has partially cooled, which prevents the rivet from stretching. These riveters, of which there are a large number, are supported by a block and fall from an overrunning trolley, and can be operated in almost any position, being supplied with air from flexible connections. There is a set of twenty foot rollers for bending the boiler plates, which are among the largest in the country. By means of these rollers long bottom sheets can be bent, so that the boiler can be built with one continuous bottom sheet, when desired.

The flanging tools are among the most interesting portions of the equipment, and these comprise tools for the flanging of the flue holes in the flue sheets, and also for the flanging of the edge of the sheets. The flue sheets are first cut to the proper diameter, and then are



BOILER—BROWNELL & CO., DAYTON, O.

brought to a white heat in a large brick furnace in which crude oil is employed for fuel. From this they are moved on an iron truck to the flanging machine proper, in which they are centered in a horizontal position and permanently clamped, the edge at one side being embraced by a pair of horizontal rollers, about six inches in diameter, which are attached by a quadrant to a crank arm, and which when set in motion passes rapidly around the plate, the horizontal rolls gradually turning up at an angle, thus bending and forging the edge of the plate in one operation. The flue holes are then drilled in the ordinary manner, and when designed for large flues are each flanged, as shown above, by being heated one hole at a time over a flat forge, when they are transferred to the flue flanger which consists of a perpendicular spindle terminating in a head with small rollers set at a particular angle. The plates are shifted from the forge to the flanging machine by means of automatic jib cranes, of which there are a large number about the shops. The cranes are lifted bodily by means of pneumatic cylinders located under the floor, the perpendicular arm of the crane being a continuation of the pneumatic piston. There are also numerous flue scarfing and welding machines, heavy punches and shears and boring machines.

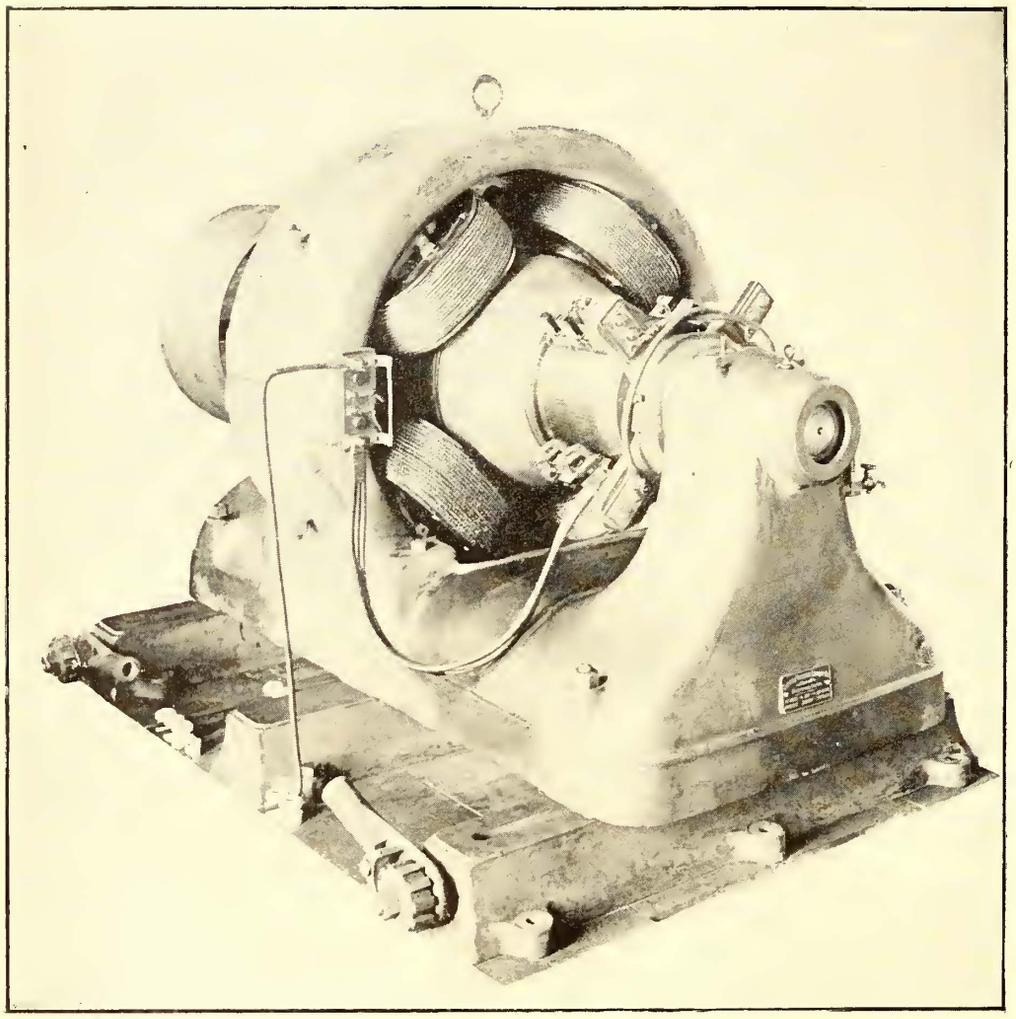
Parallel to the boiler shops proper is the shipping shed, which is 70 × 200 ft., through which a spur of one of the steam lines passes. Passing back through this we come to the engine and boiler room, in which are also located the large Ingersoll & Sergeant air compressors which supply the air for the riveting machines and for the operation of the cranes. Next this is the rattling room and the fitting department for the boiler fronts, which is 60 × 180 ft. The foundry is 200×60 ft., with a cupola located in an L near the center, and which is provided with automatic machinery in keeping with that in other departments. Next, and last, is the pattern storage building, which is of brick, 160 × 60 ft., with solid side walls, lighted only from the roof and at the ends, and is practically a fireproof building. The interior is fitted with racks and platforms with steps communicating between the different tiers, and admirably designed for the storage of patterns, which are classified and so labeled that any pattern can be readily found, the building in all respects being a model in the class for which it is designed.

Shawhan-Thresher Electric Works.

The shops of this company occupy a large building on Library Alley, just off main Street, and near the business center of the city, and are equipped with a full complement of new iron working tools. The company, however, anticipates moving into more commodious quarters in the near future. The business consists in manufacturing generators and stationary motors after the Shawhan patents, the designs being quite different from those of the motors and generators in ordinary use. Electric motors up to fifty horse power are known as the iron clad patterns, but the motors are of the multipolar type, and very like the generators. The iron clad motors are designed to prevent the dissipation of the lines of force, the surface of the fields remaining non-magnetic. The field coils are wound separately and are placed over the interior projections of the fields, and can be readily removed or replaced. The company is also about to begin the manufacture of a railway motor modeled after the design of the stationary motors.

The design is for a single motor flexibly connected to both axles, but without the employment of beveled gears.

Among the plants recently equipped by machines from these works is one at Kings Mills, O., operated by the Kings Mills Power Company. The plant is designed to generate and transmit electric power for various purposes. The power consists primarily of two Stilwell & Bierce Victor turbine wheels, of 250 H. P. each, and a 400 H. P. Buckeye engine, which is supplemented by two M. P. generators of 200 K. W. capacity, from which the current is transmitted to twenty-one motors of the Shawhan-Thresher manufacture, varying from twenty to 150 H. P. One of its generators is also employed in the Dayton & Soldiers' Home plant of the City Railway Company, which is referred to in another connection of this issue.



GENERATOR—SHAWHAN-THRESHER ELECTRIC WORKS.

Works of the Jenney Electric Company, Indianapolis, Ind.

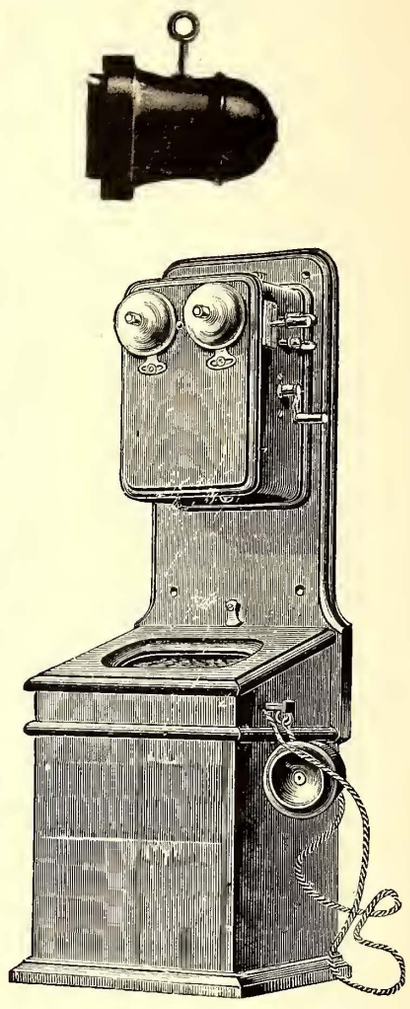
The shops of this company adjoin the works of the Woodburn Serven Wheel Works, and are admirably equipped for the production of first class work. The business has, however, outgrown its present quarters, and the company proposes soon to build more commodious shops near the outskirts of the city, when it will begin the manufacture of larger machines, and also generators and motors for railway service. The generators and motors now manufactured for power purposes range through all the sizes up to 100 H. P. and are adapted to all classes of stationary work, and are also employed to a considerable extent for the operation of electric launches. These machines are constructed with a single coil, with wrought iron field cores, and are designed to conform to the natural direction of the lines of force about a bar magnet. The fields are supported on a heavy base arranged to slide on ways for the adjustment of the belt tension. The armature shafts are made of the best crucible steel, and are mounted on self-aligning, self-oiling boxes with phosphor bronze bearings, the boxes having capacity for holding a large quantity of oil.

Another particular feature of the Jenney machines are the sectional brushes in which small carbon points are employed, each backed by a spiral spring which insures good contact with the minimum amount of friction, and allows of the brush adjusting itself to the surface of the commutator.

The company is named for Charles D. Jenney who devised the motor in 1886, having had considerable previous experience in electric work. Mr. Jenney was associated with Van Depoele when he manufactured his first generator at Detroit, and also studied at the University at Ann Arbor, Mich., under Prof. J. W. Langley, where he experimented along electrical lines and laid the foundation for his subsequent success in the electrical field. Mr. Jenney organized the original Fort Wayne Electric Company, and the Jenney Electric Motor Company, of Indianapolis, both of which companies were subsequently absorbed by the Thomson-Houston Electric Company, and later he organized the present Jenney Electric Motor Company, of which he is the secretary and treasurer.

The Columbia Telephone.

The expiration of the fundamental Bell telephone patents has enabled a number of companies to put on the market some excellent instruments for telephone communication. We present herewith engravings of the transmitter and receiver of the Columbia Telephone Manufacturing Company, of 136 Front Street, New York. Telephones have shown their value in a number of street railway plants for despatching cars, and now that the possibility of purchasing instruments outright at a low figure is certain, they will enter much more largely, we believe, into street railway service.



COLUMBIA TELEPHONE TRANSMITTER AND RECEVIER.

The long distance telephone transmitter of the Columbia Telephone Manufacturing Company resembles the ordinary type. It is of the microphone pattern, without any metal contacts or adjustable springs. The speaking diaphragm is made of a layer of thin veneer, and forms a portion of the top of the box. The receiver is very compact, being three and five-eighths inches long, and two and three-fourths inches at the broadest end. It is made of hard rubber, and all the connections are made inside, so that there are no thumb screws in sight.

This company has also on the market an automatic switchboard for central stations, by which all operators are dispensed with. This device especially recommends itself to all places where, as in street railway work, a private exchange would be used. By this switchboard a user of any telephone can put himself in direct and immediate communication with the user of any other telephone. This is accomplished by providing each telephone with several keys by which one can call the number of the telephone he desires. Thus, if he should wish to call up telephone No. 142, he goes to his telephone, presses once on the 100 key, four times on the tens key and twice on the unit key, then rings his magneto bell which sounds the alarm bell of telephone No. 142. When the receiver is placed on the hook, automatic disconnection is immediately made, and the instrument is ready for another call. All this is done absolutely automatically, and no additional wires are required with the system.

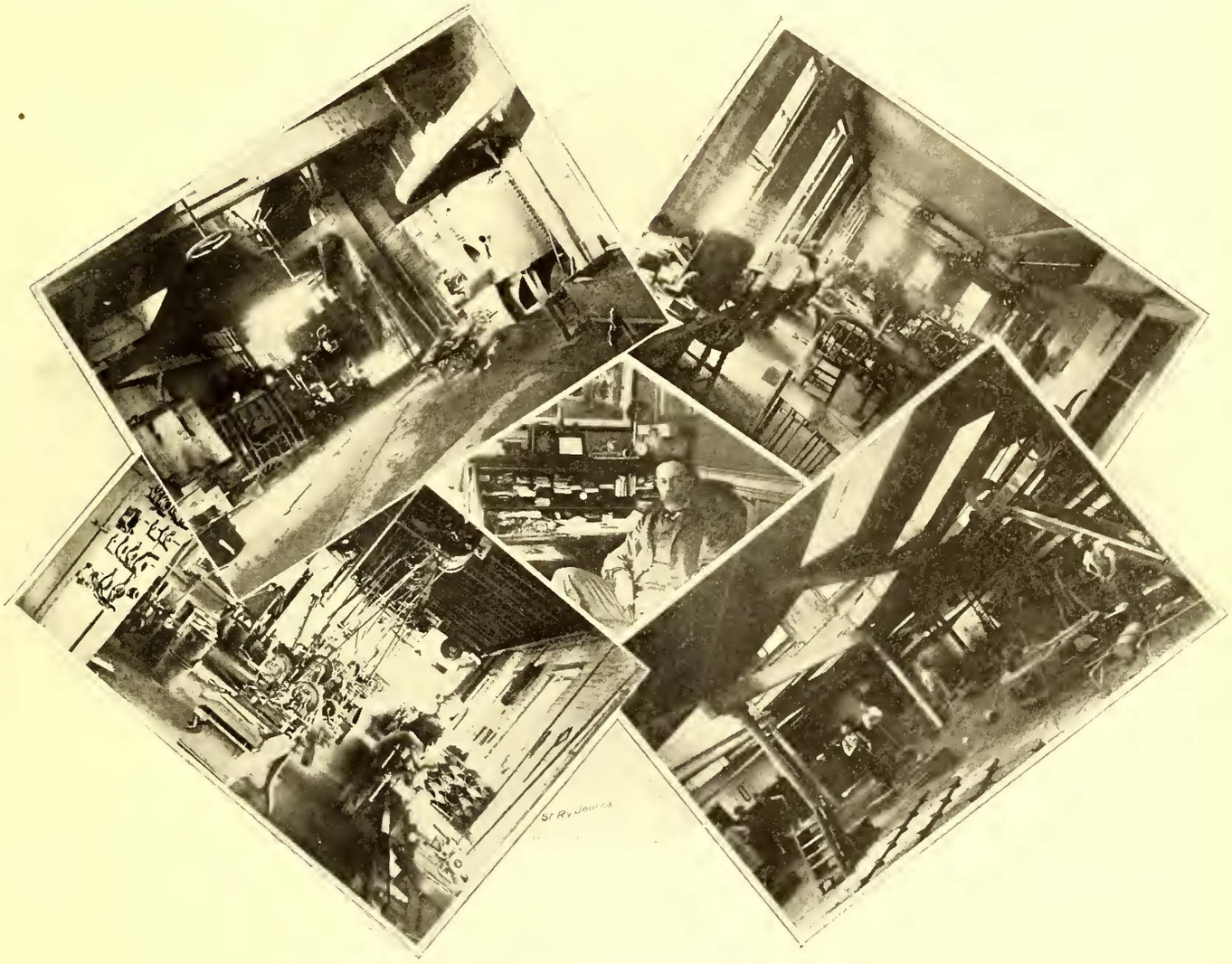
The West End Street Railway Company, of Boston, Mass., will build a new power house in East Boston.

The Works of the Fulton Foundry & Machine Company, Brooklyn.

The group of views given herewith shows a few of the different departments of the Fulton Foundry & Machine Works, of Brooklyn, N. Y. The works were founded in 1870, and the numerous departments are provided with the latest improved machine tools and appliances for turning out a finer grade of foundry and machine work for which this company is noted.

The works are located on Furman Street, near Fulton Ferry. The main building is a four story brick structure having a frontage of 100 ft. on Furman Street, and extending through the block to Columbia Heights. A view of the main foundry is shown in the lower right hand corner of the group of views. This department is 100 × 200 ft., and

The works are under the supervision of the proprietor, E. B. Wilcox. Mr. Wilcox was one of the founders of the Wilcox & Gibbs Sewing Machine Company, and has had long experience in the manufacture of high grade machinery. A view of Mr. Wilcox's office forms the center of the group.



WORKS OF THE FULTON FOUNDRY & MACHINE CO., BROOKLYN.

is equipped with all the necessary appliances for floor and bench work and the heavier castings. Large skylights are provided, affording abundance of light and ventilation. A part of the foundry annex with cone room and cupola is shown in the upper left hand view.

The machine shops, which are four in number, are 25 × 70 ft. each, and are fully equipped with the most improved types of machine tools, together with a number of machines designed by the company for the finishing of special work. One of these departments is shown in the lower left hand view in the group.

The needle room, shown in the upper right hand corner, is located in the third story of the building fronting on Columbia Heights. The dimensions are 30 × 100 ft., and it is provided with large windows on three sides, furnishing sufficient light for the delicate work required in this department.

One of the specialties of this company is the manufacture of electrical machinery, and facilities have been provided for turning out all kinds of power and lighting appliances from the drawing to the finished machine.

In addition to the above mentioned shops, there are numerous other departments, including the draughting room, wood working and pattern shops, with facilities for making wood and metal patterns. There are also shops for silver and nickel plating, enameling and japanning, and a complete brass foundry, with buffing rooms and the necessary machinery tools for finishing the work.

The company also makes a specialty of experimental model work, an important feature being the facilities for finishing the work complete on the premises.

An Improved Electric Snow Sweeper.

The Brooklyn Railway Supply Company, of Stamford, Conn., which has been prominent in the sweeper business for a good many years, has placed a new electric sweeper on the market. This machine is designed to meet all the requirements of the electric roads, and is claimed to have a very high efficiency, owing to the manner in which it is constructed and the way the broom is operated. The frame is of the best Eastern white oak thoroughly seasoned, and is made especially heavy and strong to fully stand any strain that may be put on it. It is a regular double ender. There is a broom at each end of the machine, and each broom is long enough to sweep the entire track to a width of eighteen inches outside of each rail, a distance wider, it is claimed, than any other machine. Only one broom is in operation at the same time, which makes it very easy to operate, and avoids the necessity of employing experienced men in its use.

One especial advantage in using this machine is that it can be used on any standard truck that is now on the market. It can be put on and taken off the truck like any car body; so if anything should happen to the truck or motors, the sweeper can be changed to another truck without interrupting the work.

The nearness of the sills to the rail (twenty-three to twenty-eight inches, depending on the height of the truck) gives, it is claimed, double the strength and stability of other types of snow sweepers that are forty inches from the rail.

A Handsome Publication.

The Portland Railway Company, of Portland, Me., has sent us a handsome souvenir, being essentially a guide to the points of interest on the line of the street railway company in that city and the suburban branches. The pamphlet gives a history of the city, a description of the interesting points, picturesque and historical points about the city and a large number of handsome illustrations.

The Walker Standard Generator.

In placing upon the market a line of direct current generators especially designed with a view to the very exacting requirements of railway work, it has been the aim of the Walker Manufacturing Company, to avoid as fully as possible the introduction of novelties and untried features, and to produce a type of machine which should combine all the long tried and well proven elements of dynamo-electric machinery that the best engineering experience could suggest. It is confidently believed by the company that this aim has been accomplished in the apparatus now being put upon the market.

In general these machines are notable for their beauty and strength of design and their commercial efficiency. The frames, excepting the largest sizes, are cast in only two pieces—the upper half of the yoke and the poles, and the lower half of the same with the standards for the bearings.

The armature is proportionally of large diameter, is of very low resistance with ample cooling surface, and will stand an overload of 50 per cent., without the least injury or sparking for as long a time as the emergencies of railway practice would ever be likely to demand.

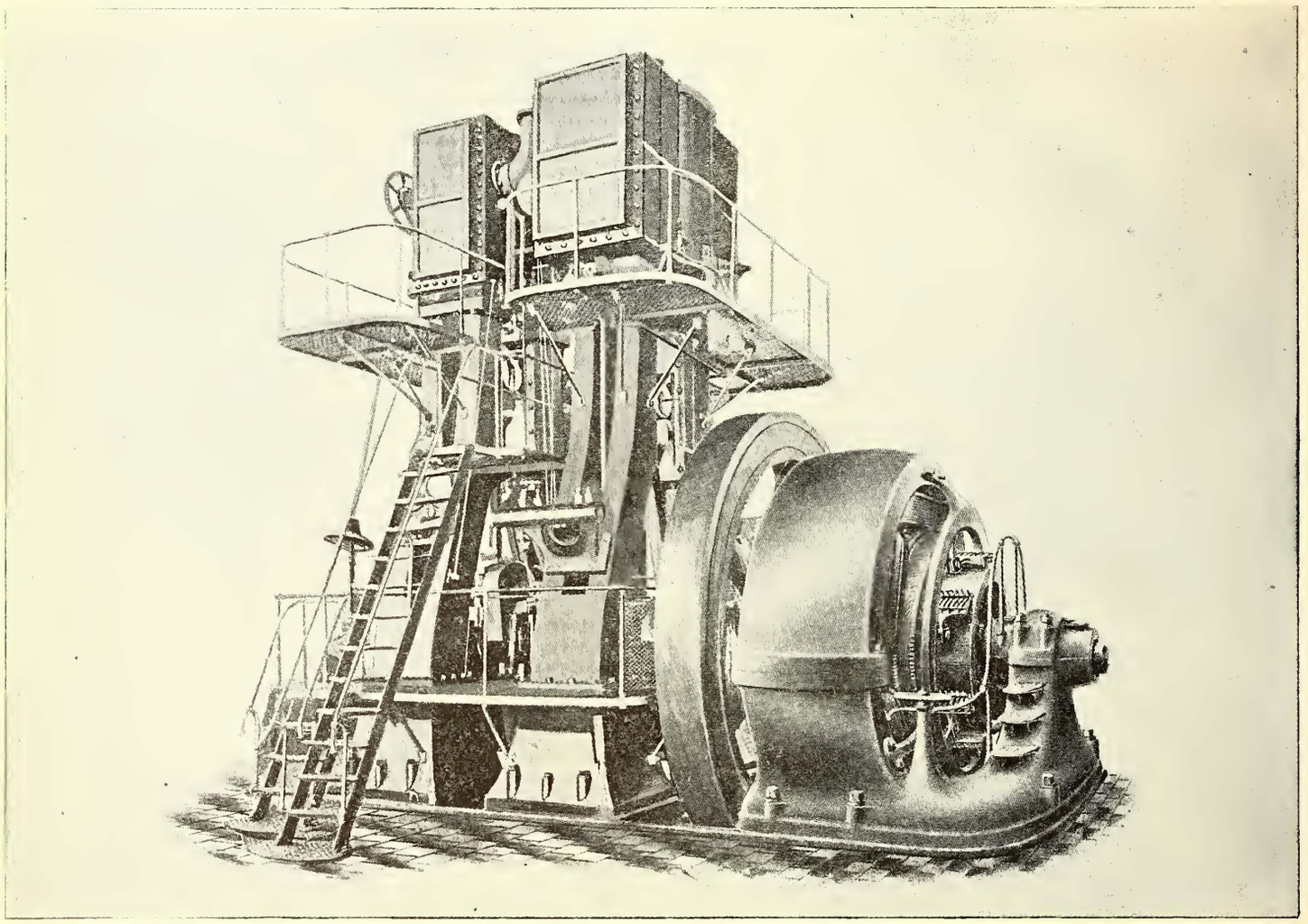
It is of the iron clad, drum type, built up of the best quality of annealed armature iron. The plates are again annealed after being punched, and then insulated with a thin coating of enamel. They are compressed into a solid core under a hydraulic pressure of 100 tons. The foucault and hysteresis losses are reduced to a very small amount.

In the smaller machines the windings consist of heavy copper wires so arranged that no wires cross within an inch of one another, and there are no joints except at the commutator bars. In the larger generators flat bars are used, but here again they are bent to shape before being applied in such manner that there are no joints except at the commutator end. The resistance being very low, the heat loss is small and the armature runs cool under all conditions. The winding is the two-path type, and the pole shoes and armature teeth are so shaped that there is absolutely no sparking at any load, and no shifting of the brushes required.

The insulation is most thorough, and will readily stand ten times the normal pressure. The insulating material is a combination of mica with a fibrous material of great toughness and durability, and it is everywhere tested to 5,000 volts alternating. This type of winding lends itself admirably to the most perfect insulation. The armature body is strongly keyed to a heavy cast center, and is so constructed that when running both it and the armature have a strong current of air circulating through them. The teeth are of such shape that they effectively hold the windings in place and no binding wires are required or used.

The shaft is heavier than is customary in usual practice, and its journals are exceptionally long and large in diameter, thus, at the same time, both reducing the pressure per square inch and providing a larger cooling surface, and in practice they have been found to run cool and give absolutely no trouble.

The magnets are of the well known iron clad type. The coils are machine wound, the shunt series being made up in separate, independent bobbins, and encased in the same manner as the motor coils, with a moisture proof covering. This method renders the insulation especially effective and durable, as there are no metallic washers or spools, which, being very difficult to insulate properly, have consequently often given trouble in machines of other makes through the grounding of the coils. The coils are held firmly in position by means of brackets bolted to the pole pieces. Their inside dimensions are such that a space between coil and pole on all sides allows of a good circulation of air. By this means in these machines a lower running temperature with a given amount of copper is attained than is possible with the metallic spools used by other makers.



DIRECT CONNECTED VERTICAL ENGINE AND WALKER GENERATOR.

The poles are made of soft laminated iron cast into the yoke. With this laminated form of construction, together with the particular form given the armature tooth, and the special shape of the polar face adopted after much experimenting, as being the most effective, all heating of the poles from eddy currents in the iron, and all sparking and shifting of the neutral point has been entirely overcome. On all sides of generators the magnet yoke is cast in two pieces, and the top half can be readily lifted off, when it is desired to remove the armature. These railway generators are compound wound, and can be made to overcompound any amount desired up to 20 per cent. They are provided with a hand regulator for adjusting the shunt coil, this regulator being of the well known enamel type, occupying a very small amount of space on the switchboard.

The bearings are of the ball and socket, self-oiling type. The frame being cast in one piece and all the boring being done in one setting, the armature is always necessarily truly concentric with the field bore. The oil rings are made to run in the opposite direction to that of the shaft. By this means a more efficient deposition of the oil is obtained. The boxes are lined with the best quality of babbit metal and where a good quality of oil is used no trouble need be feared from heating. In the smaller machines, which have two and three bearings, the oil wells are all connected together by half inch piping, so that in renewing the oil it is all drawn off from one tap, and in refilling the

filling of one reservoir fills all. Sight gauges indicating the oil level are provided. Special precautions are also taken to prevent any leakage along the shaft.

The brushes are held against the commutator in a manner that prevents the chattering and singing noise of the carbons, and causes them to wear smoothly and evenly. They may be easily and quickly removed for inspection, or dressing. The commutator is large enough to allow of ample brush area, thus permitting the brushes to run with a low current density and with a light tension. Coolness in running is in this way assured, and this feature is also aided by the current of air which constantly circulates through the interior of the commutator shell. The field and armature cables are brought out to heavy, substantial terminal blocks, and massive clamps are provided for the switchboard leads. The pulleys provided for the smaller belt driven machines are very heavy and strong, and a sub base is provided with belt tightening mechanism.

The standard switchboard is of the panel type, each panel containing all the necessary instruments switches, etc., corresponding to one generator.

New Motor and Controller.

Engravings are shown on this page of the improved type "C" motor and series parallel controller, manufactured by the Steel Motor Company, of Cleveland, O. This company has been engaged for a number of years in supplying repairs for all types of motors, and is therefore in a position to observe the undesirable features of the various types, which were naturally avoided in the designing of its own. The aim of the designers has been to produce, first of all, a substantial, well built motor of few parts, simple in construction and easily understood, with all parts requiring renewal so made as to have great wearing surface, and replaceable at small cost.

The motor of this company, shown herewith, is claimed to possess, not only these desirable features, but to also be high in electrical and mechanical efficiency, and to be the lightest motor per unit of actual horse power delivered to the axle on the market.

The armature is of the drum type, and contains ninety-nine coils wound in slots, the wire being carried well below the surface of the core; ample provision is made for perfect insulation. The fields are wound on metal shells, thoroughly insulated, and by an ingenious arrangement of the pole pieces, the armature or either of the fields can be removed independent of the others.

The type "C" controller (Fig. 2), used with this equipment, is designed to have all the advantages of existing types of series parallel controllers, is simple, and provided with a device whereby a single motion of the reversing lever to a point indicated, makes it a straight multiple controller. In connection with the double fuse box (contained in the controller), either motor can be cut out in an instant, and without leaving the platform.

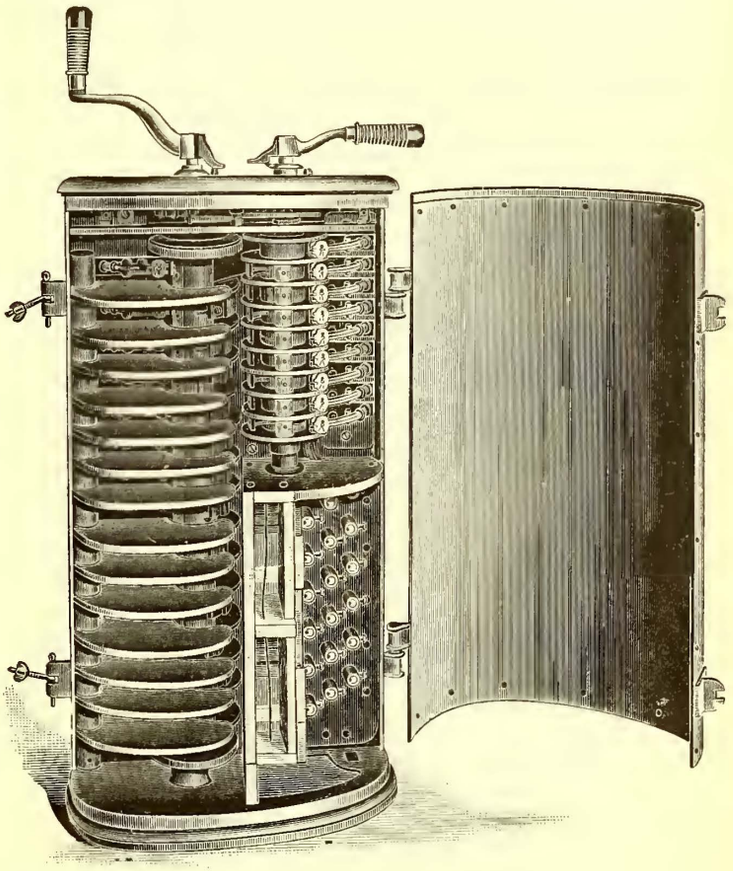


FIG. 2.—CONTROLLER—STEEL MOTOR CO.

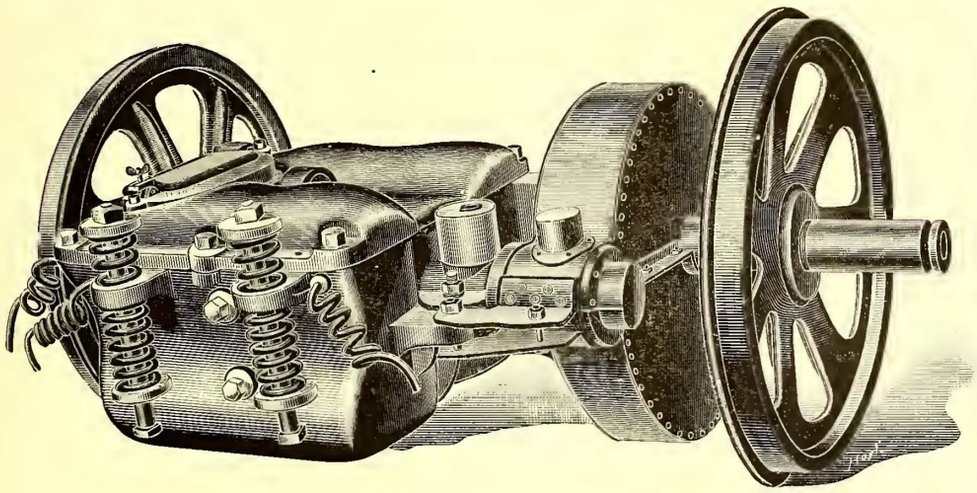


FIG. 1.—MOTOR—STEEL MOTOR CO.

In addition to the regular disks separating the contacts, vulcabeston guards are inserted between them, effectually preventing an arc from forming. These guards are hinged at the side of the controller, so as to be readily thrown back when the jacket is opened. The resistance coil used in starting the car gradually is simple in construction, entirely protected from water, and practically indestructible in ordinary service. A unique feature of this equipment is the substitution of a very simple and inexpensive device for the cutting out of the loop in the field when the highest speed is desired; the device is isolated from the motor proper, and so arranged in connection with the field that most of the danger of the field burning out by an overcharge of current is eliminated. The manufacturers have not, until recently, pushed this motor to the front, preferring to await the test of actual service before advertising it extensively, but now, after two years' operation under various conditions on some of the most difficult roads in the country, in which the motors have won unstinted praise, they offer their equipment for the consideration of the street railway fraternity. Among other equipments this company has filled two orders, aggregating 100 motors, for the Cleveland Electric Railway Company, and has just completed its fourth order for the Allentown & Lehigh Valley Traction Company. The company is now working on 120 motors for the Nassau Electric Company, of Brooklyn, N. Y., as well as on a number of smaller orders for different parts of the country.

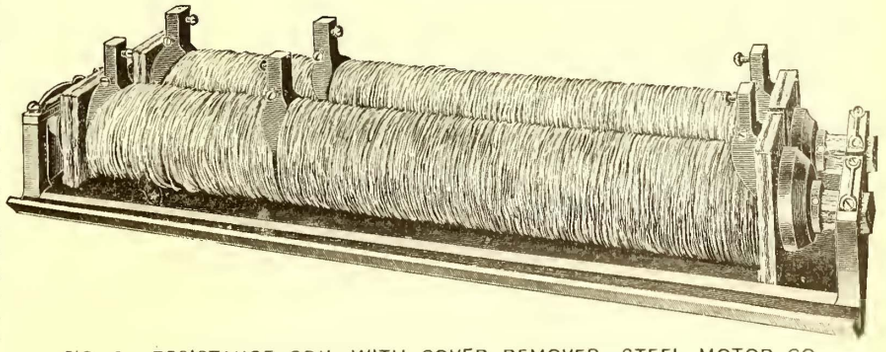


FIG. 3.—RESISTANCE COIL WITH COVER REMOVED—STEEL MOTOR CO.

THE Delaware Valley Railway Company, of Stroudsburg, Pennsylvania, with a capital of $1,000,000 was chartered June 28. The officers of the road are: Ellicott Fisher, of 343 South Front Street, Philadelphia, president; Michael W. O'Boyle, secretary; Simon Friedberger, treasurer. Mr. Friedberger, who is treasurer, is also treasurer of the Wakefield Electrical Engineering Company, of Philadelphia. Among the other incorporators are G. H. Lang, Joseph S. Pottsdamer, and Louis Lang. The company will construct and operate forty miles of road, from Port Jervis, N. Y., to Stroudsburg, Pa.; a large force of men will commence to equip the work at both ends of the line at once, and at least twenty-five miles of track, it is asserted, will be built before the end of the present year.

Automatic Oiling System.

A new system of automatic lubrication for central station machinery has recently been placed upon the market by the Wilson-Whiting-Davis Oiling Company, of the Mutual Reserve Building, New York. The system insures a proper delivery of oil under air pressure to all moving parts, and does away with manual labor required where hand feed cups are used. The saving in oil has been found to be from 20 to 40 per cent. There is also manifestly a great saving in attendance for a varying amount, depending on the number of attendants employed. The system is also positive in its action, there being no danger of neglect in filling the cups and no danger of the spilling of oil about the floor.

Fig. 1 shows a tank into which the oil is pumped from a supply tank, barrel or filter, as the case may be. It is forced from this tank by means of air pressure generated by a Westinghouse, or other, air pump, to the various points to be served, the oil first passing through filters below the tank and then into the main line of piping. The oil cups, into which the oil is delivered at points of consumption, are shown in Fig. 2. They are of brass or nickel plated, and are tested to stand any strain which can be brought upon them. Each cup is controlled by a separate valve, and may be adjusted by a screw at the top, so as to exactly regulate the feed while permitting the instant flooding of any bearing if required. Each branch of piping and each separate machine is also controlled by a separate valve; hence, when a machine is idle only the one valve requires closing and all cups on its line cease feeding.

The waste, which is very small in amount, can, if required, be returned to the reservoir by the gravity pipe system.

Two filters are provided on the main supply pipe so as to admit the use of one in case of the other needing repairs or cleansing. This main outlet, inside the tank extends several inches above the bottom, to prevent the entrance of any foreign substance into the main feed line; when the gauge indicates the presence of substances or water, the same may be drawn off by sediment cock and branch shown below the tank.

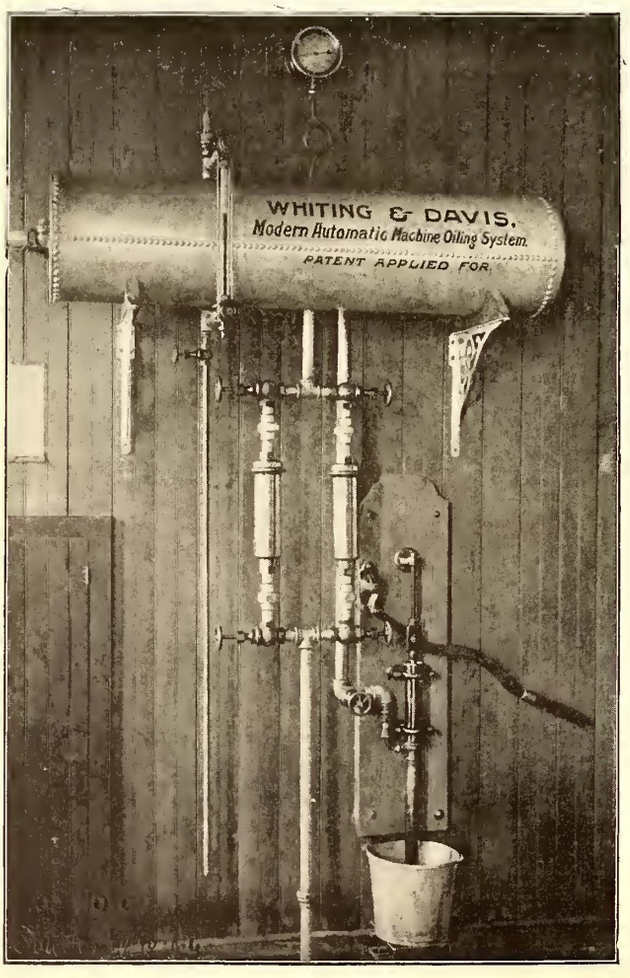


FIG. 1.—RESERVOIR—AUTOMATIC OILING SYSTEM.

The company has also applied the system to cylinder lubrication to replace the ordinary method of lubrication in which the oil passes through water. The system employed is similar to that already described except that a greater pressure is employed, it being necessary to more than counterbalance the steam pressure in the pipes.

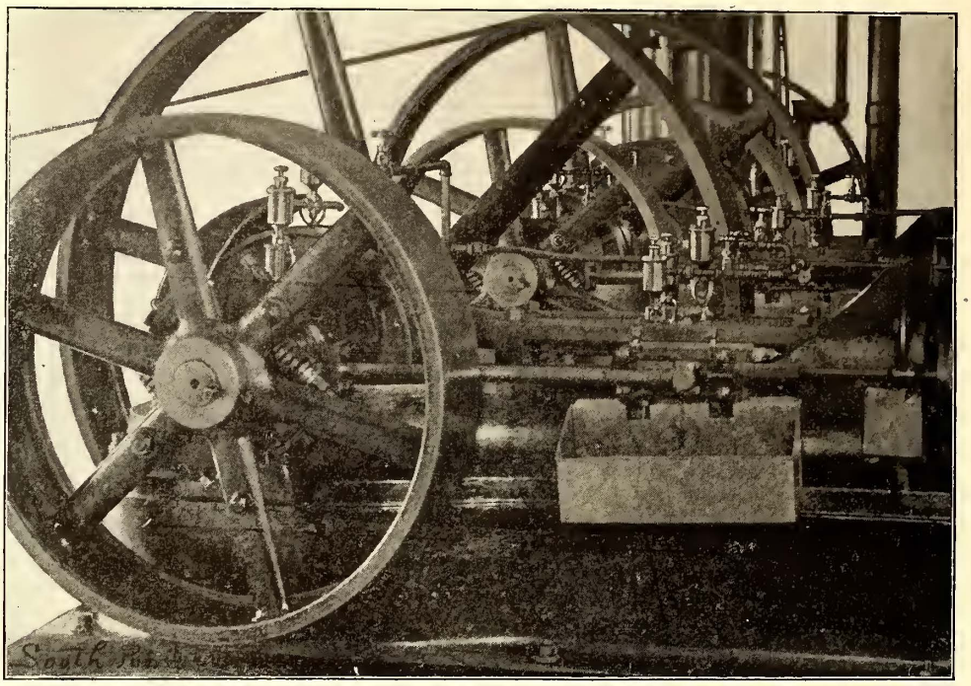


FIG. 2.—ENGINE EQUIPPED WITH AUTOMATIC OILING SYSTEM.

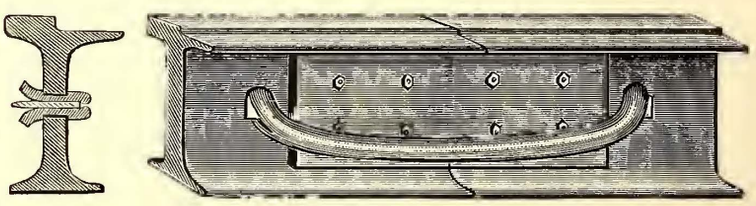
If the latter is sixty pounds, the air pressure used in the oiling system would be about sixty-five pounds and the oil fed to the cylinder as through an ordinary oil cup.

The system has been installed in a number of stations with very successful results. Among other places where it is in use can be mentioned the lighting plant in the Equitable Building, 120 Broadway, New York. Here a marked saving has been noticed in oil, and the system is giving excellent satisfaction.

The officers of the company are: President, William Wilson, Jr.; first vice-president and general manager, Morton E. Davis; second vice-president, James M. Wilson; treasurer, Charles H. Wilson; secretary, Louis A. Chandler.

An Improved Rail Bond.

We illustrate in the engraving herewith a bond which is intended to carry the same amount of current as triple lacing with channel pins. At the same time it is claimed to require less labor and be more reliable in its results. It is made out of soft copper rod of the same diameter as the hole in the rail, and is bent and slotted at each end. After being inserted in the rail a hardened steel wedge, somewhat larger than the slot, is driven into the bond at the bend. It is forced in sufficiently far so that the soft copper can be closed over it, preventing the wedge from slipping out. The action of the wedge is to spread the bond over the edge of the hole in the rail, and to force apart the split ends as well.



IMPROVED RAIL BOND.

As shown in the cut, the web of the rail has been distorted so that the work which the wedge does can be more clearly seen. In this way the bond is practically riveted, and a perfect and permanent contact, unaffected by any vibration of the rail, is obtained. The bond can also be made of No. 0000 wire, effecting the same purpose as double lacing. The bond is manufactured by the Technic Electrical Works of Philadelphia.

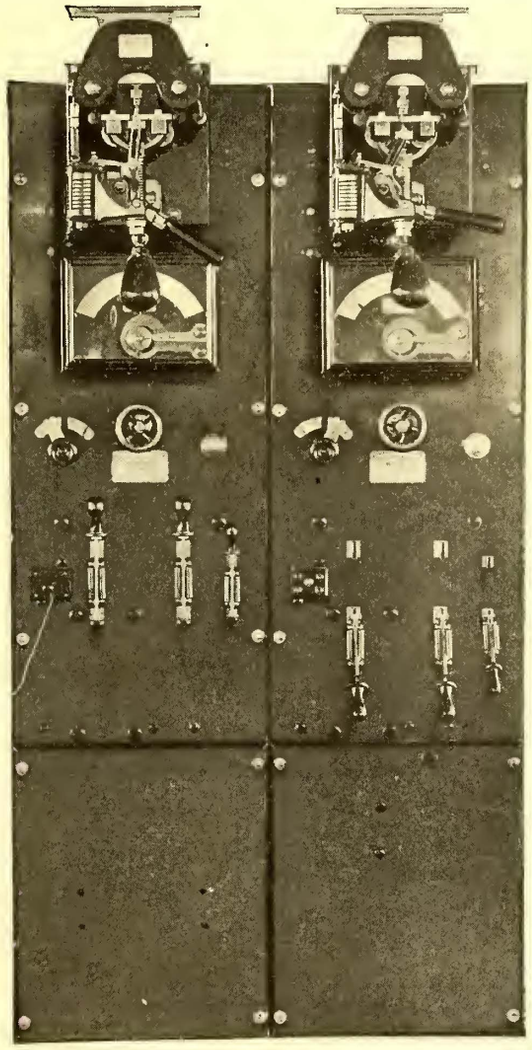
The work of bonding, as stated above, can be done very rapidly, and only a hammer and a cold chisel to open the slot at the bend are necessary.

New Type of Switchboard.

The General Electric Company has recently brought out a new type of panel switchboard, shown herewith, for which a number of special advantages are claimed.

Briefly, the system of the switchboard construction, while becoming greatly simplified, is rendered very compact and convenient. All the instruments necessary for the control of each generator are mounted together on an incombustible base, and are electrically connected before leaving the factory. Each panel may be erected in position without difficulty or delay. Being of uniform size, it may be bolted by the side of other panels already in place, and the switchboard extended as the capacity of the station increases, without taking away from its uniformity.

These new standard panels are known as type "K," and are constructed in capacities of from 200 to 3,000 amperes, corresponding to the generator outputs of from 100 to 1,500 K. W. The controlling de-



NEW TYPE OF SWITCHBOARD.

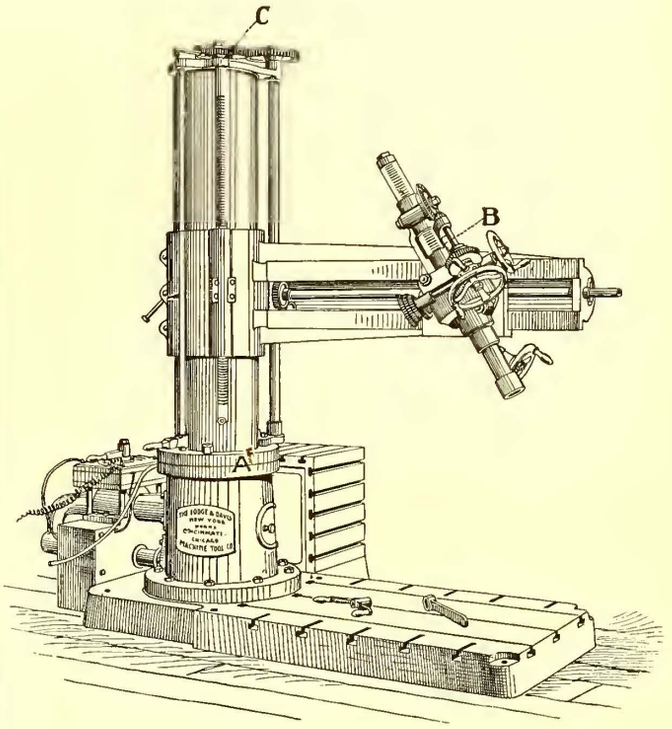
vices mounted upon each panel are the circuit breaker, current indicator, rheostat, main field and lighting switches, together with the lightning arrester and cut-outs required for the protection of generator and instruments. A double pole, plug switch allows of connection with either a portable or station voltmeter placed in some convenient position. The panels of from 200 to 1,000 amperes capacity are of the same width and height, and, in the latter dimension, are similar to the feeder panel. The illustration shows two panels of 400 amperes each.

The automatic circuit breaker is intended to relieve the generator of the severe strain caused by short circuit. The tripping armature is fitted with an adjustable spring whereby the circuit breaker can be set to open at any desired point within the range of the instrument. The current is nominally carried through a main contact in shunt to a contact operating within a magnetic blowout. Thus, when operating no arc occurs at the main contact. This circuit breaker will effectually rupture any short circuit, however severe. The armature is provided with a scale eighteen inches long, which may be easily read at a distance. The positive and negative main switches, and the station lighting switch, all of the quick break type, are mounted on the panel, the equalizing switch being mounted on a pedestal near the generators. In the lightning arrester the special feature is an iron clad electric magnet, in the field of which are two carbon points slightly separated, the line and ground each being connected to one of these points. The magnetic blowout principle, as in the automatic circuit breaker, is here employed with unvarying reliability. The incombustible controlling rheostat is placed behind the board, and is operated by a hand wheel shown on the front. The generator terminals are connected by a small four-point plug switch with an illuminated dial voltmeter mounted on an adjustable bracket fastened near the top of the panel.

The panels are supported by vertical angle irons, tie rods and brackets. They are wired complete, and after setting in place it is only necessary to connect the leads from the generators and bolt in place the bus bars which run horizontally back of the switchboard.

Motor Driven Radial Drill.

The accompanying illustration is of a new half radial drill, designed to be driven by a direct connected motor. The motor is of the iron clad type, entirely covering the armature, pole pieces and field coils, with commutator and brushes extending outside of the motor housing. It is free from external magnetism, which is necessary in order to keep small particles of steel and iron from adhering to the drill. The armature is mounted on a bronze spider which is attached to the cone pulley. The controlling lever is arranged on top of the motor, and by a semi-circular movement of the same all forward and backward speeds may be instantly obtained, This, together with the back gears at the rear of the swinging arm, gives, not only a much wider range of speed than can be obtained by a cone pulley, but a much more finely graduated speed.



MOTOR DRIVEN RADIAL DRILL.

The column swings around an internal stump, and rests, at its lower flange, A, on balls to insure easy movement. The thrust on the elevating screw at C, and the drill spindle at B, is also taken up by ball bearings. The drill head is moved on the arm by a hand wheel, rack and spiral pinion, which is always within reach of the operator. The spindle is spring balanced, and fed by a rack and pinion in connection with the quick return, which can be instantly released, a valuable feature for tapping. The feed is obtained by pin gearing, and can be changed while the drill is running. This tool is built by the Lodge & Davis Machine Tool Company, of Cincinnati, O.

High Insurance Rate on a Car House.

An extraordinarily high rate of insurance has been fixed by the New York Tariff Insurance Association upon the new car house of the Brooklyn City Railroad Company, at Third Avenue and 58th Street. The structure is the largest of its kind in the country, and covers a block 700 × 200 ft. Cars are stored on three floors, and it contains several miles of tracks. The rate fixed for insurance on the building is 6 per cent. per year, and on the contents 5.55 per cent.

For the last three years the City Railroad Company has insured its own property, but six weeks ago it was decided to seek insurance from the regular companies. The rate expected was 1.5, which had been what was charged when the company sought insurance before. But the advanced rate was fixed upon the excuse of an increased danger of fire from the use of electric traction. At the office of the Tariff Association, in New York, it was said that the rate had not been advanced, for there had been no rate for the building until the one recently fixed. It was decided upon from experience with like property in other parts of the country. There have been large losses in the last few years where electricity was used as a motive power.

The Mather Improved Generator.

The generator shown in Fig. 1, and which has recently been put on the market by the Mather Electric Company, of Manchester, Conn., is of an entirely new design and contains a number of important features. The railway generators are wound for a nominal voltage of 500, but, having a rheostat in the field circuit, the potential can be raised to 600 volts without undue heating, and even 50 per cent. overloads will be borne for short periods without injury to the machine.

Automatic alignment is secured by the use of ball bearings, which adjust themselves and can never bind on the shaft. The supports for the bearings and the entire bed plate are cast in one piece, a construction which gives great strength and rigidity to the bearings, and secures the greatest possible freedom from vibration. There are four sets of brushes used, each brush being held in an independent holder.

The armature core is built up with thin disks of soft iron which are forced together under pressure and rigidly keyed to the shaft. All washers used are first treated to an improved annealing process, with the result that the armatures when revolving in the most intense magnetic field will only heat up to a few degrees above the surrounding temperature. The greatest care is taken in the insulation of these armatures. Before winding, there is fitted into each slot a carefully made mica duct, through which the wire is wound, and nothing but the very best mica and insulating material is used throughout the whole construction.

The winding is of the simplest form possible; the simplicity being particularly noticeable at the ends, where the wires, instead of being overlapped and bunched together, stand out from the core and from each other, thus allowing free circulation of air around every conductor. No wires having a large difference of potential are adjacent to one another.

The necessary voltage is secured by revolving a comparatively small number of coils of wire in a powerful magnetic field, rather than by using a large number of coils and weak field, as is the usual practice. The small amount of wire on these armatures results, in great measure, in the absence of sparking at the brushes.

The field consists of four steel castings which are rigidly bolted together, and which, in turn, are bolted to the cast iron frame, or bed plate. The exciting coils are compound wound on metal bobbins, which can be readily slipped on or off by loosening a few bolts and raising one of the field castings. The winding is so compounded that, as the current supplied to the circuit increases, the voltage rises sufficiently to make up for the loss of drop in the circuit, or for a variation in the speed.

One peculiar feature is the employment of cast steel in the fields, which increases the efficiency and gives nearly double the magnetic field possible where cast iron is used. Another advantage in the use of cast steel in the fields lies in the fact that the motion of the armature is practically powerless to disturb the lead, and consequently the machine may be operated under full load within the limit of its capacity, and even under a load considerably exceeding its normal capacity, without shifting the brushes and without sparking at the commutator.

The commutator is of exceedingly massive and substantial construction. Drop forged, pure lake copper bars and the best mica are used throughout. By a peculiar construction of the commutators, it is an absolute impossibility for any bar to work loose while the commutator is on the shaft.

The Mather Company writes us that it is also prepared to furnish complete station equipments, including marble or slate switchboards and the latest improved station appliances of its own manufacture, such as switches, ammeters, voltmeters, lightning arresters and automatic circuit breakers.

After a series of careful experiments, the company has placed on the market an improved automatic circuit breaker, for which the claims

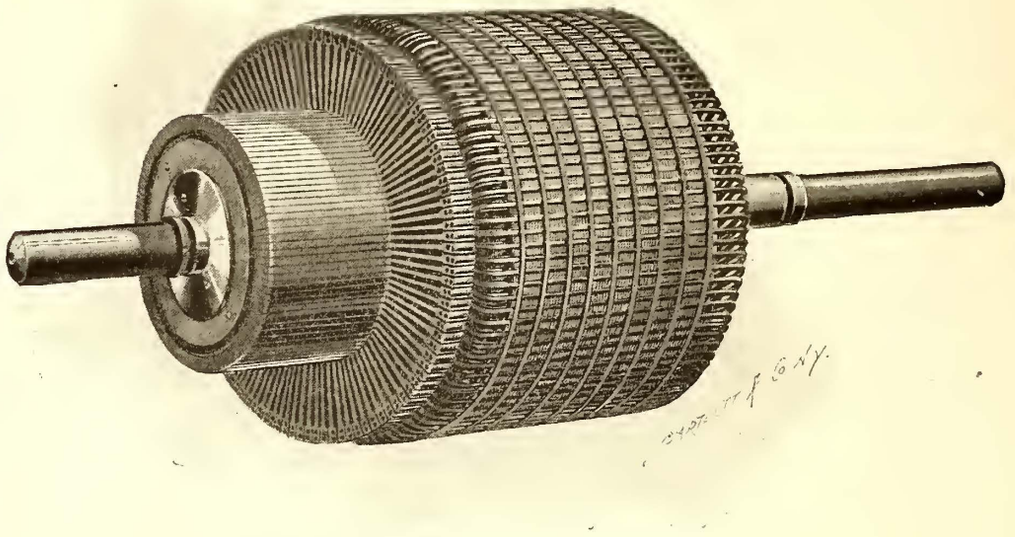


FIG. 2.—ARMATURE—MATHER ELECTRIC RAILWAY GENERATOR.

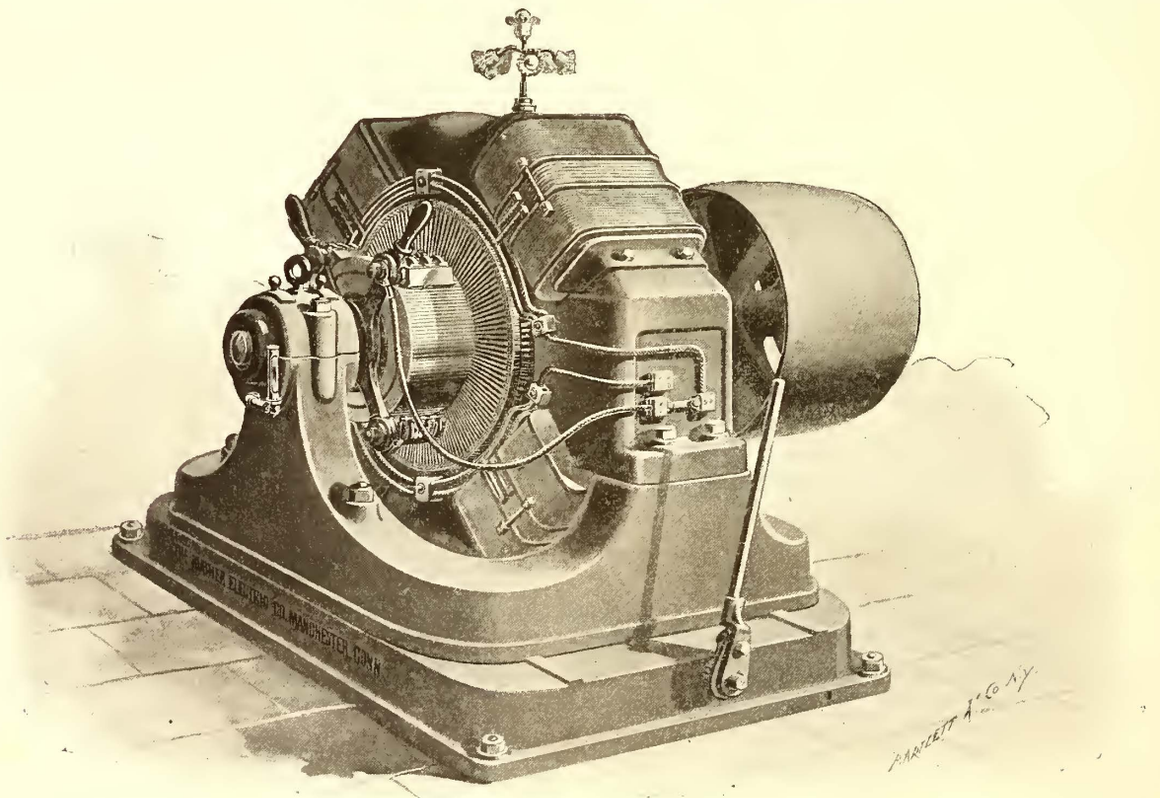


FIG. 1.—MATHER ELECTRIC RAILWAY GENERATOR.

of simplicity and reliability are made. It consists of an electro-magnet in series with a double break switch. When the current exeeds a certain predetermined limit, the electro-magnet releases a trigger or latch, and the switch is opened by a powerful spring. The circuit is not entirely broken at the moment when the contact terminals attached to the lever arm leave the jaws of the switch, two carbon pencils carried by the lever arm still making contact with carbon plates connected to the jaws of the switch. The final break occurs between the carbon pencils and plates, and the metal jaws of the switch are thus protected.

Adjustments for different currents are secured very readily with little trouble.

These automatic circuit breakers are equally well adapted for use on lighting as well as railway generators, and the company earnestly recommends their use as a reliable safeguard against overloading of machines.

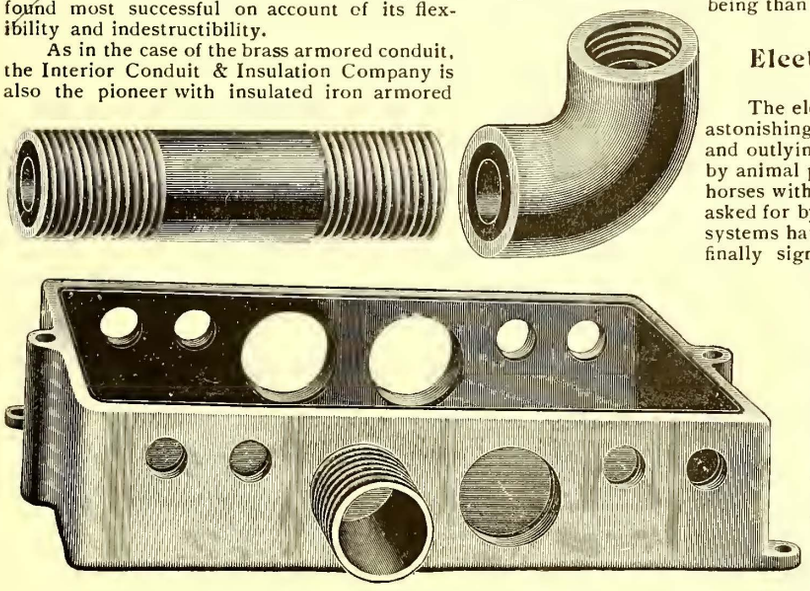
The company is prepared to furnish lightning arresters of improved form, which, in actual practice for a long time, have proved themselves absolutely reliable.

The company's plant, covering a number of acres of ground, is situated in Manchester, Conn., on the main line of the New York & New England Railroad, allowing the best of shipping facilities. The company has recently completed an extension to its plant in the form of an iron building 300 × 50 ft., for an erecting shop, constructed by the Berlin Iron Bridge Company, and fitted with an electric traveling crane and extra heavy machinery, especially adapted for expeditious handling of large generators up to 500 K. W. in capacity. The entire plant is operated by electric motors, thus giving an exceedingly satisfactory and practical demonstration of the advantages of this system of power distribution.

Iron Armored Insulating Conduit.

A system of iron armored insulating conduits has been brought out by the Interior Conduit & Insulation Company, of New York. The system is designed for the interior wiring of buildings, and has been found most successful on account of its flexibility and indestructibility.

As in the case of the brass armored conduit, the Interior Conduit & Insulation Company is also the pioneer with insulated iron armored conduit. The latter consists essentially of plain insulating tubing placed within a lap seamed, wrought iron pipe, one eighth of an inch in thickness. The conduit possesses all the qualities of gas and water pipe, and by means of tools for cutting, threading, etc., the iron insulated junction boxes, elbows, couplings, etc., can be installed with equal ease. We present herewith a few views of the conduit.



IRON ARMORED CONDUIT, ELBOW AND JUNCTION BOX.

The Prizes Awarded in the Car House Competition.

The prizes in the competition for the best design for a car house, offered in our June issue by J. G. White, the electrical engineer, were awarded last month as follows:

First prize, $100, to D. M. Pratt, engineer Pennsylvania Steel Company, Steelton, Pa.

Second prize, $50, to D. B. Banks, engineer Baltimore Traction Company, Baltimore, Md.

Third prize, $25, to J. H. Bickford, Salem, Mass.

Fourth prize, $5, to F. J. Tone, Pittsburgh, Pa.

Fifth prize, $5, to William P. Anderson, Baltimore, Md.

Sixth prize, $5, to W. Nelson Smith, New Orleans, La.

Seventh prize, $5, to A. S. Krotz, Springfield, O.

Eighth prize, $5, to J. S. Hill, Lafayette, Ind.

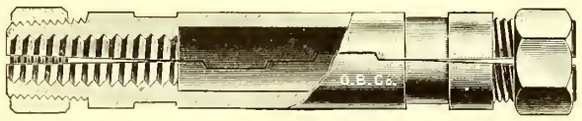
The committee of award consisted of three gentlemen, including Edward E. Higgins and two others experienced in street railway construction, but who do not, for business reasons, wish to have their names known. G. W. Davenport, who was to have been one of the judges, was unable to act on account of illness. The committee wishes to state, in connection with this matter, that the plan and specifications of J. H. Bickford were presented in better shape than those of any other competitor, as they included complete working details. The design however, submitted by Mr. Bickford, was for a car barn larger than was called for by the advertisements for the competition, and as his plans did not, therefore, strictly conform to the requirements of the competition, the third prize was awarded him for the general merit of the plans submitted by him.

A decision in regard to the second series of prizes offered by Mr. White for an article on the best method of operating parks in connection with street railways has not yet been reached.

Feeder Wire Splicer.

This device was brought out last year by the Ohio Brass Company, of Mansfield, O., and has met with almost universal approval from construction men. Besides making a practically perfect joint in the feeder wire, it saves enough time over the ordinary way of splicing to more than pay for its first cost. It can be used as a permanent or temporary connector.

In making a splice the insulation is first removed and the halves of the splicer are placed over the abutting ends of the bare wire. The



FEEDER WIRE SPLICER.

nuts are then screwed on the tapered ends of the splicer which is slightly corrugated on the inside, thus securely clamping the wire. Solder can be poured through a slot provided for this purpose.

A joint made in this way is but a trifle larger than the wire, and is of low resistance and great strength, the average electrical resistance .02 of an ohm and the mechanical strength of the joint being more than being than the wire itself.

Electric Railway Construction in Chicago.

The electric roads in Chicago are going forward at a pace that is astonishing. Not only are new lines projected in many of the suburbs and outlying districts of the city, but the older roads formerly operated by animal power are making extensive preparations to replace their horses with electric motors. Almost without exception the franchises asked for by the companies operating the North, West and South Sides systems have been granted, and the necessary ordinances have been finally signed by Mayor Hopkins, although the stipulations in some instances are rather burdensome to the street railway companies. In less than two years Chicago will have a system of surface electric roads that in the extent of territory covered will surpass anything yet constructed. In addition to this there is every probability that at least three, and perhaps four, of her elevated railroad systems will in the same period be equipped with electricity. The Chicago City Railway Company has been granted the right to equip with the overhead system nearly all of its existing horse car lines, including the Indiana Avenue line, and construction work will begin at once.

During the month the control of the Lake Street elevated has passed into the hands of Mr. Yerkes and his friends. The board of directors now includes Mr. Lauderbach, of the Northwestern elevated road, Mr. Furbeck, the general manager of the North Chicago road, and Mr. Parsons, the general manager of the West Chicago lines. This deal practically consolidates the Northwestern and the Lake Street elevated roads, and the construction work on these lines will now be carried on without interference with each other. Both roads will be equipped electrically, and the presence of B. E. Sunny on the board of directors of the Lake Street elevated makes it quite certain that the equipment of the lines will be similar to that used on the Intramural road at the World's Fair.

Street Railway News.

New Roads.

Ambler, Pa.—The Ambler Electric Railway Company was incorporated June 19, with a capital stock of $12,000. Jas. W. Shepp, of Philadelphia, is the president of the company. Others interested are N. H. Lazelere, of Norristown, Pa., and Wellington B. Krick, of Reading, Pa.

Argentine, Kan.—At a recent meeting of the Argentine City Council, Ernest L. Engeren and others made application for a franchise for an electric road, beginning near the Southern Bridge, crossing the wagon viaduct and running on Silver Avenue.

Bath, Me.—The Bath Street Railway has proved so successful that there is talk now of another line to be put in by an entirely new company. The idea is to connect with the present system at the southern end and run to Phippsburg Center, a distance of three or four miles.

Belleville, Ill.—An ordinance has been presented to the City Council granting a franchise to the St. Louis & Belleville Railway Company to construct an electric railway through West Belleville, and

over Franklin Street to Illinois Street, in this city. The company proposes to build an electric line from East St. Louis to Belleville over the St. Clair turnpike.

Bluff City, Ill.—Bluff City Electric Street Railway Company was incorporated June 28, with a capital stock of $200,000. The incorporators are Dewitt L. Jones, S. D. Talcott and Chas. Whitney.

Broad Ripple, Ind.—The Town Board has granted a fifty year franchise to the Indianapolis & Broad Ripple Rapid Transit Company. The company may use any motive power but steam.

Cincinnati, O.—O. B. Brown, of Dayton, recently appeared before the County Commissioners for the purpose of securing the right of way over the Paddock Road for the Cincinnati, Middletown & Dayton Traction Company, which proposes to build and operate an electric road between this city and Dayton.

The Commissioners of Hamilton County have granted the Cincinnati, Middletown & Dayton Traction Company, which was recently incorporated for the purpose of building an electric railway between Cincinnati and Dayton, the right to construct and operate the road from Avondale to Carthage. Construction must be commenced by January 1, 1895, and be completed not later than January 1, 1897.

Cleveland, O.—The Cleveland & Elyria Railway Company was incorporated recently by Benjamin F. Phinney, Jay Comstock, J. M. Gasser, H. D. Coffinberry and Dallas Bebe. The capital stock is $100,000. The company proposes to build a railway line to be operated by electric or other motive power between Cleveland and Elyria, for the purpose of conveying passengers, freight, express matter and the United States mails between the two points named.

Columbus, O.—It is reported that a company of New York capitalists has been organized for the construction and maintenance of an elevated railroad in Columbus. It is to be operated in connection with the Columbus and Johnston and the Columbus and Harrisburg lines, and the plan includes an electric road to be built to the Licking reservoir and Zanesville.

Defiance, O.—The Defiance Light & Railway Company, of Defiance, has been incorporated by Samuel L. Nelson, Charles E. Miley, Alvaro S. Krotz, Lawrence L. Minor and Oscar T. Martin. The capital is $100,000.

Duluth, Minn.—Articles of incorporation have been filed by the Duluth & Superior Traction Company, the incorporators being Frank Bergen, of Elizabeth, N. J.; Edward J. Douglas, of Philadelphia and John H. Davis, of New York. The capital stock of the company is $2,000,000. Its object is to construct and operate a system of electrical street railways in Duluth, Minn., and Superior, Wis.

Essex, Conn.—There is a movement under way to construct an electric railway from Essex to Ivoryton.

Fort Dodge, Ia.—The City Council has granted a franchise for twenty-five years to S. T. Meservey for a street railway and electric lighting plant.

Homestead, Pa.—A contract for building the new line of the Homestead Street Railway Company, between Homestead and Pittsburgh, has been let to the New York Electric Construction & Engineering Company. The work is to be commenced by October 1.

Kansas City, Kan.—The Stock Yards & Northwestern Railway Company has asked the City Council for a franchise for a street railway running from the stock yards to the northwestern part of the city.

Newark, N. J.—A certificate of incorporation of the North Jersey Street Railway Company has been filed. The incorporators are James K. Corbiere, of Caldwell; Daniel V. Harrison, William H Power, of Montclair; James C. Beach, Samuel M. Barrett, of Bloomfield, and others. It is capitalized at $5,000,000. The company will operate in Newark.

Philadelphia, Pa.—The Aramingo Avenue Passenger Railway Company, and the East Aramingo Avenue Passenger Railway Company were incorporated June 21, with a capital stock of $12,000 and $18,000 respectively. Henry C. Moore, 624 N. 22d Street, Philadelphia, is president of both companies. Others interested are Henry M. DuBois, David C. Golden and Hyland C. Murphey, all of Philadelphia.

Phillipsburg, Pa.—With Charles A. Bragg, of Philadelphia, as one of the incorporators, the Clearfield Traction Company, of Phillipsburg, was chartered Jluy 18. Its capital is $10,000.

Plainville, Conn.—The Bristol & Plainville Tramway Company has made application to the Selectmen of this place for right to lay tracks in the streets.

Rutland, Vt.—A new street railway company has been organized here, to be known as the City Electric Company. The following are the officers: President, E. A. Morse; secretary, James Carruthers; treasurer, H. O. Edson. The capital stock of the company is $100,000. The company will begin the construction of the road as soon as the city will grant permission.

Scranton, Pa.—The Scranton North End Street Railway Company was incorporated July 10, with a capital stock of $20,000. Lemuel Amerman, of Scranton, is president of the Company. Other stockholders are Plummer S. Page, Henry H. Archer, Robert C. Adams and Louis A. Watres, all of Scranton.

There was chartered, July 20, the Lackawanna Valley Traction Company, of Scranton; capital, $400,000. Lieutenant Governor Watres and ex-Congressman Amerman are two of the incorporators.

Skowhegan, Me.—The Skowhegan & Norridgewock Street Railway & Power Company has organized by the election of W. H. Wildes, of Skowhegan, president; I. C. Libby, of Waterville, treasurer; A. R. Bixby, clerk; A. F. Gerald, of Fairfield, manager. The capital stock is $50,000. The building of the road is let to the Worcester Construction Company, of Massachusetts, and the company expects to have the road running early in September.

Stillwater, Minn.—The Stillwater Electric Railway Company has been organized here. The new company is organized with a capital stock of $75,000, and succeeds the Stillwater Street Railway Company. J. C. Nethaway, of Stillwater, is secretary, and Allan Curtis, of Boston, president.

Tonawanda, N. Y.—Mr. West, contractor for the electric railroad from Tonawanda to Sanborn, a distance of six miles, is reported to have said he intends to commence the work shortly.

Washington, D. C.—A project for an electric railroad between Washington and New York has been brought before Congress in a bill for the incorporation of the National Rapid Transit Railway Company. Ex-Representative Hemphill, of South Carolina, and Washington capitalists are interested in the road.

Wilmerding, Pa.—The Pitcairn, Wilmerding & Braddock Street Railway Company was incorporated July 19, with a capital stock of $21,000, to construct and operate an electric railway at Wilmerding, Allegheny County. The president of the company is W. J. K. Kline, of Greensburg; and others interested are H. L. Castle, of Pittsburgh, and S. A. Taylor, of Wilkinsburg.

Yonkers, N. Y.—The North & South Electric Railway Company has been incorporated to construct a street surface road, about five miles in length, in Yonkers, the northern terminus to be in the vicinity of Shonnard Place and North Broadway, and the southern terminus to be the southern boundary of the city of Yonkers on South Broadway. The capital is $50,000. The directors are William Delavan Baldwin, S. T. Hubbard, John C. Shotts and T. H. Silkman, of Yonkers, and others.

New Publications.

The Best Light for City Railway Cars. Published by the Safety Car Heating & Lighting Company, New York.

This is a handsomely printed and tasteful circular issued to present the advantages of gas lighting for street cars. The success of the Pintsch gas as an illuminant, as our readers well know, has been phenomenal, and that the system is equally well adapted for street railway cars, the well lighted cars of the Broadway, Third Auenue and other roads using this system show. The circular presents views of the cars on a number of lines using this system, and gives extracts from the daily press and opinions of users as to its desirability and value.

Electricity One Hundred Years Ago and Today. With copious Notes and Extracts. By Edwin J. Houston, Ph. D., New York. The W. J. Johnston Company, Limited, 253 Broadway. 199 pages, illustrated. Price $1.00.

This book gives a brief review of the advance in electrical science made during the last century, and contains the text of a lecture originally delivered before the Electrical Section of the Brooklyn Institute. In its present form the text is amplified by foot notes containing much interesting historical data. Professor Houston throws much new light on the date of electrical discoveries, and shows among other points that Davy was not the inventor of the carbon voltaic arc, but was anticipated by many others.

The Railway Surgeon. Vol. 1. No. 1; $5 a year. The official organ of the National Association of Railway Surgeons. Published every other Tuesday. Monadnock Block, Chicago, Ill.

The National Association of Railway Surgeons is one of the most successful of the many organizations connected with the railway service. Railway surgery forms a distinct branch of the science of surgery in general, and there are many classes of injuries which pertain particularly to this department. There are also many other questions which come up in railway service, such as the proper sanitation of railway cars, which are peculiarly within the province of the railway surgeon. We welcome this latest publication, and particularly recommend it to the heads of the medical departments of our street railway companies.

General Information in Regard to Electric Installations. Published by *Allgemeine Elektricitäts Gesellschaft*, Berlin.

This is a very handsome catalogue of over 200 pages, printed in two colors, and giving a good deal of valuable information, with illustrations of the machines and other appliances supplied by this company, which manufactures apparatus for all branches of electrical work. The book is bound in white ivory celluloid, and bears upon the front cover the name and trademark of the company. On the four inside cover pages of the book are printed handsome colored maps of Europe, Germany and the two hemispheres. This company, whose work abroad we have had frequent occasion to describe and commend, has recently decided, we understand, to engage in the electric railway business in America.

The Report of the Eleventh Annual Meeting of the Street Railway Association of the State of New York.

The annual report of the Rochester meeting of the New York Street Railway Association has been received. It is uniform in size with the other reports, and contains in addition to the proceedings of the convention several notes by Mr. McTighe, whose paper on return circuits of electric railways was read at the convention, upon certain points brought up during the discussion. A copy of the constitution and by-laws of the Association is also printed, together with the special committees for 1894, which consist of Major George W. McNulty, who will present a paper on "Recent Improvements in Cable Practice," and J. B. Craven, of Buffalo, who will present a paper on "Economy in Electric Power Stations."

Electrical Engineering Leaflets. By E. J. Houston, and A. E. Kennelly. Published by the *Electrical Engineer*, 203 Broadway, New York.

We are in receipt of the first four numbers of three series of leaflets prepared by Messrs. Houston and Kennelly for the use of students of electrical engineering. There are three grades, the elementary, intermediate and advanced, so that each student can select whichever is most suited to his requirements. Each grade is designed as a complete course in itself. The subscription price is $3 for each series of thirty-five issues.

We consider this work an important one from an educational standpoint, and believe that it will be found a valuable aid to the acquisition of knowledge of the underlying principles of electricity and magnetism.

Personal.

Mr. George E. Pratt, of the Jackson & Sharp Company, Wilmington, Del., was in New York last week.

Mr. M. G. Hubbard, Jr., chief engineer of the McGuire Manufacturing Company, of Chicago, was in the East last month on a business trip.

Mr. Henry Elliott, of the Elliott Frog & Switch Company, of St. Louis, has gone abroad on an extensive trip, and will be absent about five months.

Mr. Benjamin Frick has been elected secretary and treasurer of the Atlantic Avenue Railway Company, of Brooklyn, *vice* Mr. William J. Richardson, resigned.

Mr. W. J. Richardson, secretary and treasurer of the American Street Railway Association, sailed for Europe July 21. Mr. Richardson will be gone about seven weeks, and will attend the meeting of the International Street Railway Association in Cologne during the early part of September.

Mr. Edward Caldwell, well known to our readers as an experienced journalist, has taken a position on the staff of the STREET RAILWAY JOURNAL, with headquarters at New York. Mr. Caldwell was for a long time one of the editors of the *Electrical World*, and more recently the editor of the *Street Railway Gazette*.

Mr. W. S. Rogers, special agent for the Sperry Electric Railway Company, of Cleveland, O., is in the East at present, making his headquarters at the Imperial Hotel, New York. Mr. Rogers tells us that the Sperry motor equipments are meeting with more and more favor, and that the demand for these motors is good. The first of the large order of 125 equipments of Sperry equipments for the People's Traction Company, of Philadelphia, was put in operation last month.

Mr. E. J. Wessels, formerly of the Short Electric Railway Company, has been appointed general manager of the Genett Air Brake Company, with offices at 33 Wall Street, New York. Mr. Wessels reports business as being very promising. The company has just closed a contract with the New Orleans Traction Company to equip a number of its cars with its air brake. The matter of braking is receiving unusual attention at this time, owing to the numerous accidents which have recently occurred. Mr. Wessels predicts that the Genett air brake is destined to become in street railway practice what the Westinghouse brake has become on steam roads.

Equipment Notes.

The Gleason & Bailey Manufacturing Company, of New York, will build for the town of Port Chester, N. Y., an elaborate steel frame city truck.

E. F. Dewitt & Company, of Lansingburgh, N. Y., report, among other recent orders one with the Electric Traction Company, of Philadelphia for the equipment of 200 cars with their "Common Sense" sand box.

The R. A. Crawford Manufacturing Company, of Pittsburgh, Pa., mentions among its recent orders, an additional order for fifty fenders from the New Orleans Traction Company, which has already a number of the Crawford fenders in use.

The East River Gas Company, of Ravenswood, Long Island, N. Y., is building, in connection with its new works, an exceptionally large coal pocket, designed to hold 11,000 tons, and is equipping it with C. W. Hunt Company machinery.

The Manhattan General Construction Company, of New York City, has been appointed by the Buckeye Electric Company its agent for New York and vicinity and for Massachusetts, Rhode Island and Connecticut, in addition to the territory already covered.

The Pettingell Andrews Company, of Boston, Mass., has opened an office at 39 and 41 Cortlandt Street, New York, in connection with their Boston street railway business and general electrical supplies. Frank X. Cicott, manager of the railway department, will be in charge.

The Billings & Spencer Company, of Hartford, Conn., has made an arrangement with the Pettingell Andrews Company of 72–4 Federal Street, Boston, by which the latter company is to act as agent for the sale of the Billings & Spencer Company's patent drop forged commutator bars to street railway companies in the United States and Canada.

M. T. Davidson, Brooklyn, N. Y., builder of the Davidson steam pumps, finds business good. A recent order from the United States Government authorities at Washington calls for a 10,000 lb. pressure pump of the latest Davidson type, which will be used in the Bureau of Engraving and Printing. Other large orders are also under way at the works.

Carleton & Kissam, of New York, have lately added to their extensive list of street cars in which they control the exclusive advertising privileges, all the cars of the Pleasant Valley Traction Company, Allegheny, Pa., and the Suburban Traction Company, in Pittsburgh. Carleton & Kissam now control the advertising privileges in all but four lines in Pittsburgh and Allegheny.

The Fiberite Company, of Mechanicsville, N. Y., is making large sales of the Medbery insulation. Among the roads which this company is now supplying are the Montreal Street Railway Company; Montreal Park & Island Company; Union Street Railway Company, of Providence; Middletown-Goshen Traction Company; Philadelphia Traction Company; Buffalo Street Railway Company, and the Wissahickon Railway Company.

The Knott Manufacturing Company, of 796 Seventh Avenue, New York City, has placed upon the market a commutator lubricating compound intended as a substitute for either machine oil, glycerine, vaseline or any paraffine preparations used on commutators. The company has issued a pamphlet giving a number of reasons why this compound should be used on electrical machinery, and presenting a number of testimonials from those who have used it in their stations.

H. Ward Leonard, of New York, has just had issued to him patent No. 522,718, of July 10 1894, for an electric heater which is likely to mark a very distinct advance in that line. The invention is quite radical, and the patent obtained by him contains very broad claims. The first claim reads as follows: "A device in which electrical energy is converted heat, having a thinly insulated conductor embedded in, and completely surrounded by, a closely applied mass of metal substantially as set forth."

The Bemis Car Box Company, of Springfield, Mass., reports large increase of orders. P. T. Pullen, of the company, tells us that among the recent orders the company has received an order for fifty trucks from the Electric Traction Company, of Philadelphia, and twenty-five trucks from the Hestonville, Mantua & Fairmount Avenue Railway Company, of the same city. The company has also supplied thirty trucks for the Fairhaven & Westville Street Railway Company, of New Haven, Conn., and 180 trucks for the Third Avenue Railway Company, of New York.

The Mather Electric Company, of Manchester, Conn., has just issued a new catalogue of its street railway apparatus. The company has on hand a number of orders for new multipolar generators, of the type described elsewhere in this issue, for both belted and direct connected work. The company reports that it has had even more success in putting this new apparatus on the market than had been anticipated. It has contracted and closed for the equipment of a number of electric roads both in the East and West. The Western business of the Mather Electric Company is controlled by J. Holt Gates, of 1140 Monadnock Building, Chicago.

George Cradock & Company, of Wakefield, England, write us that the Lang lay rope, which was removed from the tunnel line of the North Chicago Street Railway Company after making a record of ninety-eight days, and which was put to work on the South Clark Street line on May 12, was taken out June 9, after having run twenty-nine days on this line. The record on the tunnel line was wonderful in itself considering the great wear, and it was removed from this line only because it had worn too small for the grips to take hold of it. The fact that it was useful, however, for further service speaks volumes for the durability of the Cradock ropes.

The Composite Brakeshoe Company, of 620 Atlantic Avenue, Boston, Mass., writes us that it has made arrangements with the Pennsylvania Iron Works Company, of Philadelphia, for the manufacture of its composite brakeshoe. Shipments with bills of lading will be made directly from the factory, but all orders should be sent to the Boston office. The company has also made arrangements with the Kinzer & Jones Manufacturing Company, of Pittsburgh, Pa., for the manufacture of its composite brakeshoes in that section of the country. This brakeshoe is becoming the standard on many street railways, especially for electric service, and has superior braking and wearing qualities.

The Harrison International Telephone Company, of New York City, is meeting with excellent success in the sale of its telephones in all sections of the country. On August 1, the company will commence the sale of the Ford automatic switchboard, by the use of which the need of a central station will be avoided and connections can be made at any instrument with any other. Owing to the large demand for Harrison telephones the construction department of the company, organized as the Harrison International Construction Company, has moved its general offices to Chamber of Commerce Building, Chicago, where all correspondence with reference to the establishment of exchanges, the construction of the same, and the purchase and lease of telephones should be addressed.

Allan, Whyte & Company, of Rutherglen, Glasgow, Scotland, is the title of a new firm organized some time ago, as already mentioned. The firm has commenced the manufacture of wire ropes for cable railways, mines, transmission of power, suspension bridges etc. Both the principals of this company are well known in cable work. Alexander B. Allan has been lately connected with George Cradock & Company, of Wakefield, England, and has spent a considerable time in this country representing those manufacturers. The other principal, Robert M. Whyte, was formerly connected with Messrs Thomas and William Smith, of Newcastle-upon-Tyne, England, the prominent English cable builders. The personal knowledge of these gentlemen of the manufacture and application of wire ropes makes them especially competent to advise with cable railway managers as to the type of

rope to use, and insures a high degree of excellence for the product of their works.

The Lewis & Fowler Manufacturing Company, of Brooklyn, N. Y., recently sold to the South Jersey Street Railway Company, of Point Pleasant, N. J., five open cars complete and ready for operation, including an equipment of Lewis & Fowler fare registers. These cars are to be mounted on Peckham trucks, and will be equipped with Westinghouse motors. This is a new road, having been opened July 20. The Q. N. Evans Construction Company, of New York, was the builder and contractor for equipment of every description. The Lewis & Fowler Company reports that the demand for its Acme car jack, recently described and illustrated in the JOURNAL, has resulted in large sales. The company is constantly receiving very complimentary letters regarding its merits. This car jack is intended for use in repair shops, and is equally adapted for use anywhere along the line, as it is capable of quick adjustment and action. It is sufficiently powerful to lift the heaviest cars that are built, and two men can operate it with very slight effort.

The John Stephenson Company, Ltd., of New York, is doing an excellent business, and the factory of the company presents a very busy appearance. The company has recently delivered fifty-five closed cable cars to the Broadway & Seventh Avenue Railway Company, in addition to the other extensive orders which have been filled for this company, showing that the Stephenson car is felt to be the standard in this company's work. The Stephenson Company has also delivered 100 open cars to the Metropolitan Traction Company. Among the orders on which the Stephenson Company is busy at present is one for fifty cars for the Consolidated Traction Company, of New Jersey; eight cars for the Bridgeport Street Railway Company, of Bridgeport, Conn.; ten cars for the Dartmouth & Westport Railway Company, of New Bedford, Mass.; eleven open cars for the Steinway Railway Company, and sixty twenty foot cars for the Nassau Electric Railway, of Brooklyn, N. Y. The Stephenson Company reports the usual foreign demand, and among other foreign orders filled recently was one for a number of horse cars to be used in St. Petersburgh.

The Standard Paint Company, of New York, has recently been awarded a decree in the United States Circuit Court for the District of New Jersey, establishing the validity of the United States patent under which this company has manufactured its paper. The case was that of The Standard Paint Company *vs.* Henry J. Bird and James L. Reynolds, and the decision was that the assignors of the Standard Paint Company were the first persons to produce a paper coated with the solid residuum of petroleum, and combining the characteristics of an odorless, water, acid, alkali and air proof paper, and that the patent under which this company has hitherto manufactured was valid, and had been infringed. The court, by Hon. George M. Dallas, circuit judge, holds that any paper possessing the same essential characteristics and produced by the coating with any material similar to that employed by this company, by whatever name it may be called, is an infringement of the patent, and that patent is good and valid in law. Having now obtained an injunction in the courts, the company will, of course, seek to fully protect its rights, and cautions the public against the use of any sheathing, building or insulating papers which falls within the decision.

The Berlin Iron Bridge Company, of East Berlin, Conn., has received an order from the St. Louis Railway Company, of St. Louis, Mo., for the construction of that company's new car barn. The building will be sixty-four feet in width, and 185 ft. in length, with brick walls, the roof being of iron covered with the Berlin Iron Bridge Company's patent anti-condensation, corrugated iron roof covering. It is the intention of the railroad company to make this station absolutely fireproof and thereby save insurance. There will be no woodwork used in the construction of the building, and it will not be necessary to carry any insurance whatever, as the danger from fire is entirely eliminated. The United States Projectile Company at Brooklyn, N. Y., is making extensive additions to its machine shop, and has placed the contract for this work with the Berlin Iron Bridge Company. Another contract received by this company is for a new electric light and power station for the Bradford Electric Light & Power Company, Bradford, Pa. The building is 65 × 160 ft., with brick side walls, the roof being of iron, covered with the company's patent anti-condensation, corrugated iron roof covering. When completed, this will be one of the finest and most complete stations in western Pennsylvania, and also so constructed as to be absolutely fireproof, there being no woodwork about the building to take fire. The Berlin Company has also received the contract from M. C. Henry & Company, of New York, to cover their stone yard with an iron roof, and also for a traveling crane. The building will be 50 × 100 ft., constructed entirely of iron, the whole space to be controlled by the traveling crane.

The Altoona Manufacturing Company, of Altoona, Pa., manufacturer of the M. A. Green engine, is meeting with a large demand for this popular machine. Edward F. Austin, of Pittsburgh, Pa., the energetic agent in that city for the Green engine, has just completed the installation of one of the fifty horse power, improved, automatic cut-off engines to drive a 500 light Westinghouse dynamo in Christ's M. E. Church of the East End of Pittsburgh. As this is the first engine installed in a church in that section, it makes an especially interesting installation. The M. A. Green engine has been largely adopted in Western Pennsylvania largely through the untiring efforts of Mr. Austin, who from his first examination of the engine felt assured of its success, especially for electric lighting work and for street railways. It is designed and constructed particularly for this line of work. Mr. Austin has also made the following sales in his section: One 80 H. P. M. A. Green improved, automatic cut-off engine to the New Castle Car Manufacturing Company, of New Castle, Pa.; one 150 to 180 H. P. M. A. Green engine to Jones & Laughlin, of Pittsburgh, to run the electric cranes with which they have recently equipped their mills; two 60 H P. M. A. Green engines to the McIntosh-Verner Buildings, of this city; one 12 × 14 M. A. Green engine to the Lorch-Eble Machine Company, of Pittsburgh, and one 150 H. P. M. A. Green engine to the Watson Mining & Manufacturing Company, of Monongahela City, Pa. Other recent orders are as follows: One 280 H. P. engine for the Akron Street Railway Company, of Akron, O., to be direct coupled to a 250 H. P. generator built by the Walker Manufacturing Company, of Cleveland, O.; one 65 H. P. enclosed type, self-oiling engine for the Lyceum Theatre, Philadelphia; one 175 H. P. standard, center crank engine for the Freeport Electric Company, Freeport, Ill.; one 65 H. P. enclosed type, self-oiling engine for Knights Brothers, Fayette County, Ia. There is considerably more inquiry, and with a settlement of the railroad strike it is believed that a substantial improvement in business will be the result.

WESTERN NOTES.

The American Car Company, of St. Louis, has just taken an order for twenty-five cars from the Union Depot Railroad Company of that city. These will be equipped with Mr. Sutton's new truck.

The Central Electric Company, of Chicago, is now getting into shape to do a large business in street railway supplies. The managers of the company tell us that the demand for their street railway appliances is growing, and that they are increasing in popular favor.

The American Carbon Company, of Dayton, O., is now experimenting on motor brushes, and hopes soon to be in the market with a superior carbon brush for street railway and stationary motors. Mr. Dickey is the general manager of the company, which has an unusually large plant, and is already doing a good business in the manufacture and sale of carbon specialties.

The Lodge & Davis Machine Tool Company, of Cincinnati, O., has just been awarded a contract by the United States Government for one of its improved screw machines to work stock up to one and one fourth inches, to be shipped to the Norfolk navy yards, Norfolk, Va. The company is also erecting a repair shop for the Silver King Mining Company, of Salt Lake City, at the Park City mines of the latter. The equipment will include special engine lathes, planers, drill presses, shafting, pulleys, etc.

The McGuire Manufacturing Company, reports doing an excellent business, having just closed a contract with the Electric Traction Company, of Philadelphia, Pa., for 140 Columbian trucks. The company also has a contract from the Cincinnati Street Railway Company, of Cincinnati, O., for ninety Columbian trucks, and an order for forty Columbian trucks to go to the Los Angeles Consolidated Electric Railway Company, Los Angeles, Cal. Large sales of the new Columbian car heater are also reported.

The Card Electric Company, of Mansfield, O., is busy filling orders for its single, thirty-five horse power, street railway motors. This company has found that its medium weight motor gives very good results on practically level roads, showing, it is claimed, that it is not necessary to have two motors on a car except where heavy trailers are used. The motors that have been running at Mansfield and Fremont, O., for some months have given entire satisfaction. J. Holt Gates, 1139 and 1140 Monadnock Block, Chicago, Western agent, reports numerous inquiries and a good outlook.

The Electrical Installation Company, Monadnock Block, Chicago, of which L. E. Myers is secretary and treasurer, has a large amount of important work under way. It has a contract with the Englewood & Chicago Electric Street Railway Company to build forty-seven miles of overhead work, furnishing all material. It also has a contract for the complete equipment of the Fox River Electric Railway Company, of Green Bay, Wis., which consists of six miles of track, all electrically equipped. Westinghouse equipment will be used here. It is also building five miles of track and overhead construction for the Freeport Street Railway Company, of Freeport, Ill. As in the other cases, it furnishes all the material, and here the Walker Manufacturing Company's electrical equipment will be used. It has just completed several miles of heavy cable work, and installed one G. E. multipolar generator in the power house of the Alley Elevated road. It has also just completed an electric light plant for the city of Le Roy, Ill., and a large central station at Racine, Wis.

The Standard Railway Supply Company, of Chicago, is busy filling orders for overhead line material, steel gongs, and Standard stoves. The company has had some excellent orders for these three lines of supplies. Although the agency for the Nuttall Company, of Allegheny, Pa., was taken only recently, some very satisfactory orders for gears and pinions, trolley bases and trolley wheels have been received. This company, of which Garson Myers is manager, has been building up during the past two years a substantial street railway supply business. Mr. Myers has given his attention especially to the Standard car stove and the "Gilt Edge" steel gongs. A number of Standard stoves are now in service in Germany and Canada in addition to their extensive use on the street railways in the United States. Another and an entirely new stove has just been made by Mr. Myers' company, and this will be placed on the market in a short time. It will be known as the Myers self-feed car stove. It is entirely of cast iron, will contain sufficient coal to operate it for eighteen hours, and is so constructed as to deliver the coal to the fire without waste. It is intended to be placed either on the car seat or upon the floor. No cutting of the seat is necessary. When placed upon the floor a coal box compartment forms part of the stove. The company will guarantee that it will heat a twenty-five foot car at a cost not exceeding ten cents for eighteen hours.

J. G. Gustin & Company, of Chicago, report that orders for the Hercules trolley clamp are coming in thick and fast. A particularly gratifying feature about the orders is that a number of them are duplicates from companies who first ordered a few for trial. Street railway contractors are also recognizing the fact that the Hercules trolley clamp has a very strong hold on the wire, and is so inexpensive to install, that by using it they are enabled to employ an excellent article, and at the same time to figure their contracts to a very close figure.

The Hooven, Owens & Rentschler Company, of Hamilton, O., has sent us the report of a test of its engine in the power plant of the Lynn & Boston Railroad Company, at Salem, Mass., made July 7, 1894, by J. H. Bickford and G. H. Davis. The engines used are three tandem compound with cylinders, 18.125 × 34 ins. by 48 ins. stroke, and run condensing. The average indicated horse power of the engine was 385.21, and the showing made was excellent. The average cut-off per cent. of stroke was: High pressure 26, low pressure 21.36, average M. E. P. high pressure 49.25, low pressure 11.66. Pounds dry steam per indicator horse power per hour 14.87; pounds dry coal per indicator horse power per hour 1.603; pounds combustible per indicator horse power per hour 1.519.

List of Street Railway Patents.

U. S. STREET RAILWAY PATENTS ISSUED MAY 29, 1894, TO JULY 10, 1894, INCLUSIVE.

MAY 29.

ELECTRIC RAILWAY TURNTABLE—Rudolph M. Hunter, Philadelphia, Pa. No. 520,527.

In an electric railway, the combination of a turntable operated by the electric railway current through the car motor.

CABLE RAILWAY—Charles W. Hunt, West New Brighton, N. Y. No. 520,644.

The combination in a cable railway of sheaves around which the cable passes and which are located so that portions of the cable are parallel to each other along a straight portion of the track, from the respective ends of which straight portion of the track, the cable descends and is acted upon by the driving drum whereby the cars can be disconnected from the cable at any part of the straight portion of the track, and then reconnected to the adjacent parallel portion of such cable.

TROLLEY WIRE SUPPORT—Budd J. Jones, Sioux City, Ia. No. 520,737.

In a trolley wire support, the supporting piece of an approximately triangular form, adapted to fit a bend in the trolley wire, with its outer surface on a plane with the surface of the trolley wire, in combination with a bridge piece, a stirrup strap, and means for adjusting the stirrup strap.

CONDUIT RAILWAY TROLLEY—William Lawrence, New York. No. 520,758.

A contact plate formed in parts fitted one against the other, insulating material around said parts, a casing binding said parts together, and arms pivoted to one of said parts, said arms having contact wheels journaled therein.

JUNE 5.

ELECTRIC MOTOR TRUCK—John C. Henry, Westfield, N. J. No. 520,780.

An electric car truck having a frame comprising horizontal side bars of magnetic metal, axles journaled in each end of the side bars, and pole pieces lying in a horizontal plane and projecting from cross bars joining the side bars between the axles, whereby the magnetic connection between said pole pieces lies through the cross bars and side bars. The electric motor has its field coils wound with a multiplicity of parallel conductors, the strand through which the circuit is first completed and last broken being of higher resistance than the others. A switch is located on the positive side of the field magnets, and is adapted to close the circuit through one or more of the conductors.

ELECTRIC LOCOMOTIVE—Walter H. Knight, Lynn, Mass., assignor to the General Electric Company, Boston, Mass. No. 520,787.

Covers the combination in a vehicle with two or more trucks, each having a plurality of separately driven axles mechanically connected together, of means for simultaneously controlling all the motors used.

FARE REGISTER—Frederick C. Boyd and Charles E. Gurding, New Haven, Conn., assignors to the New Haven Car Register Company, of Connecticut. No. 520,912.

The first claim reads: In a fare register, the ratchet wheels secured to the side of the trip register disks, each provided on one of its sides with pins, means for turning the said wheels and disks, dogs for engaging the pins on the disk, the rockshaft by which the dogs are carried, a depending arm, and a reciprocating device for engaging said arm.

TROLLEY WIRE SUPPORT—Louis McCarthy, Boston, Mass. No. 520,937.

A trolley wire support comprising a supporting arm, an insulator, and jointed connectors extending upwardly in opposite directions from the insulator and suspending it from a bracket or span wire, leaving the insulator free to respond to the vibrations of the trolley wire.

CLOSED CONDUIT FOR ELECTRIC RAILWAYS—Paul Plodeck, Sr., Cleveland, O. No. 520,938.

In a conduit for underground electric railways, the combination with conduit provided with lids for covering the opening in the roadway, of an arm with an arched bar attached to the car truck, and adapted to lift the lids, and trolley wheels.

ELECTRIC RAILWAY OVERHEAD SWITCH—Miller A. Smith, Brooklyn, and William Clabaugh, New York, assignors to the New York Electrical Works, New York. No. 520,971.

This consists of the combination, in a switch, crossover, etc., of a rib having a substantially horizontal contact portion, an inclined groove, and a split key clamp at the outer end of said groove.

RAILWAY TRACK STRUCTURE—Edward Samuel, Philadelphia, Pa., assignor to William Wharton, Jr., & Company, Incorporated, same place. No. 521,004.

This covers the combination of two or more rails united together sidewise, each rail having a web perforated at intervals, with a continuous cast block extending through the perforations and overlapping the webs of the rails, thereby holding the rails rigidly in respect to each other.

RAILWAY SWITCH—Harry B. Büttel, Newark, N. J. No. 521,014.

This is an improved switch operating apparatus, consisting of a vertically movable rod mounted in suitable bearings secured to the car, and adapted to engage with and open the switch tongue; a lever fulcrumed on the platform of the car within reach of the driver or motorman, and means, connecting with said lever and rod, whereby the latter is operated.

JUNE 12.

CONTACT TROLLEY—Robert W. Hawkesworth, East Orange, N. J. No. 521,163.

The combination in a trolley bar of two arms, one at an angle to the other, and a support to which said bar is pivoted at a point between and above the ends of the arms.

TROLLEY—Henry Scheele, John P. Scheele, and Henry A. Rust, Milwaukee, Wis. No. 521,184.

The combination of a suitable head having pivotal levers provided with bearings, a trolley wheel loose on these bearings, and a spring under compression between the levers on that side of their pivots opposite said bearings.

CAR TRUCK—Edward Cliff, Newark, N. J. No. 521,205.

In a car truck, the combination, with a stationary frame supported upon the running gear, of a movable frame supported upon said truck, spiral springs located between the movable and stationary frames, and a half-elliptic spring suitably secured to each of the extended sections of the stationary frame and connected at one head by a shackle to the movable frame, and connected at the other head by a shackle to the stationary frame.

BOND FOR ELECTRICAL CONDUCTORS—John Herr, Philadelphia, Pa. No. 521,238.

The combination with an electrical conductor (or rail) of a tapered hole therein, a split bolt having a head and a conical shank externally threaded and a hole passing longitudinally through said head and shank, a nut adapted to be screwed up on said conical shank of said bolt, and a wire adapted to enter and be grasped by the sides of said bolt in said bolt.

SAFETY GUARD FOR STREET CARS—Stephen Norton and William H. Rice, Rochester, N. Y. No. 521,294.

The combination, with a car and truck, of a guard frame pivoted to the bottom of the car and provided with offset arms, springs interposed between said offset arms and the bottom of the car, and stay bars pivoted at one end to the guard frame and at the other to the truck.

PILOT OR GUARD FOR CARS—Robert A. Crawford, Allegheny, Pa. No. 521,307.

The combination of a pilot or guard, a support therefor, a sensitive spring acting between the pilot and its support, a swinging toe at the lower end of said pilot, and a powerful spring controlling said toe.

TROLLEY WIRE FINDER—Theophilus E. Gressle, Indianapolis, Ind., assignor of nine-twentieths to Frank Hittle, Baltimore, Md. No. 521,311.

The combination, with a trolley support and trolley, of directing bars or guides adapted to be elevated by movement upon the axis of the trolley, a double free-ended spring attached to one of said bars or guides.

CONDUIT SUPPLY SYSTEM FOR ELECTRIC RAILWAYS—Harry Alexander, New York. No. 521,326.

The combination with a slotted electric railway conduit, of a conductor supporting trough, having a side extending down from the conduit slot, and having a bottom and upturned side, and a working conductor supported in said trough.

JUNE 19.

SAFETY APPLIANCE FOR STREET RAILWAY CARS—Oswald R. Routh, Jersey City, N. J. No. 521,477.

This covers the combination in a fender of a pivoted scoop capable of a horizontal movement, a roller at the front of said scoop, a counterbalance at the rear of said scoop, pivotal movable bearings or supports for said scoop and means for normally holding suspended the said counterbalance and for releasing it to raise the scoop when the latter is moved backward.

CONDUIT ELECTRIC RAILWAY—Thomas Armat, Washington, D. C. No. 521,562.

This covers in an electric railway, the combination with an insulated supply conductor adjustably supported within a conduit and provided at intervals with contact points, of a series of frames arranged at each side and independently journaled and carrying longitudinally arranged metallic strips and transverse branches, leading from said strips inwardly toward the supply conductor and terminating in engaging

heads, and a current gatherer adapted for traveling over said longitudinally arranged strips thereby rocking the frames and bringing said heads of the transverse branches into engagement with the contact points.

Trolley Pole Catcher—Owen G. Cates, Jr., St. Louis, Mo. No. 521,602.

This covers the combination with the trolley pole and its means for holding the trolley in contact with the wire, in which means are included springs, of a bolt for holding the springs under tension, a bell crank lever connected to the bolt, a rod connected to the other arm of the bell crank lever connected to the bolt, a rod connected to the other arm of the bell crank lever, and projections on the rocker arms of the trolley pole for engaging and operating the arm when the trolley leaves the wire, whereby the bolt is actuated to release the tension of the springs.

Coupling for Electric Locomotives—Edward D. Priest, Lynn, assignor to the General Electric Company, Boston, Mass. No. 521,669.

A coupling for electric locomotives comprising a driving member normally concentric with an axle of the locomotive, a driven member consisting of a wheel keyed to said axle, and a float or independent connector mutually engaged by said members, whereby they are held in driving relation, but are permitted to move out of their normal concentric positions.

Safety Car Fender—Friedrich H. Reich, Baltimore, Md. No. 521,670.

In a safety fender for cars, the combination of the two side bars each made in two sections which are pivoted together; a cross bar connecting the lower front pivoted ends of the side bars, another cross bar connecting the back part of said side bars, springs attached by one of their ends to the car front and by their other ends to the lower front section of said side bars, said springs having an inclined position and adapted to draw up the pivoted section of the side bars, an inclined flexible curtain-like buffer, and a latch bar having one end attached to a cross bar of one section and its other end provided with a hook lip to engage a cross bar on the other section.

Fender for Tram Cars—Samuel J. Rosenfeld, New York, assignor, by direct and mesne assignments, to himself, Joseph A. Louchheim and Edwin S. Simon, Philadelphia, Pa. No. 521,672.

A rotary car fender, consisting of a shaft and arms rotating therefrom, the said arms being convexed upon ascending faces.

Supply System for Electric Railways—Thomas Harris, Detroit, Mich. No. 521,711.

In an electric railway system, the combination of a working conductor composed of insulated sections, a switch line and a return switch line extending along the working conductor from a stationary source of electricity, an electro-magnet for each section of the working conductor, the armature of which is adapted to connect the section with the power line and with the switch line, two energizing circuits for each magnet, one connecting the section of the working conductor with the return switch line through a normally open and a normally closed break controlled by the next adjacent magnets respectively, and the other connecting the two switch lines through the said normally closed break of the other circuit and a normally open break controlled by the magnet itself, and a contact on the car adapted to connect two adjacent sections of the working conductor.

Car Fender—James Tobin, Indianapolis, Ind. No. 521,741.

In combination with a car, a spring actuated bar connected to the car with an end extending in front of the same, and a triangular flexible fender supported at one of its corners on the projecting end of the bar and at the other corners attached to the car.

June 26.

Railway Car Truck—Norman C. Bassett, Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. No. 521,778.

The combination of a motor truck frame having side bars with pedestals thereon, axle boxes with side lugs, springs interposed between the side bars and side lugs, removable supports for said springs and means for clamping said supports in place.

Conduit Electric Railway—Charles J. Reed, Orange, N. J., assignor, by direct and mesne assignments, to the Reed Electric Company, Philadelphia, Pa. No. 521,891.

A pair of electrical conductors crossing each other at stated intervals and connected to the opposite poles of an electrical generator, in combination with a slitted conduit; the successive sections of the overlapping conductors lying in alignment with the slit of the conduit.

Conduit Electric Railway—Charles J. Reed, Orange, N. J., assignor to the Reed Electric Company, Philadelphia, Pa. No. 521,892.

Covers a trolley to be used with the previous invention, also combination of trolley with conduit system.

Safety Guard for Cars—August Soffel, Brooklyn, N. Y. No. 521,966.

The combination with the vertically movable cradle, of a U-shaped cradle operating spring and a rocking dog and lever engaged with the spring and with each other for manipulating the spring, whereby the cradle may be held suspended by the force of the spring and also forced downwardly by the spring.

Safety Appliance for Street Railway Cars—Frank W. Jenkins, Brooklyn, N. Y. No. 521,981.

The combination with a car having the platform rounded, of a wheel mounted loosely and in horizontal position below the platform, the wheel having a diameter equal to the gauge of a track on which the car runs, the front parts of the wheel circumference projecting slightly beyond the rounded edge of the car platform and an inclined guard extending from the car platform to the wheel.

Guard for Cars—Gustav Boehm, Long Island City, N. Y. No. 522,003.

The combination with a guard connected with the car platform, of an apron at the front end of the guard, springs for throwing up the apron, a sector and blocking lever for holding the apron in position, and means for disconnecting the blocking lever by the weight of the person upon the guard.

Trolley Stand—Eleazer F. A. Heastings, Avalon, Pa. No. 522,057.

A trolley stand, comprising a base, a bracket held to turn horizontally thereon, a second pole carrying bracket pivoted on the first bracket, and bow springs projecting from opposite ends of the first bracket and pivoted to opposite ends of the pole carrying bracket.

Means for Suspending Electric Motors From Cars—Robert Lundell, Brooklyn, assignor of two-thirds to Edward H. Johnson, New York. No. 522,067.

A car having a single propelling motor yieldingly sustained beneath its frame and the rotary part thereof connected at its opposite ends through sprocket wheels and sprocket chains to shafting which in turn is geared through speed reducing gearing to two of the axles thereof, in combination with a sliding support for the motor and means for compensating for undue stretching of the sprocket chains.

Car Fender—Marguerite Maidhof and Victor F. Maidhof, New York. No. 522 070.

In a car fender, the combination with a pivot plate attached to the car, of a fender comprising a platform, a back pivotally connected with the said platform, a vertically disposed pivot on the said back and engaging the said pivot plate, and wheels journaled on the front end of the said platform and adapted to travel on the track rails.

Automatic Switch Operating Mechanism—Cyrus P. Bachelder, Pawtucket, R. I. No. 522,096.

The combination with a car, a stationary transverse guide rod supported below the same, a block loosely mounted thereon, a vertically reciprocating, spring actuated pin arranged on the car and connected with the block, and a spring for supporting the block normally at a certain point upon the rod whereby it is adapted to operate a switch tongue.

Life Guard for Cars—Joseph J. Beals, Cambridge, assignor of one-half to Wallace L. Broadbent, Boston, Mass. No. 522,099.

A net is connected at its upper end with the car body, and the frame and stretcher connected with the lower end of the said net, and pivoted braces extending therefrom to the car body, combined with the lifting ropes for said stretcher and weight connected therewith.

Safety Guard for Cars—Joseph W. Betz, Brooklyn, N. Y. No. 522,100.

The combination, with a car and a car platform, of a fender frame hinged by its rear end upon the car below the car body, rollers on the lower side of the fender frame near its front edge, a spring pressed latch slidable from the platform, and a retractile spring engaging the car fender and frame.

Wheel Fender and Safety Attachment for Street Cars—Frank H. Homan, Patchogue, N. Y. No. 522,115.

A fender of netting for street cars inclosing the wheels and space beneath the floor, having an edge bar of pivotally connected sections provided with rolls and connected by a cross roll at each end of the car.

Flexible Belt Fender for Street Railway Cars—Richard B. Chambers, Chester, Pa., assignor to Crosby M. Black, same place. No. 522,147.

Flexible, traveling, endless belts are provided having the adjustable rollers arranged in a sliding bearing in slots, and swinging shields or frames with connecting rods and operating a pivoted table or semi-rotary yoke, and imparting its motions by rods to a friction clutch, and hand or foot lever and a stationary vertical bearing shaft arranged in different combinations.

Car Fender—Henri G. Chatain, New York. No. 522,149.

The combination with sections or lever and a spring, of a frame resting on one section and having its lower end set in advance of the lower end of the other section or lever.

Trolley Wire Hanger—Thomas J. McTighe, New York, assignor, by mesne assignments, to Frederick K. Fitch, same place. No. 522,180.

A trolley wire attachment consisting of an ear or casting of suitable shape having a slotted, screw threaded stud adapted to receive the trolley wire, a flat plug substantially filling the slot, and a screw cap adapted to fit the stud and press the plug against the trolley wire.

July 3.

Electric Railway Car Truck—Francis O. Blackwell, Lynn, Mass., assignor to Thomson-Houston Electric Company, of Connecticut. No. 522,189.

The combination with the driving axle of a railway truck and the motor shaft connected thereto through a flexible coupling and gearing, of the gear casing having a portion flexibly mounted to follow the movement of the motor shaft.

Car Fender—Alfred L. Clarke, Springfield, O. No. 522,194.

The combination with a railway car, of yielding arms secured directly to the front of said car, said arms each consisting essentially of a single piece of metal having a spring coil therein, and provided at

the lower end with a bearing portion or shoe, as described, and a guard or table arranged between the respective arms, and secured thereto.

WIRE SUPPORT FOR OVERHEAD ELECTRIC RAILWAYS—Arthur W. Jones, Boston, Mass., assignor to the Thomson Houston Electric Company, of Connecticut. No. 522,216.

The combination with a pole, of a bracket adjustably secured thereon, and having a socket provided with a watershed, and an eye in line with said socket, and having a watershed at each end.

TROLLEY CAR—Herbert J. Lycett, Bryn Mawr, assignor to John A. Brill, Philadelphia, Pa. No. 522,224.

A car having a movable platform upon its roof, supports for sustaining said platform in the raised position, and means independent of the supports and carried by the platform for holding said platform in the latter position.

RAIL JOINT AND BOND FOR ELECTRIC RAILWAYS—Julius Meyer, New York. No. 522,349.

The combination, with the rail ends, of a base plate provided with a trough and outwardly extending flanges, angle plates connected by bolts to the webs of the rail ends and to the outwardly extending flanges of the base plate, a bond or bonds connecting the base of the rail ends, and a filling of asphaltum or other plastic insulating material run into the trough of the base plate, so as to fully inclose the bond or bonds and serve as a projection for the same.

SUSPENSION CLIP FOR TROLLEY WIRES—William F. D. Crane, East Orange, N. J., assignor to the Johns-Pratt Company, Hartford, Conn. No. 522,362.

In a trolley wire clip, the combination, with a plate sloped backwardly toward the bottom of hooks projected downwardly at the ends of the plate, and a hook having the under side arched downward and its edge projected forwardly and upwardly from the bottom of the plate.

ELECTRIC RAILWAY SWITCH AND TROLLEY—Frederick S. Perrin, Lynn, Mass., assignor of three-fourths to William B. Baldwin, New York, and others. No. 522.388.

The combination with the trolley wheel, of side arms whose upper ends are arranged to extend over the trolley wire, and are movable toward and from each other, said arms carrying rollers at their ends.

SAFETY CAR FENDER—Daniel Harding, Townson, and William L. Fitzhugh, Baltimore, assignors to said Harding, and John I. Yellott, Townson, Md. No. 522,412.

The combination of a car axle provided with a clutch and clutch drum; means to keep the clutch disengaged from the clutch drum; a jack screw connected with the brake gear of a car to apply the brakes; and a swinging gate connected with the said means which keeps the said clutch disengaged.

CONDUIT ELECTRIC RAILWAY—John H. Tyrrell, New York. No. 522,440.

A conduit for electric railways, comprising a trough like structure provided with a longitudinal slot in its top, the upper portion of one of the side walls of said structure being inclined toward the said slot, a guard plate arranged on the opposite side of the slot, and a cover located on top of the structure between the guard plate and the other side wall of the structure.

CAR FENDER—William V. Cleary, New York. No. 522,449.

The combination, with a car, of connected oscillating shafts supported beneath the car, a vertically movable fender hung beneath the car, spring depressed arms carried by the shafts and engaging the fender, and a catch to hold the fender up.

ELECTRIC RAILWAY CONDUIT—Albert T. Fay, Minneapolis, Minn. No. 522,460.

The combination, in an electric conduit, of the cross ties and rails, with middle stringers resting upon said ties, surface plates arranged on said stringers, a space being left between the inner edges of said plates, an insulating strip extending parallel with said stringers and secured on the tops of the cross ties, a conductor wire or rail provided on said strip and a trolley arranged to travel in the conduit formed between said stringers and upon said conductor.

CONDUIT FOR TROLLEY ARMS—Albert T. Fay, Minneapolis, Minn. No. 522,461.

The combination with a car, of the track for the same, an underground conduit provided with a surface slot, a trolley arm having the thin flattened portion and the yoke to receive the trolley wheel, and a breakable section of weaker metal arranged between the top of the conduit and the car.

CAR FENDER AND BRAKE—Henry Maass, Jersey City, N. J. No. 522,530.

The combination of a movable fender, a spring actuated brake, a lock for the brake, and a trip operatively connecting the lock and the fender.

TROLLEY WHEEL—Charles E. Bostwick, DuBois, Pa., assignor of one-half to G. E. Grier, and others, same place.

In a trolley, the combination with a fork of the journal rigidly mounted in said fork, said journal having collars formed thereon intermediate at its ends, the outer faces of which are concaved, a wheel having a central opening, and a cylindrical casing located in said opening and through which the journal passes, said casing being integrally closed at one end and provided with an integral annular flange at said end, a cap for closing the opposite end, the said ends being concaved upon their interior faces, anti-friction balls held between said ends and the collars formed on the journal, and the bolts for securing the casing in the wheel,

JULY 10.

GEAR CASING FOR RAILWAY MOTORS—Norman C. Bassett, Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. No. 522,579.

A gear casing pivoted on the gear wheel shaft, and having a small removable section boxing in the pinion, said section being joined to the casing on a line between the pinion and the gear, whereby the pinion can be removed axially.

CONDUIT RAILWAY TROLLEY—John L. Creveling, Auburn, N. Y. No. 522,655.

An electric trolley, consisting of a depending plate in combination with trolleys, supported on either side thereof by a pair of pivoted arms.

CAR BRAKE—George W. Kramer, Peoria, Ill. No. 522,665.

A friction clutch cone mounted upon and rotating with a shaft, supported by the car in such manner as to be longitudinally movable on said shaft, a cup shaped bowl loosely mounted upon the same shaft, adapted to be engaged by said cone; and means for moving the cone longitudinally to engage said bowl; in combination with means for imparting the rotation of the car axle to the clutch cone, and means for transmitting the rotation of the clutch bowl to the brake stem.

CONTACT SHOE FOR ELECTRIC LOCOMOTIVES—John J. Green, Boonton, N. J., assignor to the Universal Electric Company, New York. No. 525,709.

A contact shoe for electric railways consisting of separate end pieces, side strips of flexible metal secured thereto, and a flexible or yielding central bar to which the insulated end pieces are loosely attached.

CONTACT BAR FOR ELECTRIC LOCOMOTIVES—John J. Green, Boonton, N. J., assignor to the Universal Electric Company, New York. No. 522,710.

Covers different forms of contact shoes or bars similar to the above.

SUPPLY SYSTEM FOR ELECTRIC RAILWAYS—John J. Green, Boonton, N. J., assignor to the Conduit Construction Company, New York. No. 522,711.

Covers a conduit adapted to be operated with the two preceding inventions.

CABLE RAILWAY—Charles W. Hunt, West New Brighton, N. Y. No. 522,713.

The combination with the cable and rollers in close proximity, and around which the cable passes in turning a curve, of a grip wider at the ends than in the middle, and having inner curved sides between which the cable is received, and exterior curved surfaces adapted to rest against the rollers around which the cable passes in turning a curve, and mechanism for clamping the cable within the grip.

TROLLEY EAR—Charles A. Lieb, New York, assignor to the General Electric Company, Boston, Mass. No. 522,844.

As a new article of manufacture, a trolley ear having a sheet metal portion with an upwardly-extending fin or fold and a cast metal bolt portion secured to the fin or fold.

TROLLEY WHEEL—Charles A. Lieb, New York, assignor to the General Electric Company, Boston, Mass. No. 522,845.

As a new article of manufacture, a trolley wheel having a central core of good conducting metal, as copper or bronze, and steel flanges secured to such core, such steel flanges being provided with radial corrugations.

SUBSTRUCTURE FOR BRACING AND SUPPORTING RAILROAD RAILS. James M. Price, Philadelphia, Pa., assignor to the Price Railway Appliance Company, of Pennsylvania. No. 522,852.

A rail support consisting of two chairs with a connecting bridge having openings for fastening bolts, and a grooved bed piece, and provided with a horizontal, inwardly projecting ledge.

CLOSED CONDUIT FOR ELECTRIC RAILWAYS—Charles I. Greer, Washington, D. C., assignor of one-half to Charles B. Peirce, same place. No. 522,894.

The combination of a conduit for electric wires, of a slot cover composed of rigid plates having central depending webs, and sectional filling blocks having channels in which said webs lie, the ends of the latter being lapped upon and pivotally linked to each other.

CAR FENDER—Lucius Q. C. Lamar, Oxford, Miss. No. 522.905.

A fender having its fending member projecting, when in action, below the other parts of the fender, and formed of material readily broken away in meeting unyielding obstacles, yet capable of resisting impact of the human body at any probable speed of a car.

TROLLEY POLE—Alexander S. McBean, Montreal, Canada. No. 522,915.

A trolley wheel support composed of a metal section rigidly secured to the trolley pole, an adjusting platform and a frame piece, the latter carrying the trolley wheel or runner, with a swiveling connection between the adjusting platform and the frame piece.

PILOT FOR CARS—Robert A. Crawford, Allegheny, assignor of one-half to Samuel D. Warmcastle, Pittsburgh, Pa. No. 522,932.

A pilot or guard adapted to fold back on the main portion thereof, a hinged section thereon, and fastening devices for holding said hinged section in position.

Some Comments on Our Financial Supplement.

"American Street Railway Investments" has met with a most favorable reception. We publish below extracts from a few of the many letters which we have received in regard to the work, and from notices in the daily and technical press:

"The work as a whole is the best attempt to present these facts that has yet been made."—Philadelphia *Inquirer.*

John Dick, president and general manager Phœnix Iron Works Company, Meadville, Pa., says: "We are very much pleased with the general appearance of this work."

W. O. Page, secretary Jewett Car Company, Jewett, O., says: "Received your Financial Supplement, of which we feel very proud, and think it is just what we need."

A. D. Newton, treasurer Eddy Electric Manufacturing Company, Windsor, Conn., says: "We think this work will be of very great assistance to us, and think you have hit the mark you aimed for."

The J. G. Brill Company, Philadelphia, Pa., says: "We have looked over it with great interest, and think it fills a long felt want. You are certainly deserving of great credit for the bringing to the front of this matter."

R. H. Beach, Webster & Beach, New York City, says: "We will undoubtedly find it a very convenient reference. It is nicely gotten up, and so far as the writer's information goes it is the most complete thing in this line ever gotten out."

C. E. Newcomb, general manager Thiel's Detective Service, St. Louis, Mo., says: "Have not had time to fully examine this work, but its appearance stamps it as a good thing. It ought to be of immense benefit to investors and advertisers."

Benjamin F. Shaw, of Wilmington, Del., says: "I think it an extremely creditable work and one I shall always keep before me. I think you deserve great credit for the manner in which you have gotten it up, as it is certainly a very valuable book."

"The book is handsomely bound, and invaluable to those who are interested in street railways. The information is alphabetically arranged, and has been collected with great care. We shall expect to find it in all the investment offices.—*The Financial Record.*

W. J. Clark, general manager railway department General Electric Company, New York, says: "We do not wonder that you have a feeling of pride over your success in this direction, and we congratulate you most heartily for the success which is self-evident from the book itself.

Charles L. Henry, president of the Anderson (Ind.) Electric Street Railway Company, says: "Permit us to express satisfaction with map and letter press of our road as shown in "Investments," and also to compliment you on the high character of the publication which you have issued."

"'American Street Railway Investments' is the first publication giving in a comprehensive and systematic manner, data regarding the operation and management of the different properties, which will enable dealers and investors to judge of the relative merits of the securities described."—Philadelphia *Press.*

F. H. Stacey, secretary Hubley Manufacturing Company, Lancaster, Pa., says: "The book certainly presents a very handsome appearance, and is a beautiful production so far as the printer's art is concerned. I have not had time to examine same carefully, but from a cursory glance it is indeed a very valuable work."

Frank S. DeRonde, general sales agent Standard Paint Company, New York City, says: "Your pride in the success of this splendid edition is certainly pardonable. It is not often that we comment or write on publications of any kind, but we cannot help but congratulate you on this book. It is, in our opinion, ahead of anything of the kind before published."

J. G. McDuff, general manager American Electrical Advertising Company, New York, says: "From a hasty, casual glance we find it a very valuable compilation of the capitalization and other statistics of the different street railway companies, and otherwise full of valuable information for street railways and security and bond brokers or any one needing information for making investments or having the use of same."

George A. McKinlock, president and treasurer Central Electric Company, Chicago, Ill., says: "You are perfectly justified in your feeling of pride in the success of your efforts, as we entirely agree with you in reference to the pamphlet being far in advance of anything of the kind ever before compiled. It contains just the kind of information we have long felt the need of, and we are glad to have such a reliable reference book at hand."

"This is a most interesting, useful and valuable statistical work, compiled with much diligence and intelligence, and arranged in a manner that makes reference and comparison very easy. Not only is the fullest possible information given as to the financial status of the street railways of the country, but each section furnishes data as to the population of the place, its industries, its peculiarities, its rate of valuation, debt, taxation, etc., and other points likely to determine the value of a property operated under municipal franchise. In many instances the company's last balance sheet is presented.—*Electrical Engineer.*

"The Street Railway Journal has published a volume, entitled 'American Street Railway Investments,' which is aimed to occupy a a position in reference to street railway securities such as *Poor's Manual* does to steam railroads. The importance of street railway interests is brought to mind by the fact that more than 1,000 street railway companies have reported. The information is recent in date, and so far as can be judged by a casual examination, correct in character. A particularly valuable feature of the book is a large number of city maps showing street railway lines in detail."—Financial column, Chicago *Tribune.*

"There has been gathered together in this book a vast amount of detail relative to the street railways of the country. The information is of a very practical character, and is arranged for quick reference. The remarkable development in the building of street railways has brought such securities into greater popularity, and this compilation of the capitalization and other statistics of such properties is a timely one. It presents authentic information of value to the investor, giving one a very full acquaintance with the condition and operations of any particular line, and will prove a helpful aid to legitimate investments."—*Manufacturers' Record.*

"This undertaking of our contemporary is a laudable one, and should be cordially received by the public. The wild-cat financiering, which has been too much a feature of the electric railway business, would not have been possible if the railway men themselves, and those who have been buying their securities, could have been brought into closer touch, and known better how to get at each other. The financing companies which have grown fat by assessing both the public and the street railway men, would not have been able to get a foothold. We shall present a further review of this work, showing by tabulation some remarkable facts."—*Electricity.*

"This book is the first publication giving, in a comprehensive and systematic manner, detailed information regarding the operation and management of the different properties, and there is no doubt that there will be a large demand for it by railway and financial men. The cities and towns are arranged alphabetically, and particulars are given of the mileage, track, equipment, power plant, finances and statistics of operation of each railway. The population of each place is also given, together with particulars of the commercial interests and financial conditions in the case of the larger cities. The twenty-four maps show the street railway systems of several cities. The book is well printed, on good paper."—*Engineering News.*

The Car Equipment Company, of Philadelphia, writes: "We have received and carefully examined the copy of American Street Railway Investments ordered by us, and herewith express our sense of the obligation under which you have placed us in common with other manufacturers and investors, in the production of so valuable a manual. It is not only the most complete work of its kind which we have seen in this field, but contains a greater amount of information concerning the railways of the country than we supposed could have been possibly brought together, inasmuch as the development of the electric railway is yet in a somewhat transitory condition. The information is concise and to the point and is arranged in a manner that permits of instant reference."

"In this publication detailed information regarding the operation and management of the roads is given in a complete, yet condensed form. The population of cities and towns is given, and particulars as to the mileage, track, equipment, power stations and financial reports. Wherever the value of the property is affected by such details the tax rate, debt, etc., are also given, as well as general information about the commercial interests of the city. An invaluable feature of the book as a work of reference is the date, attached to the report of each road, that the information was received from its officers. The publishers have certainly succeeded in compiling a valuable book in regard to properties of which it has heretofore been almost absolutely impossible, with few exceptions, to obtain any definite and reliable information."—*Street Railway Gazette.*

"'American Street Railway Investments' is the title of a valuable manual which the Street Railway Journal, of New York City, has just issued. The work is comprehensive, giving a statement of the the leading street railways' capital stock, funded debt, character and extent of plants, executive officers and directors, and sketches of organization and development. To this is added information regarding the communities which they serve, business growth, municipal indebtedness and rates of taxation. Besides this there is a large number of maps. The presentation is concise and clear. With the tremendous expansion of these enterprises within the past half dozen years, the need of such a manual has been strongly felt by investors. For this reason it is a satisfaction to know that the present undertaking is to be continued each year, the publication hereafter to be March 15. The present issue is corrected to June 15."—Boston *Journal.*

G. Tracey Rogers, president of the Binghamton (N. Y.) Railroad Company, says: "I consider this book one of the most valuable in our library. We would not part with it for a great many times the amount of its cost, could we not secure another. I think the book will be of great service, not only to bankers and investors, but to all street railway companies, affording an opportunity which we have not heretofore had for comparing notes and getting insight as to what our neighbors are doing. I am satisfied that this publication will be of great assistance to all street railway companies in disposing of their securities. Hitherto investors have been groping in the dark more or less as to the relative value of different street railway securities which have not as yet a fair showing in the financial world. This class of investments is comparatively new, and entitled to a higher standard than has been given them. I think your book will materially assist in giving them the position that they deserve."

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., July 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	115	116
Watervleit Turnpike & R. R. Co.	100	240,000	.....	...	1863	3	.....

BONDS.	Date of Issue	Amount Out-standing.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Albany R. R. Co., 1st Mort.	1865	40,000	J. & J.	5	1905	101½	.....
" " " 2d Mort.	1873	20,000	M. & N.	7	1893	101½	.....
" " " 3d Mort.	1875	28,500	J. & J.	7	1895	101½	.....
" " " 4th Mort.	1880	11,500	M. & S.	6	1905	100	.....
" " " 5th Mort.	1888	50,000	M. & S.	5	1913	101	.....
" " " Consol Mtg	1890	350,000	J. & J.	5	1930	102½	.....
" " " Debenture.	1891	200,000	M. & N.	6	1901	111	.....
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., July 19. Stock quotations are prices per share,

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Balto. City Pass. Ry. Co.	25	2,500,000	Sem-an	4	.....	56	57
City & Suburban Ry. Co.	50	3,000,000	.....	1	.....	33	35
Central Pass. Ry. Co.	50	300,000	.....	...	.....	60	65
Balto. Traction Co. (Cable)	25	5,000,000	Quart.	1	.....	13¾	14¼

BONDS.	Date of Issue	Amount Out-standing.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Central Pass. Ry.	1882	250,000	J. & J.	6	1912	110	112
" " " cons. mort.	1892	500,000	.....	5	.....	110	110½
City & Sub. Ry. Co. gen. mort	.....	2,000,000	J. & D.	5	1922	104¾	105
Balto. Traction Co. (Cable)	1889	1,500,000	M. & N.	5	1929	105½	106
Balt. Trac. Co., No. Balt. Div	1892	1,750,000	J. & D.	5	1942	99	99¼
" " "	1891	1,250,000	M. & S.	6	1901	100	101
City Pass. R. R. Co.	1891	2,000,000	"	5	1911	113	113½

BOSTON STOCKS.—Corrected by R. L. DAY & Co., 40 Water Street, Members of Boston Stock Exchange, July 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
West End Pref.	50	$6,400,000	J. & J.	4	1887	76	76½
West End Com'n.	50	9,085,000	J. & J.	3	1890–1892	45	45¾

BROOKLYN STOCKS AND BONDS.—Corrected by C. E. STAPLES & Co., 215 Montague Street, Brooklyn, July 23. Stock quotations are per cent. values.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Brooklyn City R. R. Co.	10	6,000,000	Q.—J.	2	.....	.....	170
Brooklyn Traction Co., pref.	100	3,000,000	.....	...	1893	67	.....
" " common.	100	6,000,000	.....	...	1893	15	.....
Coney Island & Brooklyn R. R. Co.	100	500,000	Oct. 1.	4	.....	147	.....
Long Island Traction Co.	100	30,000,000			1893	14	15

BONDS.	Date of Issue	Amount Out-standing.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Broadway R. R. Co.	.....	350,000	J. & J.	5	6 m. notice	100	.....
Brooklyn Traction Co.	1893	3,000,000	.....	...	.....		
Coney Island & Brooklyn R. R. Co., 1st bonds	.....	300,000	J. & J.	5	Jan. 1909	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	112	115

CHARLESTON STOCKS AND BONDS.—Corrected by A. C. KAUFMAN, Charleston, S. C., July 23. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Charleston City Ry. Co.	50	$100,000	J. & J.	0	.....	.....	65
Enterprise Ry. Co.	25	250,000	.....	...	.....	.....	5

BONDS.	Date of Issue	Amo'nt Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Charleston City Ry. Co.	.....	100,000	J. & J.	6	1915	.....	.....
Enterprise Ry. Co.	.....	50,000	J. & J.	5	1906	.....	.....

CHICAGO STOCKS AND BONDS.—Corrected by WILLIAM B. WRENN, 108 LaSalle Street, Chicago, Ill., July 25.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Chicago City	100	$9,000,000	Q.—J.	3	.....	307	315
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	.....	240	241
West Division City	100	1,250,000	Q.—J.	8¾	.....	625	.....
West Chicago Street	100	13,189,000	Q.—F.	1½	.....	135½	136

BONDS.	Date of Issue	Amount Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Chicago City	.....	4,619,500	J. & J.	4½	.....	101½	101¾
Chicago Passenger	1883	400,000	F. & A.	6	1903	105	110
North Chicago City, 1st mort.	.....	500,000	M. & N.	6	1900	105	.....
" " "	.....	1,850,000	M. & N.	4½	1927	....	101
North Chicago Street 1st mort	.....	2,350,000	J. & J.	5	1906	.....	103½
West Chicago Street	.....	4,100,000	M. & N.	5	.....	102½	103
West Chicago Street, Tunnel	.....	1,500,000	F. & A.	5	.....	100	101½
" " " Deb. 6's	.....	2,000,000	J. & D.	6	.....	103	103¾

CINCINNATI STOCKS AND BONDS.—Corrected by GEO. EUSTIS & Co., Bankers and Brokers, 26 West Third Street, Cincinnati, July 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	106
Mt. Adams & Eden Park	50	1,600,000	Q.—J.	5	.....	106¾	107
Mt. Auburn Cable	100	300,000	.....	...	.....	.....	.....
Cin. Inclined Plane Ry.	100	500,000	.....	...	.....	59¾	60
" " " Pref.	100	100,000	.....	6	.....	98	99
Cin. Newport & Cov. St. Ry.	100	3,000,000	.....	.	.....	22⅝	24

BONDS.	Date of Issue	Amount Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
" "	.....	50,000	J. & J.	7	July, 1895	101⅛	104
" "	.....	50,000	J. & J.	7	July, 1896	104	106
" " extended	.....	100,000	J. & J.	4	.....	98¾	99⅛
	.....	150,000	J. & J.	5	.....	100¾	101¼
Mt. Adams & Eden Park	.....	50,000	A. & O.	6	July, 1895	101	103
" " "	.....	50,000	A. & O.	6	July, 1900	107½	110
" " "	.....	100,000	A. & O.	6	July, 1905	110⅛	111½
" " 10-20's	.....	200,000	J. & D.	6	Je. '94-1924	102⅛	.....
" " Cable.	.....	280,000	M. & S.	5	Mar. 1906	105¾	105¾
Cin. Inclined Plane Ry.	.....	125,000	J. & J.	7	July, 1899	107	108
" " "	.....	300,000	J. & J.	6	Jan. 1914	105	106
Mt. Auburn Cable	.....	200,000	J. & D.	5	June, 1907	.....	90
" " 5-20's 2d.	.....	100,000	A. & O.	7	Ap. '93-1908	.....	.....
S. Covington & Cincinnati	.....	250,000	M. & S.	6	Mar. 1912	114	115
S. Cov. & Cin. 2d Mort. gold 6's	.....	250,000	J. & J.	...	1932	113½	114½

CLEVELAND STOCKS AND BONDS.—Corrected by W. J. HAYES & SONS, Bankers, Cleveland, O., July 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
The Cleveland Electric Ry. Co	100	12,000,000	.....	....	1893	45½	46
The Cleveland City Ry. Co.	100	8,000,000	.....	....	1893	56	57½

BONDS.	Date of Issue	Amount Out-standing	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
The Cleveland Electric Ry. Co.	1893	2,000,000	M.—S.	5	1910	100	102½
" " City " "	1893	2,349,000	.....			100	102

DETROIT STOCKS.—Corrected by Cameron Currie & Co., Bankers and Brokers, 82 Griswold Street, Detroit, July 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Fort Wayne & Belle Isle Ry. Co.	100	$250,000	.....	...	.....	200	.....
Detroit Citizens Street Ry. Co.	100	2,000,000	.....	...	.....	.....	100
Wyandotte & Detroit River Ry.	100	200,000	.....	...	.....	100	110

HOLYOKE STOCKS.—Corrected by J. G. Mackintosh & Co., Bankers, Holyoke, Mass., July 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
Springfield Street R. R. Co.....	100	1,000,000	J. & J.	4	.....	200	225
Holyoke Street R. R.....	100	250,000	J. & J.	4	.....	200	225
Northampton Street R. R.....	100	50,000	.....	...	.....	125	150

LOUISVILLE STOCKS AND BONDS.—Corrected by Almstedt Bros Stock and Bond Brokers, 510 West Main Street, Louisville, Ky., July 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Louisville St. Ry, Co., pref...	100	$2,000,000	A. & O.	5	Jan. 1891	87	88
Louisville St. Ry. Co., com....	100	4,000,000	.....	...	Jan. 1891	37	38

Bonds.	Date of Issue	Amount Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Louisville St. Ry. Co., 1st mort	1890	6,000,000	J. & J.	5	1930	100	101
Louisville City Ry. Co. Cons .	1884	1,000,000	J. & J.	6	1909	116	117
Central Passenger Ry. Co....	1888	400,000	M. & N.	6	1908	116	117
New Albany St. Ry. 1st Mort.	1888	150,000	J. & J.	6	1913	85	90

NEW HAVEN STOCKS AND BONDS.—Corrected by H. C. Warren & Co., Bankers and Brokers, New Haven, Conn. July 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
F. Haven & Westville R. R. Co.	25	$600,000	J. & J.	4	.....	45	47
New Haven & W. Haven R. R. Co	25	.....	.....	...	.....	.....	.....
New Haven & Cent'lle H. R. Co.	.....	.....	.....	...	.....	.....	.....
Bridgeport Horse R. R. Co.....	100	140,000	.....	...	.....	.....	.....
Hartford & Wethersfield Horse R. R. Co.....	100	200,000	J. & J.	3	.....	125	.....

Bonds.	Date of Issue	Amo'nt Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
New Haven Street Ry. Co.....	1894	600,000	J. & J.	5	Jan. 1919	.....	100
New Haven & W. Haven R. R. Co	1892	500,000	M. & N.	5	Nov. 1912	100	102
Bridgeport Horse R. R. Co.....	.....	50,000	.....	6	.....	.....	.....
Hartford & Wethersfield Horse R. R. Co., Deb. Series A.....	1888	100,000	M. & S.	5	Sept., 1908	.....	.....
Hartford & Wethersfield Horse R. R. Co., Deb. Series B....	1890	100,000	M. & N.	5	May, 1910	.....	.....
Hartford & Wethersfield Horse R. R. Co., Deb. Series C.....	.....	100,000	M. & N.	5	May, 1910	.....	.....

NEW ORLEANS STOCKS AND BONDS.—Corrected by George Le Sassier, 188 Common Street, New Orleans, La., July 23. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Carrollton R. R. Co.	100	1,200,000	Quart.	1½	1867	124	127
Crescent City R. Co.....	100	1,150,000	"	3	1866	75	90
Canal & Claiborne R. R. Co..	40	240,000	Semi.	2½	1888	38	40
New Orleans City & Lake Co.	100	1,500,000	Quart.	2½	1860	99	103½
Orleans R. R. Co.....	50	185,000	"	2	1868	34	.....
St. Charles Street R. R. Co ..	50	600,000	"	2½	1865	55	57

Bonds.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Canal & Claiborne Sts. R. R.	1892	150,000	M & N	6	1912	100	.....
Crescent City R. R. 1st Mort.	1883	75,000	M & N	6	'95-'99	.....	.....
do do	1893	2,000,000	J & J	6	1943	85	.....
N. O. City R. R. Co.....	1879	416,500	J & D	6	1903	114	115
N. O. & Carrollton R. R. Co..	1882	250,000	F & A	6	'97-'06	87	.....
N. O. City & Lake R. R. Co., 1st Mort.....	1893	1,725,000	J & J	5	1943	.....	.....
St. Charles Street R. R. Co...	1881	105,000	J & D	6	'95-'01	.....	.....

MONTREAL STOCKS AND BONDS.—Corrected by Gordon Strathy & Co. Members Montreal Stock Exchange, 9 St. Sacrament Street, June 19. Stock quotations are per cent. values.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Montreal St. Ry. (old stock)	50	$2,000,000	M. & N.	4	May, '91.	149	149¾
" " (new stock)	50	2,000,000	.....	...	May, '94.	144½	145

Bonds.	Date of Issue	Amount Out-standing.	Inter-est Period.	%	Principal Due.	Bid.	Ask'd
Montreal St. Ry.....	1885	£60,000	.....	5	1905	.....	.....
	1893	700,000		4½			

NEW YORK STOCKS AND BONDS.—Corrected by James McGovern & Co., 6 Wall St., New York, July 23.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Bleecker St. & Fulton Ferry...	100	900,000	J. & J.	¾	.....	.....	30
Broadway & Seventh Avenue..	100	2,100,000	Q.—J.	2½	.....	185	188
Cen'l Park, North & East River	100	1,800,000	Q.—J.	2	.....	150	155
Central Crosstown.....	100	600,000	Q.—F.	1¾	.....	150	.....
Dry Dock, E. B'way & Battery.	100	1,200,000	Q.—F.	2	.....	132	135
42d & Grand St. Ferry.....	100	748,000	Q.—F.	4½	.....	300	.....
42d St., Manhat. & St. Nich. Av.	100	2,500,000	.....	...	.....	50	55
Eighth Avenue.....	100	1,600,000	Q.—J.	3	.....	250	.....
Houston, W. St. & Pav. Ferry.	100	1,000,000	Q.—F.	2	.....	200	.....
Second Avenue.....	100	1,862,000	Q.—J.	1	.....	132	135
Sixth Avenue.....	100	1,500,000	Q.—J.	1¾	.....	200	206
Third Avenue.....	100	5,000,000	M.—N.	4½	.....	182	184
23d St.....	100	600,000	Q.—F.	2½	.....	290	.....
Ninth Avenue.....	100	800,000	Q.—J.	1½	.....	139	.....
Union Railway Co.....	100	2,000,000	.....	...	.....	145	150

Bonds.	Date of Issue	Amount.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Bleecker St. & Fulton Ferry...	.....	700,000	J. & J.	7	July, 1900	108	111
B'way & 7th Ave., 1st mort....	.....	1,500,000	J. & D.	5	June, 1904	106	.....
2d mort.....	.....	500,000	J. & J.	5	July, 1914	106	.....
Broadway Guaranteed 1sts....	.....	1,125,000	J. & J.	5	July 1924	106	.....
" 2ds interest as rental	.....	1,000,000	J. & J.	5	July, 1905	103	.....
Broadway Consolidated.....	.....	7,650,000	J. & J.	5	 1943	109⅞	110
Cen'l Park, North & East River	.....	1,200,000	J. & D.	7	Dec., 1902	110	.....
Central Crosstown—1st mort..	.....	250,000	M. & N.	6	Nov., 1922	115	120
Dry Dock, E. B'way & Battery. 1st mort.....	.....	.....	J. & D.	5	 1932	105	.....
Scrip (can be called at par)..	.....	1,200,000	F. & A.	6	Aug. 1914	99	100
42d St. Manhat. & St. Nich. Av 1st mort.....	.....	1,200,000	M & S.	6	Sept., 1910	110	112
2d mort. income bonds.....	.....	1,200,000	J. & J.	6	1915	53	.....
Eighth Ave., Scrip.....	.....	1,000,000	F. & A.	6	Aug., 1914	100	105
Houston, W. St. & Pav. F'ry, 1st	.....	500,000	J. & J.	7	July, 1894	100	.....
Second Avenue, 1st mort.....	.....	1,600,000	M. & N.	5	Nov., 1909	102	.....
Third Avenue.....	.....	7,000,000	J. & J.	5	Jan., 1937	115	.....
Union Railway Co.....	.....	2,000,000	F. & A.	5	Feb., 1942	.....	.....

PHILADELPHIA SECURITIES.—Corrected by Huhn & Glendinning, 143 South Fourth st. (Bullitt Building), Philadelphia, July 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Citizens'.....	50	$500,000	Q.—J.	4	1858	260	265
Continental.....	50	1,000,000	J.—J.	6	1873	124½	126
Frankford & Southwark.....	50	1,250,000	Q.—J.	5	1854	310	312
Germantown.....	50	1,500,000	Q.—J.	2¼	1858	111	112
Green & Coates...	50	500,000	Q.—J.	3	1858	123	125
Hestonville...	50	2,050,000	.....	...	1859	35	40
Lombard & South.....	25	500,000	A.—O.	8	1861	90	90
People's Traction Co.....	50	10,000,000	.....	...	.....	45	46
Philadelphia City.....	50	1,000,000	J.—J.	7½	1859	155	160
Philadelphia & Gray's Ferry..	50	617,500	J.—J.	3½	1858	80	85
*Philadelphia Traction (50 pd.)	50	7,000,000	M.—N.	3	1883	96	96½
Ridge Avenue.....	50	750,000	Q.—J.	5	1872	227	235
Second & Third.....	50	1,060,200	Q.—J.	5	1853	207	210
Thirteenth & Fifteenth.....	50	1,000,000	J.—J.	9	1858	225	230
Union.....	50	1,250,000	J.—J.	9½	1864	199	200
West Philadelphia.....	50	750,000	J.—J.	10	1857	200	210
Metropolitan (N.Y.) Traction	100	30,000,000	Q.—F.	1	.....	117	117¼
Baltimore Traction.....	25	5,000,000	.....	1	1889	14	14¼
Buffalo (N. Y.) Railway.....	100	6,000,000	.....	...	.....	52	54
Newark (N. J.) Passenger....	100	6,000,000	.....	...	.....	25	29
Pitts. & Birmingham Trac. Co. *Ex. Allotments.	50	3,000,000	J.—J.	...	.....	12½	12¾

Bonds.	Date of Issue	Amount Out-standing	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Baltimore Traction 1st Mort .	1889	1,500,000	M.—N.	5	1929	107¾	108¾
" " Imp.	1892	1,250,000	M.—S.	6	1901	101	102
Balt. Tr., No. Balt. Div., Gold	1892	1,750,000	J. & D.	5	1942	100¾	102
Germantown, 1st mort.....	.....	67,000	J.—D.	5	1904	105	.....
" 2d mort.....	.....	160,000	A.—O.	5	1899	103	.....
Hestonville, 1st mort.....	.....	300,000	M.—N.	6	1895	103½	.....
" " "	.....	124,500	J.—J.	6	1901	105	.....
" 2d mort..... ...	.....	75,000	M.—S.	6	1902	105	.....
People's, 1st mort.....	.....	219,000	J.—J.	7	1905	115	.....
" "	.....	285,000	J.—J.	5	1911	100	.....
" Cons. mort.....	.....	247,000	M.—S.	5	1912	95	.....
West Philadelphia, 1st mort..	.....	246,000	A.—O.	6	1906	117	.....

OMAHA STOCKS AND BONDS.—Corrected by RICHARD C. PATTERSON, Banker and Broker, 907 N. Y. Life Building, Omaha, Neb., July 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Omaha St. Ry. Co.	100	5,000,000	M. & N.	....	Jan. 1, '89	60	.....

BONDS.	Date of Issue	Am't Out-stand-ing.	Inter'st Paid.	%	Principal Due.	Bid.	Ask'd
Omaha St. Ry. Co.	1889	2,250,000	M. & N.	5	M'y 1, 1914	95	98

PITTSBURGH STOCKS AND BONDS.—Corrected by JOHN B. BARBOUR, Jr., 306 Times Bldg., Pittsburgh, Pa., July 23. 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	.....	..	.....	19¼	20
Citizens' Traction R. R. Co.	50	3,000,000	J. & J.	3	.....	59⅜	59½
Pitts. & Birmingham R. R. Co	50	3,000,000	.....	...	.....	12⅜	12¾
Pittsburgh Traction R. R. Co.	50	2,500,000	.....	3	.....	.....	63½
Federal St. & Pleasant Valley	25	1,400,000	J. & J.	...	.....	19⅜	20¼
Pittsburgh, Allegheny & Man	50	3,000,000	.....	1	.....	35	38½
West End R. R. Co.	50	200,000	J. & J.	...	.....	...	20
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	26½

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Citizens' Traction R. R. Co.	1887	1,250,000	A. & O	5	.927	107	110
Pittsburgh Traction R. R. Co.	1887	750,000	A. & O.	5	1927	106	110
Pitts. & Birmingham Traction Co.	1892	.....	.....	5	.....	93	93¼
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	104¾	104¾
Duquesne Traction Co.	1890	1,500,000	J. & J.	5	1930	101¼	101½
Second Ave. Electric R. R. Co	1889	1,500,000	J. & J.	5	1909	.....	.....
Central Traction Co.	1889	375,000	J. & J.	5	1919	...	.....
Union R. R. Co.	1881	100,000	A. & O.	5	1901	.....	.....
West End R. R. Co.	1887	75,000	J. & J.	5	1922	101	102
Birmingham, Knoxville & Allentown Tract. Co.	.....	.....	.....	6	.....	.....	.....
Suburban Rapid Transit.	.....	.....	.....	6	.....	.....	.....
Fort Pitt Incline Plane Co.	1881	30,000	.....	6	1901	.....	.....
Mount Oliver Incline Plane Co	1871	44,500	M. & N.	6	1901	...	.....
Penn Incl'e Plane Co. 1st Mort	1883	125,000	.....	6	1903	.....	.....
Monongahela Incl'e Plane Co.	1887	50,000	A. & O.	5	1897	.....	.....
Pittsburgh Incline Co.	1889	250,000	J. & J.	6	1919	.....	.....

PROVIDENCE STOCKS AND BONDS.—Corrected by CHACE & BUTTS Bankers, Providence, July 24.

Company	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
United Traction & Electric Co.	100	.....	.....	...	.....	..	.....

BONDS.	Date of Issue	Amo'nt Out-stand'g	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
United Traction & Electric Co.	1893	8,000,000	M & S	5	1993	95	100
Newport St. Ry. Co.	.....	50,000	J & D	5	1910	100	.....

ROCHESTER, BUFFALO, PATERSON, COLUMBUS, WORCESTER AND BOSTON STOCKS AND BONDS.—Corrected by E. W. CLARK & Co., 139 So. Fourth St. (Bullitt Building), Philadelphia, July 23.

Company.	Par.	Capital.	Period.	% last div	Date of Issue.	Bid	Ask'd
STOCKS.							
Rochester (N.Y.) Ry.	100	5,000,000	.....	...	1890	27	31
Buffalo (N.Y.) Ry.	100	6,000,000	.....	...	1891	57	59
Paterson (N. J.) Ry.	100	1,250,000	.....	...	1891	13	20
Columbus (O.) St. Ry.	100	3,000,000	Q.—F.	1	1892	37	40
North Shore Traction Co. (Boston) Pref.	100	2,000,000	A.—O.	6	1892	65	75
do do Common.	100	4,000,000	.....	...	1892	18	20
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	38

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid	Ask'd
Rochester (N.Y.) Ry.	1890	3,000,000	A & O	5	1930	93	95
Buffalo (N.Y.) Ry.	1891	5,000,000	F & A	5	1931	100	102
Paterson (N. J.) Ry.	1891	850,000	J & D	6	1931	87	95
Newark (N. J.) Pass. Ry.	1890	6,000,000	J & J	5	1930	99	100
Columbus (O.) St. Ry.	1892	2,600,000	J & J	5	1932	90	95
Consol. Trac. Co. (N. J.)	1893	.....	J & D	5	1933	86	88

SAN FRANCISCO STOCKS AND BONDS.—Corrected by PHILIP BARTH, Broker, 440 California Street, San Francisco, Cal., July 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
California St. Cable Co.	100	1,000,000	Monthly	...	.....	.....	100
Geary St., Park & Ocean R.R.Co	100	1,000,000	Monthly	...	.....	.....	107
Market Street Cable Co.	.....	18,750,000	.....	..	.....	39¼	39½
Metropolitan Electric	.....	1,000,000	Monthly	...	.....	.....	27⅞
Presidio & Ferries R. R. Co.	100	1,000,000	.....	...	.....	14½	.....
Sutter St. R. R. Co.	.....	2,000,000	Quart'ly	...	.....	90	.....

Bonds.	Date of Issue	Am't Out-stand-ing.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Cal. St. Cable R. R.	.....	.....	J. & J.	5	.....	103½	.....
Ferries & Cliff House	.....	650,000	M. & S.	6	1914	106½	.....
Geary St., Park & Ocean	.....	671,000	A. & O.	5	.....	104	.....
Market Street Cable Co.	.....	3,000,000	J. & J.	6	1913	118¾	119½
Omnibus Cable Co.	.....	2,000,000	A. & O.	6	1918	115½	116¾
Park & Ocean R. R.	.....	250,000	J. & J.	6	1914	112	.....
Park & Cliff House R. R.	.....	350,000	J. & J.	6	.....	.....	100¾
Powell Street R. R.	.....	700,000	M. & S.	6	1912	111½	112½
Sutter St. Cable Co.	.....	900,000	M. & N.	5	.....	104½	...

ST. LOUIS STOCKS AND BONDS.—Corrected by JAMES CAMPBELL, Banker & Broker, Rialto Building, 218 N. 4th St., July 19. Stock quotations are prices per share.

Company.	Par.	Capital Issued.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Cass Ave. & Fair Grounds.	100	2,500,000	.....	...	1876	55	60
Citizens'	100	1,500,000	Oct. '93	4	1887	80	85
Jefferson Avenue.	100	112,000	Dec. '88	2	1885	125	135
Lindell	100	2,500,000	.....	...	1890	90¼	91½
Missouri.	100	2,000,000	Q.—J.	2	1891	200	210
People's.	50	1,000,000	Dec. '89	50c	1889	20	25
St. Louis.	100	2,000,000	J. & J.	3½	1890	148	151
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	13	15
Southern, Pfd.	.....	800,000	Jan. '94	3	.....	80	85
" Com.	.....	700,000	.....	...	.....	15	25

BONDS.	Date of Issue	Amount Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Cass Avenue & Fair Ground.	1892	1,800,000	J. & J.	5	1912	98	100
Citizens' Cable	1887	1,500,000	J. & J.	6	1907	105	107
Fourth St. & Arsenal	1888	50,000	J. & J.	6	1898-1903	98	100
Lindell	1890	1,500,000	J. & J.	5	1895-1910	101	102
Missouri Cable	1887	500,000	M. & S.	6	1907	100	102
People's 1st mort.	1882	125,000	J. & D.	6	1902	99	100
" 2d mort.	1886	75,000	M. & N.	7	1902	100	102
People's Cable	1889	800,000	J. & J.	6	1889-1914	90	95
St. Louis Cable	1890	1,500,000	M. & N.	5	1900-1910	101	103
Union Depot	1890	4,000,000	A. & O.	6	1900-1910	104	105
Southern	1884	200,000	M. & N.	6	1904	103	105
Southern	1889	300,000	M. & N.	6	1909	100	104
St. Louis & Suburban	1891	1,400,000	F. & A.	5	1921	84	86
St. Louis & Suburban (incomes)	1891	300,000	.....	6	.....	70	80

WASHINGTON STOCKS AND BONDS.—Corrected by CRANE, PARRIS & Co., Bankers, 1344 F Street, N.W., Washington, D. C., July 23. 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	280	300
Metropolitan R. R.	50	750,000	Q. J.	2	1864	94	96
Columbia R. R.	50	400,000	Q. M.	1	1870	60	65
Belt R.R.	50	500,000	Q. J.	...	1875	25	30
Eckington & Soldiers' Home	0	352,000	.....	...	.....	31	35
Georgetown & Tenallytown	0	200,000	.....	...	.....	.....	85

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Wash'tn & Geo'tn conv't. 1st.	'83-'99	3,000,000	J. & J.	6	1899-1929	130	138
" " " 2d.	.....	500,000	J. & J.	6	1903-1943	130	138
Eckington & Soldiers' Home.	.....	150,000	J. & D.	6	1896-1911	100	103
Belt.	1921	240,000	J. & J.	6	1921	85	90
Metropolitan R. R. convert.	1901	200,000	J. & J	5	1901	104½	106
Anacostia R. R.	.....	200,000	A. & O.	6	1901-1931	.....	.....

Financial.

THE York (Pa.) Street Railway Company paid a dividend of 2½ per cent. on July 20.

$ $ $

GEO. W. JONES has been appointed receiver of the Schenectady Street Railway Company, *vice* John Muir, resigned.

$ $ $

THE Raleigh Springs Railroad plant of Memphis, Tenn., was sold by order of the court last month to J. T. Fargason for $101,000.

THE Citizens' Street Railway Company, of Indianapolis, reports that June net earnings were $42,000, an increase of $14,000 over June, 1893.

$ $ $

THE Cleveland (O.) Electric Railway Company paid a dividend of three-fourths of 1 per cent. on July 5, to the stockholders of record June 30.

$ $ $

THE Chattanooga (Tenn.) Electric Railway Company has been put in the hands of a receiver upon application of the St. Louis Trust Company. W. T. Adams, president of the company, has been appointed receiver.

$ $ $

AT a monthly meeting of the directors of the Worcester Traction Company, held July 13, a semi-annual dividend of 3 per cent. on the preferred stock was declared. The report of the treasurer showed the transportation last month was greater than ever before.

$ $ $

THE gross earnings of the West End Street Railway Company, of Boston, for June show an increase of business over 1893, being, in round numbers, $643,000, against $618,000 in 1893. The 1893 figures were the largest on record to that date, and set against $598,000 in June, 1892. The pleasant weather has stimulated travel. The net gain over June, 1893, was over $50,000.

$ $ $

THE following is a comparative statement of the operations of the Worcester Traction Company for the month of June:

	1894.	1893.	
Gross earnings,	$36,233.56	$32,607.49	Inc., $3,626.07
Operating expenses,	16,523.79	20,463.78	Dec. 2,939.99
Net earnings	19,709.77	12,143.71	Inc. 7,566.06

$ $ $

NOTICE has been given that a special meeting of the stockholders of the Winnipeg (Man.) Street Railway Company would be held at the office of the company, on July 25, for the purpose of authorizing the sale of the company to the Winnipeg Electric Street Railway Company. A special meeting of the stockholders of the Winnipeg Electric Street Railway Company was also held on July 25, for the purpose of authorizing the purchase of the Winnipeg Street Railway Company.

$ $ $

THE Long Island Traction Company, it is said, contemplates the issue of collateral trust notes to the extent of $2,000,000 or over. The notes which it proposes to issue are redeemable in one year or five years, and they are to be offered first to the Long Island Traction Company's stockholders. Those which the shareholders take are to be underwritten by a syndicate, composed, it is said, by Brooklyn trust companies and banks, and the Mutual Life Insurance Company, of New York.

$ $ $

THE following is a comparative statement of the operations of the Buffalo Railway Company for the month of June: Gross earnings, 1894, $133,486.15; 1893, $133,133.28; increase, $352.87. Operating expenses, 1894, $74,054.33; 1893, $76,146.84; decrease, $2,092.51. Net earnings, 1894, $59,431.82; 1893, $56,986.44; increase, $2,445.38. For the six months ending June 30: Gross earnings, 1894, $727,167.01; 1893, $687,662.77; increase, $39,504.24. Operating expenses, 1894, $425,134.13; 1892, $453,223.19; decrease, $28,089.06. Net earnings, 1894, $302,032.88; 1893, $234,439.58; increase, $67,593.30.

$ $ $

THE agreement on the consolidation of the Watertown Street Railway Company and the Watertown & Brownville Street Railway Company, forming the Watertown & Brownville Street Railway Company, has been filed with the Secretary of State. The basis of consolidation is share for share of the capital stock. The capital of the first named company was $40,000 and of the latter $60,000, and the capital of the newly formed corporation is $100,000. The directors are: Byron B. Taggert, Joseph Mullin, Hiram F. Englehart, Edward S. Goodale and Samuel F. Bagg, all of Watertown, and John B. Thompson and Charles A. Starbuck, of New York City.

$ $ $

THE following is a comparative statement of the operations of the North Shore Traction Company, of Boston, for the month of June:

	1894.	1893.	
Gross earnings....	$128,437 10	$116,050,88	Increase $12,386.22
Operating expenses	60,878.22	58,999.41	Increase 1,878.81
Net earnings.....	$67,558.88	$57,051.47	Increase $10,507.41

For the nine months ending June 30, the earnings and expenses of the company were as follows:

	1894.	1893.	
Gross earnings.....	$802,319	$766,176	Increase, $36,143
Operating expenses...	538,947	607,894	Decrease, 68,947
Net earnings.....	$263,372	$158,282	Increase, $105,090

$ $ $

THE following is a comparative statement of the operations of the Columbus Street Railway Company for the month of June: Gross earnings, 1894, $50,355.82; 1893, $49,979.40; increase, $376.42. Operating expenses, 1894, $21,288 89; 1893, $30,740.73; decrease, $9,451.84. Net earnings, 1894, $29,066.93; 1893, $19,238.97; increase, $9,828.26. For the six months ending June 30, 1894, the earnings and expenses of the company are shown by the following report: Gross earnings, 1894, $264,272.30; 1893, $260,561.85; increase, $3,710.45. Operating expenses, 1894, $128,280.07; 1893, $171,138.30; decrease, $42,858.23. Net earnings, 1894, $135,992.23; 1893, $89,423.55; increase, $46,568.68.

$ $ $

THE following is a comparative statement of the operations of the North Shore Traction Company for the month of May:

	1894.	1893.	
Gross earnings....	$104,569.84	$102,845.17	Increase, $1,724.67
Operating expenses	63,906.67	62,524.68	Increase, 1,381.99
Net earnings.....	$40,663.17	$40,320.49	Increase, $342.68

For the eight months ending May 31 the showing made by the company is as follows:

	1894.	1893.	
Gross earnings.....	$673,882	$650,126	Increase, $23,756
Operating expenses...	478,069	548,895	Decrease, 70,826
Net earnings.....	$195,813	$101,231	Increase, $94,852

$ $ $

WE are just in receipt of a statement of the earnings for the month of June of the companies operated by the Brooklyn Traction Company:

Gross earnings Atlantic Avenue Railroad.....	$88,347.35
" " Brooklyn, Bath & West End Railroad.....	17,279.67
Total.....	$105,627.02
Operating expenses Atlantic Avenue Railroad.....	$52,814.75
" " Brooklyn, Bath & West End Railroad	9,664.91
Total.....	62,479.66
Net earnings.....	$43,147.36

The gross earnings of the above systems show an increase of $13,847.16 on the corresponding month of 1893.

$ $ $

THE receiver who was appointed for the Richmond Railway & Electric Company, of Richmond, Va., June 11, at the request of certain stockholders of the Richmond & Manchester Railway Company, was removed two weeks after his appointment, upon a hearing upon the ground that there was no reason for even a temporary receivership. John H. Davis & Company, of New York, bankers, refer to this case in their monthly financial circular for July, 1894, as follows:

"In Richmond, Va., a contract was entered into in 1893 by which certain street railway and other property was to be transferred to a new ownership under certain conditions, no fixed time being set for the consummation of the trade. It was one of the provisions of the contract that after this transfer should have been made the Richmond Railway & Electric Company—not one of the contracting parties, but under the management of the proposed purchaser—would place its guarantee upon certain new bonds to be issued upon the property in question. There was delay in executing the transfer, the purchaser claiming that the vendors had not as yet met their obligations as to free land and clear title, etc., and that whenever this should be done, to the satisfaction of counsel, he was ready to do his part. The vendors claimed that they had done and were ready to do all they had agreed. It was a question of business and legal interpretation, and if any suit of any kind was necessary, it would manifestly be one for specific performance of a contract, at which both sides should have a hearing. The courts were open in Richmond, the United States District Court being in session, presided over by one of the oldest judges on the bench. Ignoring this court upon the spot, the vendors went before another judge of the same court in South Carolina, presented a complaint and asked for a receiver, not only of the property in question, but also of the Richmond Railway & Electric Company. Incredible as it may seem, the request was granted, and the latter company, without notice, and a solvent concern in every sense of the word, found itself in the hands of a temporary receiver, with all the inconveniences and the discredit attaching thereto. It is needless to say that the company itself and its friends lost no time in making a determined effort to have this gross injustice remedied, and the court was asked to give a hearing at the earliest possible moment. That hearing was had on Monday and Tuesday last before the Federal Court judge in Richmond who had been ignored in the former proceedings, and resulted in an instant discharge of the receivership of the Richmond Railway & Electric Company in the following unequivocal words:

" 'After full argument of counsel, the court being of opinion that the Richmond Railway & Electric Company is *entirely solvent* and that there exists no ground for the appointment of a receiver of its property, the motion to appoint a receiver of the said company is denied, and it is ordered that the temporary receiver appointed in this cause do forthwith surrender and deliver unto the Richmond Railway & Electric Company, its officers and agents, all of the property in his hands or under his control, including all moneys remaining in his hands realized from the operations of said company.' "

We are further informed that during the first week that the receiver was in possession he took in over $10,000 from the operation of the lines, and that for the two weeks he took in from the railway and turned over to the officers of the company when the receivership terminated over $20,000, while his total payments had been less than $500. These facts seem to be in themselves abundant refutation of any charge that the Richmond Railway & Electric Company was an insolvent concern.

Electric Snow Sweepers.

From the first of August on is generally recognized as the time to consider winter equipment. The summer season by this time is half over, and only three, or at most four, months must intervene between it and the arrival of cold weather. Inquiries at the offices of a number of the supply companies show that winter orders are now being placed, and that many companies are already providing for the coming cold weather.

The Lewis & Fowler snow sweeper promises to be more popular this year than ever before. This sweeper was brought out during the year 1891, and attracted much attention at the Pittsburgh Convention, where it was exhibited for the first time. It was illustrated and described in our issue for September, 1891.

The sweeper has been found to be so well fitted for the purpose for which it was designed that snow has ceased to have any terrors for the average railway manager, and the sweeper has come to be regarded as a necessary portion of the equipment of every railway. The Brooklyn *Eagle* quotes General Manager Bogardus of the Brooklyn Heights Railway, as saying in a recent interview, "They go far ahead of anything I ever saw for cleaning streets. All we have to do for an ordinary storm is to run the sweeper back and forth over the tracks, and they are kept as clean as in summer."

A list of the railway companies using the Lewis & Fowler sweepers is an interesting one, showing, as it does, the wide adoption of the sweeper. It includes the following roads: Baltimore City Passenger Railway Company; Baltimore Traction Company; Baltimore & Curtis Bay Street Railway Company; Bangor Street Railway Company, Bangor, Me.; Brooklyn Heights Railroad Company, Brooklyn, N. Y.; Camden Street Railway Company, Camden, N. J.; Citizens' Street Railway Company, Indianapolis, Ind.; City & Suburban Railway Company, Baltimore, Md.; Chicago North Shore Street Railway Company; Columbus Consolidated Street Railway Company, Columbus, O.; Consolidated Traction Company, Newark, N. J.; Cleveland City Railway Company; Detroit Citizens' Street Railway Company; Duquesne Traction Company, Pittsburgh, Pa.; Easton Transit Company; Erie Electric Motor Company; East Harrisburgh Passenger Railway Company; Elizabeth Street Railway Company, Elizabeth, N. J.; Federal Street & Pleasant Valley Railway Company, Pittsburgh, Pa.; Fort Wayne Electric Railway Company; Hamilton Street Railway Company, Hamilton, Ont.; Jamestown Street Railway Company, Jamestown, N. Y.; Lindell Railway Company, St. Louis, Mo.; Milwaukee Street Railway Company; McKeesport & Reynoldtown Passenger Railway Company, McKeesport, Pa.; North End Street Railway Company, Worcester, Mass.; Omaha Street Railway Company; Ottawa Electric Railway Company, Ottawa, Ont.; Oswego Street Railway Company; Pittsburgh, Allegheny & Manchester Traction Company, Pittsburgh, Pa.; Rochester Railway Company; Sioux City Street Railway Company; Second Avenue Passenger Railway Company, Pittsburgh, Pa.; South Chicago Street Railway Company; Toledo Electric Street Railway Company; Terre Haute Electric Railway Comwany; Trenton Passenger Railway Company; Third Avenue Railway Company, New York; Toronto Railway Company, Toronto, Ont.; Utica Belt Line Street Railway Company; Woodland Avenue & West Side Railroad Company, Cleveland, O.; Wilmington City Railway Company, Wilmington, Del.; West Chicago Street Railway Company; Worcester Consolidated Street Railway Company.

Utica Belt Line Reorganized.

After a series of unsuccessful efforts extending over a long period, the Utica Belt Line Street Railroad Company was reorganized July 13, and within a short time the road will be taken from the receiver's hands and the new organization put in possession.

At the meeting 1,500 shares of stock were represented and out of this number voted, 1,454½ were voted for the following board of directors: Charles W. Mather, John W. Boyle, Edward Bushinger, William B. Putney, of New York, James T. Gardiner, of Albany, Camile Weidenfeldt, of New York, Robert G. Young; inspectors of election, John H. Grant, Thomas P. Weston, John Weston.

After the election the directors met and elected the following officers: President, John W. Boyle; vice-president, James T. Gardiner; treasurer, Charles W. Mather; secretary, Edward Bushinger; executive committee, John W. Boyle, Charles W. Mather, James T. Gardiner.

It is understood that by the agreement of the organization, it is provided, among other things, that money is to be furnished and expended upon the property in order to put it in proper condition for economical operation. The board of directors elected by virtue of the order of the court and the notice sent out to stockholders is to be made up, so far as the three interests now represented are concerned, in the same way that it is now made up; the Utica interests are entitled to four directors; the New York interests to two directors; and the Thomson-Houston or General Electric interests to one director. This arrangement is to continue for a period of years.

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 any address on receipt of fifteen cents in postage by P. S. Eustis, General Passenger Agent, C., B. & Q. R. R., Chicago, Ill. ***

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.***

Special Train to the Atlanta Convention.

We are in receipt of the following letter from Mr. L. J. Ellis, the eastern passenger agent of the Norfolk & Western Railroad Company, the famous Shenandoah Valley Route, which will be of interest to all street railway men who contemplate a trip to Atlanta to attend the October convention. Our representative has been over the route outlined for the special train, and we can endorse the statements made as to the attractive scenery along the line and the excellent facilities offered. Mr. Ellis says:

Dear Sir:—Please do me the kindness to call attention editorially to the arrangements we have made to carry the delegates and visitors to the National Street Railway Convention to convene in Atlanta October 17, as shown in the advertisement I enclose for insertion in the Street Railway Journal.

A canvass among the street railway men has satisfied us that we are justified in making these arrangements. The fact that a part of the programme for those attending the Atlanta convention is to visit Lookout Mountain makes our route the only practicable one, as it is the only direct line to Atlanta via Chattanooga from the East. As you have been over the entire route, you can speak with the courage of conviction as to its attractiveness, its equipment and management, and our ability to take the best of care of those who go with us on this occasion.

Very truly yours,
(Signed) L. J. Ellis, E. P. A.