

# Street Railway Journal

VOL. XV.

NEW YORK AND CHICAGO, SEPTEMBER, 1899.

No. 9.

## A CROSS COUNTRY ELECTRIC RAILWAY IN EASTERN MASSACHUSETTS

The remarkable electric railway system of Eastern Massachusetts, a system comprising nearly 1500 miles of track contained within but five counties, and paralleling and cross connecting with the closely-woven network of steam railroad lines contained in the same area—all giving transportation facilities to the people of this favored section unequaled in the world—has been developed in three different stages.

In the first stage, the half dozen independent horse railway properties in Boston and the immediate suburbs were

lines radiating from the city proper. These lines were generally profitable almost from the first, and later on became quite distinctly so, as a rule, though a rule not without exceptions. The increase of transportation facilities brought about a movement of the population from the city and the near-by suburbs to the remoter ones, buildings went up rapidly, and while there was little direct "booming" of real estate, such as is found in newer and less conservative districts, there was a substantial and very heavy growth of population and increase of values, which



CAR HOUSE, TRANSFORMER STATION AND WAITING ROOM OF THE NORFOLK WESTERN STREET RAILWAY

reduced by consolidation to two, electricity was adopted, and, thus possessed of greater competitive power in the suburban transportation field, the lines of the metropolitan system were pushed into an outer fringe of suburbs, still, however, contained within a radius of about 10 miles of the central business district.

The mileage of this consolidated metropolitan system was then (1890) larger than that of any other street railway property in the world. The money requirements for reconstruction and electrical equipment were so heavy, the organization was so complex, and the engineering and operation problems were so absorbing that the management had little time or disposition to add to its burdens by reaching out still further into the surrounding country, although the beautiful clusters of cities and towns, north, west and south, must have offered great temptations, in spite of the more or less uncertainty in those days about the traffic-developing power of electric traction.

The second stage, therefore, came in the building by independent companies of a large number of "feeder lines" tributary to the metropolitan system, and laid out still on

had a reflex action upon the prosperity of the electric railways in the new territory.

Now, Boston is by no means the only business and manufacturing city in Eastern Massachusetts. Lynn, Lowell and Lawrence on the north, Worcester on the west and Brockton on the south, are all centers of an independent money-making activity, each with its own suburbs and townships more or less dependent upon it for trading purposes. It came about naturally, therefore, that these cities also should first have their own local systems, and should then follow the example of the Boston lines in gradually extending to adjoining townships. The result was, therefore, a series of little independent street railway networks separated from the metropolitan system, but awaiting only opportunity, courage and capital to become firmly welded thereto.

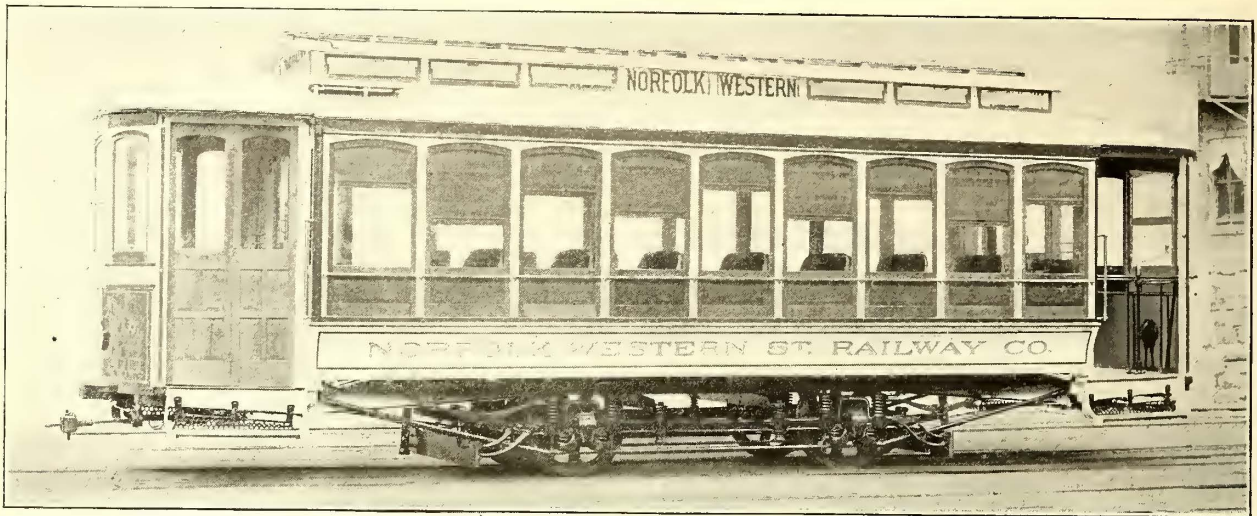
Thus has come the third stage in Massachusetts' electric railroading, by which "cross country" connecting lines are building everywhere throughout this rich territory. It is now a joining together of small towns and of suburbs each with the other, the metropolis itself being only indis-



tinctly visible through many transfer connections. Pleasure riding has become a science in Eastern Massachusetts, and guide books, time tables, posters and all the varied literature which we have been accustomed to think of as belonging solely to railroad passenger departments have been drawn into service to increase the movement of the population from one point to another. Parks have been

forming the "Massachusetts Electric Companies," so called. As the earning power of the cross country lines is ascertained and established, it is probable that further absorptions may take place.

One of the most prominent centers of electric railway activity in the entire district of Eastern Massachusetts is the quiet town of Dedham, lying 10 miles to the south of

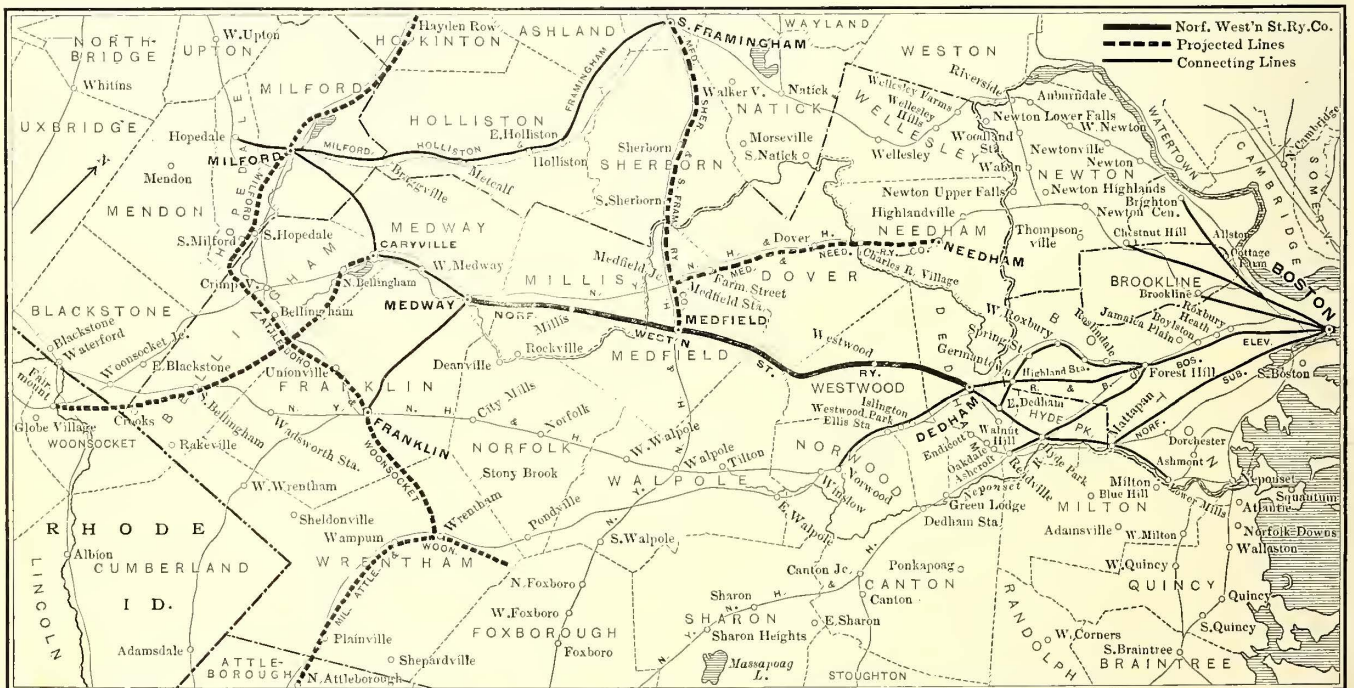


CONVERTIBLE CAR, NORFOLK WESTERN STREET RAILWAY COMPANY

developed to some extent, although the magnificent park and boulevard system which the State of Massachusetts has so wisely provided in this beautiful district, furnishes in itself almost sufficient attractions to the people for pleasure riding.

Nevertheless, these cross country lines must, as a rule,

Boston, and forming the terminus of the "Dedham Circuit Line" of the New York, New Haven & Hartford Railroad, upon which an excellent train service is given. Dedham is connected with Boston through Forest Hills and with the coast line by electric railway lines which have a large patronage. Within the last two years a line has also been



MAP OF NORFOLK WESTERN RAILWAY AND ALLIED LINES

look to the future rather than the present for any large profits, and it is probable that their destiny lies largely in consolidation, rather than in independent existence. This consolidation has, in fact, already commenced, for during the past few months there have been brought together under one control more than thirty street railway properties, built in the first and second stages of development, and

built to Islington and Norwood on the south, and in May, 1899, the Norfolk Western Street Railway Company, the subject of this present article, opened its line from Dedham through Westwood to Medfield. Construction is now going on from Medfield through Millis to Medway (see map herewith), and these lines will eventually connect with the Milford, Attleborough & Woonsocket Street Rail-



way, to be built by the same parties in interest. From Medfield also will be built the Medfield, Sherborn & South Framingham Street Railway and the Medfield & Needham Railway, both owned also by parties interested in the Norfolk Western Street Railway Company. At Milford and Dedham the Norfolk Western system joins the line of the Massachusetts Electric Companies, thereby obtaining Boston connections.

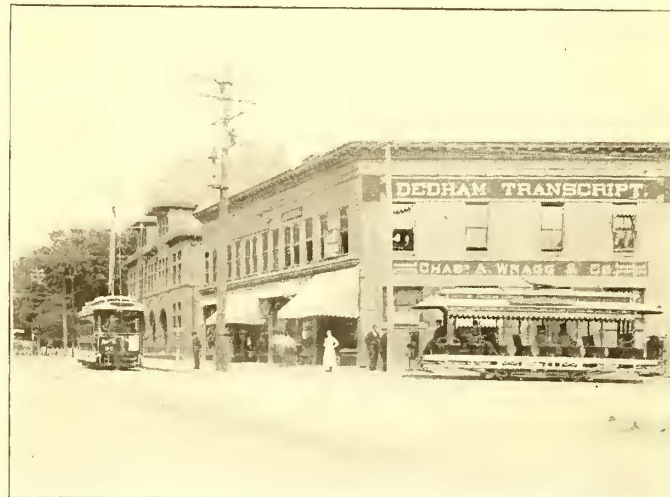
By the last Massachusetts census, in 1895, the population of Dedham was 7211, of the town of Dover 668, of Westwood 1800, of Medfield 2872, a total population

residential population. The country is exceedingly beautiful in summer, the line passing through pleasant groves and long, quiet country roads to its termini at Dedham and Medfield Squares.

It is obvious that in building cross country lines of this character, where cars must be run at comparatively infrequent schedules, at least until sufficient traffic is developed to warrant closer ones, the investment account should be kept as small as possible. The distribution system particularly might easily be a heavy burden to carry if ordinary 500-volt direct current distribution were



TRANSFORMER STATION AT WESTWOOD

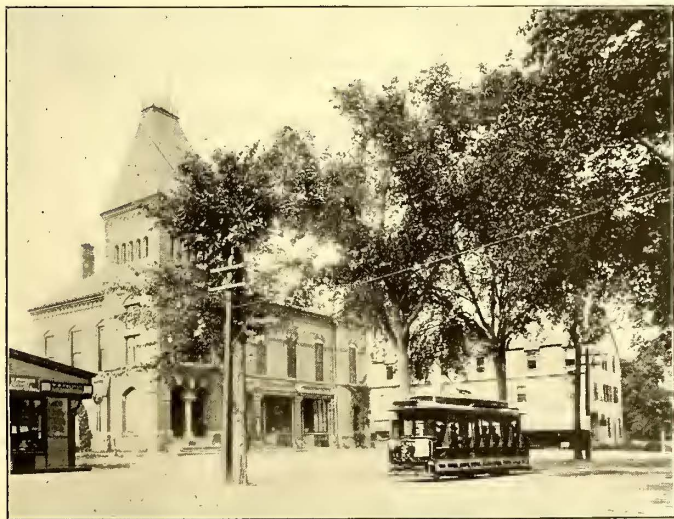


DEDHAM TERMINUS

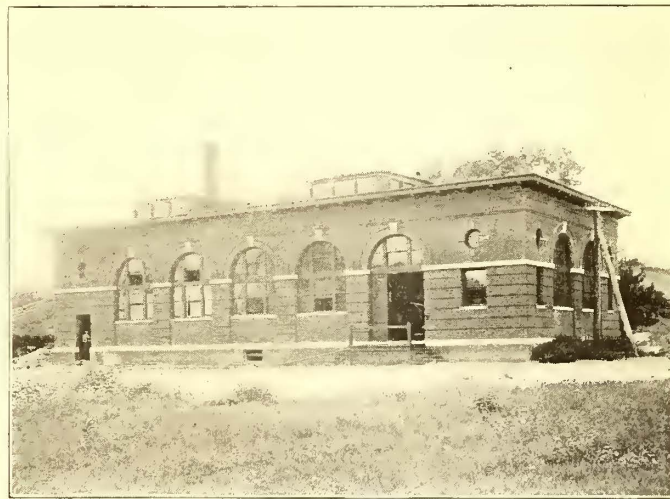
reached by the portion of the line so far built, of 12,551. Adding to this population that of Millis and Medway we obtain a total population for the present and projected lines of the Norfolk Western system alone of about 34,551. The fare from Dedham to Westwood is 5 cents, from Dedham

adopted, or if power stations were placed ill advisedly. On the other hand, speed is a necessity in this cross country work, and great care must be taken with the roadbed and equipment to permit high speeds to be obtained.

The Norfolk Western Street Railway Company has



MEDFIELD TERMINUS



POWER STATION AT MEDFIELD

to Medfield 10 cents, and when the extension to Medway is completed an additional 5 cents will be charged. The distance from Medfield to Boston by the combined electric roads will be 19 miles and the fare 20 cents, as against the steam railroad distance of 24 miles with 56-cent fare, while from Medway, which is on another branch of the New Haven system, the distance from Boston is 26 miles and 61 cents fare is charged, while by the electric road the distance is 24 miles and a 25-cent fare will be charged.

The country through which the line passes is distinctly a farming region except that Dedham has a large suburban

built its line thoroughly and well, and no money has been spared to give the property the best chance of success from an engineering standpoint. As a consequence, it is in many respects a model cross country road, the characteristics of which may well be carefully studied by those who are proposing to do work of a similar character.

The line as so far constructed from Dedham to Medfield is 9 miles in length. Its maximum grade is 5 per cent and its curves are from 125 ft. to 145 ft. radius. The track is placed chiefly on the side of the road, with bracket pole construction, and there are a number of crossings from

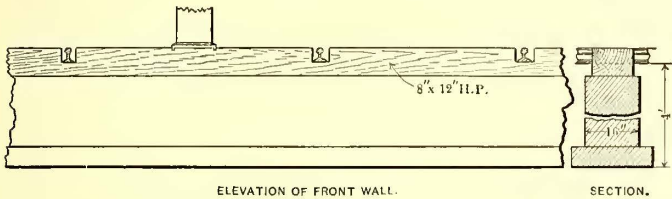




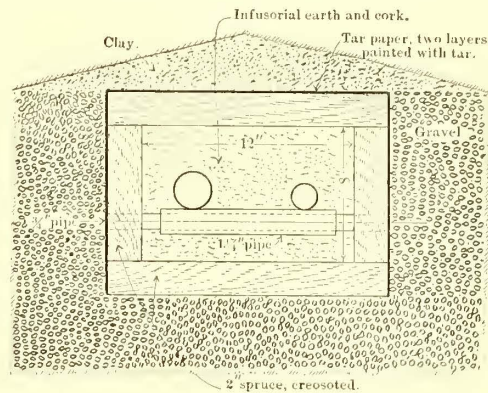


well-built brick and granite structure, 85 ft. long x 40 ft. wide, containing the engine room, 48 ft. x 40 ft., and the boiler room, 37 ft. x 40 ft. A tar and gravel roofing covers the station. It was built in 1898-9 by the Jarvis Engineering Company, Hodges & Harrington being the consulting engineers and Robert Coit, the architect. In the engine room is a 250-h.p. Ball & Wood engine and two 140-h.p. Buckeye engines, belted to four General Electric three-phase generators by 16-in. belts.

The boilers are three in number and are of the tubular pattern, and are of 125 h.p. size. The station has two American feed-water heaters, two separators, an 8-in. x 22-in. Dean condenser and two 6-in. x 3 $\frac{3}{4}$ -in. x 7-in. Dean pumps. Coal is obtained by a side track from the New



SECTION OF FLOORING IN CAR HOUSE



CONDUIT FOR STEAM PIPES FOR HEATING WESTWOOD CAR HOUSE

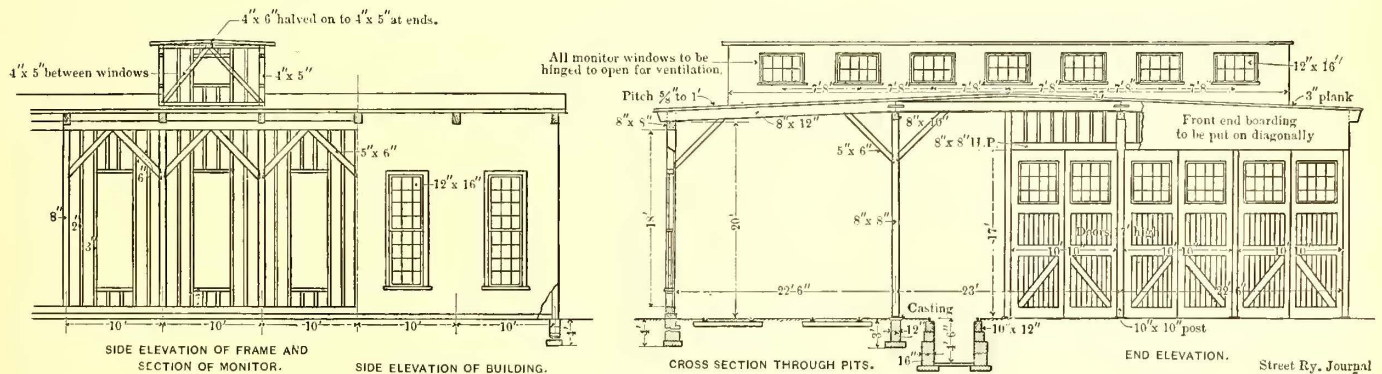
Haven Railroad. Ground connection is made by a copper plate sunk in the ground and surrounded by charcoal.

At Westwood are found three exceedingly neat and attractive buildings, one a car house, the second the transformer and storage battery station, and the third a passenger waiting room.

The car house is of wood, 130 ft. x 69 ft. in size, and has a capacity of thirty-two cars. To the central portion are appended two wings, one the superintendent's office, the other the motormen's and conductors' lounging room. In the latter each man has a separate locker for his extra clothing, etc., and there are toilet rooms fitted with every convenience. Entrance to the car house is made by switches running in generous curves both ways from the main line, which latter passes the waiting room, which is immediately in front of the car house. No transfer table is used in the car house, but cars are run upon any one of the car tracks desired, by means of switches. The three central tracks have deep pits connected with each other below, so that passage can be had from one to the other,

transformers, while the rear room contains a 100-h.p. boiler and pump, which are used for heating and pumping. Back of the group of buildings on the hillside is a standpipe, and somewhat forward of this is a large well sunk to a depth of 30 ft. and usually full of water. The standpipe is kept filled with water for fire and car-washing purposes, and when emptied to a certain point the boiler is fired and the water pumped from the well to fill the standpipe.

In the transformer room are six step-down transformers, built by the General Electric Company, and of its type H, each having a capacity of 30,000 volts and adapted for a 60-cycle transmission. On a line at right angles with these transformers and with the station switchboard are two rotary converters of the General Electric type, 4-75-1800, and of a capacity on the direct current side of 136 amps. at 550 volts. On the three-phase side the voltage is 340, delivered from the step-down transformers. The speed of the converters is 1800. The switchboard is of marble, and contains two Weston continuous current ammeters, two Thomson alternating current ammeters, a



WESTWOOD CAR HOUSE

and another pit running at right angles permits motors to be brought from the pit to the surface on an inclined plane overhead. In the car house are cranes and hydraulic apparatus of sufficient strength to make it possible to lift a car while trucks are moved and replaced or motors attached. In the pits are steam pipes connected with a boiler in the transformer station, by means of which the barn will be kept warm and the cars dried out in winter. At the rear of the car house are the repair shops, consisting

Weston ammeter for the battery circuit, and necessary switches, automatic cutouts, battery circuit breakers, etc.

The waiting room at Westwood is also built of field stone, and, in addition to accommodations for passengers, contains a cigar, confectionery and news stand and other conveniences of a similar character. It has a large open fire-place, which will probably come into excellent use during the winter months.

On the front of the car house are large balls of incan-



descent lamps, which are illuminated at night and add to the attractiveness of the spot. There is also a clock similarly illuminated, so that the time can be seen day or night. The company possesses a car which it has specially fitted up for excursion travel with a large number of incandescent lamps, and at present it is sending this car over the line each night and into the terminal towns as a kind of advertisement and an attraction to travel. The result has been that the cars have been quite fully loaded in the evening hours, although ordinarily little traffic would be obtained at such hours.

The company employs eight motormen, to whom it pays \$2 a day for a ten-hour service.

The officers of the company are as follows: president, J. F. Merrill; treasurer, James A. Fitton; superintendent and electrical engineer, Edward C. Spring. The chief engineer of the power station is A. E. Read. One of the parties largely interested in the system is John R. Graham, of Quincy, general manager of the Quincy division of the Massachusetts Electric Companies.

### A Difficult Piece of Track Conversion

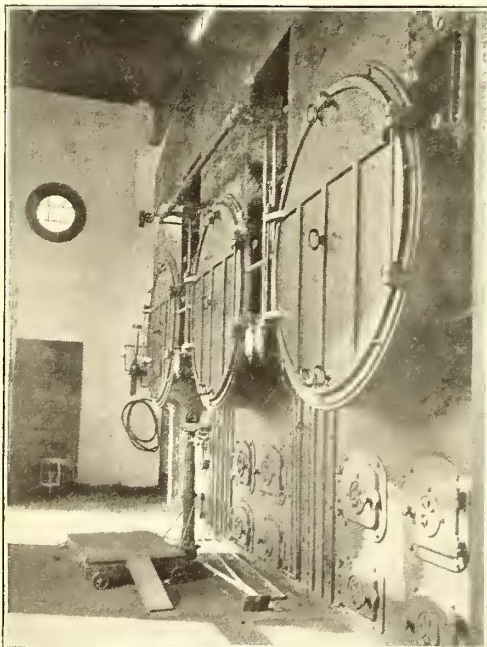
There is now in course of construction on a section of Broadway, New York city, an open conduit track, the work on which is about as difficult an undertaking of its kind, outside of switches and crossings, as can be imagined. The Metropolitan Street Railway Company has had in use for a year and a half on this section its standard underground trolley track with central conduit and slot carrying the Amsterdam Avenue cars. The Third Avenue Railway possesses a right of way through the same street on what is known as its Boulevard line. To operate the latter line electrically and by the independent power sys-

tem of the latter company a separate pair of conductors in a separate conduit were needed, but the company was not allowed to lay another pair of tracks. The existing conduit is therefore being pushed over to one side to give room for the other conduit beside it between the track rails. Difficulties are introduced by the fact that the track is being kept in service for the Amsterdam Avenue cars with

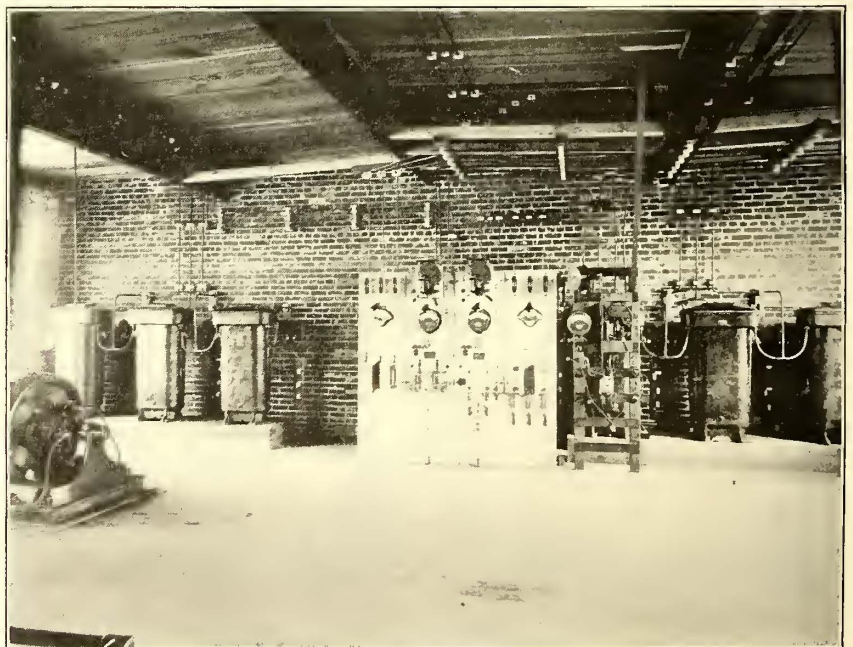


STORAGE BATTERY ROOM IN TRANSFORMER STATION

up meanwhile to carry the heavy double truck cars which constantly run over it. Temporary wooden yokes are then inserted to maintain the gage of the track rails, and the old yokes are loosened from them and pushed to one side, carrying with them the old slot rails, insulators and conductor rails. The conductor rails are then removed



BOILER ROOM AT MEDFIELD



TRANSFORMER ROOM

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in single rail lengths, and the free ends are fitted with outwardly flaring slippers to prevent the shoes on the plows of the cars from being carried away, the cars being allowed to drift through this open section. The old yokes are promptly removed and replaced by new ones fitted with apertures for the two conduits symmetrically placed between the track rails. The track as completed has only one pair of track rails and two slots.

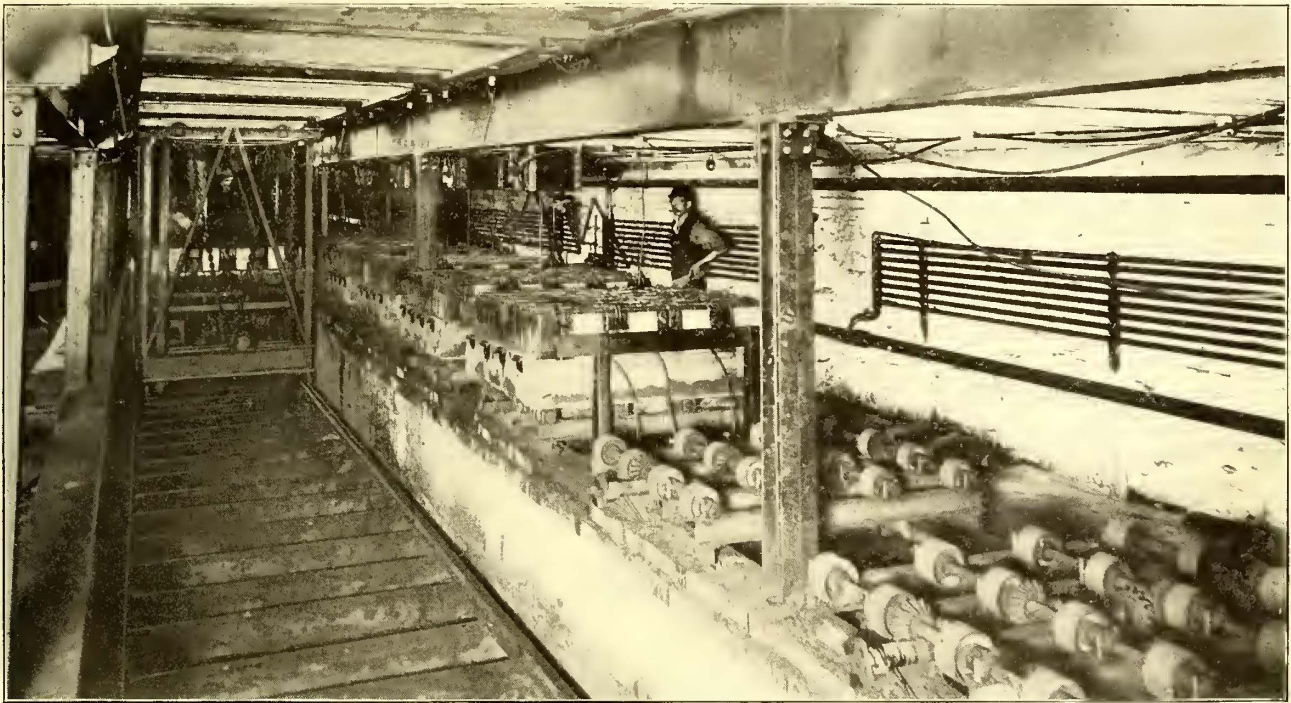


### The Englewood & Chicago Storage Battery Line

The storage battery cars on the line of the Chicago Electric Traction Company, formerly known as the Englewood & Chicago Street Railway Company, have now been running a little more than two years, and are said by the management to be handling the traffic in a satisfactory manner. It is not claimed, however, that cars can be operated more cheaply by the storage battery than by the overhead trolley system, but that for suburban lines of this character, or in cities where the overhead trolley is not allowed, the storage battery provides a very efficient and acceptable method of electric traction. The cost per car mile for operating the system in 1898 was 8.7 cents, and during the month of August it was as low as 7.2 cents. This year it is a little higher owing to track repairs which were not required during the first two years of service.

The original equipment of the line embraced 24 miles. The main system extends in a southwesterly direction from Sixty-third Street and South Park Avenue to the village of Blue Island, with a branch running to Morgan Park. On

The distance traveled by one charge of battery is 11 miles. A much longer distance can be run when necessary, but about this distance is regarded as the most economical. Each cell of the battery is charged to an e.m.f. of 2.18 volts. In the trip of 11 miles this is reduced to two volts, and it is seldom that the batteries are reduced below this rate. The life of the positive plates of the battery is sufficient for a distance of 23,000 miles, and the negative plates for about twice that mileage, or the negative plates will usually outlast two sets of positive plates. The plates are run until the surface is too much reduced by the dropping out of the active material from the grids. Worn plates are not repaired, but the waste material, in the form of fine powder, is sold to the junk dealers. In service the plates do not buckle, but it is found to be of advantage to thoroughly wash and clean them after making about 4,000 miles. The electrolyte is composed of distilled water with chemically pure sulphuric acid at a density of 1.25. This is found to be reduced by 15 degs. on account of spilling and evaporation in about three weeks, when the cells of each battery are replenished and the fluid is brought up to the standard.



STORAGE BATTERY PIT AND SHIFTING CAR

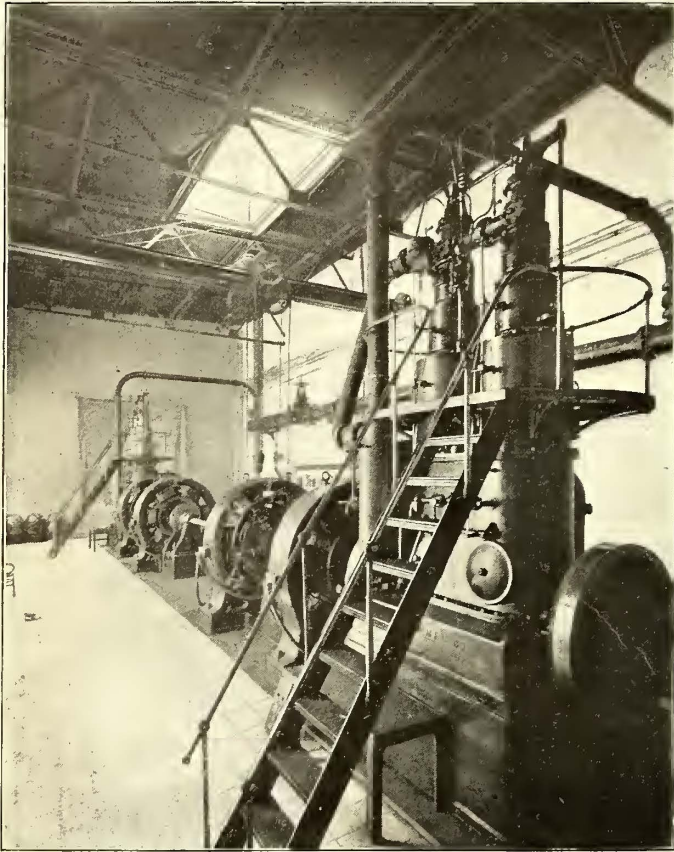
this branch is a 9 per cent grade, up which the cars are assisted by a balance weight system designed by M. H. Bronsdon, of Providence, R. I. The system has recently been extended as a single track line a distance of 5 miles to Harvey, and the cars are now running through to the latter place, where a small power station has been erected. The company has in regular operation twenty-five cars, for which forty batteries are provided. The latter are of the Electric Storage Company's type, manufactured in Philadelphia, and what is known as the Manchester plates are employed.

Each battery is composed of 72 cells, arranged in a tray, by means of which it is shifted about or removed or replaced in the car. The weight of each battery, including the tray, is about three tons. The cars are mounted on Dupont trucks. The battery is carried in the middle of the truck between the axles, and is removed and replaced from beneath. A 525-lb. wheel and a 4-in. steel axle are employed. Each car is equipped with a 50 h.p. Walker motor, which is mounted outside the axle, and during the hours of excessive traffic each motor car hauls a trail car.

The main power station is located at Eighty-eighth Street and Vincennes Road, about  $5\frac{1}{2}$  miles from the northern terminal of the line, and the most interesting feature of the station is the arrangement and location of the batteries and the method employed for shifting and replacing. The battery pits occupy two long rooms in the basement, as illustrated on this page. These pits extend under the car house in a line at right angles to the car tracks and the street tracks which pass in under an alcove extending in front of the station. Each battery pit is provided with a sunken way, in which is a track over which a shifting car operates. There are two of these cars, one in each pit. Each tray of battery is located on a nest of rollers, as shown in the illustration, which are connected by a system of shafting and beveled gear, the main shaft terminating in a clutch at right angles to the line of the tracks. The shifting car is constructed of a steel framework, is equipped with five motors and is controlled by levers arranged at the middle section of the car, as shown. At each end of the car is a platform equipped with rollers, the same as those for supporting the batteries in position. This platform is



fitted with an elevating apparatus, by means of which the exhausted battery is removed and a fresh battery substituted. For loading the battery on the platform, the car is run into position, when the shaft on the car platform is automatically coupled to that supporting the battery; the shaft is then revolved by the car motor and the battery rolls forward on to the car platform. The car is then run



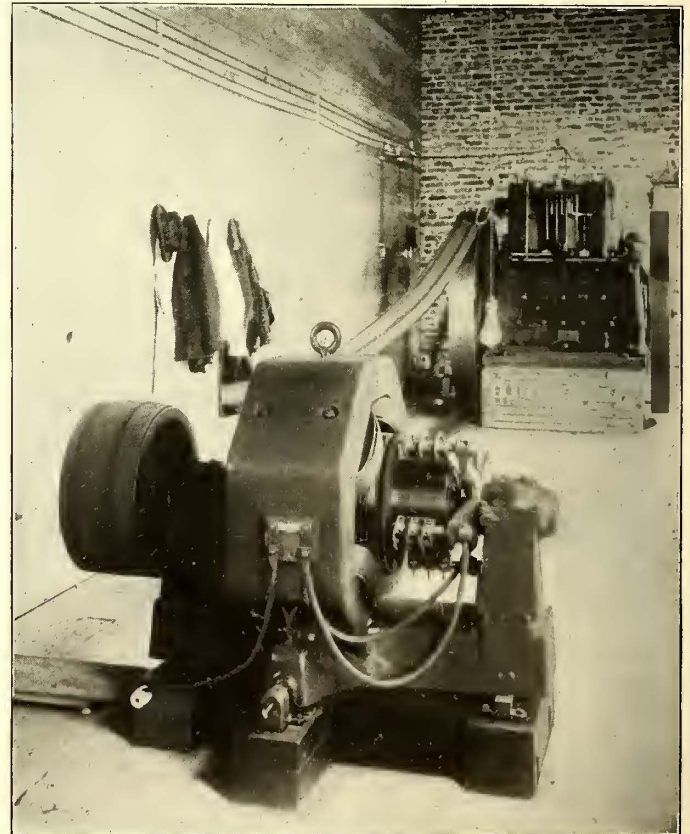
MAIN POWER STATION

down the line directly under the shifting pit, when the vacant platform is raised and the exhausted battery lowered from the car. The battery or shifting car is then moved forward, bringing the fresh battery directly under the shifting pit, when this in turn is elevated and automatically hooked into the truck, while at the same time the connections are automatically made by contact springs, located on the sides of the tray. The platform is then lowered and the replenished car proceeds on its course. An expert in handling the shifting car has been able to remove and replace a battery in 28 seconds, ordinarily it requires about one minute and a half. The exhausted battery is returned and shifted to the charging stand in the same manner as described for loading.

All the appliances for charging and shifting the batteries have been designed on very ingenious and economic lines, and it is hard to conceive how they can well be improved upon, as no hand labor whatever is required in shifting or in making connections for charging. In charging the batteries a current of only 160-volt pressure is first employed. Afterwards this is raised in stages to 170volts and finally to 180 volts. The motors are wound for operating normally under 135 volts pressure, but have never been injured by the ordinary voltage delivered from the battery. During more than two years of service no repairs whatever have been required on the motors. The manager would prefer to have two motors to the car, especially for winter travel, and it is the intention of the company to provide two motors on all new cars. As it is, only a little difficulty is ex-

perienced in keeping the cars operating during snowy weather. The snow plows and sweepers are equipped with three sets of batteries, and are as efficient as the trolley sweepers in keeping the tracks clear from snow and mud. The power equipment of the main station consists of two 250 h.p. Willans' central valve high speed engines and four 250 kw. Walker generators. The engines are vertical, triple expansion, condensing and run at 380 r.p.m. One is placed at each end of the engine room, and they are connected by a system of hollow shafting and clutches so that either one of the engines can be made to operate either or all of the four direct coupled generators, one engine and two generators being regarded as a unit, however. In charging the batteries three circuits are employed, as above described, so that one generator may be run at 160, the second at 170 and the third at 180 volts. When only two generators are run the voltage is 166 and 178. During the time of light loads but one engine is run, but for heavy traffic both are employed.

These engines were made by the M. C. Bullock Manufacturing Company, of Chicago, and are of the same type that this firm had running on exhibition at the World's Fair in 1893. They have been in constant service in this storage battery plant since it was installed in 1896, and are still working without any apparent depreciation. Each engine, as illustrated, is really a double vertical engine, and each half consists of three tandem cylinders, or is a tandem triple expansion single action engine, with central simple valve gear, with a fourth cylinder at the base, which acts as an air cushion. An important and particular feature of



HARVEY SUB-STATION

this type of engine is the drainage arrangement, which is accomplished by having the pistons dished downward in the center, while the hollow piston rod has a ring of ports flush with the surface of the piston, being in the best possible place for drainage. This feature is claimed to make a saving of at least 15 per cent in the steam consumption, as there is no water left in the cylinder to rob the incoming



steam of its heat during the period of admission. Paradoxical as it may seem, the piston speed, 500 ft. per minute, owing to the short stroke, only 8 ins., is slower than in so-called slow running engine. In these engines the diameter of the three cylinders is as follows: Low pressure, 23 $\frac{3}{8}$  ins.; intermediate, 14 15-16 ins.; high pressure, 10 $\frac{1}{4}$  ins. The engines run entirely noiseless, and the governing features are unusually sensitive and efficient. Among the claims for this type of machine are durability, economy and safety.

The boiler equipment consists of three 200-h.p. Heine boilers, provided with Roney mechanical stokers. Jet condensers are employed and there is a cooling tower, installed by the H. R. Worthington Company, which consists of a steel tank, 30 ft. high and 12 ft. in diameter. This is partly filled with vitrified sewer pipe placed on end so that the water when pumped to the top of the tower trickles over the pipes to the tank below. The cooling blast is provided by a large fan, operated by an electric motor, which serves to cool the water that it may be used over and over again for condensing purposes.

The new power station at Harvey is equipped with a 50-h.p. Nash triple cylinder gasoline engine, manufactured by

In connection with the operation of the line, a funeral car is operated when chartered, which serves to carry the attendance at funerals for the different cemeteries that are located along the line. This car is named Virginia, and is handsomely upholstered; in fact, it is finished very much like the private cars on other lines. End doors through the front vestibule provide for loading and unloading the box containing the body.

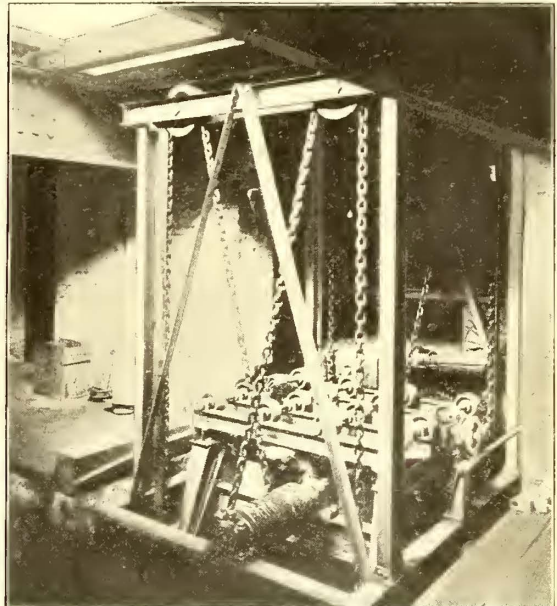
The system is now operated under the management of E. R. Gilbert, with A. E. Davis as superintendent.

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**Electric Road Between Haarlem and Zandvoort**

During the first days of July the electric road between Haarlem and Zandvoort, the first of its kind in Holland, was put into operation. This occurrence has a particular significance, as the Netherlands, with their vast commercial interests, have heretofore arrayed themselves against the introduction of electric roads, and up to this time the short accumulator road, Haag-Scheveningen, operated in summer alone, was the only electric road in existence.



BATTERY SHIFTING CAR



END OF SHIFTING CAR

the National Meter Company, of New York, run at 250 r.p.m. This is belted direct to a 40-kw. Eddy generator, manufactured by the Eddy Manufacturing Company, Windsor, Conn. This generator is operated in multiple with a stationary storage battery in the station so arranged that when the current is not being delivered to the car batteries it is charging the stationary battery. This battery consists of 95 cells of 320 amp. hours' capacity. This station is provided with two extra car batteries, the same as those described above, and which are charged in connection with the stationary battery. The arrangement is such that a steady load is provided for the engine and the car batteries are charged without an undue expenditure of power. The battery shifting device provided for the Harvey station differs somewhat from that described for the main station, as the trays are mounted on trucks and are rolled by hand power by means of a windlass under the elevating platform, which is raised and lowered by means of a stationary motor. The Harvey power station is a one story plain brick building, 30 ft. x 70 ft., and is divided lengthways into two sections. In one is located the track and pit on which the car is run for battery shifting. The other section houses the power equipment.

The projectors and owners of the new road are the Eerste Nederlandsche Trammaatschappij, of Amsterdam, the capital of which is 1,000,000 fl. The line was built and equipped by the Siemens-Halske Company. The generating station contains three units of 170 h.p. each, consisting of vertical engines direct connected to the well-known interior pole machines of the Berlin firm. The line is 16 km. (10 miles) long, and has two tracks along nearly its entire length. It also serves for the transportation of freight. At present the rolling stock consists of twelve small and eight large motor cars, nine trailers and four freight cars.

◆◆◆  
**Card Catalogue of Employees.**

The Milwaukee Electric Railway & Light Company uses the card catalogue system for keeping track of all employees, each being given a card on which is contained the history of his connection with the company from its beginning. This card shows the date of entering the pay-rolls, the occupation, the department, the salary per month, report number, the date of leaving service and the reasons therefor, the age, whether married or single, and the home address.



## Practice in the Repair Shops of the North Chicago Street Railway Company

### CUTTING GEARS AND PINIONS

All the gears and pinions employed on the lines of the North and West Chicago Street Railway Systems are cut and finished at the Limits Repair Shop, located at the corner of North Clark Street and Dewey Street. These shops are under the supervision of V. T. Lynch, who has designed most of the tools, or, in fact, all the tools described in this connection. For cutting the gears and pinions two old planers are employed. These have been fitted up with a cross-head, which carries the shafting and cutting tools, and have been provided with a belt shifting device and other attachments, as shown in Fig. 1. Two cutting tools are employed on each machine, one known as the stocking cutter, the other the finisher. These are attached to the ends of shafts which are driven from either side of the machine, so that the cutters are placed one in rear of the other, near the middle of the machine. The same general design is employed for both the pinion and gearcutting machines. For making the malleable iron gears blanks are employed, which are planed and mated, when after being bored out and turned down to the proper diameter, they are made ready for the gear cutting. Seven of the blanks are arranged on a shaft, as shown, with a templet or pattern wheel at the end. The bed plate carrying the gears is then started and the blanks, passing under the cutters, are each cut to the proper depth for a line of teeth. When finished the nest of gears is turned one notch by hand and fastened in place, when a second cut is made, and so on until finished. The pinions are cut in nests of six in the same manner as described for the gears, only one attendant being required for the two machines. In the operation a pump forces the lubricating mixture in quite a

eter is first employed, and this is followed by a second about  $2\frac{1}{4}$  ins. in diameter, and when sufficient depth is drilled, a section forming a single blank is cut off on the lathe.

Fig. 3 illustrates a keyway cutting device for cutting the keyway in the gears. This is a home-made machine, the

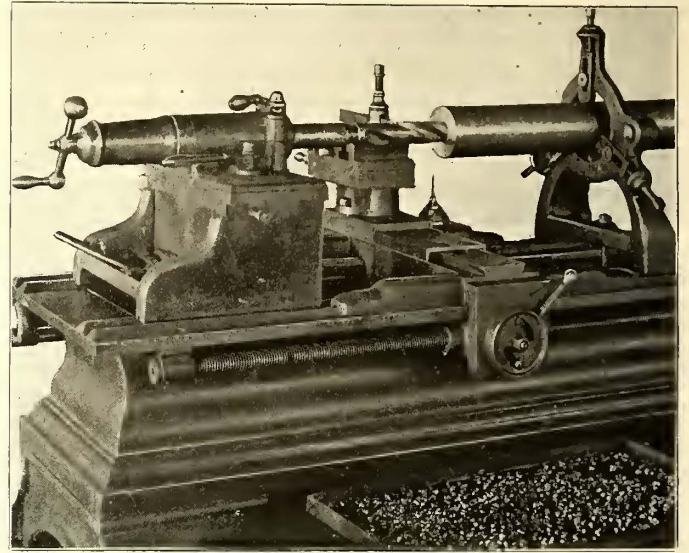


FIG. 2.—DRILLING AND CUTTING PINION BLANKS FROM HOT ROLLED BAR

frame work being constructed of two steel flat bars, the same as employed for grip slides on the grip cars. The gear is placed at one end of the machine, as shown, where it is held in position when the shaft or bar carrying ten cutting knives, which are placed 4 ins. apart, is forced endwise through the bore of the gear. Each of these knives is of

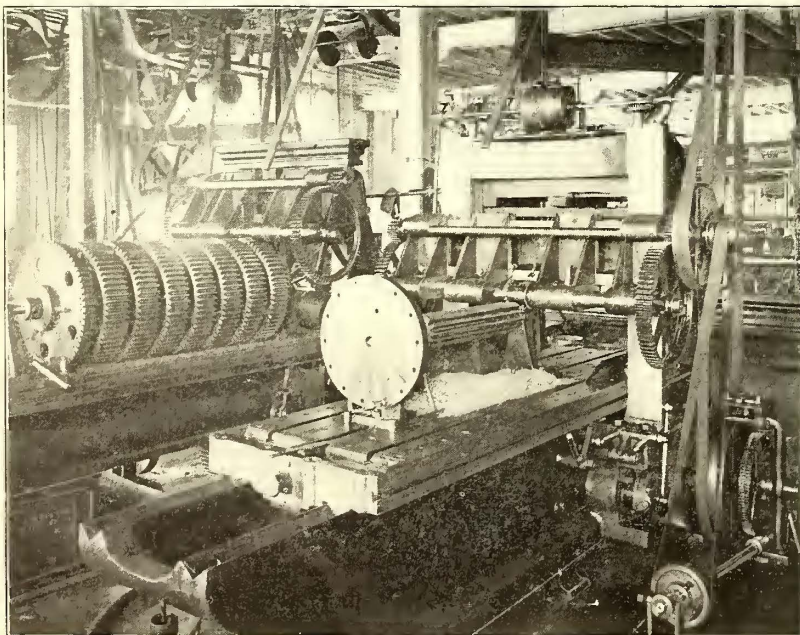


FIG. 1.—LATHE FOR CUTTING GEARS AND PINIONS

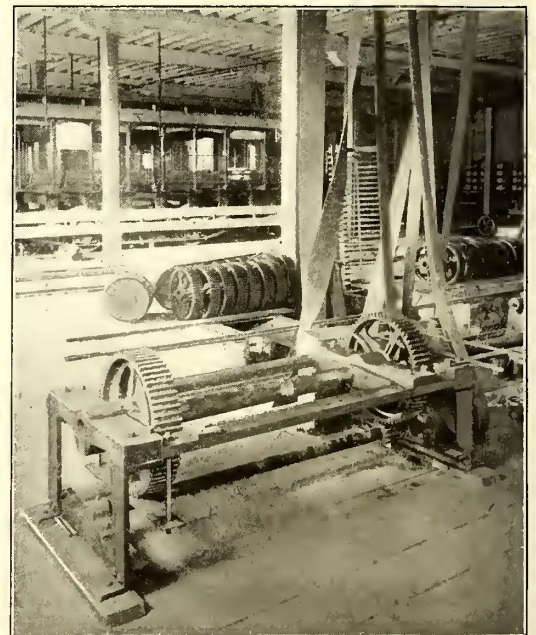


FIG. 3.—KEY WAY CUTTING DEVICE

large stream to each of the cutters. The two machines have a capacity of eight pinions and two gears complete in ten hours. The blanks for the pinions are cut from hot rolled steel bars or shafts. These are drilled, turned to accurate size and cut off to a suitable length on a lathe, as shown in Fig. 2. The original bars are long enough for sixteen pinion blanks. For drilling the holes in the shaft two operations are required. A twist drill  $1\frac{1}{8}$  ins. in diam-

the full width of the keyway, and each in succession is set about  $1\text{--}32$  in. higher than the other, so that by one motion of the shaft through the bore, a complete keyway is finished. This shaft, carrying the cutters, is forced endwise by means of a screw, cut on its outer extremity, and which is actuated by a nut in the driving gear, the shaft having a travel of about 4 ft. This is actuated by a countershaft and small gear, which is driven by means of



belting from the overhead shafting. By the use of this machine it requires about a minute to cut a keyway in a gear, including the time consumed in putting the wheel in

shifts the belt, starts or stops the compressor, at the same time cuts off or lets on the flow of water through the water jacket of the cylinder.

USE OF COPPER

Hard-drawn copper bars are employed in commutator construction. In practice it is found that the life of the commutator varies greatly, depending on the service. The cars on the lines of heavy traffic are the ones on which most of the repairs are necessary; the others seldom come in for repairs. It is the practice of these shops to return the copper wire employed in field coils to the manufacturers, after a coil has been damaged, to have it reinsulated,



FIG. 4.—CRANE FOR LIFTING MOTORS FROM CAR ON TRANSFER TABLE

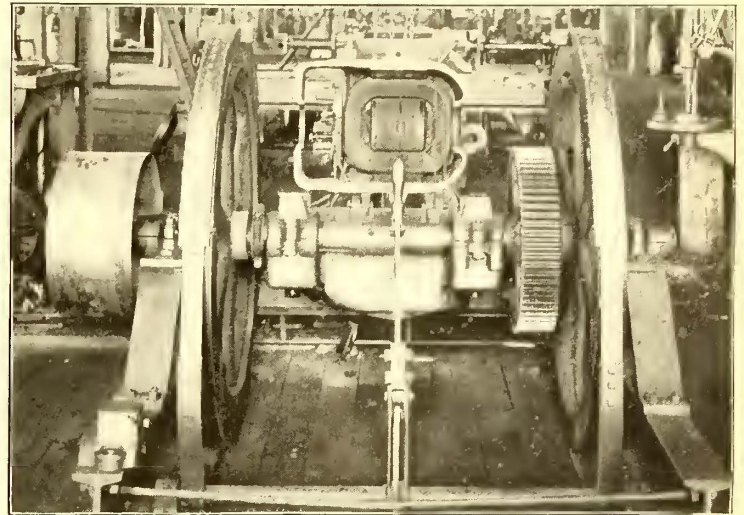


FIG. 5.—FRICTION BRAKE FOR TESTING ARMATURES

position and taking it out, and all the ways are cut to an exact size.

An electric motor drives the shafting for all the shop machinery, and there is an air compressor made over from one of the Connelly gas motors that were employed on this system some years since for driving the motor cars. These

as it is found to result in quite a saving in the matter of motor repairs. Before shipping the coil away, however, the old insulation is all burned off.

MOTOR CRANES

In the repair department two stationary cranes of special design are employed for lifting motors or armatures out

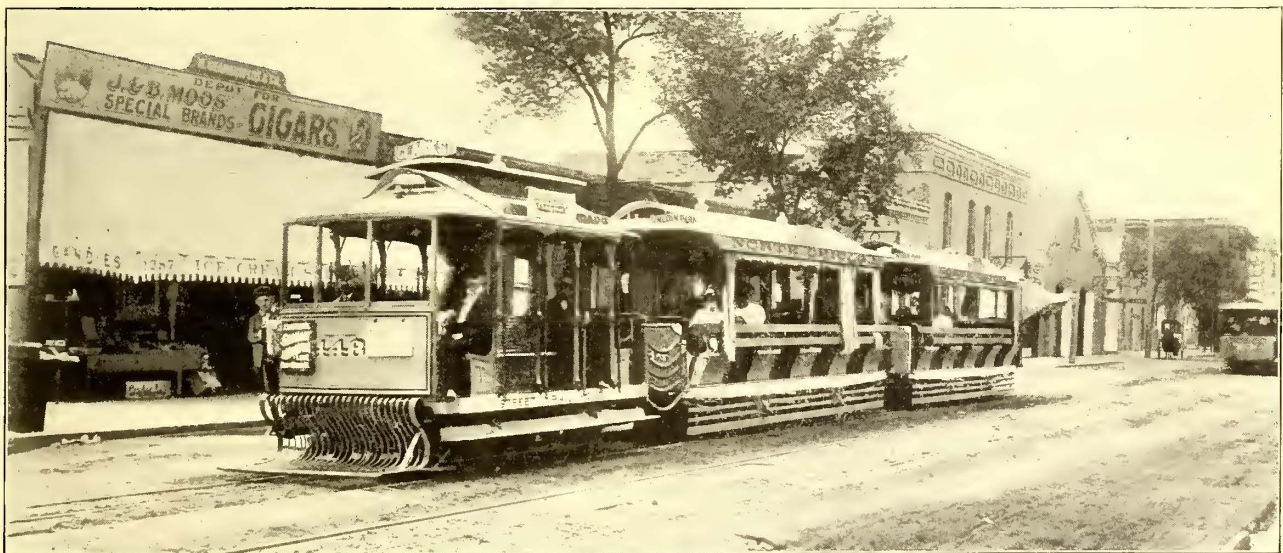


FIG. 6.—FENDER FOR CABLE CARS, SAFETY GUARD SPRINGS BETWEEN CARS AND GUARD RAILS

provide the pressure for operating the power hammers in the blacksmith shop, will furnish the power for some pneumatic hoists which are about to be installed, and also blows the shop whistles. These compressors are provided with an automatic starting and stopping device, which was also designed by the superintendent of the shops. This device

from the open and sometimes from closed cars. These cranes consist of 3-in. bars of iron, bent as shown in Fig. 4, and braced in position at the end of the run of the transfer table. For removing any part, the car is placed upon the transfer table, when it is run in position to bring the ends of the cranes well within the car, as shown. Hand hoists



are then attached, the armature or frame is lifted to a suitable height, the car is moved away from the crane and the part which has been lifted from the car is lowered and shifted about the shop on trucks.

#### ARMATURE TESTING DEVICE

In Fig. 5 are shown the method and appliances for testing armatures. The motor case is mounted in brackets when the armature is put in place and current applied. By means of a gear wheel on the shaft, power is communicated to the two 4-ft. fly wheels, about each of which is a band brake, which is operated by means of a lever shown between the wheels. By means of the brake any degree of power within the capacity of the motor is obtained, and when the consumption of current reaches a certain amount, as indicated by the meters, the test is suspended. In addition to testing, this machine is sometimes employed as a motor for driving the shop shafting. For this purpose a belt pulley is attached to the end of the axle, so that the

be turned up in position, as shown. A simple bracket on each side of the platform under the dash serves to hold the fender in position. It is attached to the platform by an elbow-shaped casting, having a spiral spring, which gives to the fender the proper tension, so that when a body strikes the fender it will move down and back, preventing a sudden shock when it is again lifted in position by the spring. Two brackets under the bumper, with small hooks, as shown, assist in holding the fender in position and provide for a quick adjustment or for a release when it is necessary to fold it up. There are also two chains by which the device, when folded, is attached to the dash rail. These fenders are very light, are constructed at little expense and are claimed to be working in a very satisfactory manner, having picked up without injury quite a number of persons. It is also noted that since the fenders were adopted there have been less accidents from collision with vehicles, the motormen being more cautious than when fenders were not employed. It is the practice of the company to charge

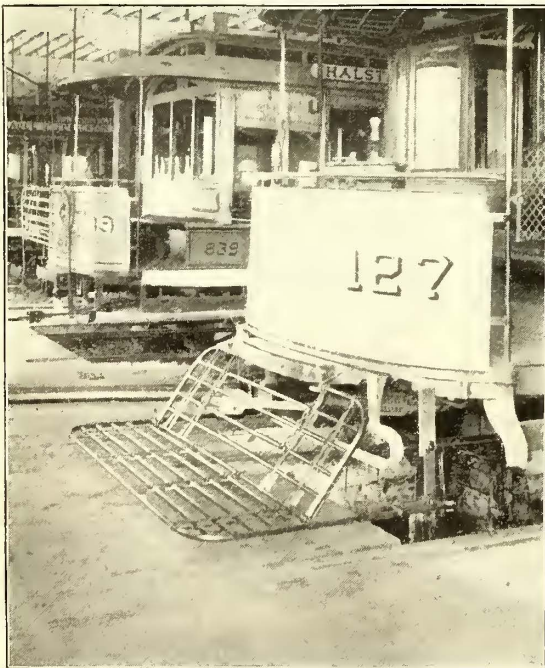


FIG. 7.—FENDER FOR ELECTRIC CARS

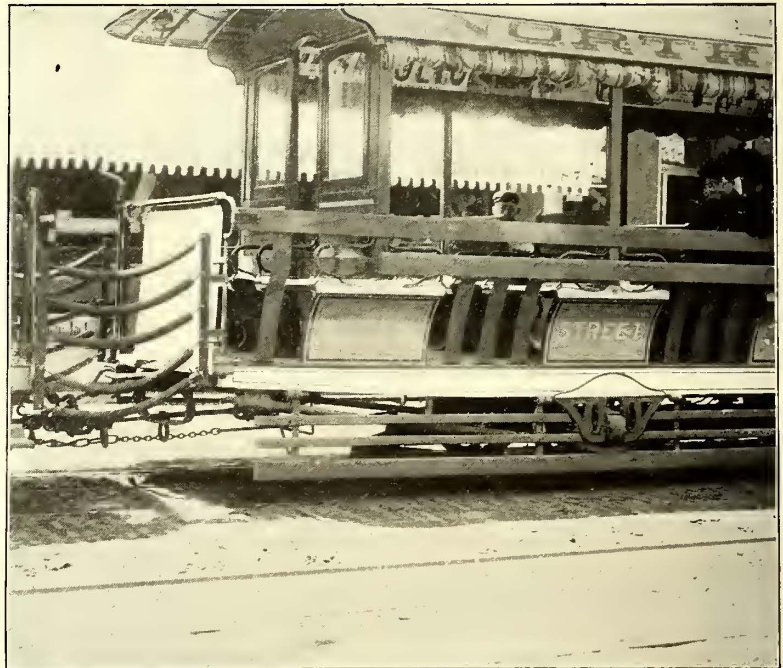


FIG. 8.—SAFETY DEVICES FOR TRAIL CARS

power is readily transmitted by belt to the shafting. This is used in case the motor which drives the tools of the repair shop should be out of order or undergoing repairs.

#### FENDERS AND OTHER SAFETY DEVICES

All of the cars, both electric and cable, on the North and West Chicago systems have recently been equipped with fenders to comply with the city ordinance to that effect. The fenders are all home-made, and that designed for the cable cars is shown in Fig. 6. It is of the stationary type, and is constructed from steel springs bent and arranged as shown in the engraving, the outer or front edge being reinforced by a sheath of rubber belting. The design of fender for electric cars is shown in Fig. 7, and was designed and patented by V. T. Lynch, superintendent of the shop. In the foreground the fender is in position for service, while that in the background is folded up against the dashboard. These fenders consist of a frame work of steel tubing, about 1 in. in diameter, and are provided with wooden rods, which are supported in position between thin strips of steel. Near each end on the underside, curved bars are riveted, which serve as runners for lifting the fender over rough places when it strikes the paving. The upper portion folds against the flat portion, when both can

the motormen with all damage to the fenders, unless they can prove that a collision was unavoidable.

Among other safety appliances employed on the trains of both the North and West Chicago systems are guard springs, in sets of five, placed between the grip-car and trailer and between the trailers on the right-hand side of the train, Figs. 6 and 8. These springs, together with the method of attaching them to the dashboard, were designed by the general manager of the two systems, J. M. Roach, and have been patented by him. These spiral springs are made of No. 5 wire, and are 26 ins. in length and  $1\frac{3}{4}$  ins. in diameter, and are attached to a hinged bar placed against the dashboard, as shown. On the trains that do not run the same end forward all the time the springs are attached to hinged bars, which can be removed by lifting them up out of the carrying sockets, so that any set of five springs can be moved from one side to the other without detaching the individual springs. In rounding curves the springs stretch sufficiently to permit of the relative adjustment of the cars and always form a safeguard to prevent people falling between the trail cars.

Permanent guard rails, together with metal guard strips, have been attached to the outside of all open trail cars. These, as well as the springs above described, are also il-



illustrated in Fig. 8. At first only the two wooden guard rails, as shown, were employed, but it was found that venturesome passengers would frequently attempt to board or leave the car by passing under the guard rails between the seats; hence the necessity of providing the metal strips, as shown.

Practice in the Repair Shops of the Chicago City Railway Company

TROLLEY WHEEL TURNING DEVICE

Fig. 1 illustrates a rapid method for turning the grooves in trolley wheels, as employed in the repair shop of the Chicago City Railway Company. A Reoric & Ayer milling machine is employed, to the bed plate of which the groove cutting device is attached. This consists of a frame work having a pair of movable heads, each of which carries a cutting tool shaped to correspond with the desired groove in the wheel. These cutting tools are placed one on each side of the trolley wheel, one just above and the other below the center of the shaft or mandrel which carries the wheel. The wheel is placed upon the mandrel, and held in place by a nut which is adjusted by hand; lugs cast on the back of the wheel engage the arms on the mandrel and cause it to turn. The wheel being in position, the heads carrying the tools are moved toward each other by means of a right and left screw, which is operated by a crank and gears, as shown in the illustration, so that the groove is readily cut to the desired depth. As soon as finished the cutting tools are caused to retreat by a reverse motion of the crank. The cutting tools are adjusted with reference to the distance from the mandrel by shifting the bed of the milling machine. By the use of this device one man is able to turn out complete fifty wheels in an hour, almost one a minute. Old wheels are turned down in the same

when, by one revolution of the wheel, it is driven half way in; then a large washer is placed on top and a second revolution pushes it home. This work is performed very rapidly, one man being able to place the bushings in four wheels a minute. This method of adjusting the bushings is pre-

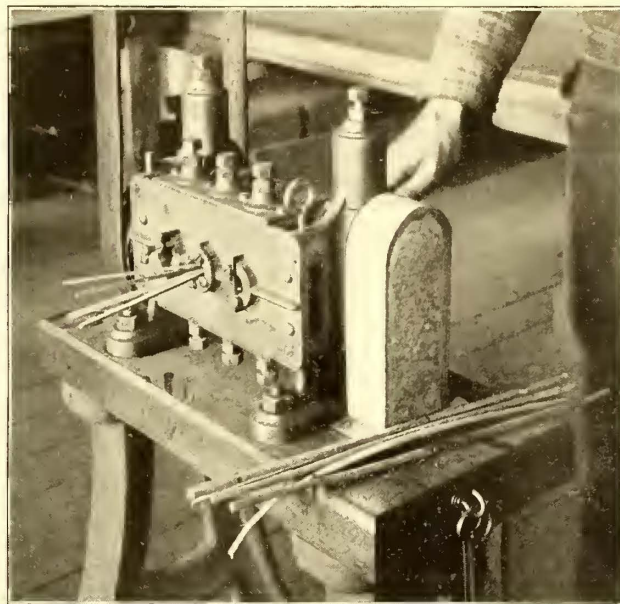


FIG. 2.—RATTAN SPLITTING MACHINE

ferred to that of hammering them in, as the blows from the hammer were found to crumble and dislodge the graphite.

MACHINE FOR SPLITTING RATTAN

Fig. 2 illustrates a rattan splitting machine. This consists of a frame work of brass with adjusting screws, be-

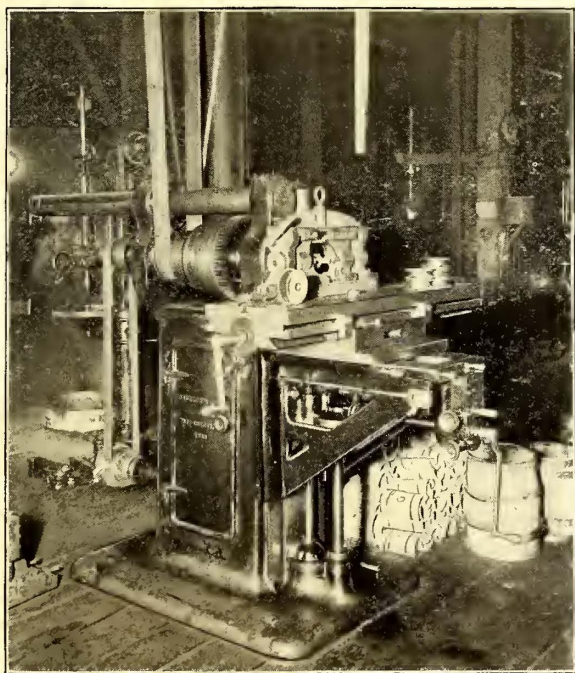


FIG. 1—TOOL FOR CUTTING GROOVES IN TROLLEY WHEELS

manner as new, and the device is readily attached to the bed of the milling machine by clamps, as shown.

For placing the graphite bushings in trolley wheels a Crossly power press is employed, which is also used for punching and bending purposes. After the bore of the wheel is turned to the proper size, the bushing is placed in position by hand, and then under the plunger of the press,

hind which is a pair of rollers driven by a belt from an overhead shaft. These rollers have three grooves corrugated at their base and of about the size of a rattan. Opposite the grooves, in the outer face, as shown, is a set of knives placed across the tube through which the rattan emerges. There are three tubes and three sets of knives. The first one has a single knife and halves the rattan; the





second has a knife in the form of a cross, and quarters the reed; the third and last splits the reed into three parts. There is a funnel-shaped mouth on the side toward the attendant, and the reeds are fed into the different cutters according to their size. The small ones are halved, the medium size split into thirds, and the large ones are quartered. The reeds are first cut into suitable length for making the brushes for the sweepers and are fastened in bunches in holes in the back by means of rosin cement. The brooms are not formed by doubling the rattans and placing the two ends of a bunch through, as in ordinary practice, which results, as is well known, in the waste of a great deal of stock, but singly, as described above. By the process of splitting and using short reeds, the life of the brooms is greatly increased.

COIL TAPING STANDS AND BOBBINS

Fig. 3 illustrates different forms for holding coils to facilitate taping. These forms consist of a plain board having strips of different shapes nailed on the top, which form grooves to correspond with the shape of the different coils. The coils are held in position by buttons. These forms are mounted on stands having a revolving attachment, so that they are readily brought in position in front of the operator. A set of different shaped forms is shown on the platform, as are also the parts of forms employed in making the field coils. In connection with the taping stands are shown the bobbins in which the tape is enclosed and which greatly facilitates the winding of the tape about the coils. These bobbins consist of two-part circular boxes, made of wood or metal (light metal like aluminum being preferred), about 4 ins. in diameter. After the tape coils are wound to proper size, they are placed over the stem in the bobbin. The latter is threaded at one end, extends through the cover on one side and is fitted with a thumb screw, by means of which a suitable tension may be placed upon the

against the roll of tape. A second method consists in providing a small roller on a half spring, which, being pressed to one side, allows the roll of tape to be placed in position. Then when the bobbin is closed the tape is brought out over and under a set of four small bars which serve to give it sufficient tension, so that by holding the bobbin in the hand and passing it through the coil there is sufficient tension to form the wraps perfectly. By the use of the bobbin

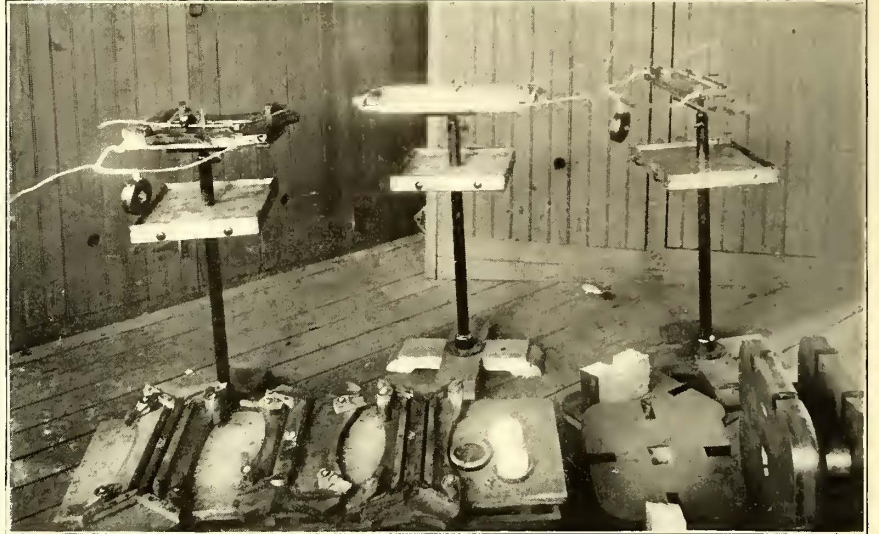


FIG. 3.—COILS FOR WINDING MOTOR COILS

and stands the work of taping the coils is greatly facilitated and a more uniform finish can be secured than by the old method. These forms and bobbins were designed by W. C. Bryant, who is in charge of the motor repair department of the Chicago City Railway shops.

A similar bobbin is also employed for taping car cables. This is made with a very stiff spring, and is mounted on a spindle in a clevis provided with a handle, so that the workman is able to wind the tape very tightly by pulling on the handle of the bobbin after the bobbin is passed once around the bunch of wire.

BAKING COILS

It is the practice in winding motors after the coils are taped to soak them in white paraffine wax. Then, as they are to be placed in the slots of the core, the completed coils

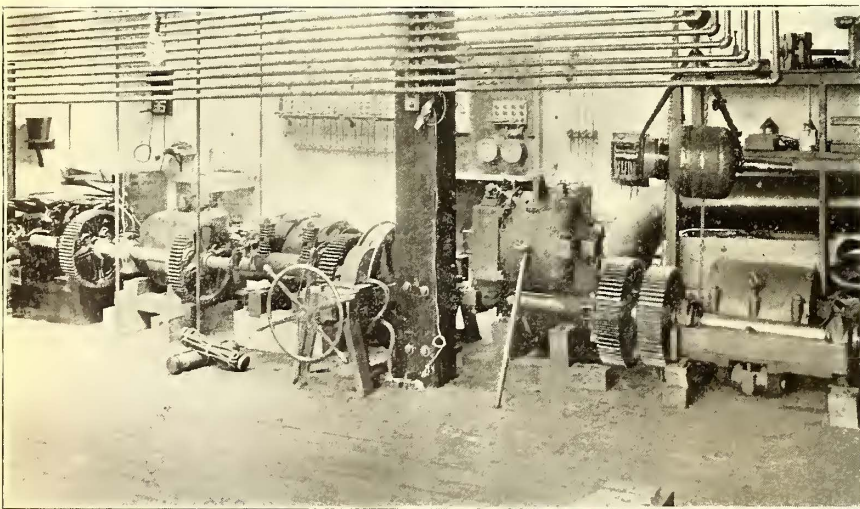


FIG. 4.—ARRANGEMENT OF FIELDS FOR TESTING FIVE TYPES OF ARMATURES

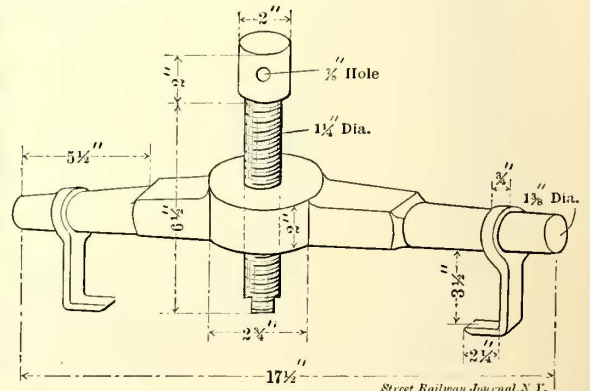


FIG. 5.—SCREW JACK FOR REMOVING FIELD COILS FROM POLE PIECES

coil of tape to prevent its running out too fast. There are two methods of adjusting the interior spring to provide the necessary tension; one consists of a slightly dished thin metal disc, which is placed each side of the roll of tape, and as the thumb screw is turned up, pressure is brought

are heated in an oven sufficiently to soften the wax and make the coil pliable, so that the wax acts as a lubricant. This facilitates placing the bottom coil in the slot and provides for the use of more insulating material in the bottom of the slot than when the coil is put in without heating.



ARRANGEMENT OF MOTORS FOR ARMATURE TESTING

Fig. 4 illustrates an arrangement of five motor frames for testing the different types of armatures employed on the lines of the Chicago City Railway. As will be noted, the shaft is provided with gears, into which the pinions from each armature mesh. The current being applied, the motor drives the shaft, and, as this carries a set of brake wheels near the middle, it can be regulated as to speed or power. At the same time the current consumed is registered by the volt and ammeters located on the switchboard, as shown. The braking mechanism consists of two old car wheels with the flanges on the outside, giving a broad braking surface. The brake shoes, which are placed one on each side of the wheel, and which are held in position by forged bars that bend over the axle and around the wheels, are hollow, and are provided with pipes, through which a stream of water is directed, designed to absorb the heat generated by the friction. The brake shoes are applied by means of a screw shaft, operated by a hand wheel, which is shown in the illustration. The covers of the frames are lifted and the armatures shifted about by means of a trolley hand-hoist, which is also shown, having an armature suspended above the frame. The controller, switchboard and resistance boxes are located back of the shaft and against the wall. Every armature, either new or old, is tested before being placed in service. The test for new armatures consists of a run of twenty-five minutes under 55 amps. of current, followed by a ten-minute run at 60 amps. Old armatures, however, undergo a test of only ten minutes with 55 amps.

DIVISION OF WORK

Ten hands, besides the foreman, are employed in the motor repair department, and the work in this department includes, besides repairs, the making of armature and field coils, the making of commutators entire after the bars have been repaired and the slot in the shank milled out, also the making complete of all the resistance boxes or rheostats

repairing commutators; one man winding field coils and repairing old ones, and one boy for miscellaneous work.

For removing a field coil from the pole piece, a screw jack has recently been devised which is made in the company's shop, and one is kept in each car depot, see Fig. 5. This consists of a bar, through the middle of which is a large screw, and on each arm of which is an adjustable hook. To use this jack the hooks are first placed under

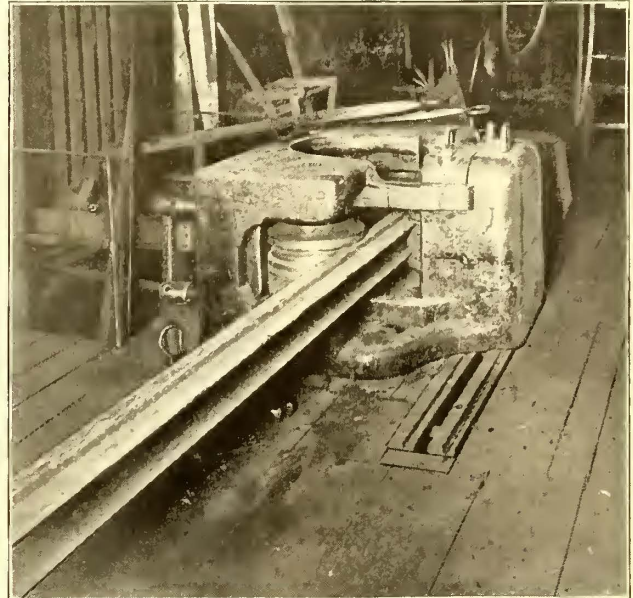


FIG. 7.—RAIL BENDER

the sides of the coil and the end of the screw adjusted to the face of the pole piece, then by turning the screw, the coil is readily drawn off from the pole.

About 1000 motors are employed on the system, and these embrace seven types, including the Westinghouse 12-B, of which there are the greatest number, Westinghouse 12-A, Westinghouse No. 3 and No. 49, Walker No. 5 and G. E. 800 and G. E. 52.

NEW FORM OF RHEOSTAT

A number of the motor cars of the Chicago City Railway Company are being equipped with a new form of rheostat, and in some cases with a double rheostat, especially those on lines of heavy traffic and where trailers are hauled. With the old form of rheostat the life has not been more than two and one-half to three years, and it was found that in 80 per cent of those burned out the short circuit occurred on the last half of the resistance. At the same time a good many burn outs occurred on the first half on lines where there were grades and the cars were held up by excessive street traffic, or when it was necessary to run a long distance on the first two notches. In order to provide for these contingencies

and after experimenting with various types of rheostats, the electrical engineer of the company became satisfied that the most successful type of rheostat at present was that constructed of soft steel ribbon with ample carrying capacity (*i. e.*, at least from 25 to 30 per cent more current capacity than ordinarily needed), and that the last half of the rheostat should be of heavier ribbon than the first half, as ordinarily this portion carries current for nearly double the time than the first half. With



FIG. 6.—BRASS FOUNDRY, SHOWING INDIVIDUAL BLAST PIPE FOR EACH FURNACE PIT

employed on the system. The division of the work is as follows: Two men winding new armatures, one man repairing armatures and grounded commutators, (in this connection it is interesting to note that none of the armatures built in the shop has ever become grounded); one man turning commutators and binding them; one boy winding armature coils; three girls taping coils and cutting insulating material; two men building rheostats and repairing controllers, switches and fuse boxes; one man building and



the new construction he expects to get three times the life out of the new rheostats than was formerly possible. The two rheostats to be used are known as No. 1 and No. 2, and are made up as follows: No. 1 is composed of six panels of specially made soft steel ribbon. In the first three panels the dimensions of the ribbon are .019 ins. x 0.562 ins., and the last three are made of .028 ins. x 0.625 ins., having nearly double the capacity of the former. The first four panels the dimensions of the ribbon are .019 ins. x 0.562 ins., No. 2 rheostat is composed of six panels, in which the ribbon is .028 ins. x 0.625 ins., which are connected in multiples of two, so that the connections for the two are as follows:  $R^1$  to  $R^2$ , four panels in series;  $R^2$  to  $R^3$ , eight panels in multiples of two, making the resistance as follows:  $R^1$  to  $R^2$ , 3.3 ohms;  $R^2$  to  $R^3$ , 1.2 ohms;  $R^1$  to  $R^3$ , 4.5 ohms. In the manufacture of No. 1, 43 lbs. of steel ribbon are used, and 8 lbs. of asbestos installation. For No. 2, 45

lbs. of steel ribbon are employed, with 8 lbs. of asbestos. The layers of ribbon of which the rheostats are composed are formed from the coil on a forming board in panel style. This is a board about 12 ft. long, having flat steel pins on each edge a short distance apart. About these the ribbon is wound in zig-zag form by hand, and when necessary the ends are spliced, making a lap of about 2 ins., with parts riveted together. Being bent in proper form, the panels are removed from the forming board and placed upon a table, when strips of asbestos, which have been cut to the proper width, and which are about 1-32 in. in thickness, are placed between the folds or the loops composing a panel. The whole is then placed in a specially designed iron vise or press, in which a pressure of about ten tons is secured against the coil by means of two screws, which are operated

by means of a crank placed upon the head. This press is laid flat upon the table, and being fastened in position, the folds are pressed very closely together and held in position by a yoke or clamping device which is placed over the coil by means of slots in the press. The panels are then placed in the forms or frames, and two frames are used in place of one because a single frame would be too heavy to handle.

The rheostat formerly used consisted of six panels of iron ribbon of two thicknesses, one being .017 in. x  $\frac{3}{4}$  in. wide; the other .02 in. x  $\frac{3}{4}$  in. wide, which gave a resistance of about 4.2 ohms, which was divided as follows:  $R^1$  to  $R^2$ , or the first contact to the second contact, 3.8 ohms;  $R^2$  to  $R^3$ , 1.12 ohms. The amount of ribbon used was 40 lbs., with 7.5 lbs. of asbestos, which was in strips  $\frac{7}{8}$  in. wide x 1-32 in. in thickness.

It is thought that the rapid rusting of rheostats is due to condensation while in the barns over night, as they come in off the road warm, and as the barns are usually damp, the condensation is excessive. Rapid rusting follows, and results in short circuits and burn outs.

## BRASS FOUNDRY

Fig. 6 illustrates the furnaces and crucibles in the brass foundry at the repair shops of the Chicago City Railway. The particular feature for which this illustration is produced is the method of providing an individual air blast for each furnace pit. The air is conveyed from the storage tank in the header pipe located against the wall, and is directed by means of the descending pipes directly into each furnace. Each pipe is fitted with a cut-off slide valve, which regulates the flow to each pit. As has been previously noted, it is the practice in this repair shop to manufacture all the brass and copper work for overhead line purposes or car trimmings. The cupola for melting the babbitt and lead for journal boxes and for lining the cable carrying sheaves is also made here, as are composition metal grip dies, trolley wheels, and, in fact, all the brass and copper supplies that are required.

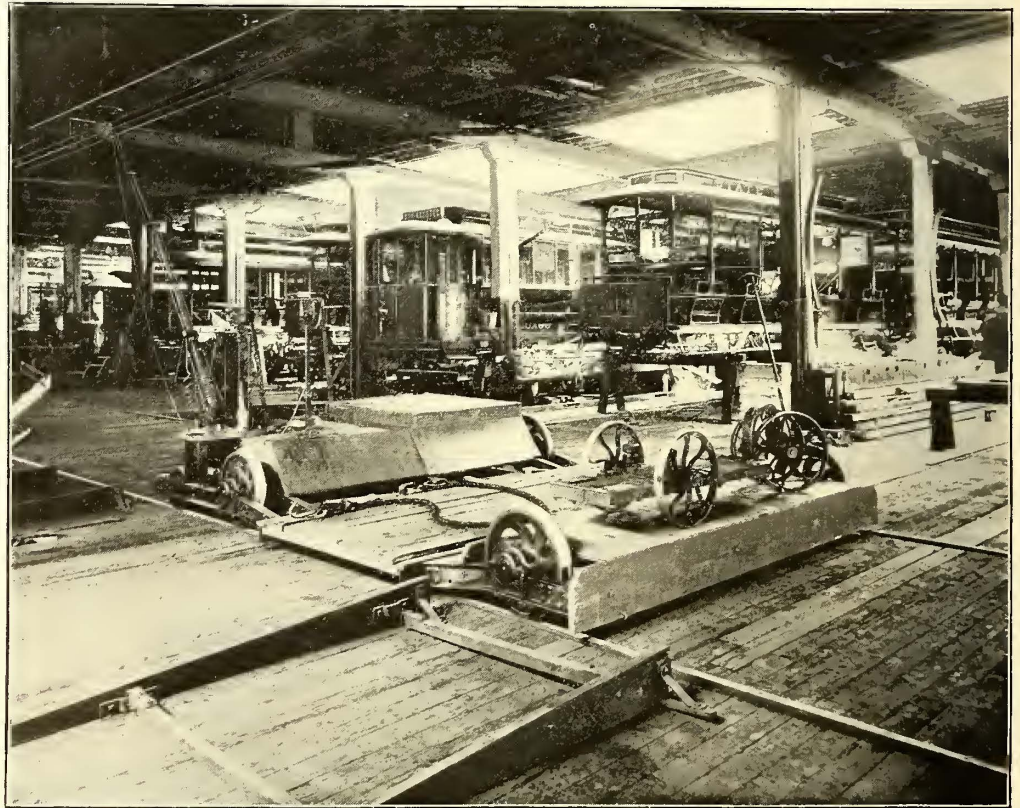


FIG. 8.—ELECTRIC TRANSFER TABLE AND WHEEL TRUCK

## RAIL BENDER

Fig. 7 illustrates a power rail bender which is also employed in the same shops. This consists of three cast rollers, which are set vertically in a solid cast frame, but are revolved horizontally by means of shafting and gear placed under the floor and driven by a belt from the main shafting. The rollers are attached to adjustable guides, which slide back and forth in channels in the main casting and the two inside rollers are adjusted by means of large set screws, as shown. The belt is shifted and machine started by means of hand levers placed above the main casting, as shown in the illustration. By means of this machine rails of any size are readily bent to any arc by passing them repeatedly through the rollers. The rails are handled and adjusted by pneumatic hoists.

On the first floor of the wood shop are suspended racks on which the track tools and other repair tools, including the shovels, picks, buckets, hammers and hoes are stored. A careful record is kept of these, and each gang is charged the kits taken out. The rules require that all tools be



returned and delivered to the keeper when each job is finished. This prevents the tools being lost.

In this connection it is interesting to note that all the axes and picks employed on the lines are manufactured in the blacksmith shop of the company.

REMODELED ELECTRIC TRANSFER CAR

A transfer car has recently been remodeled in the repair shop of the Chicago City Railway Company. It is illustrated in Fig. 8, and is now working in a much more satisfactory manner than formerly. The original equipment of



FIG. 9.—STANDARD SINGLE TRUCK CAR

this car was an S. R. G. No. 30 electric motor, and wound for 500 volts circuit. The new equipment consists of a No. 3 Westinghouse, 25 h.p. motor, operated by the type K-2 controller, and in series with the armature are two car rheostats. There is also a two-panel rheostat, arranged in series with the field circuit and designed to choke

a lever and system of friction clutches a drum is operated on which a rope is wound. This rope leads out onto the platform between two stationary iron pulleys, and is utilized for hauling cars on or off from the table. Triangular pieces of track are employed to lead up to the top of the table.

NEW CAR

Fig. 9 illustrates the new standard closed car designed by the Chicago City Railway Company. This car was briefly described in the July issue, and sixty have recently been ordered from the St. Louis Car Company. The color is seven shades of olive green. The body is 20 ft. long and the car is 30 ft. over all. Both ends are vestibuled and provided with folding doors, made in three sections. The sash is stationary, and the glazing is done in rubber. One of the particular features of the construction of the car is the precautions to deaden the noise. For this purpose double panels are used. The first, or inside, panel, which is attached to the inside of the posts, is in strips  $\frac{5}{8}$  in. thick, while the outside panels are of the usual material and the space between is filled with mineral wool. A double floor is also provided, with tar paper between. The upper floor is really Everett matting, and is made of maple. The interior of the car is of stained cherry, with bronze trimmings. All the posts are hand carved, in what is known as the Empire style of decoration. The ceiling is of three-ply birds-eye maple, and the deck lights are of glass known to the trade as alligator pattern. Longitudinal Hale & Kilburn seats, upholstered in Wilton brussels, are employed. Hunter destination signs are mounted above the hood at each end, as shown, and are operated by means of a shaft depending from the ceiling of the hood.

TRUCKS

The cars are mounted on the Moore trucks, which were designed by C. E. Moore, master mechanic of the com-

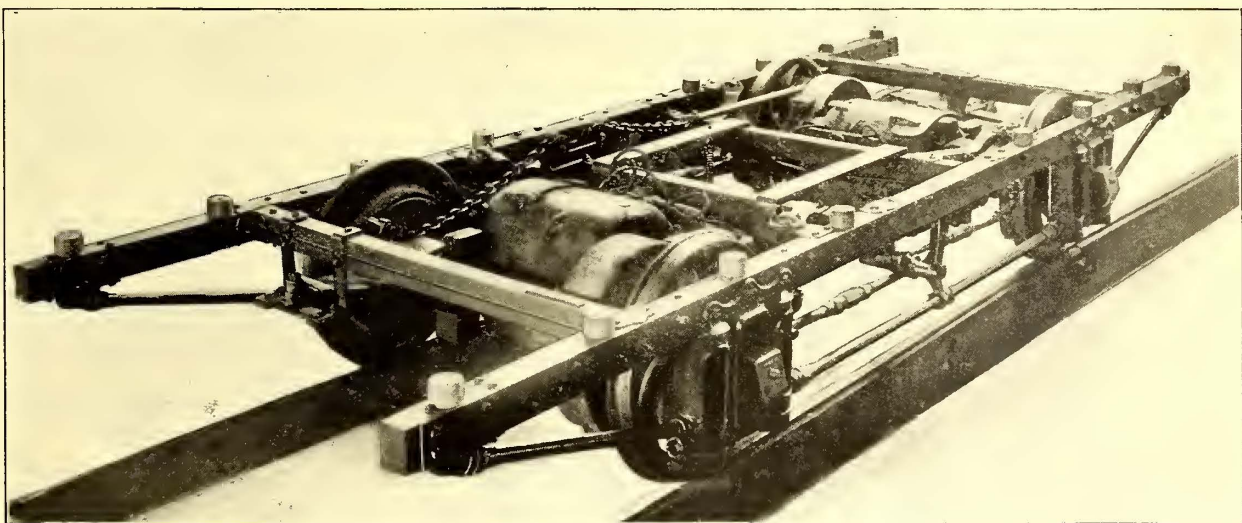


FIG. 10.—STANDARD MOTOR TRUCK

off the current when the controller is on the first and second notch, after which it is cut out. This rheostat allows the cars to start easily with a heavy load, when it can be speeded up to the required degree. It will be noticed from the illustration that the table is supported by three pairs of wheels on a side, the small one within the frame being an idler, or a plain wheel without shaft or flanges. Current is obtained from a double overhead trolley, and the trolley pole has a wooden harp, which carries two trolley wheels, 14 ins. apart, and the wires lead down each side of the pole, as shown. A G. E. safety switch and a G. E. fuse box complete the electrical equipment. By means of

pany. This truck differs essentially from the ordinary motor truck in that the frame work is chiefly of wood, instead of metal, the side bars being of Georgia pine,  $3\frac{1}{2}$  ins. x  $4\frac{1}{2}$  ins., reinforced on the outside by  $\frac{3}{8}$ -in. steel plate. There are no metallic springs employed for supporting the body, but the body rests on rubber cushions, as shown. There are two spiral springs in each yoke, and they carry the load. These trucks have an unusually long wheel base, the standard being 9 ft., and to facilitate rounding the curves a link motion is provided for the axle, the link being so attached as to permit a side movement of  $2\frac{1}{2}$  ins. for each axle. Inside brakes are used, so as to avoid the use of brake



leams. They are operated by means of a tumbling shaft, which is supported by pendent brackets attached to the middle of the side bars. This bracket has a slotted hole in which the tumbling shaft revolves, providing for perfect equalization of brake shoe pressure. The wear of the brake shoes is compensated for by means of turn buckles in the connecting rods. The brake shoe holders are supported by means of pendant ball joint rods, which are at-

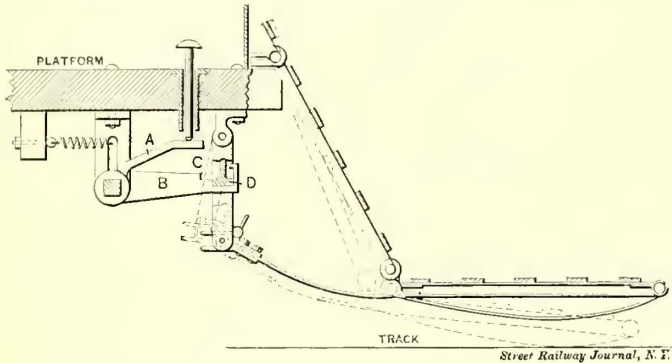


FIG. 11.—STANDARD FENDER

tached to brackets bolted to the inside of the side beams. These supporting rods terminate in balls which are held in cast sockets, giving a universal movement to the shoe. Power for operating the brakes is obtained by means of the Price friction device, which is shown in position on the inside of one of the wheels and which has frequently been described in these columns. Power is transmitted to the tumbling shaft by a chain which droops between two rollers and passes beneath a roller on an arm of the tumbling shaft, which is lifted up by the application of the brake.

This arm is attached to the tumbling shaft by means of a ratchet arrangement, which provides for adjustment to compensate for wear on shoes. There is also a second arm to which a spiral spring is attached for releasing the brakes. The brake mechanism is also so designed as to work the brakes on the trailer at the same time, and when this attachment is in use, a second release spring assists in unwinding the chain from the friction drum.

Two bolts in each yoke support the pedestal binder and hold the spiral spring in place. These bolts are removed by taking off the bottom nuts. The top of the bolt can then be removed sideways to allow the head to be drawn out through a hole in the top of the cap adjoining and opening into the hole through which the bolt passes when in position. By this means the springs may be drawn down out of the pedestal yoke, when, by removing a nut from each corner brace and disconnecting cables, the truck can be readily dismantled.

The trucks are equipped with what is known as the Anti-Hot-Box Journal Bearing, and the oil box has an improved cover, which is absolutely tight. A large number of these trucks have now been in service on the lines of the com-

pany for over two years, and have given such universal satisfaction that they have been adopted as the standard, and the company is now building 200 in its own shops. It is claimed that the long wheel base will prevent teetering, while the body is supported throughout nearly its entire length. By the use of the yoke principle, a swing motion is secured, which allows the truck to round sharp curves without strain or undue wear on the wheel flanges.

#### FENDERS

Owing to the requirements of a recent city ordinance the cars, to the number of 1200, have all been equipped with fenders, which are illustrated in Fig. 11. These fenders were designed and patented by A. G. Carlson, chief draughtsman of the company. They are of the type known as folding fenders, and are supported by brackets placed under the platform. These fenders are light and strong, being built on a frame work of steel tubing known as structural steel tubing, the seam not being welded. The body of the fender consists of wooden slats, made of elm or hickory, and are 2 ins. wide by  $\frac{3}{8}$  in. in thickness. On some of these fenders a wide slat is employed and park advertising signs are printed on this slat in white letters. The slats are attached by means of small bolts and nuts. The cross bars are of crucible steel, and on the under side are two curved bars or runners, which serve to lift the fender over rough places. There is also an attachment under the platform which provides for dropping the fender down to the paving. It is operated by means of a foot button extending through the platform, so that the motorman is able to drop the fender quickly, should he think there is danger of striking a person standing on the track. The dotted lines in Fig. 11 illustrate the position of the fender when dropped for action. These fenders, without the platform attachment, weigh only about 80 lbs., but have sufficient strength for picking up a large body.



FIG. 12.—POLE RAISING WAGON

When folded up the fender comes inside the line of the bumper, and is held in position by means of chains and hooks attached to the dash. The construction is such that



the fenders are readily taken off or shifted from one end of the car to the other.

Since the adoption of this fender, in May last, the cars have picked up sixteen people without injury, and in one instance a man and a woman were taken up by a fender at the same time, being caught in an attempt to cross the track.

POLE RAISING WAGON

Fig. 12 illustrates a pole raising wagon employed on the lines of the Chicago City Railway Company, by means of which, in the recent equipment of the State Street line for electric traction, a crew of seven men with two spans of horses are frequently able to raise and place 137 poles a day. This wagon is equipped with a boom, as shown, which may be lowered to any angle by means of the hoisting apparatus on the front end of the wagon. A set of three interchangeable booms are provided, so that the wagon is able to handle any pole up to 65 ft. in length. The poles, after being distributed, are hauled into position by an extra team of horses, when they are picked up by the block and fall attachment, the power being supplied by the extra team of horses attached to the end of the rope. The wagon is then readily put back into position, and the pole is lowered into the hole, after which the wagon and appliances are quickly moved to the next hole. The wagon is so constructed that it can be turned in a short radius and the team moved out of the way of passing cars. A second hoisting apparatus is placed near the rear of the wagon and can be employed for pulling the poles out of a concrete foundation, when, for any reason, it is necessary to remove a pole. This hoist is operated by hand power. The wagon is also employed for loading and unloading reels of wire from the supplying wagons, the boom being canted in such position as to permit of placing the reel in any position on the wagon. The tackle blocks are designed for

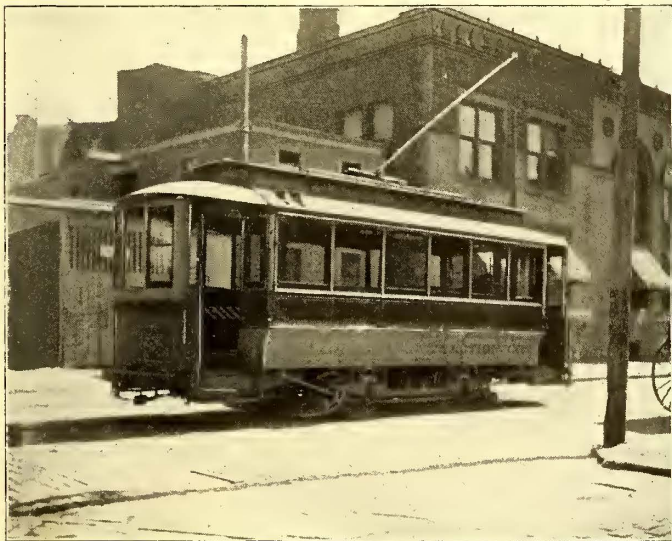


FIG. 1.—ORIGINAL 18-FT. CAR, AS USED ON THE LINES OF THE UNION TRACTION COMPANY

two loops in the top block and one in the bottom, so that there is sufficient power for lifting the poles and securing quite rapid movement.

This derrick wagon is also used for unloading and piling rails, when it is operated by the windlass. It was found that the cost of unloading rails by hand from gondola cars and piling them in the yard was 39½ cents per ton; now, by the use of the derrick wagon, the cost is only 11½ cents per ton, including the labor and team for moving the wagon.

Splicing Cars in Philadelphia

When the electric lines in Philadelphia were equipped in 1894 and 1895 most of the cars were mounted on single trucks, and measured 18 ft. body. The management has, for some time, been considering the advisability of replacing some of these cars with long cars. The plan was suggested to utilize some of the short cars by splicing two together to make a long car. This has been done with a number of cars, and the results have been most satisfac-



FIG. 2.—CAR SAWN IN TWO

tory. The work was all performed in the shops of the Union Traction Company, and the accompanying engravings show the method adopted.

Fig. 1 shows the car in its original condition. The body,

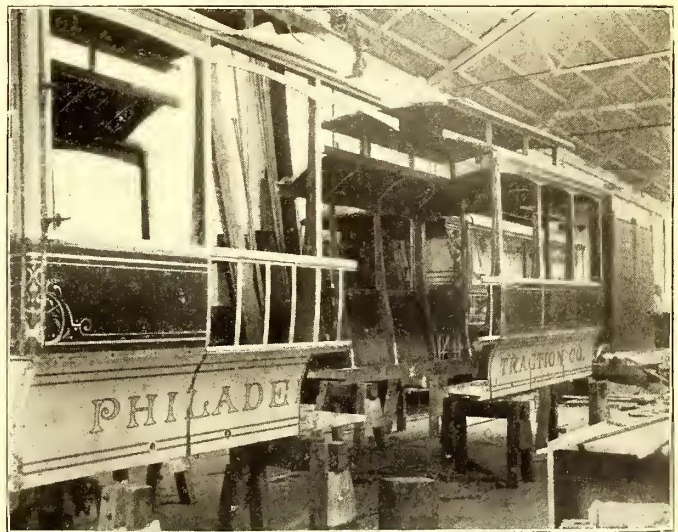


FIG. 3.—TWO HALVES OF BODY DRAWN APART, READY FOR SILL INSERTION

as stated, was 18 ft. in length and had six windows. Fig. 2 shows the car sawn in two, and Fig. 3 with the two ends separated, ready to receive the piece which is built in the middle of the car. As will be noticed, the side sills are cut apart on a dovetail and the interior framing of the car has been entirely removed.

Fig. 4 shows the car with the sides spliced by the introduction of a sill insertion and two additional panels. The frame has also been completed and the car is ready for the



sheathing. As the sills in the new car are used only to hold the uprights, and are not depended upon for strength, a large steel angle is fitted to each side, as shown in Fig. 5. This angle forms the real sill of the car. In addition to the angle iron, a truss is placed behind the seats to reinforce this angle. The end of the truss rod is shown below the angle in Fig. 6, which represents the car in its finished condition, ready to receive the trucks. The cars, when

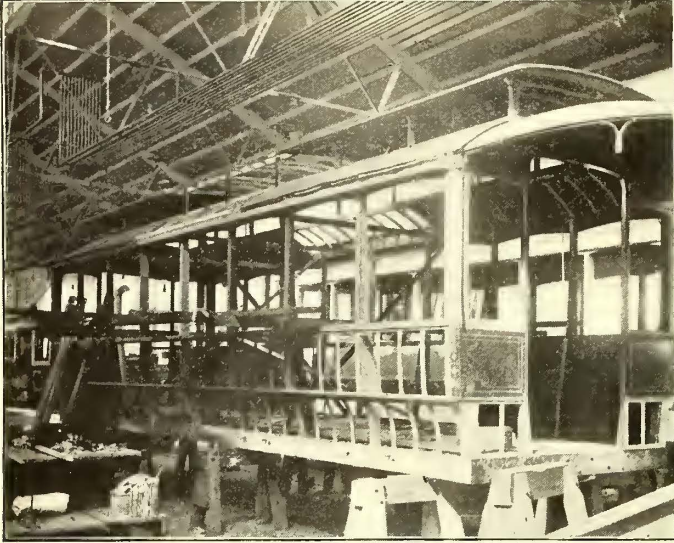
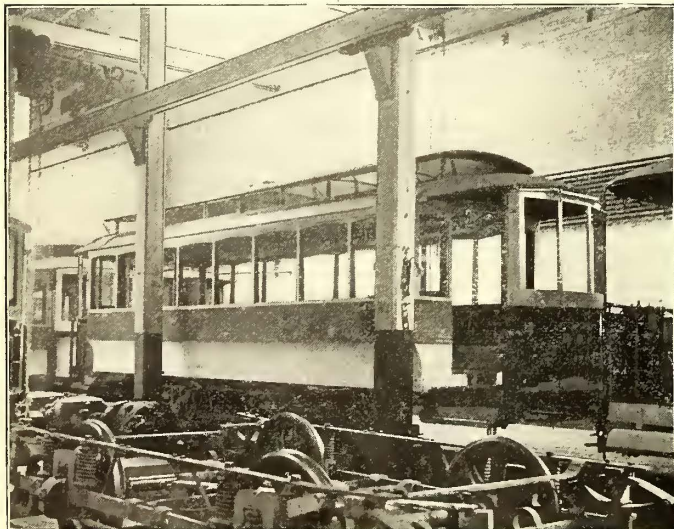


FIG. 4.—VIEW AFTER INSERTION OF PANELS

finished, have a 24-ft. body, the length being increased just one-third. When in use they are not carried on the single truck shown in the engraving, but on Brill maximum traction trucks.

#### Off-Hand Trolley-Pole Repairs

Accidents to trolley poles are frequent, owing to the liability of the wheels to jump the wire. The force of the



effect of twisting it so that the wheel stands at a considerable angle from the vertical. This is frequently so bad that the wheel will not stay on the wire. A rough and ready cure for this is to place a switch iron through the Y of the trolley yoke, then using the iron rod as a lever, twist the pole until the yoke stands true with the wire again.

Sometimes a pole becomes bent close down to the socket. A quite slight bend here, will bring the trolley wheel so low that the springs have not sufficient reserve force to keep the wheel in place. In such a case, take the pole down, thrust the butt-end into a casting underneath the frame of the car, then put two men on the free end of the pole and let them pull slowly, but steadily. If the pole be bent more than one way, straighten all the crooks and turns into one plane before trying to get them out, then the bends can be taken out for good. Care should be taken to so place the pole that the end is not jambed or dented to the extent that it will not go into the socket. Avoid this by a judicious placing of the pole in the casting, across which the purchase is taken. A little attention paid to this matter may save a pole which would otherwise be spoiled for further use.

#### Taxing Street Railways

The opinion of the "Boston Herald" on the subject of street railway taxation is expressed in a recent editorial as follows: "Suppose it were possible for a city to collect, say, \$400,000 in public franchise taxes each year from a street railway system. This money would then go into the treasury and would be a relief, to that extent, of the ordinary burden of taxation. On the other hand, if, instead of collecting this tax, the municipality compelled the street railway company, in consequence of the franchise given, to run more frequent cars, to run these cars to non-paying points, or at times in the night when there was no profit in maintaining the service, or compelled it to reduce its rate of fare, or give free exchange of tickets in all direc-



FIGS. 5 AND 6.—COMPLETED CAR

spring is sufficient to bend the pole badly, or even to break it in two, if an obstruction of stability is encountered during the rebound of the pole. Usually, the damage done consists of a plain bend near the middle of the pole, and this is allowed to remain as long as it is not great enough to prevent the wheel from staying on the wire when passing under intersecting overhead rigging.

Sometimes a pole receives a green bend which has the

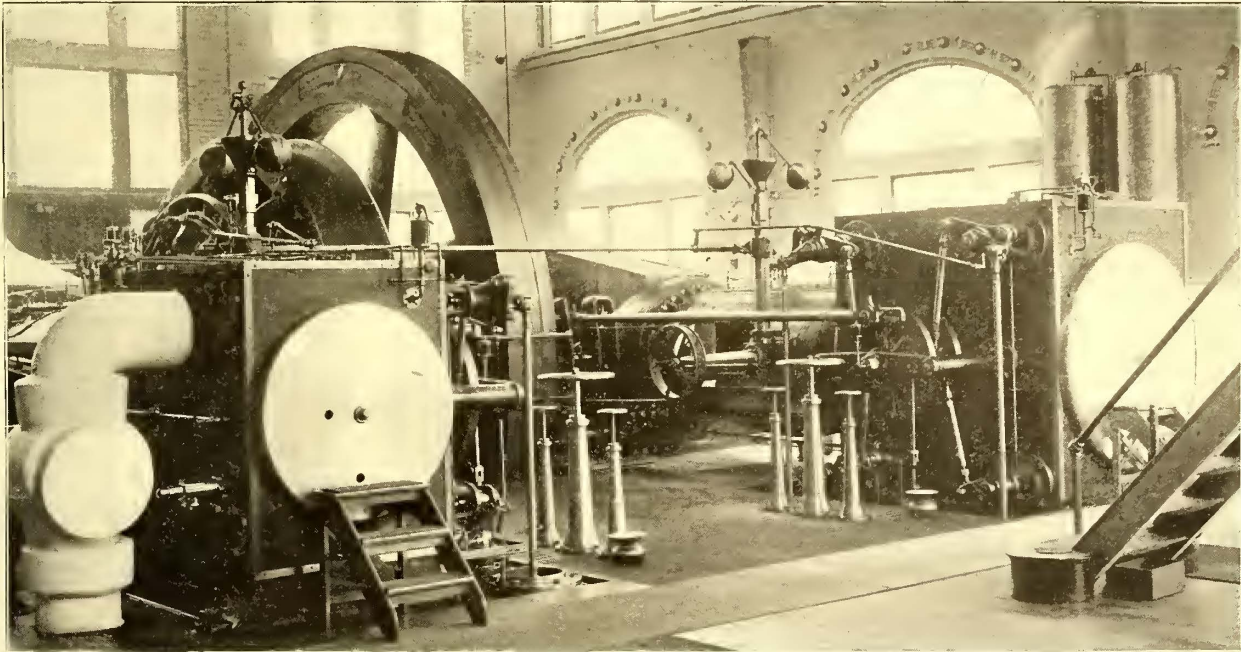
tions, it seems to us probable that the general benefit derived therefrom would be greater than that secured by having the same amount of money paid into the municipal treasury. It is altogether a question of policy, but to our mind a slight relief granted to a few taxpayers may be of less general advantage than the direct gain of improved transit service which might be enjoyed every day by hundreds of thousands of people."



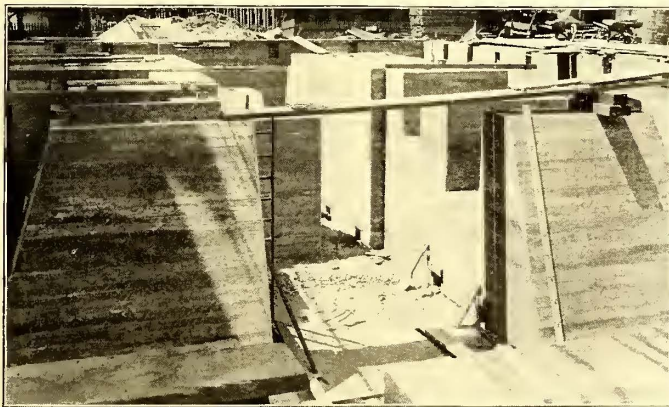
**"Kinks" from Hartford**

The Hartford Street Railway Company has recently been making several additions to its power station on Commerce Street. This station was described quite fully in the issue of May, 1895, of the STREET RAILWAY JOURNAL. Its original equipment consisted of Ball & Wood 300-h.p. engines, each belted to a 220-kw. generator. An addition to the capacity of the station having been found necessary, the company decided to try a Corliss engine, and consequently one built by the Pennsylvania Iron Works of 1250-h.p. capacity was installed. The engine is cross compound condensing, and is directly connected

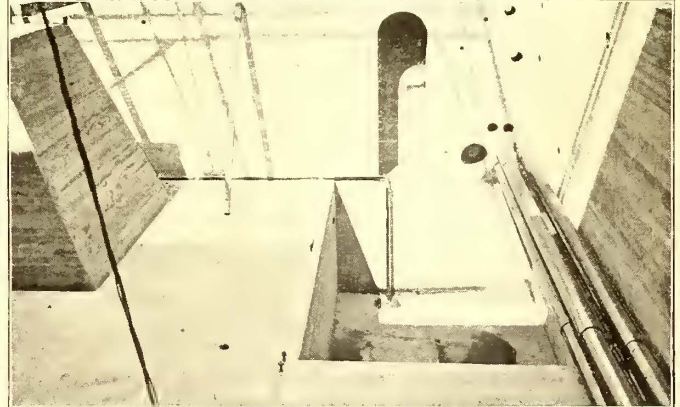
station is built on a quicksand, close to the Connecticut River. This made the use of piling impossible, and the construction finally adopted was that of using concrete throughout for the foundation and side walls of the annex to the station in which the new unit has been placed. The work was done by the Hartford Paving and Construction Company. The foundation was constructed by day's work, and not by contract, and consists of 960.3 cubic yds. of Portland cement concrete, requiring 1996 cubic yds. of excavation to be moved in its construction. Atlas Portland cement was used exclusively, and the entire cost of the work was \$6,412.39. The foundation is underlaid by a bed of soft clay and quicksand, into which the condenser pit



1250-H. P. DIRECT-CONNECTED ENGINE AND GENERATOR



FOUNDATION FOR ENGINE AND GENERATOR UNDER CONSTRUCTION



CONDENSER PIT

to a 800-kw. General Electric generator. An extensive series of tests, which has been conducted by the company, has disclosed but very little difference between the economy of the two types of machines. If anything, the large engine is slightly more economical, but only when running at full load, and this condition can best be assured, of course, by cutting in and out the small machines. Part of this difference can also be accounted for by the fact that the high-speed engines are belted to their generators, while the slow-speed engine is direct connected. The management speaks in the highest terms of both types of engine.

In installing the Corliss engine the question of foundations became an important one, from the fact that the

penetrates. There are no piles or similar contrivances under the foundation, and its stability depends entirely upon the weight being properly distributed over the required area.

The engine foundations are battered 3 ins. to 1 ft., and are made solid with the floor, the side walls and pump pit, forming a monolith. All the pipes from the station are carried to the river through a concrete sub-way 10 ft. in diameter, giving plenty of room for access and inspection.

**CAR HOUSES**

The main car house of the company is located on State Street, near the center of the city. The tracks, which are



9 in. girder rails, are mounted directly on brick piers, 14 ins. x 16 ins., except where there is special work, where the rails are mounted on brick foundations. The piers are spaced about 15 ft. apart, one at each joint and one midway between the joints, and carry the rails on a cast-iron plate.

ft. 1 in. At this place are also the repair shops and store-rooms of the company.

STORAGE OF OIL

The oil for the headlights is stored at the main car house

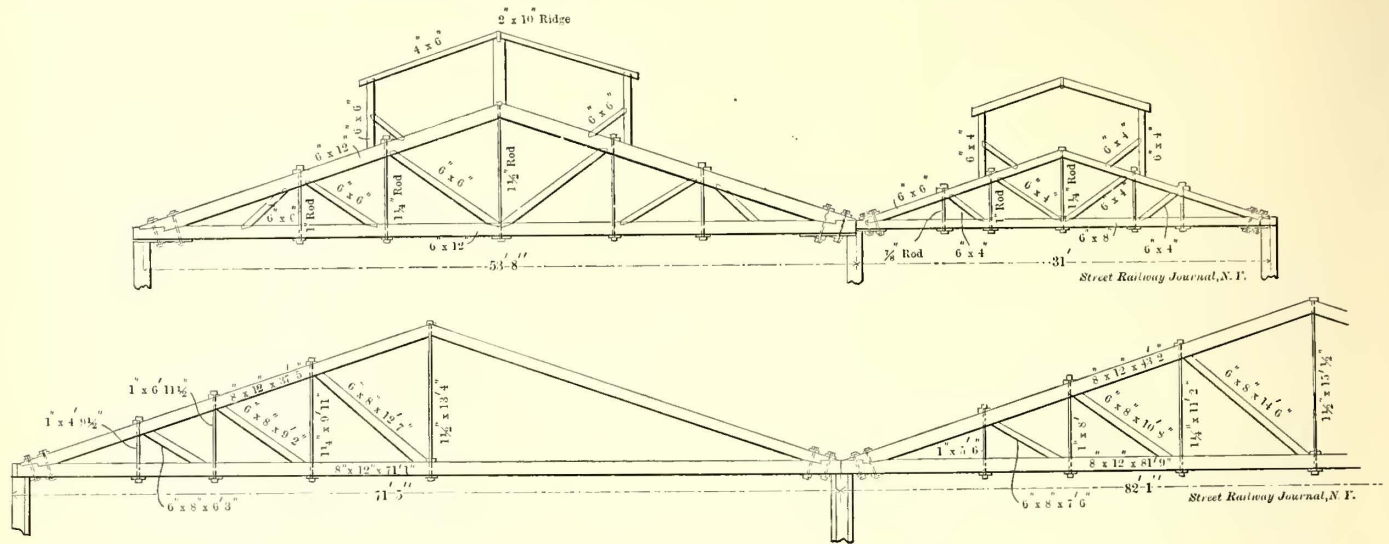


FIG. 2.—WOODEN ROOF GIRDERS—VERNON STREET CAR HOUSE

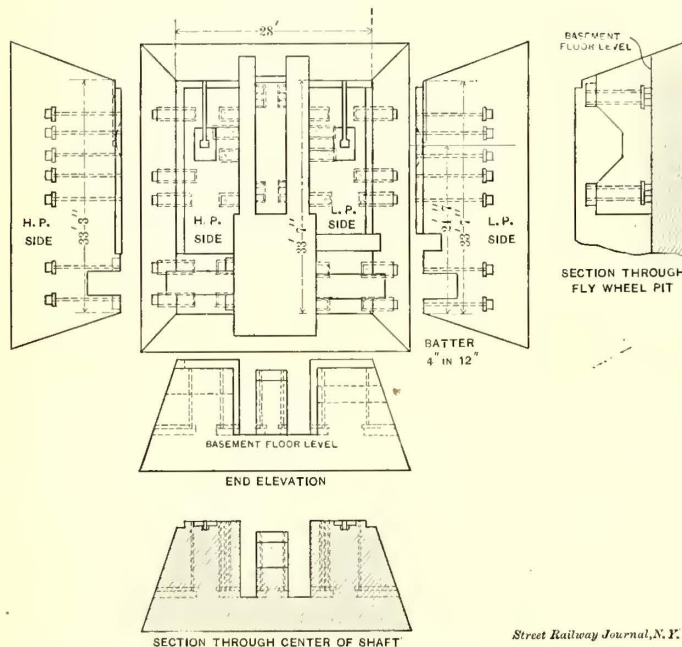


FIG. 1.—ENGINE AND GENERATOR CONCRETE FOUNDATION

They are held to gage by tie-rods, and the space between the rails is planked over, except where room is left for pit work. The floor is concreted, and has a pitch of 4 ins. to 100 ft., this being sufficient to provide for drainage.

The overhead conductors in the car house are steel T bars, which are attached to the roof girders. This makes a very firm running surface for the trolley wheel, and one which is indestructible. For skylights the company is a very large user of translucent fibre, a very light material which reduces greatly the weight carried on the roof girders. It allows plenty of light to pass through it, and at the same time is unbreakable. The roof itself is the special roofing of the Berlin Iron Bridge Company, by whom the entire structure was built.

The company has also built on Vernon Street a large car house of somewhat different design, which is shown in the accompanying diagrams. This car house is of brick, with track on piers, as in the main car house. The roof girders, however, are of wood, and include one span of 82

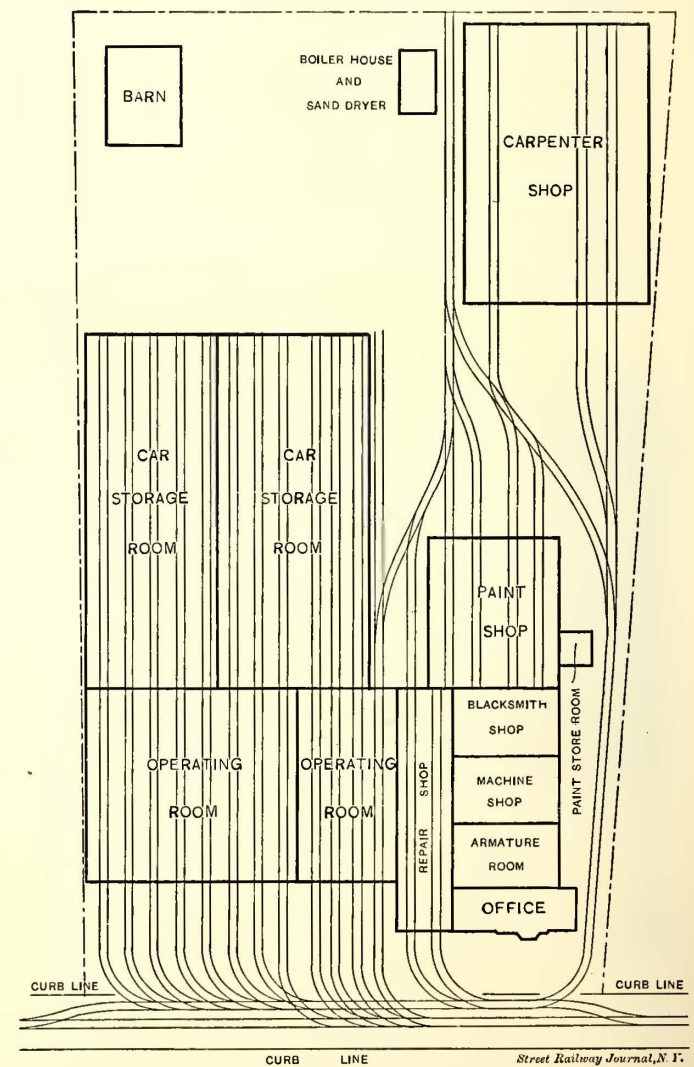


FIG. 3.—PLAN OF BUILDINGS—VERNON STREET

in a galvanized iron tank, which is buried in the ground near the car house. This tank has a capacity of 7 barrels, and when needed, oil is drawn from it by a hand pump. Underneath the pump is a drain, so that the waste oil runs







SPEED CARDS

Special attention is given by the company to insure the maintenance of the running schedule adopted on the different divisions, and for preventing the motormen from running either ahead or behind, a time-table has been drawn

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wheels, carrying four 30-h.p. Westinghouse motors, No. 3, and operated by two K 12 General Electric controllers. The car is to be fitted with sand boxes of the company's own make, and is equipped with fenders and four electric signal lamps, placed at each corner of the vestibule over the windows.

It is needless to say that the car is built strong for the uses for which it is intended. The company is well equipped for this kind of work, having all necessary shops and machinery.

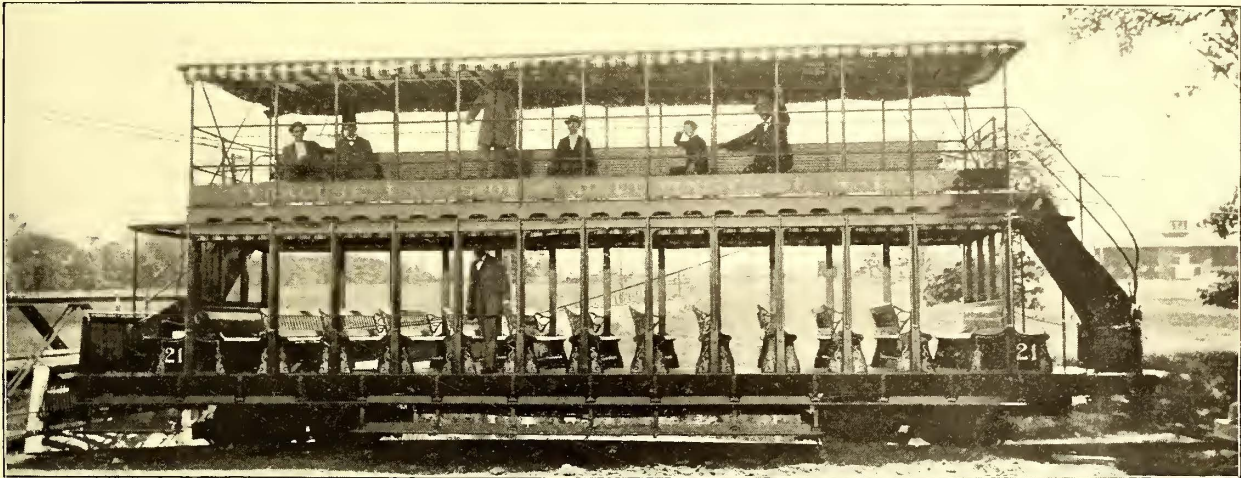
### Double Deck Cars in Syracuse

The Syracuse, Lakeside & Baldwinsville Railway Company has in operation four double-deck trolley cars, which are giving excellent satisfaction. H. S. Newton, general manager of the company, writes as follows concerning this new rolling stock:

"Our road at present is a summer line, having very heavy traffic at certain times. During last season we had quite a little trouble in handling this traffic satisfactorily with the ordinary type of cars, with trailers attached, and determined this year to make an effort to handle the people

this large mileage was that the flanges of one wheel of each pair had worn somewhat thin, and that the outer edge of the tread was chipped. The flanges were not so thin, however, as to require the removal of the wheels from the car, and the latter were kept in constant service until May 15, when one of the flanges was broken. Both pair were then removed from service, although the wheels at the other end of each axle were as strong and as sound as ever, so far as could be determined from inspection. The piece broken from the flange was about a foot long, and at the ends of the fracture showed silver-white iron. Between the ends the color of the iron was shaded between blue and purple, like that of pyrites of iron and pyrites of copper.

The facts as given by Mr. Hook tend to prove the theory that in most cases where the flanges of motor wheels break, especially after some service, the break does not indicate any defect in the metal, but is incident to the service. The difference in thickness between the flanges on one side and the other of the car must, of course, have been due to the grinding of the flanges against the rails in curving, and the location of the road must have been such as to bring this wear more to one side of the car than the other. This constant grinding on curves may be so severe as to heat the tread and flange of the wheel to an



DOUBLE DECK CARS IN SYRACUSE

more expeditiously in a new way. The result has been the construction of the four double-deck cars above mentioned, which are of the fifteen-bench, open type, very heavily constructed below, and with the upper compartment capable of holding, on a pinch, 100 persons. We have shown our ability on more than one occasion to carry off a good-sized crowd at one load on one of these cars. Altogether, I can say that this class of rolling stock has proven eminently satisfactory."

### Interesting Wheels Records in Los Angeles

There is considerable discussion as to the maximum mileage ever made by an electric car wheel, but if Los Angeles does not hold the record, it certainly comes very near doing so. T. J. Hook, superintendent of the Los Angeles Traction Company, reports that car No. 122, which is 38½ ft. long, and is mounted on Brill maximum traction trucks, recently completed 185,000 miles with the same full set of 33-in. driving wheels. The car weighs empty 11 tons, and the wheels were supplied by the Lobdell Car Wheel Company.

Up to January of this year the only effect noticed from

extent sufficient to start a fine crack at the base of the flange. The effect of this is naturally greater with a thin than with a thick flange, as the latter dissipates the heat more quickly. This crack in service gradually extends until a piece breaks out when some sudden thrust comes at that point against the flange.

The chill of a cast iron wheel is composed of crystals which are radial to the chill mould against which they are cast. This can readily be seen from any of the various photographic sections of wheels, which have been published in the STREET RAILWAY JOURNAL. These crystals naturally follow the radius of the flange, and, as the bases of these crystals have a cleavage, they easily separate under the action of heat. That this was the cause of the rupture in the case at Los Angeles is evidenced by the discoloration of the chill to a violet hue, which color can only be produced in the chill by heat. The chilled tread of wheels which are subjected to thermal tests show this conclusively. Another evidence of this is the fact that while a careful examination and the intentional breaking of the flanges of new motor wheels do not disclose the slightest evidence of a crack or any discoloration of the metal, the breaking of old wheels in this way frequently shows a condition of this kind.



# STREET RAILWAY JOURNAL

SEPTEMBER, 1899.

PUBLISHED MONTHLY BY

THE STREET RAILWAY PUBLISHING COMPANY

MAIN OFFICE:

NEW YORK, BEARD BUILDING, 120 LIBERTY STREET.

BRANCH OFFICES:

CHICAGO.....Monadnock Block.  
PHILADELPHIA.....929 Chestnut Street.  
LONDON.....39 Victoria Street, Westminster.  
PARIS.....50 Boulevard Haussman.  
COPENHAGEN.....V. Faber-Madsen, 9 Valby Langgade.  
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ST. PETERSBURG.....Alexander L. Lineff, Ligovka, 67-22.

Long Distance Telephone, "New York, 4044 Cortlandt."  
Cable Address, "Stryjourn, New York."

## TERMS OF SUBSCRIPTION.

In the United States and Canada.....\$4.00 per annum.  
In all Foreign Countries, per annum..... $\left\{ \begin{array}{l} \$6.00 \\ 25/ \\ 31 \text{ fr} \end{array} \right.$   
Subscriptions payable always in advance, by check (preferred), money order or postal note, to order of C. E. WHITTLESEY, Treasurer.

## NOTICE.

*Papers and correspondence on all subjects of practical interest to our readers are cordially invited. Our columns are always open for the discussion of problems of operation, construction, engineering, accounting, finance and invention.*

*Special effort will be made to answer promptly, and without charge, any reasonable request for information which may be received from our readers and advertisers, answers being given through the columns of the JOURNAL, when of general interest, otherwise by letter.*

*Street railway news and all information regarding changes of officers, new equipment, extensions, financial changes, etc., will be greatly appreciated for use in our Directory, our Financial Supplement, or our news columns.*

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*Address all communications to*

*The Street Railway Publishing Co.,  
Beard Building, 120 Liberty Street, New York.*

The October (souvenir) issue of STREET RAILWAY JOURNAL will be a "World's Practice Number," in which will appear a series of papers prepared by leading engineers throughout the world, describing practice in electric railroading in countries where development has been greatest. American practice will be illustrated by several papers upon various branches of the work done in Chicago. Louis J. Magee, managing director of the Union Elektricitäts Gesellschaft, of Berlin, will contribute an extensive and very valuable article upon "Electric Railway Practice in Germany;" Prof. Sidney H. Short will embody the results of his recent close examination of electric railway practice in Great Britain by an article on that subject; and papers upon practice in Russia, Switzerland and Argentina will be contributed by able engineers in the re-

spective countries. The financial characteristics of the large city railway systems of the world will be presented in tabular form, from late and accurate information obtained from original sources, and many other articles of the greatest present interest and value will appear in this number.

There appears to be a somewhat general impression among advocates of municipal ownership who have but superficially studied street railway statistics in our principal cities, that the large street railway systems of New York city are not paying their just burdens of taxation and that, in fact, they are paying almost nothing into the State and city treasury for the privileges which they enjoy. It is not uncommon even to learn from some of these ill advised and irresponsible moulders of public opinion that New York city franchises have been granted to their holders without any compensation whatever—that they have been free gifts to the corporations. The actual facts of the matter, however, as disclosed by a recent careful investigation of the tax records of New York city, are that one system alone is paying over \$1,000,000 annually to city and State in the form of taxes upon earnings, real estate and personal property, licenses, etc., and this \$1,000,000 amounts to over 8 per cent of the gross receipts. What would be thought if an income tax of 8 per cent was imposed upon the gross income of any citizen, or a tax of 16 per cent upon his net income?

The results of the tests of power brakes to be made this month on certain lines in New York city, under the auspices of the Board of Railroad Commissioners of the State of New York, will be looked forward to with great interest in the hope that a substantial and valuable contribution to existing data upon the braking of electric cars will be brought out. We understand that nearly fifty devices in all are to be tested, and manufacturers of air, electric and mechanical brakes of all kinds are taking great pains to comply with all requirements of the Board and to prepare their apparatus carefully to produce good results.

The coming two months are generally regarded by street railway managers as those in which the pressure in business is lightest upon them, and these months have therefore been generally selected for holding the various conventions. By this we do not mean that the lot of the railway manager is at any time an easy one, for he always has something to think about and worry over; but by the 1st of September the summer traffic has begun to wane, and until the end of October the immediate approach of winter and the holiday season, with their accompanying problems, are some distance off. For this reason the American Street Railway Association and many of the State associations have done wisely to select this time for holding their annual conventions. Of the State meetings, the two most numerous attended are those of New York and Pennsylvania; the former occurring at Ithaca, Sept. 12 and 13, and the latter at Lancaster, Oct. 4 and 5. To both a most cordial invitation by the respective officers has been extended, not only to the street railways of the State in which the convention is held, but to those of other States in case they may wish to attend, and also particularly to the representatives of manufacturers or the supply men engaged in



electric railway business. Both these associations have been most successful, and both have probably never been more prosperous or attained a larger membership than at present.

\* \* \* \* \*

It is not necessary at this time to dwell on the benefits which these organizations confer on the industry in general and on their own members. These benefits are too widely known and enjoyed to require further discussion here. There is one benefit, however, which can be derived from them that does not seem to be appreciated as much as it should be; and that is the opportunity which is given to individuals, among lesser known engineers, superintendents and other operating men in the business, particularly to the young men who have only recently engaged in the industry, to introduce themselves and their ideas to the "magnates" of the business. We know from personal experience that there are in the electric railway business, particularly among the small roads, a great many men whose ability warrants their holding more lucrative positions than they do at present. The owners and the responsible officials of the larger roads, on the other hand, are constantly on the lookout for assistants who can aid them in their enterprises. There is perhaps no business in which ideas and intelligence are more required than in that devoted to electric railroading, and none in which a possession of these qualities is more quickly appreciated by the important men in the business. The New York State Street Railway Association, in particular, established several years ago the practice of devoting the major part of its proceedings to short addresses and papers on timely topics. A long list of subjects, covering a wide field in the mechanical, electrical, operating and accounting branches, is published in advance of the meeting, and anyone who wishes to give his views on any of these topics is invited to do so, provided only they are to the point and not too long. In addition, however, it may not be generally known, but should be understood, that if anyone in the railway business has something to say upon any other topic connected with electric railways, not mentioned in the published list, the association would be glad to hear him, and an application to the president or secretary will insure the giving to him of the necessary time. If instead of presenting a paper he prefers to make his remarks orally the discussion is always open to him. What has been stated respecting the New York State Association is practically the same of all State associations which hold open meetings. We again urge, therefore, the bright men of the business to take advantage of the excellent opportunity thus offered to let their light shine before men, take an active part in the State associations to which their companies belong, and show the managers of the larger roads that they are capable of solving the problems which have come before them in the properties under their charge.

A peculiar incident in the testimony given at the investigation of the recent trolley accident near Stratford, Conn., was the evidence submitted by a man named Kelly. He stated that he was on the car at the time of the accident, and described graphically and with great detail his sensations when the car ran off the track, when it climbed the guard-rail, and when it took its final plunge over the bridge into the gorge below. He attributed his escape to the fact

that during the descent he fell outside of the car and landed in some mud. During the first few days of the investigation he was regarded with a great deal of interest by the members of the jury and the attendants, including the newspaper reporters. Subsequent testimony, however, proved that he was not on the car at all, but that he witnessed the accident while driving a carriage in the neighborhood. When confronted with this evidence Mr. Kelly did not deny it, but stated that his imagination overcame him to such an extent, and that he had thought so much about what he had seen, that he came to believe he was on the car itself. While in itself trifling, the incident simply proves the proposition which many jurists have held for a long time, that direct testimony is not only not as good as circumstantial evidence, but very often extremely unreliable, especially of events which happen during moments of great excitement. Leaving out of consideration entirely the wish for notoriety, or the desire to participate in damage suits by means of perjured testimony, some people, after a crisis of this kind, are so constituted that they come to actually believe that they have participated in or seen things which never occurred, and the most graphic description of some of the incidents is drawn entirely from their imagination, without any real intention to deceive. This fact is worth remembering in accident cases, and there are many cases on record similar to that cited above.

During the trial of a recent suit for damages brought by a water company against an electric railway company for alleged injury to the pipes of the plaintiffs through electrolysis, the attorney for the water company stated that all of the alleged damages were limited to the territory within 2000 ft. of the railway power station. Soon after this statement, the attorney of the railroad company arose and asked his opponents if their clients would sign a contract releasing the railway company in the future from all claims for damages to the water pipes from electrolysis outside of this district, provided his clients would agree to repair all troubles due to electrolysis within the region specified, viz., that within 2000 ft. of the station. After consultation with the managers of the water company, the attorney of the latter stated that the water company would be perfectly willing to agree to this condition. Before the contract was signed, however, the managers of the railroad company good-naturedly decided to be generous to their opponents and advised them not to sign the contract. When asked why, the railway managers said that if it was signed, they would immediately *reverse their current*, thereby *transferring* any possible trouble from near the station to the suburbs.

#### Comparative Costs and Profits of Cable, Electric and Horse Traction in New York City

In November, 1898, we published, from the private cost sheets of the Metropolitan Street Railway Company, of New York City, a comparative exhibit of the receipts and expenses in detail of the cable lines, the electric (underground conduit) lines and the horse railway lines of that important system, for the year ending June 30, 1898. We are now able to present, in comparison with these figures, those of the corresponding financial year just ended. The comparison is the more valuable, inasmuch as the track



mileage of the system is the same this year as last, so that the results are not complicated by the purchase of new lines or the building of extensions, but the full effect of the change of motive power and the giving of greater facilities may be seen reflected in gross earnings, while the results of the ageing of electrical apparatus and of certain other influences affecting operation during the year are shown in the detailed operating expenses.

On June 30, 1899, the company had 25.3 miles of track in operation by the cable system, the construction dating from 1893 and 1895; 82.1 miles of track in operation with the underground electric system, nearly all of which was opened from Nov. 1, 1897, to Oct. 1, 1898; and 113.4 miles of horse railway track. It will thus be seen that in both years, the results of which are now presented, there was serious interruption to traffic because of construction, the company last year losing three complete months' traffic on two of its most heavily patronized lines.

The first lesson to be derived from these figures is the way in which the public responds to increased facilities. In the last year the company ran its cars over the same trackage nearly 42,000,000 miles, as against but 35,000,000 miles in the previous year, the new cars being, moreover, nearly double the capacity of the old. The passenger receipts jumped nearly 25 per cent as a consequence, while the receipts per car mile were actually increased from 29.7 cents to 30.7 cents, or about 3 per cent. The traffic of the cable lines fell off about 10 per cent, and of the horse lines about 30 per cent, while the electric lines carried three times as many passengers in 1899 as in 1898, and their receipts per car mile increased from 26.99 cents to 31.23 cents.

Taken as a whole, the Metropolitan system operated last year at 15.18 cents per car mile, as against 15.83 cents in the previous year, and the earnings from operation have become 15.50 cents, as against 13.87 cents for 1898. The electric lines have made all of this increased net earning power, and have, in addition, overcome a combined diminution on the horse and cable lines of 1.15 cents per car mile.

The percentages of operating expenses to passenger receipts of the three motive powers compare as follows:

	1898	1899
	Per cent	Per cent
Cable .....	47.8	50.8
Electric .....	37.9	38.3
Horse .....	65.3	69.8
Total .....	53.3	49.4

Coming now to detailed operating expenses, we find much to study in the comparisons, and some things which require explanation. The winter of 1898-9 was an extremely severe one, the most so that New York has known since the great blizzard of 1888. It was not only that there were two or three severe storms to contend with, but there was a long succession of stormy conditions, and the snow was not off the ground for weeks at a time. This had a serious influence, not only in the item of "removing snow and ice and street cleaning," which increased from \$27,725 in 1898 to \$67,322 in 1899, but also in "renewals of cable" for the cable system, "tube cleaning" for both cable and electric systems, "repairs of cars, vehicles and electrical and cable equipment," and in lost traffic, the latter a very material figure, inasmuch as the system was

almost completely blocked for several days during the winter. During these heavy snow storms the cable lines were kept in almost continuous operation, but only at the expense of immense strain and wear upon the cables. During parts of the stormy period last winter a new cable on the Broadway line would last hardly more than a week.

As a result of these and other influences, including the ageing of apparatus, there has been a general increase in the cost of all three motive powers in the last year as compared with the previous one, and this increase is found in all of the main divisions of operating expenses with all three motive powers, except in "general expenses" for the cable system, and in "transportation" and "general expenses" in the horse system, which show slight decreases.

It will be noticed that in the power figures of the electric line appear a number of charges belonging to horse railroading, and it is again explained, as was done last year, that these are owing to a short crosstown horse railway line so joining a number of the electric lines as to make it impossible to consider it other than a part of the electric system. The cost of electric motive power proper, excluding these items, was 1.21 cents per car mile in 1898, and 1.57 cents per car mile in 1899. The company's new 70,000-h.p. power station was not in operation at all during the year, and is even now running but a single unit out of the ten to be installed, so that the advantage of economical power has not yet been obtained, but the company has been forced to use a number of temporary power stations with storage batteries, etc., and has been many times forced to work them above the economical limit, the demand for power at certain hours of the day severely taxing the station capacities.

In connection with these detailed figures of passenger operation pure and simple, which are the ones, of course, which will be of special interest to the street railway manager and engineer, it may be well to present a complete financial statement of the operation of the Metropolitan system for the last two years. In this statement the "receipts from all sources" include not only the passenger receipts, but those from advertising, dividends on stock of other companies held in the treasury, income from rental of offices in the power station buildings owned by the company, etc.; while the operating expenses of this statement are slightly larger than those in the accompanying table, by reason of items covering cost of caring for office buildings and a few other small charges. A complete statement follows:

	1898	1899
Receipts from all sources....	\$11,076,021	\$13,525,524
All operating expenses.....	5,620,484	6,408,711
Earnings from operation....	5,455,537	7,116,813
Per cent operating expenses		
to total receipts .....	50.7	47.4
Fixed charges .....	3,609,966	4,477,757
Dividends paid .....	1,500,000	2,471,675
Surplus over dividends .....	345,570	167,381

We cannot forbear to again speak of the generosity of the management of the Metropolitan Street Railway Company in freely giving to the engineering and street railway public valuable figures of this kind, thus throwing light upon the problems which both foreign and American cities are grappling with at the present time.



RECEIPTS AND EXPENSES OF THE METROPOLITAN STREET RAILWAY COMPANY, OF NEW YORK,

For the Years Ending June 30, 1898, and June 30, 1899,

SHOWING THE RELATIVE COSTS AND PROFITS OF CABLE, ELECTRIC AND HORSE RAILWAY OPERATION.

STREET RAILWAY JOURNAL.

SEPTEMBER, 1899.

ITEMS.	CABLE.				ELECTRIC.				HORSE.				TOTAL.			
	1898.		1899.		1898.		1899.		1898.		1899.		1898.		1899.	
	Amount.	Per Car Mile.	Amount.	Per Car Mile.	Amount.	Per Car Mile.	Amount.	Per Car Mile.	Amount.	Per Car Mile.	Amount.	Per Car Mile.	Amount.	Per Car Mile.	Amount.	Per Car Mile.
<b>GENERAL EXHIBIT.</b>																
Total passenger receipts.....	4,130,225	34.42	3,690,615	35.43	1,918,873	26.69	6,043,538	31.23	4,375,597	27.35	3,085,559	25.72	10,424,695	29.70	12,819,712	30.70
Passenger operating expenses.....	1,970,486	16.42	1,874,422	18.00	727,406	10.23	2,312,682	11.95	2,858,235	17.87	2,154,969	17.96	5,550,127	15.83	6,342,073	15.18
Earnings from passenger operation.....	2,159,739	18.00	1,816,193	17.43	1,191,467	16.76	3,730,856	19.28	1,517,362	9.48	930,590	7.76	4,868,568	13.87	6,477,639	15.50
<b>OPERATING EXPENSES IN DETAIL.</b>																
<b>MAINTENANCE OF WAY.</b>																
1 Repairs roadbed—track, labor.....	41,447	.35	44,891	.43	6,153	.09	25,796	.13	72,928	.46	58,810	.49	120,528	.34	129,499	.31
2 " " material.....	6,673	.06	4,685	.05	*105	..	4,223	.02	7,549	.05	14,462	.12	14,117	.04	23,370	.06
3 " " steel rails.....	200	..	375	..	954	.01	28	..	705	..	711	..	1,859	..	1,114	..
4 " " switches, cstgs., spikes, etc.....	10,108	.08	17,227	.17	3,128	.04	10,083	.05	5,507	.03	4,936	.04	18,804	.05	32,247	.08
5 " " ties and timber.....	287	..	14	..	148	..	746	..	2,304	.01	1,093	.01	2,739	..	1,854	..
6 Repairs overhead and underground construction.....	80,787	.67	82,411	.79	5,779	.08	22,978	.13	165	..	..	..	86,731	.25	105,389	.25
7 " " renewals of cable.....	189,391	1.58	239,481	2.30	..	..	..	..	..	..	..	189,391	.54	239,481	.57	
8 " " tube cleaners.....	11,758	.10	11,824	.11	4,230	.06	30,818	.16	..	..	..	..	15,988	.05	42,642	.10
9 " " oilers.....	40,708	.34	41,511	.40	12	..	..	..	..	..	..	..	40,720	.12	41,511	.10
10 " " gearsmen and splicers.....	21,240	.18	21,339	.20	..	..	..	..	..	..	..	..	21,240	.06	21,339	.05
11 Repairs of buildings.....	4,099	.03	7,783	.08	821	.01	11,853	.06	17,262	.10	13,695	.11	22,182	.06	33,331	.08
12 Removal of snow and ice, and street cleaning.....	15,328	.13	17,045	.16	2,731	.04	25,413	.13	9,666	.06	24,864	.21	27,725	.08	67,322	.16
Total.....	422,027	3.51	488,590	4.69	23,851	.33	131,938	00.68	116,145	.72	118,572	.99	562,024	1.60	739,099	1.77
<b>MAINTENANCE OF EQUIPMENT.</b>																
13 Repairs of cars and vehicles.....	68,768	.57	78,174	.75	28,687	.40	134,339	.69	61,449	.38	50,950	.42	158,904	.45	263,463	.63
14 " " electrical or cable equipment of cars.....	42,287	.35	37,380	.36	29,952	.42	90,320	.47	8	..	..	..	72,247	.21	127,701	.31
17 " " tools and machinery.....	1,714	.01	1,974	.02	152	..	2,562	.01	328	..	74	..	2,195	..	4,610	.01
Total.....	112,770	.94	117,528	1.13	58,792	.83	227,222	01.17	61,784	.39	51,024	.42	233,345	.66	395,774	.95
<b>POWER.</b>																
15 Repairs of steam plant.....	15,147	.13	19,396	.19	2,042	.03	8,148	.04	9	..	..	..	17,197	.05	27,543	.07
16 " " electrical or cable plant.....	12,395	.10	9,252	.09	824	.01	3,042	.02	3	..	..	..	13,221	.04	12,293	.03
18 " " harness.....	458	..	219	..	584	..	1,057	..	15,361	.10	13,964	.12	16,404	.05	15,240	.04
19 Stable equipment, supplies, etc.....	174	..	113	..	424	..	642	..	12,206	.08	8,594	.07	12,805	.04	9,349	.02
20 Renewals of horses.....	550	..	250	..	3,030	.04	750	..	62,440	.39	23,925	.20	66,020	.19	24,925	.06
21 Horse shoeing.....	571	..	352	..	2,477	.03	3,175	.02	80,933	.51	62,737	.52	83,981	.24	66,264	.16
22 Cost of provender.....	3,432	.03	4,081	.04	14,010	.20	15,575	.08	445,183	2.78	377,736	3.15	462,624	1.32	397,392	.95
23 " " feedmen—wages.....	92	..	270	..	1,687	.02	2,228	.01	40,419	.25	28,516	.24	42,198	.12	31,014	.08
24 " " removing manure.....	60	..	75	..	*85	..	*137	..	7,109	.04	6,637	.06	7,084	.02	6,575	.01
27 Hostlers, hutchers and stable help.....	2,485	.02	3,033	.03	12,795	.18	15,347	.08	347,855	2.18	271,283	2.26	363,134	1.07	290,163	.70
28 Engineers, firemen and power service.....	65,262	.54	64,342	.62	20,662	.29	63,480	.33	240	..	..	..	86,163	.25	127,822	.31
32 Fuel, power houses.....	104,912	.88	112,428	1.08	51,050	.72	188,455	.98	455	..	..	..	156,381	.45	300,883	.72
33 Light and other supplies at power house.....	15,471	.13	16,383	.16	5,370	.08	13,414	.07	59	..	..	..	20,900	.06	29,797	.07
34 Water tax.....	21,775	.18	19,383	.19	5,842	.08	27,300	.14	11,138	.07	8,691	.07	38,754	.11	55,374	.13
Total.....	242,784	2.02	249,577	2.39	120,675	1.70	342,974	1.77	1,023,408	6.40	802,082	6.69	1,386,867	3.95	1,394,634	3.34
<b>TRANSPORTATION.</b>																
25 Conductors, drivers, gripmen and motormen.....	711,630	5.93	652,262	6.27	353,127	4.97	1,083,104	5.60	1,156,395	7.23	837,390	6.98	2,221,151	6.33	2,572,756	6.16
26 Inspectors, starters, switchmen, etc.....	143,512	1.20	142,125	1.36	50,292	.71	166,515	.86	119,400	.74	93,411	.78	313,204	.89	402,051	.96
29 Car house exp. watchmen, car cleaners, oilers, etc.....	36,820	.31	37,848	.36	27,192	.39	93,205	.48	63,245	.40	44,829	.37	127,457	.36	175,882	.42
30 Car service—car lighting.....	39,227	.33	33,814	.33	1,142	.02	2,306	.01	11,690	.07	9,305	.08	52,059	.14	45,425	.11
31 " " oil, waste, etc.....	12,932	.11	11,634	.11	5,158	.07	19,991	.10	7,191	.04	3,574	.03	25,281	.07	35,198	.08
Total.....	944,120	7.87	877,683	8.43	437,111	6.15	1,365,121	7.06	1,357,921	8.49	988,508	8.24	2,739,153	7.81	3,231,312	7.73
<b>GENERAL EXPENSES.</b>																
35 Salaries of officers and clerks.....	30,359	.25	28,123	.27	11,051	.16	35,831	.19	1,938	.26	29,308	.24	83,348	.24	93,262	.22
36-40 Injuries and damages.....	150,325	1.25	59,474	.57	43,829	.61	101,968	.53	79,076	.49	50,711	.42	273,229	.78	212,154	.51
41-48 Other general expenses.....	68,099	.57	53,446	.51	32,100	.45	107,628	.56	177,962	1.11	114,764	.96	278,162	.79	275,837	.66
Total.....	248,784	2.07	141,043	1.35	86,978	1.22	245,428	1.27	298,976	1.87	194,783	1.62	634,738	1.81	581,253	1.39
Total operating expenses.....	1,970,486	16.42	1,874,422	17.99	727,406	10.23	2,312,682	11.95	2,858,235	17.87	2,154,969	17.96	5,550,127	15.83	6,342,073	15.18
Car mileage run.....	11,991,404		10,416,079		7,110,090		19,347,978		15,994,912		11,996,799		35,096,406		41,760,856	

\* Surplus account.



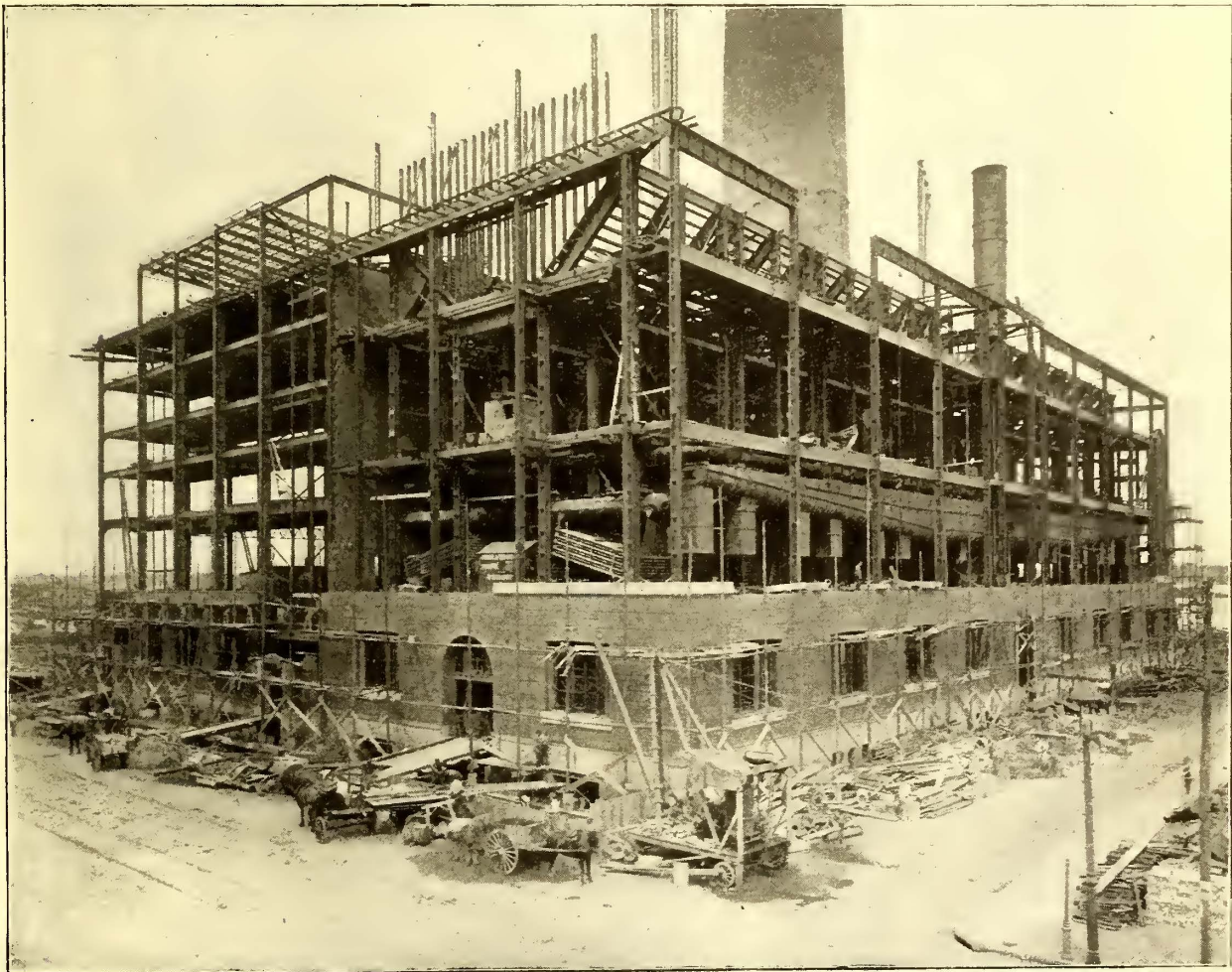
### Power Station of Metropolitan Street Railway Company

The work on the main power station of the Metropolitan Street Railway Company, of New York, has been carried on continuously since the construction was decided upon about two years ago, and the building is now nearing completion. Frequent reference has been made in the STREET RAILWAY JOURNAL to the power station, and the fact that during the last month the first of the large engines which are now being installed was turned over by steam makes the present time a fitting one to publish a short description of the work which has already been performed, and to give a number of views showing the present condition of the work.

The station is located on the extreme eastern side of the city, between Ninety-fifth and Ninety-sixth Streets, and First Avenue and the East River. While somewhat out-

being 37 ins. in diameter at the center, and having an opening 16 ins. in diameter extending the entire length. The journals are 34 ins. x 60 ins. The fly-wheels of these engines are 28 ft. in diameter, and are made up with a cast-steel rim 2 ft. 5 ins. deep and 2 ft. 4½ ins. wide, to which are riveted eighty 1½-in. steel plates at each side, making 160 plates in all. The engines can develop 4500 i.h.p. at greatest economical load, and will be able to work continuously at 6000 h.p. if required, and for a short time to work at 7000 h.p. Each engine is directly connected to a 3500-kw. General Electric generator. This machine has forty poles, and will have a frequency of twenty-five cycles at 6600 volts, and will operate at 75 r.p.m. At present the engine room contains three Ideal engines for operating exciters, and two 1200-h.p. engines supplied by the Pennsylvania Iron Works for temporary service.

The power room will contain eighty-seven Babcock &



VIEW OF NEW MAIN POWER STATION, METROPOLITAN STREET RAILWAY COMPANY, NEW YORK

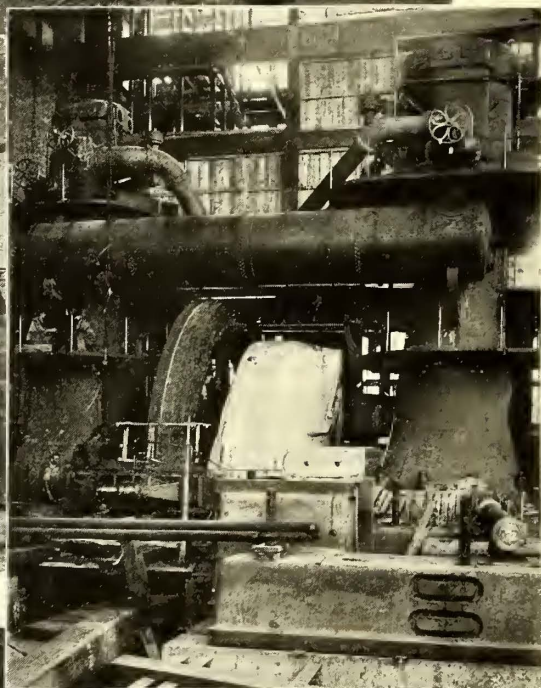
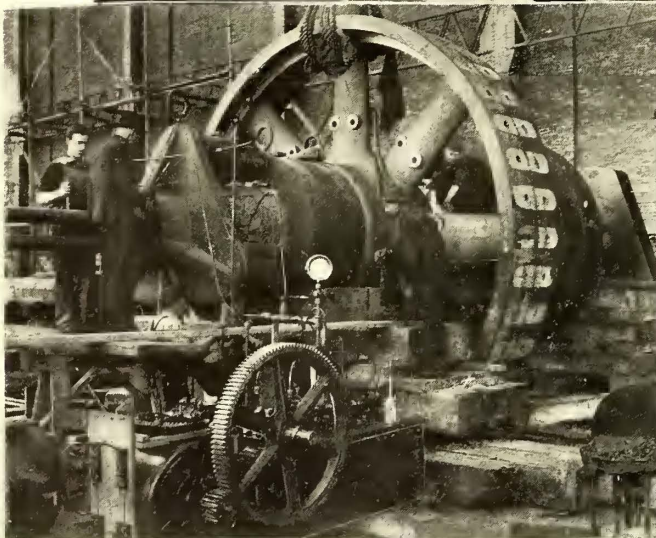
side of the center of distribution, it offers the best of facilities for the handling of fuel and ashes and for obtaining water for condensing purposes. As the alternating system of current distribution at high potential will be used, the losses in transmission, on account of the location of the station outside of the center of gravity, will be trifling compared with the other advantages secured at this point.

The building is of brick, with steel trusses and framing, and occupies a space of about 201 ft. by 279 ft. The engine room will occupy the northern end of the building, and will be about 110 ft wide and 200 ft. long on the short side. It will contain eleven vertical cross-compound condensing Allis engines,—the largest of any kind ever built in this country. The cylinders are 46 ins. x 86 ins. x 60-in. stroke, and the distance from the foundation to the top of the cylinder is about 38 ft. 3 ins. The shaft is hollow,

Wilcox water-tube boilers in three tiers of twenty-nine boilers each. Each boiler will have a rated capacity of 250 h.p., with (ultimate) capacity of 400 h.p. Over the boiler room, extending the entire length of the building, is a steel coal storage bin, with a capacity of about 9000 tons. The piping is extra heavy throughout, and was installed by the Walworth Manufacturing Company and Best, Fox & Company. The joints are of the Van Stone type, and Walworth valves are used throughout. A Mead coal conveyor is being installed and a Sellers' traveling crane operates the entire length of the engine room.

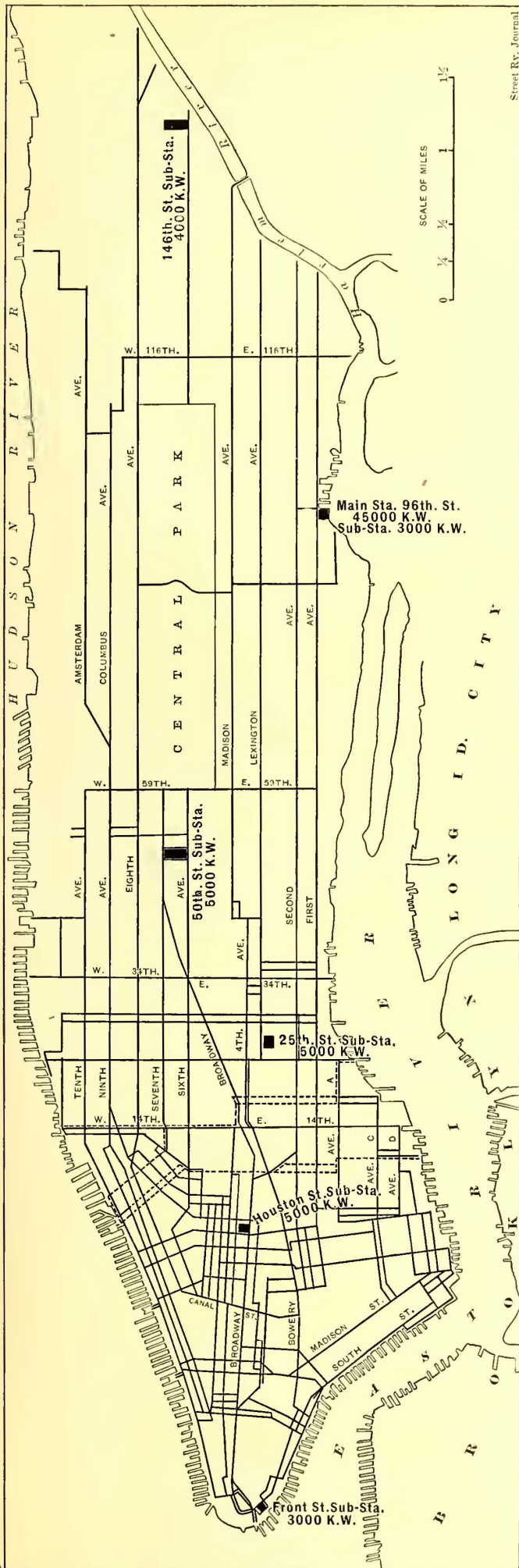
One of the interesting features of the station is the chimney, which is stated to be the largest in the world and the tallest on this continent. It is 353 ft. in height, with a 22-ft. core. The concrete foundations for this stack are 85 ft. square, and are carried down to a depth of 20 ft. be-





VIEWS SHOWING CONSTRUCTION OF NINETY-SIXTH STREET STATION





MAP OF NEW YORK CITY, SHOWING LINES AND STATIONS OF THE METROPOLITAN STREET RAILWAY COMPANY

low the level of the station. At this depth piles were driven, spaced 2 ft. 3 ins. and 2 ft. 6 ins. apart; 1345 piles altogether were driven in this space, after which the pit was filled with a mixture of one part cement, three parts sand and five parts broken stone, making a block of concrete 85 ft. square and 20 ft. in depth. The chimney, which is built upon this block, contains 3,600,000 bricks and weighs 8540 tons.

The accompanying map shows the location of the sub-stations to be used in connection with the main station at Ninety-sixth Street. These stations run in sizes from 3000 to 6000 kw., as follows: 146th Street, 4000 kw.; Ninety-sixth Street, 3000 kw.; Fiftieth Street, 6000 kw.; Twenty-fifth Street, 5000 kw.; Front Street, 3000 kw., and Houston Street, 5000 kw. The main generating station, as stated, has a capacity of 45,000 kw. Two more stations will probably be located in the lower end of the city a little later, possibly on new plots to be purchased.

Storage batteries will be used extensively, thereby increasing the capacity of the stations, but the sizes of the batteries to be employed have not yet been fully determined.

### Important Electric Railway Recently Opened in Switzerland

The first electric trunk line in Switzerland was put in operation recently. It extends between Burgdorf and Thun, and is, with exception of the Chavornay-Orbe Road, which is only 4 km. (2.6 miles) long, the first road in Switzerland to be operated by electricity under steam railroad conditions. Up to the station of Hasle it uses the track of the Emmenthal Railroad. From that point it branches off and enters the Biglen Valley, in which are located the villages Schafhausen, Bigenthal, Walkringen and Biglen, and meets the Berne-Lucerne branch of the Jura-Simplon Railroad at Konolfingen. The new road then follows the Kirsbach River to Thun.

The electric power for the operation of the road is generated at Spiez, on the Thuner See, and is in the form of three-phase alternating current at a pressure of 15,000 volts. The current is led into Thun by lines strung on iron poles, and from Thun to Burgdorf, on wooden poles located adjacent to the roadbed. Fourteen transformer stations, with a maximum capacity of 450 kw., reduce the pressure from 15,000 volts to 750 volts alternating current, which is directly employed for the operation of the road. The trolley line consists of two hard drawn copper wires 8 mm. in diameter, and the rails form the third conductor.

The rolling stock of the road consists at present of six motor cars, weighing 32 tons, and a corresponding number of trailers. The motor cars will seat sixty-six persons. To each one of these cars an ordinary car seating fifty-five persons, of the second and third class, can be attached. The speed is 36 km. (22 miles) per hour. All cars are equipped with hand and Westinghouse brakes, and are electrically lighted. The motor cars are electrically heated, while the trailers are warmed either by electricity or steam.

For the freight traffic two electric locomotives are in service, each of which can transport 100 tons on the steepest grades (2.5 per cent). Each locomotive is equipped with two motors of 150 h.p. each, and can attain a speed of 18 or 36 km. (11—22 miles) per hour. The company also proposes to provide a small equipment of standard steam locomotives for emergencies and times of extra traffic. For this reason steam heating has been provided for in the trailers, besides the electrical method.

Between Burgdorf and Thun are thirteen way stations. As the line is 41 km. (25.4 miles) long, the average dis-



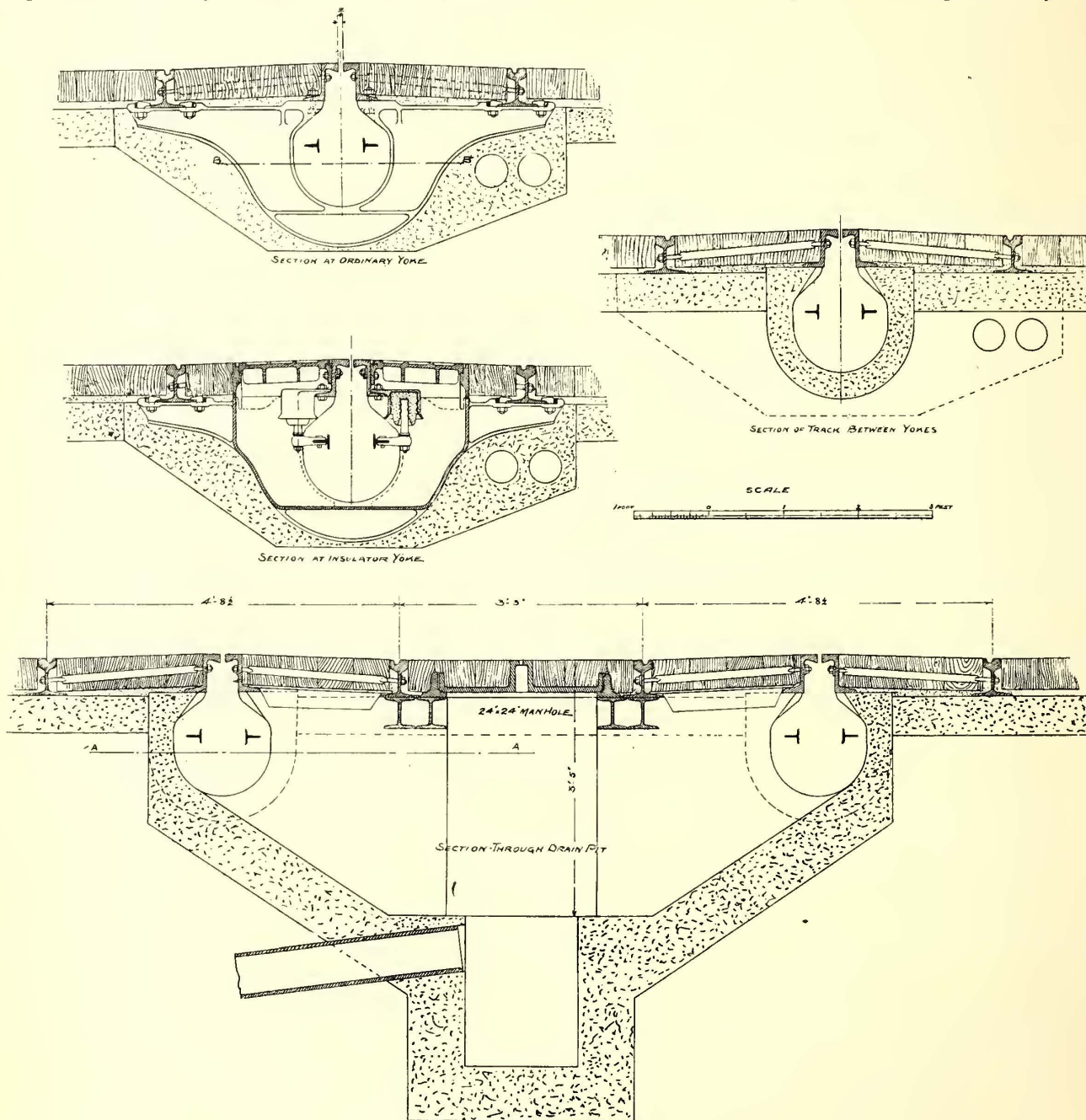
tance between the stations is 3 km. (1.8 miles), with a speed of 36 km. (22 miles) per hour. Stops are made about every five minutes. The depots are simple in construction, but are, nevertheless, handsome and practical. They are all lighted by electricity.

◆◆◆  
**Wages at Hull, England**

The City Council of Hull, England, has fixed upon the following scale of wages for its employees: The time required per week is seventy hours, which, however, includes

**Plans of the London United Tramways Company**

The most important tramway work now being projected in London is that of the London United Tramways Company, occupying the district extending from Hammersmith to Hounslow and Hamton Wick on the southern boundary of the city, and from the Central London Railway terminus at Shepard's Bush and Hanwell to Uxbridge on the north. With the junction line uniting these tramways this system amounts to about 75 miles of track, covering 39 miles of street. Of this about 27 miles are in operation by horses.

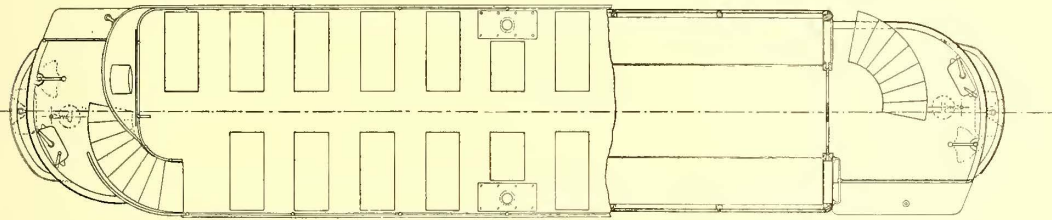
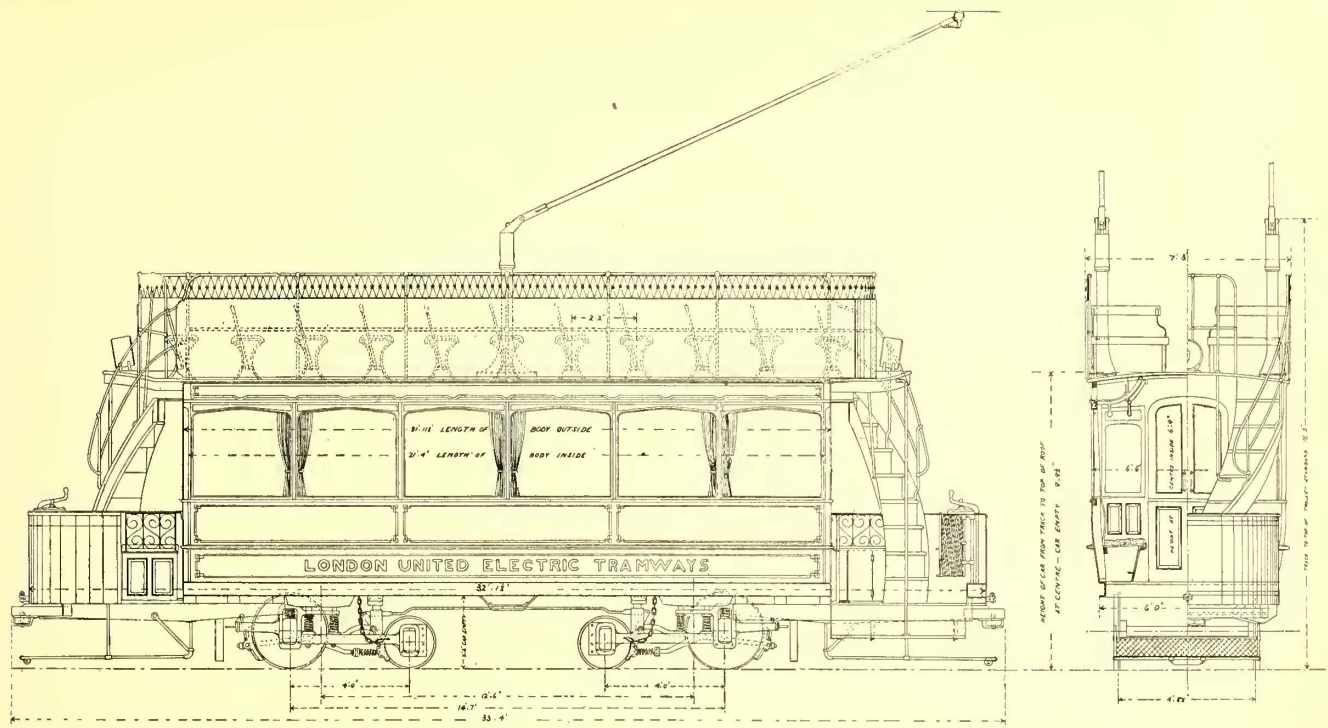


SECTIONS OF CONDUIT CONSTRUCTION

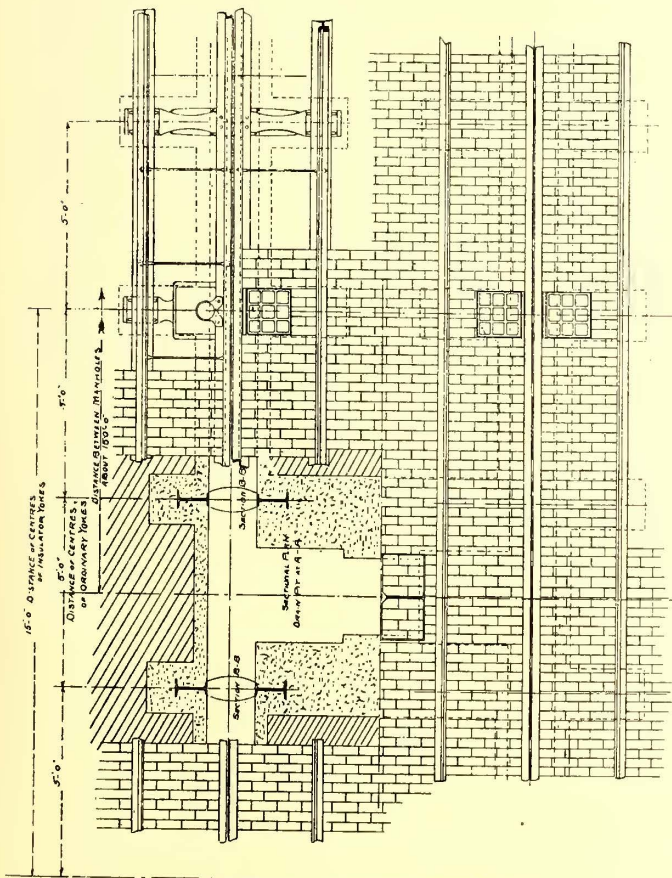
the time allowed for meals. Inspectors receive 30s. (\$7.20) per week, and for each year of service one additional shilling per week up to 40s. (\$9.60). Motormen start with 28s. (\$6.72) per week, and are raised to 35s. (\$8.40). They also receive 6d. (12 cents) for each hour overtime. Conductors receive 18s. (\$4.32) per week, and are raised to 25s. (\$6). For overtime during the first three years they receive 4d. (8 cents) per hour, later 4 1/2d. (9 cents). Barn hands receive 21s to 25s. (\$5.04 to \$6) per week; stove attendants, 28s. to 30s. (\$6.72 to \$7.20); laborers, 25s. to 27s. (\$6 to \$6.48) per week. The city furnishes the uniforms.

The plans of the company for electrical construction were described fully in an article in the STREET RAILWAY JOURNAL for July, by J. Clifton Robinson, managing director of the company. Both the trolley and underground systems will be used. The former will cover about 20 miles, and is now under construction. It will be located, of course, in the suburban portion of the route. The road will be operated on the three-wire system, and two trolley wires will be carried over each track, making a complete metallic return. The two inside wires will be inter-connected, and will form the neutral pole of the system. The

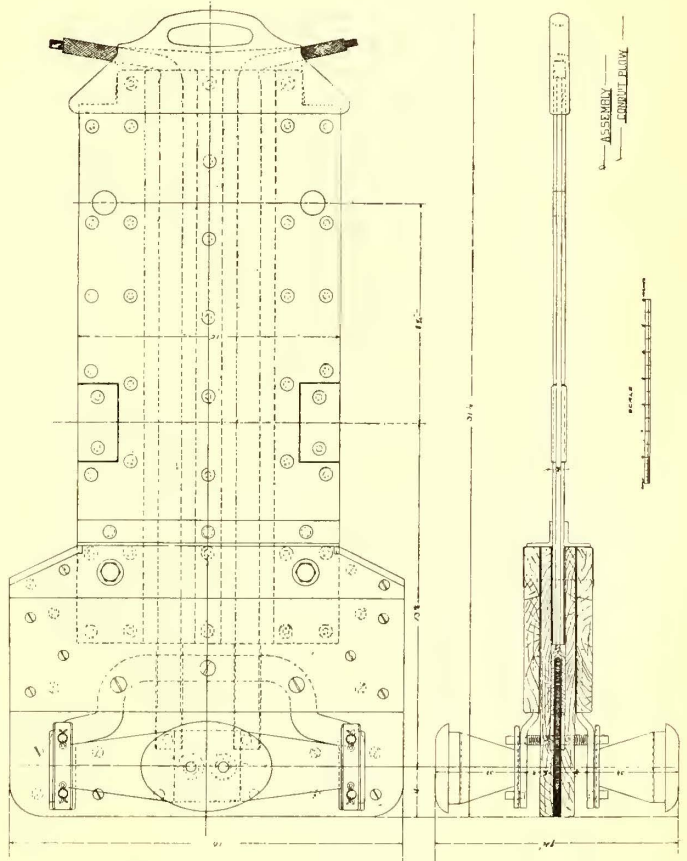




PLAN, SECTION AND SIDE ELEVATION OF CAR



PLAN OF CONDUIT CONSTRUCTION



SIDE ELEVATION AND CROSS SECTION OF PLOW

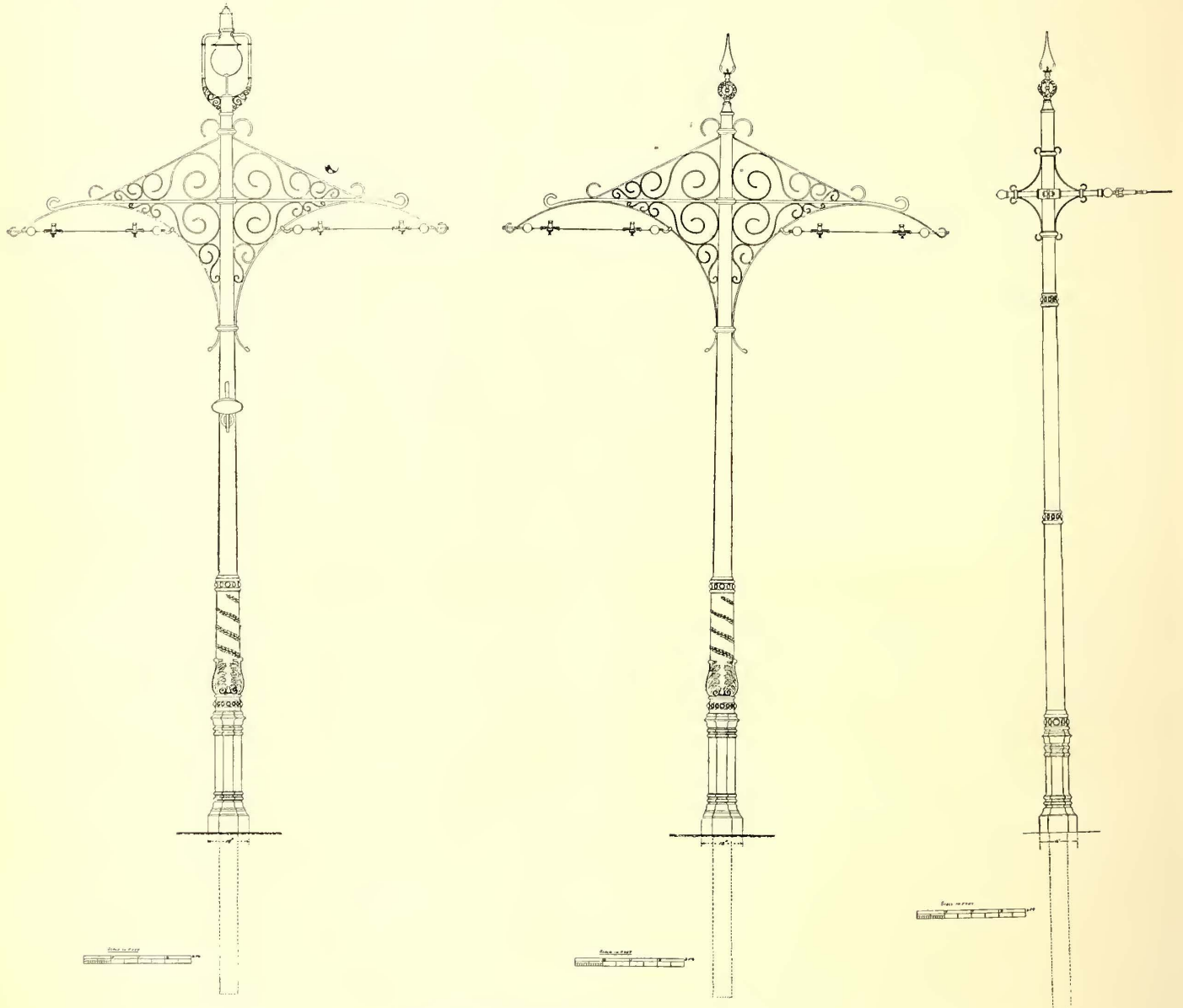


overhead wires will be divided into half-mile sections, and, in order to meet the Board of Trade requirements, each  $1\frac{1}{2}$  miles of the line will be supplied by an independent feeder running direct to the power station. The neutral return will also be reinforced for each section of a mile and a half by a separate feeder.

The power station will be at High Road, Chiswick, and will have a capacity of 5000 h.p. The engine room will contain at present three 750-h.p. engines, each driving a 500-kw., three-phase 500-volt generator, with a frequency of 25 cycles per second. The section farthest from the center of the line, about 8 miles distant, will be operated

The underground conduit system will be similar in general features to that used in New York, with cast iron yokes every 5 ft., and concrete sub-struction. Hand-holes will be located every 15 ft. and man-holes about every 150 ft., depending upon local conditions. The slots will be  $\frac{3}{4}$  in. in width, and the conductors will be T irons, held in depending porcelain insulators similar to those employed in New York and Washington. The plow will provide a sliding contact by means of shoes held against the contact rails by spring pressure.

The cars will be double decked, mounted on maximum traction trucks. They will be 33 ft. 4 ins. over all, with



STANDARD BRACKET AND SPAN POLES

by a sub-station, to which the alternating current will be carried by underground feeders. In this station will be seven transformers of 150 kw. each, and four rotary converters of 200 kw. each, which will deliver the current to the line at 550 volts. The converters will be electrically connected, so as to act both as converters and balancers. In case one side of the three-wire system is overloaded the converter will act on the opposite side as a motor, and thus assist the overloaded machine. The line poles will be extremely tasteful in design. As shown in the accompanying engravings, they will be of three types, one a span wire pole of three sizes, measuring respectively 16 ins., 18 ins. and 20 ins. at the base; and two bracket poles, one surmounted by an arc light.

length of body outside 21 ft.  $11\frac{1}{2}$  ins., and length of body inside 21 ft. 4 ins. The width of the car at belt rails will be 6 ft. 6 ins., and the height from the track to the top of the roof, when the car is empty, 9 ft.  $9\frac{1}{2}$  ins. From the track to the top of the trolley standard the height will be 15 ft. 2 ins. The cars will be equipped with cross-seats on the top and longitudinal seats inside. H. F. Parshall is consulting engineer for the company.

The economic and social results which are to follow from the development of the electrical street railway are only second in importance to those which have followed from the development of the steam railroad. From address at the Boston Convention, 1898.



**Electric Rail Welding in Buffalo**

The work of electric welding 7500 rail bonds in Buffalo for the International Traction Company, referred to in a recent issue, is now well under way, and about 2500 joints have been made up to date. The method employed is the

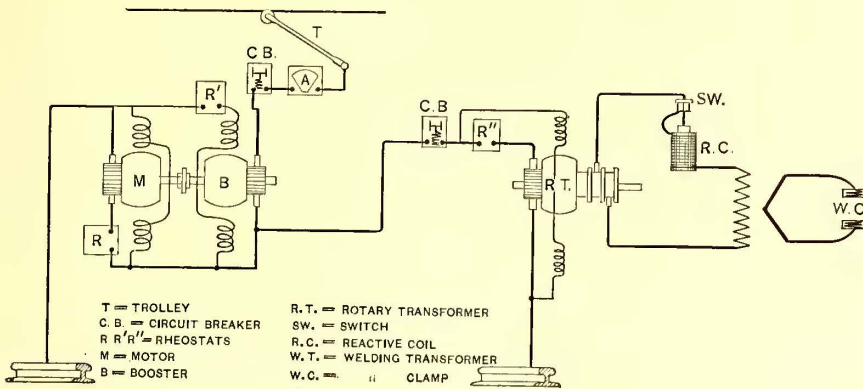


DIAGRAM OF CONNECTIONS FOR RAIL WELDER

**Method of Checking Fares on Interurban Railways**

A most complete system of auditing railroad tickets, cash fare receipts, checks, etc., is employed by the Dayton & Western Traction Company. It is the invention of J. W. Lutz, cashier of the company, and seems to be well

Lutz's Universal Auditor No. 2.

1	11	21	31	41	51	61	71	81	91
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9
10	20	30	40	50	60	70	80	90	100

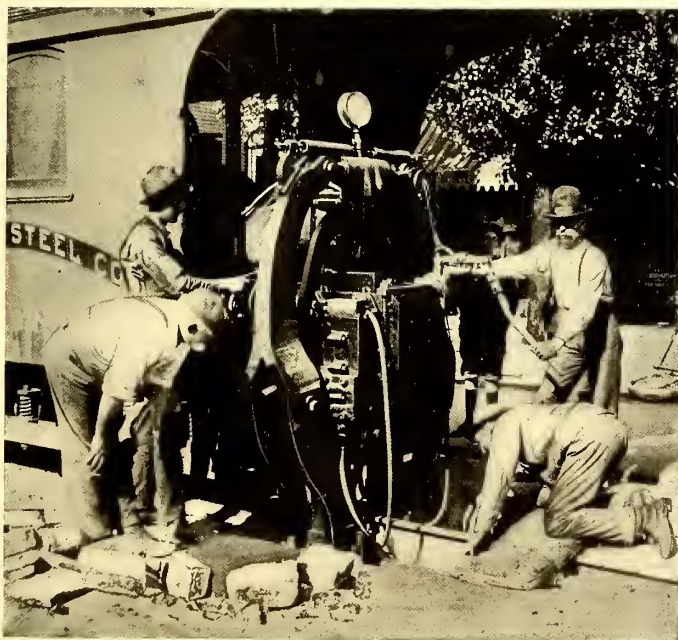
FORM OF TABLE

improved system of the Lorain Steel Company, described fully in an article by Mr. Kleinschmidt in the May issue of the STREET RAILWAY JOURNAL.

The outfit in use in Buffalo consists of five cars, one of which is the welding car, the second a rotary transformer car, the third the booster or motor car, the fourth car is a sand and ballast car, which goes in advance of this train and prepares the joint for welding, and the fifth car, which

adapted to long electric lines, where a variety of fares is employed. It affords a complete check on conductors and agents, as by it no ticket can be a total loss to the company. Duplicates turned into the office do not need to be counted and placed consecutively, and no other record than the checking described is used.

A sheet of paper 17 ins. x 24 ins. is printed or stamped with sixty tables, each similar to that shown above.



FRONT VIEW OF RAIL WELDING MACHINE

is equipped with a motor and emery wheels for grinding down any inequalities of the joints.

The connections of the apparatus used are shown in the accompanying diagram. The welding transformer primarily is run at 300 volts, and the voltage at the welding plant terminals is from 5 to 7 volts. The current used for the welding runs as high as 25,000 amperes. The use of the rheostat is to enable the attendant to raise the voltage of the machine by any amount desired to compensate for any lack of line voltage.

<b>Dayton &amp; Western Traction Co. CASH FARE RECEIPT</b>				<b>Dayton &amp; Western Traction Co. RETURN PASSAGE</b>			
Good for One	Fare Collected			Fare Collected			Good for One
Continuous Ride	5	30	55	55	30	5	Return Passage
between	10	35	60	60	35	10	to Station
Stations where	15	40	65	65	40	15	Indicated by
Fare Collected is	20	45	70	70	45	20	Double Punch
Punched.	25	50	75	75	50	25	Mark.
<i>Valentine Winters Gen'l Mgr.</i>				<i>Valentine Winters Gen'l Mgr.</i>			
<b>A</b>	<b>17304</b>	<b>HALF FARE</b>	<b>HALF FARE</b>	<b>A</b>	<b>17304</b>		
5	10	15	20	25	30	35	40
SOLDIERS' HOME	UNION ROAD	NEW LEBANON	JOHNSVILLE	COUNTRY LINE	WEST ALEXANDRIA	BONTAS FORD	EATON
DAYTON							
45	40	35	30	25	20	15	10
45	40	35	30	25	20	15	10
45	40	35	30	25	20	15	10
45	40	35	30	25	20	15	10

FORM OF TICKET

These are numbered consecutively, and as each table represents 100 tickets, a sheet of the size mentioned represents 6000 tickets, or numbers. If 21,001 is the number of the ticket first to be checked then the first table would, of course, be numbered 210(00) and the sheet would then be ready for checking all tickets between 21,001 and 27,000



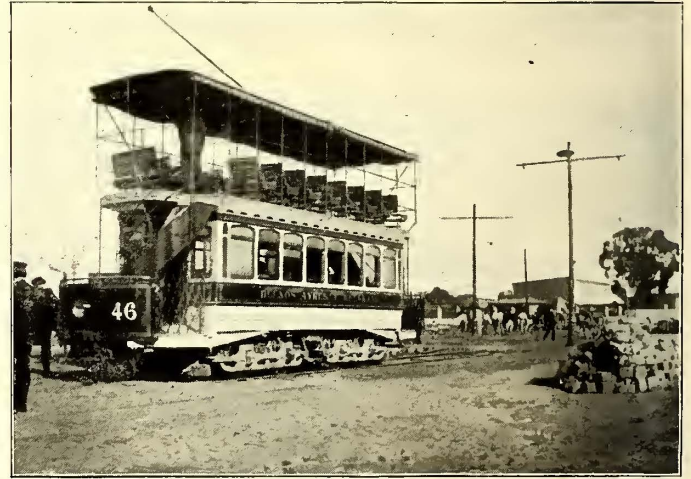
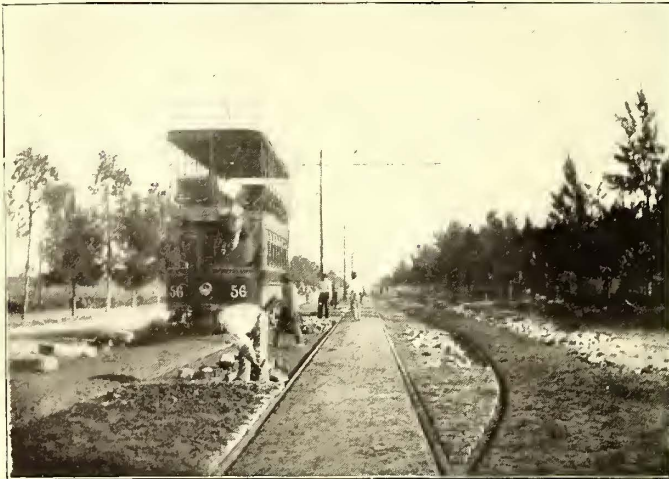
inclusive. It will also be noticed that the table has a blank line at the top. On this is entered the name of the conductor or agent to whom the 100 tickets represented by the table are issued. The Dayton & Western Traction Company has adopted a rule that where a ticket is not accounted for within a certain length of time, the person to whom it was issued pays for it just as if he had collected the fare for it. This makes conductors careful, cautious and accurate.

The form of ticket below shows the company's standard form of cash fare receipt and return trip tickets. It consists of two parts, as shown. Where a cash fare is paid, the points between which the ticket is issued are punched, together with the charge for a single fare. The left hand half is then given to the passenger and the right hand half is turned in to the company, hence it can never be used. Where a round trip ticket is purchased, the points between which the ticket is issued and price paid are punched, but the right hand half is given the passenger and the left hand half returned to the office. The portion given to the passenger is then good for a return trip, and is taken up by the conductor of the car by which the trip is made. Half fares are indicated by punching the space marked "half fare."

The auditing system is copyrighted, and the form of ticket shown has been patented by Mr. Lutz.

### Electric Railway Construction in Buenos Ayres

The work on the construction of the Buenos Ayres & Belgrano Electric Tramway, which is being carried on



DOUBLE DECKED CARS AT BUENOS AYRES

under the instruction of Messrs. Kincaid, Waller & Manville, of London, is approaching completion. Six miles of this line are now open, and the financial results have been most satisfactory. Current is obtained from a French electric light company.

Both single and double deck cars are used. They were supplied by Jackson & Sharp, The J. G. Brill Company and Barney & Smith, and are mounted on Peckham trucks.

The first engraving shows a view of one of these cars taken opposite the Hippodrome, where a long siding was installed to care for the extra traffic. As will be seen, double bracket poles are used, the bracket on one side extending across two tracks. The second engraving shows a car at Portones.

It is reported that the Westinghouse Company has received a large order for electric railway apparatus to be used at the Paris Exposition in 1900.

### A German Definition of a Railroad

During a recent law suit in Germany for injuries sustained through a railroad accident the question arose as to the true definition of a railroad. The highest German court, the Imperial Court at Leipzig, has given the following:

"A railroad is an enterprise whose function is to transport persons and merchandise over comparatively long distances upon a metallic roadway, which, in view of its peculiar construction and ease of operation, can transfer great weights and permit a high rate of speed during this transportation by employing natural forces (such as steam, electricity, animal and human muscular power), including in some instances the weight of the operating agent, and, under certain circumstances, is able to render considerable service, as well as be dangerous to human life and health."

### Stiffening a Stairway

Where room is at a premium, as it frequently is in car shops and barns, the spiral stairway is an economizer of space, but the problem arises how to make safe the railing necessary around such stair openings. A cheap and easily applied method is to put up a light fence of  $\frac{7}{8}$ -in. sheathing, using a 2-in. x 4-in. rail near the top of the boarding, and, perhaps a light cap on top, the bottom of the sheathing to be nailed to the floor with a quarter-round one on both sides. To strengthen this light construction, run a 1-in. pipe around inside the sheathing, the pipe being either put

together with elbows, or, what is better, the corners bent in the smith's forge. Holes are drilled even 12 ins. or 15 ins., and common wood screws or carriage bolts used for fastening the pipe to the 2-in. x 4-in. rail above mentioned. In most cases, it will not be necessary to fasten the pipe to the wall or floor, as it stiffens the woodwork sufficiently without such fastening. But if desirable, the pipe may be fastened to the wall by means of a flange screwed directly to the end of the pipe or to the floor by means of an inserted T and a drop leg thereto.

The method of lubrication largely affects the life of brasses. After long tests with various lubricants the writer has discontinued entirely the use of grease on armature brasses, and in most cases on axle brasses, a good grade of engine oil, supplied through wicks, being more satisfactory and economical. From paper at the Boston Convention, 1898.



## Plymouth Electric Tramways

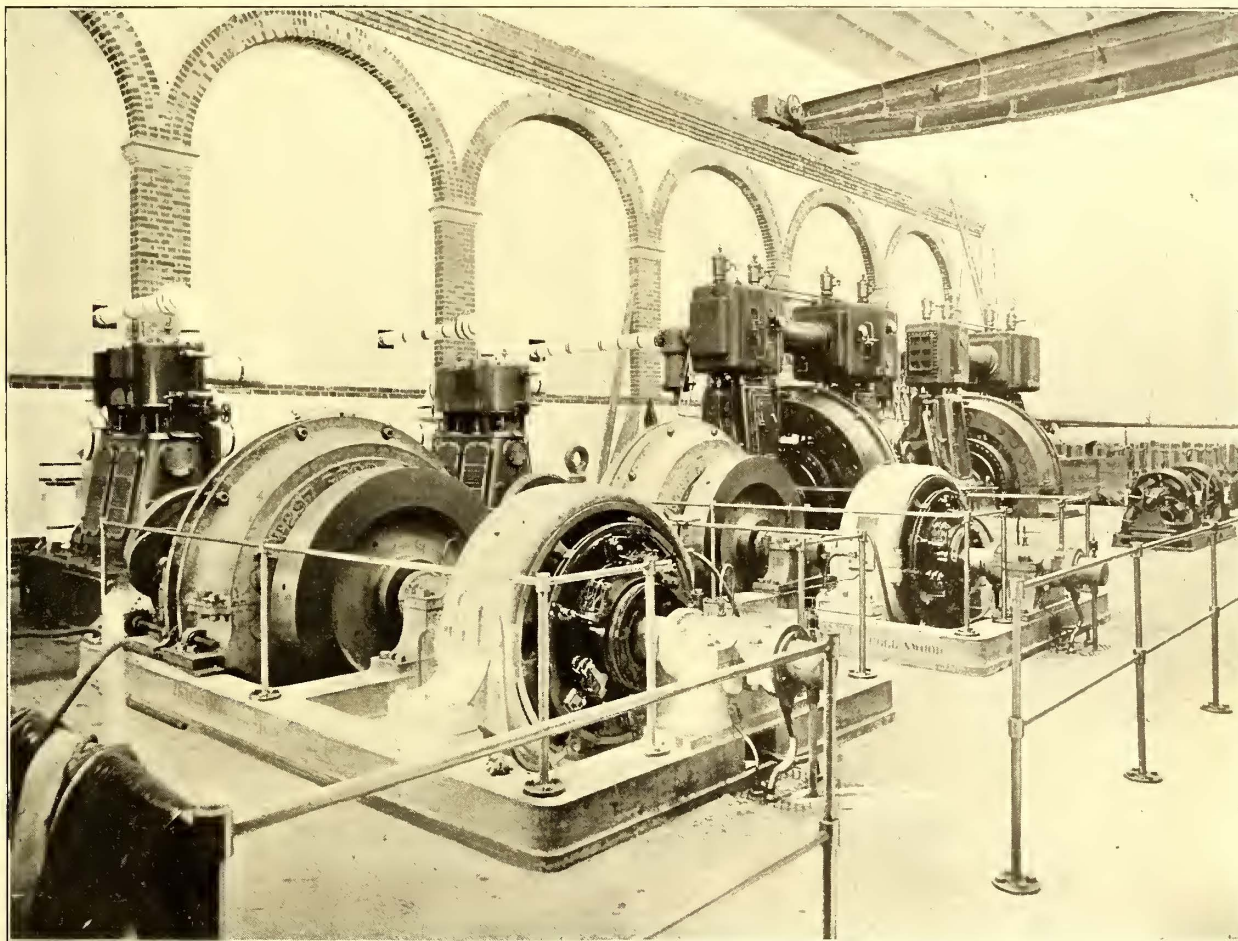
(By Our Special Correspondent.)

Plymouth, the first town in England to be incorporated by act of Parliament (so long ago as Nov. 12, 1439) is among the first of the great towns in England to adopt electric traction on its corporation tramways. The system will, I think, compare favorably with any now in operation.

Plymouth has an interesting municipal history. It possesses the oldest municipal water works, authorized by an act passed in 1585 through the influence of Sir Francis Drake, the celebrated navigator, who was then mayor. In 1892 the corporation acquired the tramways and in February, 1896, unanimously appointed J. Hall Rider, A. M. Inst. C. E., etc., its electrical engineer. Mr. Rider,

The accompanying map shows the existing electric lines in solid black, horse lines, authorized for conversion to electricity, in dashed lines, and proposed new electric extensions in dotted lines. Horse cars have been running for some time on the electrically equipped route from the Theatre Royal to Prince Rock. The length of this section is 3 1-10 miles of single track. The lines are double nearly all the way, and were laid by the corporation. The rails are grooved girder section, 92 lbs. to the yard and 30 ft. in length. Probably 60-ft. rails will be used in future extensions. Each joint is bonded with three No. 000 Chicago bonds 30 ins. long. The tests of the conductivity have given most satisfactory results.

The electrical equipment of the tramways was undertaken by the Westinghouse Company, who sublet the overhead construction to R. W. Blackwell & Co. The de-



INTERIOR OF POWER STATION, PLYMOUTH, ENGLAND

upon his arrival at Plymouth, was at once called upon to prepare plans and specifications for the proposed electric supply works, and these, the first works in this country, designed primarily for running the tramways, combined with the lighting of the town, are now completed.

They have been built on corporation land, with rocky subsoil, at Prince Rock on the Cattewater, as the estuary of the river Plym is called, and immediately adjoining will be constructed a refuse destructor by contract with Goddard, Massey & Warner, who are guaranteeing 280 i.h.p. per hour. This destructor will be used for the tramways and the electricity committee will pay the works committee (who are responsible for the destructor) at the rate of ¼d. per kw. hour of electric energy produced. This arrangement will mean economy to both committees, as it will bring some £1560 to the credit of the destructor and is a much cheaper rate for the electricity committee than could be secured by independent action.

tails were designed by Mr. Rider to suit the character of the road, and no fewer than five different methods of carrying the wires have been employed, viz: (1.) Side bracket arm, carrying both wires on one side of bracket. (2.) Side bracket arms on both sides of track, each carrying one wire. (3.) Span wire from pole to pole. (4.) Span wire from pole on one side of rosette fixed to building on other, and (5) span wire from rosette to rosette.

Owing to the great number of telegraph and telephone wires, guard wires will be put up over more than half the route. This rather detracts from the exceptionally neat and workmanlike appearance of the overhead construction, which is helped, in no small degree, by the handsome bracket arms, the wrought iron scroll work of which is most effective. This scroll work was designed by E. G. Okell, Mr. Rider's chief assistant, who has been associated with him throughout the designing and construction of the works. He, Mr. Rider and W. T. Tester, the con-



tractor's resident engineer, are to be warmly congratulated on the successful results of their combined efforts.

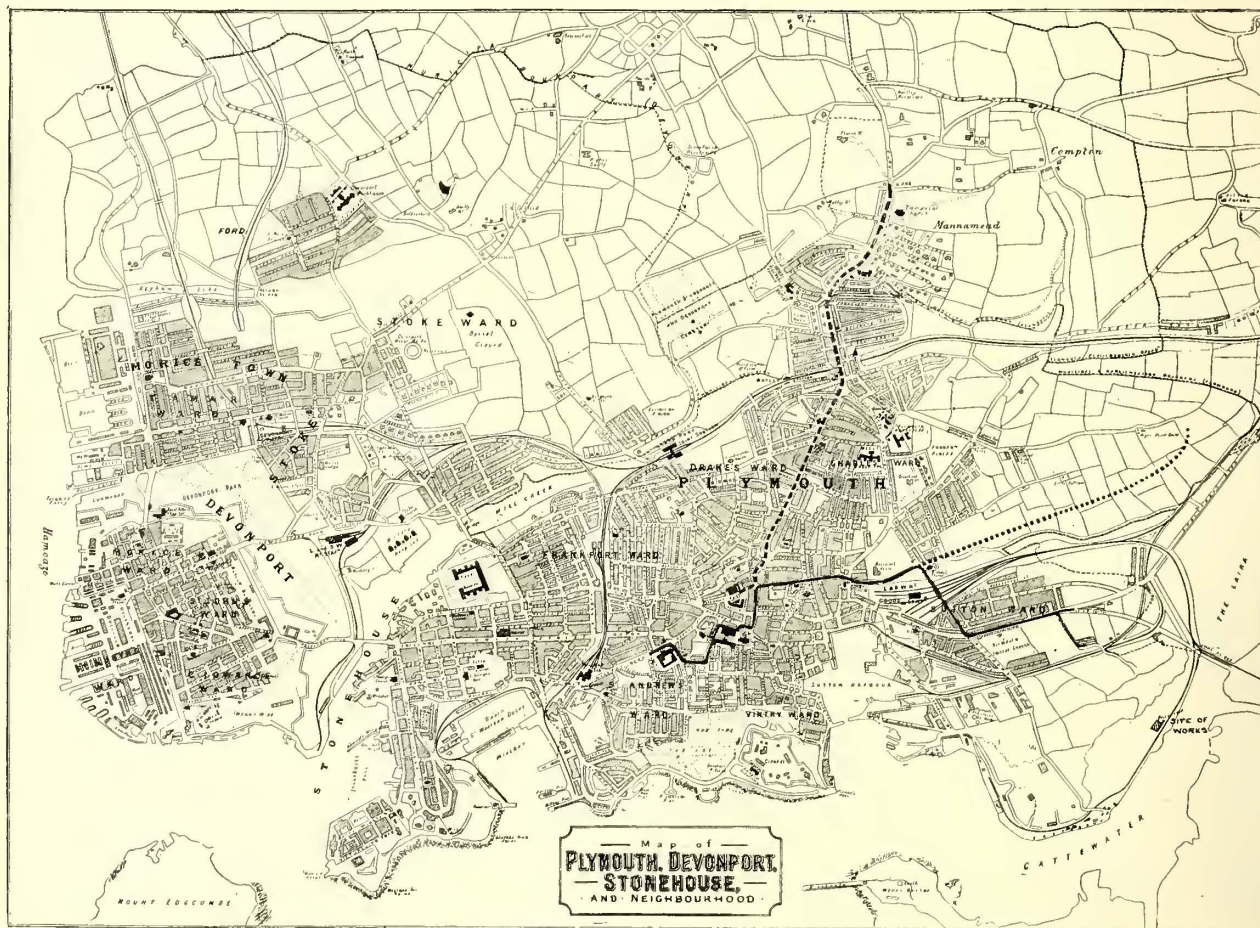
The poles are three sectional, with S. S. S. joints, of 7 ins., 6 ins. and 5 ins. outside diameter, with heavier poles of 8 ins., 7 ins. and 6 ins. diameter at curves. There are a few single tube poles, 8 ins. in diameter for half way and then tapering to 6 ins. at top. These, as well as a large proportion of the sectional poles, were supplied by Russell & Sons, of Wednesbury. Arc lamps are fixed in a number of streets on the tops of alternate poles and, where possible, on alternate sides of streets, and a fiddle-bow suspension, between the ears holding the wires, has been fitted to take off the oscillation from the lamps.

The line is divided into  $\frac{1}{3}$ -mile sections, according to Board of Trade requirements, and insulated in the usual manner. Of the section boxes two have been very neatly

car bodies were built by Milnes & Company, of Birkenhead, and are 14 ft. long, 24 ft. 6 ins. over platforms, and 6 ft. wide. Each car is fitted with two Westinghouse No. 46 motors, giving 1000 lbs. tractive effort at 8 miles an hour. The cars are housed in a temporary car shed near the Prince Rock terminus, which will hold, in addition to the six motor cars, six trailers. These will be converted from the best of the horse cars now in use.

The controllers are of the Westinghouse series parallel type with a graded brake, and perfect control is kept over the car by putting the two motors in parallel and by connecting them by a variable resistance, if necessary, to the extent of short circuiting the motors. This brake has been working most satisfactorily throughout the trial trips.

The trolley is of the Blackwell side acting swiveling type. The standard, 6 ft. 6 ins. high, is placed in the center



MAP SHOWING PLYMOUTH ELECTRIC TRAMWAY SYSTEM

disposed of, by being built into the walls of corporation buildings. They contain four switch fuses, lightning ar-restor, telephone, wire terminals, etc.

The overhead equipment, the permanent way and the cars are provided by the tramways committee, while the electricity committee is responsible for all the underground cables and supplies the current to the section boxes, just as would be done in the case of a private consumer, charging the tramway committee  $3\frac{1}{2}$ d. per unit up to 150,000 units, beyond which figure there will be a reduction in price. It is estimated that the price will be reduced to 2.3d. per unit as soon as contemplated extensions are completed, when some 600,000 units will probably be required.

At present there are six motor cars to seat twenty inside and twenty-two outside. They are mounted on Peckham standard cantilever extension trucks with 30-in. wheels, 3 ft. 6 ins. gage, and a 5 ft. 6 ins. wheel base. The

of the roof of cars, so that the arm can reach equally on either side. The arm is 15 ft. long.

Sanction has been given for electrically equipping the line from the Market Place to Compton. This route will take  $2\frac{3}{4}$  miles of single track and will tap the residential district of Mannamead. Six more motor cars will be required for this section, and another six for the section from Theatre Royal to Hyde Park at Mutley. The cars on this route will run from the theatre over the Prince Rock tracks as far as the market and then run up the Compton line, turning off to the terminus at Hyde Park. There will probably be a sub-station with a large battery of accumulator cells for the Compton route. The corporation is also applying for power to the Board of Trade to construct 2 miles of additional lines to the eastward of the town. This district is growing very rapidly and is peopled by the working classes.

The power station contains a lighting plant, distributing



an alternating current at 2000 volts pressure to sub-stations and a 500-volt to 550-volt continuous current tramway plant. In order to avoid having to run the engines at a light load during the day, a special combination plant has been designed by Mr. Rider. There are two sets in use; each consists of a Belliss high speed compound engine of 150 i.h.p. running at 275 r.p.m., direct coupled to a Ferranti alternator of 100 kw. and also to a Westinghouse generator of 100 kw. The engine is therefore capable of driving either machine at full load or both at half load. Between the engine and the machines is a special shaft coupling, so that the engine can be disengaged when required. A battery of 260 Tudor cells is kept in parallel with the generator. During the day the engine can be kept at practically full load, the alternator supplying what small amount of current is required for lighting, and the generator driving the cars. The battery, in parallel with the generator, takes up the inequalities of the tramway load, any current required above the output of the generator being supplied by the accumulators, and all under being taken in by the accumulator in the form of a charge. In this way a practically constant load can be kept on the generator and therefore on the engine, and the cells are continually charging and discharging according to the demands of the line.

As the lighting load increases during the evening, the load is gradually taken off the generator by the accumu-

quired; thus on Sundays, when the cars are not running, the generator will be run as a motor from the accumulator, driving the alternator for what lighting load there may be. Similarly the alternator can be run as a synchronous motor from either of the other alternators in the station and the generator used either for charging the battery or for tramway work with the battery in parallel.

It is not proposed to continue this type of combination



BRACKET POLE CONSTRUCTION



SPAN POLE AND ROSETTE CONSTRUCTION

lator, leaving the engine free to drive the alternator at full load for the lighting. After midnight, when the cars have ceased running, the generator is driven at full load for charging the battery until 6 o'clock in the morning when the cars commence running.

The use of the clutch enables the generator and alternator to be used independently of the engine when re-

quired through the station when additional tramway machinery is put down, its great use being for a day load plant.

The battery consists of 260 Tudor cells of 600 amp. hours capacity; maximum discharge rate 200 amps. The battery is maintained by the Tudor Company under guarantee for ten years at a rate of 5 per cent on first cost. The terms of the contract are that at any time within twelve hours of being fully charged the battery must give its full specified capacity of 600 amp. hours without the voltage per cell falling below 1.85 volts. The rest of the plant comprises two 200-kw. Ferranti alternators for lighting, driven at 250 r.p.m. and a 20-kw. booster, motor driven and used in series with the generator for charging the accumulator so that the bus bar pressure need not be raised. The booster generator is compound wound so that the current can be sent round the fields if it is desired to use the booster when the cells are being discharged. When the line current is equal to the output of the generator the two windings will neutralize each other and the booster will give no pressure. Then the battery will neither charge nor discharge. When the line current is less than the output, the shunt winding will predominate and the booster pressure will be in the right direction for charging the cells. When the line current is greater than the output, the series winding will change the polarity of the booster so that it will add a pressure to the battery circuit and thus help it to discharge.



The probable additions to the plant will include a steam driven generator of from 450 kw. to 500 kw.

All the auxiliary plant, stoker gear, feed pumps are electrically driven by E. C. C. motors.

The three Lancashire boilers were supplied by J. Musgrave & Sons, of Bolton, and are rated at 350 h.p. each. One supplies the two Bellis engines and the other two the two Ferranti alternators. Welsh coal is brought by steamer to the wharf alongside and is distributed by a Vicars stoker.

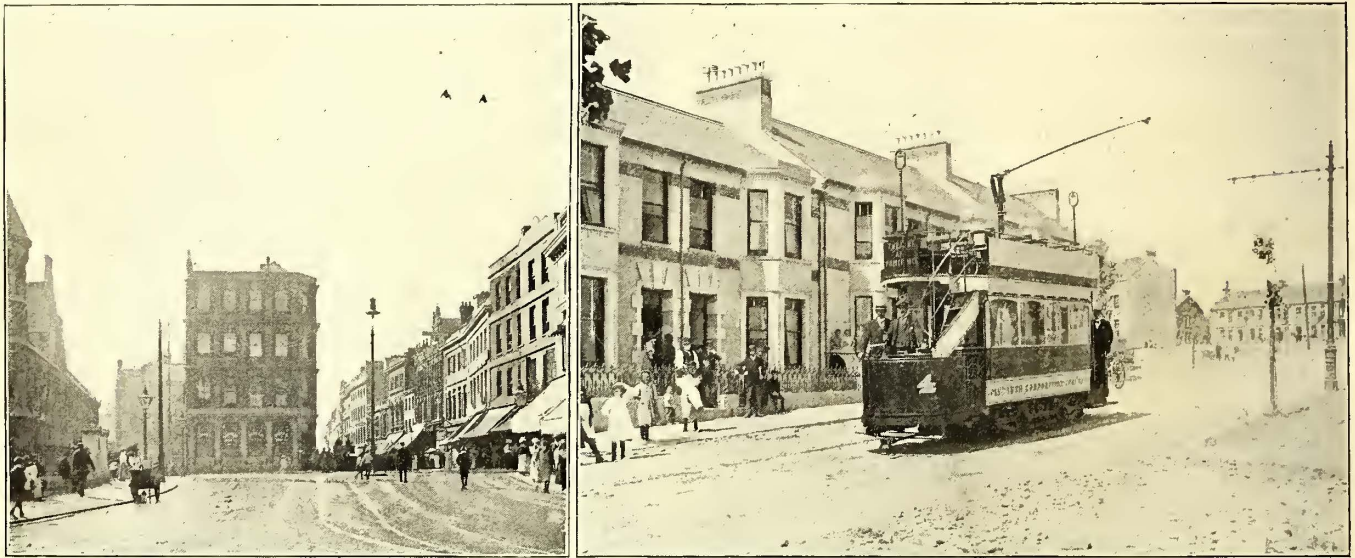
There are three switchboards, one of the Westinghouse tramway type, one Ferranti type, and the third a Ferranti rectifier board. All of the regulating resistances are fixed

of the tunnel 4 m.; this leaves 3.4 m. of solid earth above the tunnel.

The grade directly under the river is 1:600, while that near the mouths is 1:20. The total length, including the masonry at both ends, is 609 m.

A few details of construction may prove interesting:

The iron shell is composed of separate rings 650 mm. long, joined together by stiffening ribs 15 mm. in thickness. Each ring is composed of nine wrought iron flanged sections. The ribs project 50 mm. outside of the shell, and 15 mm. inside, the outer projections being utilized to hold a cement covering, while the inner serve for caulking, so as to insure water-tight joints. The cement is



SCENES IN PLYMOUTH, SHOWING ELECTRIC TRAMWAY

in the room immediately under the switchboard recess. The cables were supplied by the British Insulated Wire Company and laid by the corporation.

At present the tramways only pay expenses, the cost of 10d. per car mile preventing the formation of a sinking fund. With electric power the expenses are calculated at 5d. per car mile, and as owing to the increased speed a much more frequent service of cars will be run; it is not unreasonable to expect a handsome profit.

### The Spree River Tunnel

The tunnel under the Spree River, intended for street railway traffic between Stralau and Treptow, near Berlin, has been completed and will be opened for public service in a very short time. The construction of this tunnel illustrates the increasing tendency in late years of the German corporations to follow American practice by selecting the shortest route, regardless of cost, and thereby meeting competition successfully. For a long time the park at Treptow, on the banks of the Spree, has been a much frequented resort for the residents of Berlin, because of its proximity to the city. This tunnel gives to the thickly populated section at the Silesian railway depot a new route by which the park may be reached in a shorter time. The most interesting part of the construction of this tunnel is the fact that it is the first that has ever been built curving under a river, by the Greathead system. To still further add to the complexity of construction quicksand was encountered along its entire length.

Its dimensions are as follows:

It is 453 m. long, and crosses the river nearly at right angles, the river being 200 m. wide at this point. Its lowest point is 10.7 m. below the average water level, the average depth of the river being 3.3 m., and the diameter

forced through holes in the shell, which are afterwards closed with iron or wooden plugs.

As extensive experiments before the construction of the tunnel and previous practical experience had proven that plates only 10 mm. in thickness were sufficiently strong, a great saving in cost was thereby effected.

To prevent the rusting of the interior and the exterior of the iron shell coatings of cement, from 80 to 100 mm. thick, were applied.

The tracks on the bottom of the tunnel, which are of the standard gage, are embedded in beton. A ditch collects all water, which is pumped out by means of an electrically driven pump.

The header used during the construction of the tunnel is patented, and is composed of an iron tube, the cutting end of which is beveled at an angle of 30 degs. to the base of the tunnel. A partition divides it into two compartments, the rear one always projecting over the forward end of the tunnel.

The breast wall of the tube is provided with openings, through which the sand is removed, also ball and socket stuffing boxes, through which drills may be passed to break up hard obstructions.

The header is moved forward by means of hydraulic jacks placed against the partition in the tube, and the end of the last section of the tunnel put in place. The total pressure amounts to 900 tons. The downward curve given to the tunnel is effected by an unequal location of jacks, in other words, by putting more pressure on the top than on the bottom of the partition in the tube.

Owing to the great difficulties encountered two and one-half years were occupied in the completion of this project. The daily advancement at the beginning amounted to 0.7m. to 1.00 m.; on some days a progress of 2 m. was made, and the general average being 1.5 m. per day.



## LEGAL NOTES AND COMMENTS\*

EDITED BY J. ASPINWALL HODGE, JR., OF THE  
NEW YORK BAR

## CHARTERS, ORDINANCES, FRANCHISES, ETC.

ILLINOIS.—Removal of Causes—Electric Railroads—Condemnation of Land—Highways—Price—Consent of County Board—Instructions.

1. Two of several tenants in common, who are non-residents, and who have been joined with their resident co-tenants and the resident mortgagee of the interest of one of them, in condemnation proceedings, are not entitled to a removal of the proceedings to the United States Circuit Court when the aggregate of their claims exceeds the sum of \$2,000, but the amount of their separate claims is less than that amount.

2. In condemnation proceedings for an electric railroad, evidence that the secretary of the company, seeking to condemn the land, called on one of several tenants in common, and made him an offer for the whole tract; that the tenant then said he would have to see his co-tenants, who were his sisters, about the matter, and requested two or three days to consider the matter; that at the end of such time the secretary called again, and that the offer was refused,—shows an inability to agree on a price for the tenant's separate share as well as that of the whole tract.

3. The County Board, and not the Township Commissioners of Highways, is the proper body from which to obtain consent to the construction of an electric railway on a public highway over which a turnpike company has an easement.

4. The giving of an instruction in condemnation proceedings, in regard to a matter not in issue, and which could not, one way or the other, affect the amount of compensation defendants were entitled to, is not error.

5. Refusal to give an instruction which leaves to the jury the construction of a deed is not error.

6. In condemnation proceedings by an electric railroad company against the owners of the fee, to secure the right to operate its line on a public highway over which a turnpike company has an easement, an instruction that, if the jury believed from the evidence that the turnpike company had abandoned that part of the road on which the railroad was to be constructed, the jury might take that fact into consideration, is properly refused, as it would still be a highway, and the amount of defendant's damages would not be affected. (*Trotter vs. St. Louis B. & S. Ry. Co.*, 54 N. E. Rep., 487.)

MICHIGAN.—Municipal Corporations—Power to Operate Street Railroads—Constitutional Limitations—Internal Improvements.

1. Under Const. art. 14, sec. 9, providing that "the State shall not be a party to or interested in any work of internal improvement, nor engaged in carrying on any such work," works of internal improvement, which the State itself is prohibited from undertaking, it cannot authorize municipalities to undertake or become interested in.

2. The street railroads of Detroit, comprising over 140 miles of track, and valued, with their equipment, at from five to twenty million dollars, are works of internal improvement.

3. The act of the Legislature of Michigan authorizing the creation by the Common Council of the City of Detroit of a commission of three men, to be known as the "Detroit Street Railway Commission," and conferring on such commission, when appointed, the power, in their discretion, to purchase, lease, or otherwise acquire by conveyances to the city, any street railroad wholly or partly within the city, together with its property, rights, and privileges, and to extend and operate the same in behalf of the city by the carriage of passengers and freight for hire, is in violation of the provision of the State constitution prohibiting the State from becoming interested in any work of internal improvement, and is void. (*Attorney General vs. Pingree et al.*, 79 N. W. Rep., 814.)

MISSOURI.—Authority to Amend Charter—Extension of Lines—Parallel Law—Repeal—Quo Warranto.

1. Rev. St. 1889, sec. 2779, authorizing a corporation to "extend its business to any other purposes authorized by this article," is not merely a permission to a corporation, organized for one of the eleven purposes allowed by sec. 2771, to extend its business so as to embrace another of the eleven purposes, but authorizes a street car company, whose termini were fixed by the original incorporation, to amend its charter so as to extend the original termini, and thereby carry the public a greater distance for the same fare,

or so as to include the right to buy or lease a road already constructed.

2. Where a street railway company has, from time to time, by municipal authority, extended its lines beyond the termini stated in its original charter, and such grants are greater in extent and longer in mileage than the one challenged in the case at bar, but no one has ever questioned their legality, and relator expressly disclaims any desire to have the company ousted therefrom, the writ of quo warranto will be refused.

3. Act Jan. 16, 1860 ("Third Parallel Law"), provides that no street railroad shall hereafter be constructed in the city of St. Louis nearer to a parallel line than the third parallel street from any road now constructed, or which may thereafter be constructed, except the roads hereinbefore mentioned. At that time the Legislature alone had power to legislate as to the city of St. Louis. Acts 1865-66, pp. 279-287, amended the St. Louis charter, and gave the city sole power to grant the right "to construct street railroads in any street of said city, and to regulate and control the same and the use thereof." Const. 1875 expressly prohibited the Legislature from granting the right to construct or operate or transfer a street railway in any city of the State, without its consent, and gave the city of St. Louis the power to adopt a charter which should supersede all prior charters. The charter so adopted by the city gave it the sole right to grant the right to construct street railways and to regulate street car companies. *Held*, that Act 1860 was repealed by implication by Act 1866 and Const. 1875. (*State ex rel. Crow, Attorney General vs. Lindell Ry. Co.*, 52 S. W. Rep., 248.)

NEW JERSEY.—Abandonment of Operation—Excuse for Non-performance—Mandamus—Parties.

1. A street railway company incorporated under the laws of this State, and the route of its road, and the location of its tracks, established by an ordinance of the municipality in the streets of which the company is to operate its road, such ordinance being accepted by such company, and its tracks laid in accordance therewith, and the road constructed and in operation, cannot, at its mere will and discretion, cease and abandon the operation thereof, or any portion thereof. It becomes the duty of the railway company, in the exercise of its rights, privileges, and franchises, for the benefit of the public to maintain and operate its road according to the terms of the ordinance, and in compliance with statutes which confer upon the company such rights, privileges and franchises.

2. An implied condition attaches itself to the grant of the franchise that it be held for public benefit, and the duty upon the railway company is to exercise it for such purpose, and, as a public agent, it cannot escape this duty.

3. The company, duly incorporated, which has the ownership of, and is in possession and control of, such street railway, its appliances and property, whether under a lease of or by sale from the original or other company incorporated to construct and operate such railway, or by sale under a decree of the Court of Chancery of this State upon foreclosure under the statute of the State concerning the sale of the property and franchises of certain corporations (P. L. 1897, p. 229, c. 127), has conferred upon it all the corporate rights, liberties, privileges and franchises of such original or other company, and upon it rests the same burden and duty to maintain and operate such street railway under the statutes and the ordinance of the municipality as was imposed upon the original company.

4. The fact that the located route of the railway is laid across a bridge over a stream, the construction, maintenance and control of which bridge is in the Board of Chosen Freeholders, which will not permit the tracks to be laid thereon unless upon proper and reasonable regulations for the safety of the bridge for the traveling public, furnishes no excuse why the road should not be operated upon its route through the streets of the municipality lying upon either side of such bridge. The acceptance of the ordinance being apart from the control of such bridge by the Board of Chosen Freeholders, and having no relation to it, or to its use, and there being an agreement between the railway company and the chosen freeholders in relation to the use of such bridge, the court will not enter upon the consideration of the reasons why the company has not performed such agreement, in order to excuse the company from the performance of its duty towards the municipality in the operation of its road.

5. Mandamus is the proper remedy to compel such street railway company to perform the duty of maintaining and operating such railway for the benefit of the public. The public duty imposed upon the company is always active, potential and imperative, and must be executed until lawfully surrendered, suspended or abandoned by the legally expressed consent of the State, and the performance of this duty can be lawfully enforced by mandamus.

6. The municipality in the streets of which the railway is located by the ordinance is a proper relator in a proceeding by mandamus

\* Communications relating to this department may be addressed to the Editors, Johnston Building, 30 Broad Street, New York.



to enforce the duties of the company toward the public. (State ex rel. City of Bridgeton vs. Bridgeton & M. Traction Co., 43 Atl. Rep., 715.)

**NEW YORK.**—1. Electric Street Railway—Grant of Certificate.—The grant of a right to build a street surface elevated railroad, connecting several localities of considerable importance, between which there is no direct railroad communication, in territory for the most part within the city of New York, is proper, though the proposed road would in some instances nearly parallel a steam railroad, where it would furnish means of local transportation which were not, and could not well be, furnished by such steam railroad.

2. Same—Grant.—Under Railroad Law, sec. 59, authorizing the Board of Railroad Commissioners, before granting a certificate for the construction of the road, to permit errors, omissions, or defects to be supplied and corrected, a change in the route of an electric railway, not affecting substantially its character, and made to obviate objections of the local authorities, is such a defect as could be corrected under the powers given under said section; and such change could be disregarded or approved, if made after the filing of the articles, and before the application to the board. (People ex rel. Long Island Ry. Co. vs. Board of R. R. Com'rs of New York, 59 N. Y. Suppl., 144.)

**OHIO.**—Change of Venue—Suit Against Corporation—Constitutional Law—Sufficiency of Affidavit—Presumption of Credibility—Rule as to Evidence—Order Overruling Application—Error Waived.

1. Sec. 5033 of the Revised Statutes, which provides for a change of venue "when a corporation having more than fifty stockholders is a party in an action pending in any county in which the corporation keeps its principal office or transacts its principal business, if the opposite party make affidavit that he cannot, as he believes, have a fair and impartial trial in that county, and his application is sustained by the several affidavits of five credible persons residing in the county," is not in conflict with the State or Federal Constitution.

2. It is not necessary, to entitle the applicant to the benefit of the statute in a case for which it provides, that his affidavit shall state the grounds of his belief that he cannot have a fair and impartial trial in the county in which the action is pending, nor that the sustaining affiants shall state the grounds of their belief. It is sufficient that the affidavit of the applicant state that he cannot, "as he believes," have a fair and impartial trial in that county. And his application is "sustained," within the purview of the statute, when there is filed the several affidavits of five credible persons residing in the county, stating that they entertain the same belief. When so complied with, the statute is mandatory.

3. Unless the character of an affiant for truth is attacked, he will be presumed to be a credible person, and evidence in his support is not required nor admissible; but, if attacked, it becomes a question for the court to determine whether he is a credible person, and unless found to be so, the application may be denied.

4. Whether the action is one in which a corporation having more than fifty stockholders is a party, or is pending in the county where the corporation keeps its principal office or transacts its principal business, are questions for the determination of the court in which the application is made; and, if the statement of these facts in the affidavit is denied, the burden is on the applicant to establish them.

5. An order overruling an application for a change of venue is not an order made in a special proceeding, which may be made the foundation of an independent proceeding in error, but is properly reviewable on error prosecuted to the final judgment in the action. The error is not waived by proceeding to a trial of the action without objection by the applicant. (Snell vs. Cincinnati St. Ry Co., 54 N. E. Rep., 270.)

#### UNITED STATES COURTS (OHIO)

1.—Constitutional Law—Impairment of Contracts—Ordinances Granting Street Railroad Franchises.

City ordinances making grants of franchises to street railroad companies on specified conditions, when accepted by the companies, constitute contracts, which cannot be annulled or amended except by consent of both parties, and which are protected from impairment by the fourteenth constitutional amendment.

2.—Equity Jurisdiction—Restraining Enforcement of Unconstitutional Ordinance.

A federal court of equity may grant relief by injunction against a city ordinance which impairs the contract rights of complainant or deprives him of his property without due process of law.

3.—Right of Municipality to Fix Rates of Fares.

The statutes of Ohio confer power upon municipalities to determine the conditions of the grant of a franchise to a street railroad company, including the rates of fare to be charged, but no power to thereafter prescribe rates of fare; and where the grant

itself fixes the rate of fare a reserved right of regulation does not authorize the municipality to thereafter change it during the life of the grant.

4.—Constitutional Law—Impairment of Obligation of Contracts—Ordinance Changing Rates of Fare on Street Railroads.

A city, in granting franchises to two certain street railroad companies, fixed the rates of fare to be charged, reserving the right to increase or diminish such rates, as it might deem justifiable and expedient. Afterwards, by different ordinances, it granted additional franchises to each company, expiring with the original franchise, to build extensions, lay additional tracks, or to change the motive power. It imposed conditions to each of such additional grants, which were accepted by the respective companies, in the way of requiring street paving and repairing, or the furnishing of increased car service, to which the companies were not before subject. Such ordinances also made changes in the rates of fare by providing that but a single fare, at the rate then charged, should be charged for passage between any two points on either the original lines or their extensions, and by requiring the companies to sell tickets at a reduced rate. As to one of the companies, which, under the ordinance containing the reservation, had the right to, and did, charge two fares for passage over the entire length of its line, a subsequent ordinance granting it the right to lay a double track, and to maintain it during the life of its original franchise, required the carriage of passengers over the entire line for a single fare at the rate then charged, and such company was subsequently granted the right to change its motive power from horses to electricity, which it did, at a large expense. Each of said companies subsequently consolidated with a number of other companies, as to whom no power to change the rates of fare had been reserved by the city, their original lines, to which the reservation in regard to changing rates of fare applied, thus becoming parts of two several consolidated systems, each containing many miles of road, operated together. These consolidations were consented to by the city, the consents containing provisos, accepted by the consolidated companies, requiring transfers to be given, or through cars run, so that a single rate of fare or ticket at the rate then charged should entitle a passenger to ride over the lines of any two of the constituent companies, whereas they were before entitled to charge separate fares over each line. None of such legislation of the city subsequent to that granting the two original franchises mentioned contained any reservation of the right to make future changes in rates of fare. *Held*, that such subsequent legislation, and its acceptance by the companies, operated as a repeal of the provisions of the original grants reserving the right to change the rates of fare on the original lines of the two companies to which they applied, or constituted new contracts with such companies and their successors, which the city could not impair during the life of their franchises; and that an ordinance passed by the city requiring the consolidated companies to reduce the rates of fare on such original lines, aside from being impracticable in operation, since each of such lines had become a part of a larger system, operated together as a whole, was unconstitutional and void as an impairment of the contracts made by such subsequent ordinances.

5.—Same—Modification of Grant by City—Validity Under Ohio Statute.

Rev. St. Ohio, sec. 2502, providing that, after a grant or renewal of a grant is made by a municipal corporation, it shall not, during the term of such grant or renewal, release the grantee from any obligation or liability imposed by the terms of such grant or renewal, does not prohibit a city making a grant of a franchise to a street railroad company, in which it reserves the right to change the rates of fare to be charged, from thereafter modifying such contract on sufficient consideration. (Cleveland City Ry. Co. vs. City of Cleveland. Cleveland Electric Ry. Co. vs. Same, 94 Fed. Rep., 385.)

#### LIABILITY FOR NEGLIGENCE

**ALABAMA.**—Passengers — Personal Injuries — Complaint — Street Cars—Operation Without Conductor—Plea—Rules of Carrier—Negligence of Passenger—Death—Proximate Cause.

1. A complaint averring that plaintiff's intestate was a passenger on one of defendant's street cars, and that defendant then and there so negligently conducted said business that by reason of such negligence plaintiff's intestate received personal injuries, which caused his death, sufficiently alleges the negligence of defendant.

2. A complaint in an action for personal injuries to passenger, causing death, alleging that "deceased gave the usual signal to stop the car, whereupon the motorman \* \* \* slowed up and stopped, or so nearly so as to render it reasonably safe for deceased to proceed to alight, whereupon deceased proceeded to alight, placing himself in a standing position on the platform or running board alongside the car for that purpose, \* \* \* whereupon the motorman, negligently failing to look and see whether deceased



was in a place of danger, \* \* \* started the car with a sudden motion, \* \* \* thereby throwing deceased violently from said car," is not objectionable, in that it does not show whether he was injured by reason of attempting to get off the car after it had stopped, or while it was moving, and that it does not show that the motorman was informed of his desire to get off the car.

3. It is not necessary to allege the name of the carrier's employee whose negligence caused the injury.

4. Where a complaint alleges several negligent acts or omissions of a carrier, and that, combined together, they produced the result complained of, it is error to strike out the words charging one of the acts or omissions.

5. Whether the operation by a street railroad company of its cars without a conductor constitutes negligence is a question for the jury.

6. In an action for personal injuries to passenger, a plea that the car was equipped with bell and cord attached so that passengers could notify the motorman when they wished the car stopped should be stricken out, in the absence of an averment that the passenger did not pull the cord or ring the bell.

7. A rule of a street car company that passengers must not leave its cars while they are in motion is a reasonable one.

8. A passenger cannot be charged with negligence in violating a rule of the carrier, unless he knew the rule.

9. Whether a passenger was guilty of negligence in going upon the running board of the car preparatory to alighting, while it was in motion, was a question for the jury.

10. Negligence resulting in an injury to decedent's finger, which produced blood poisoning, causing his death, is the proximate cause of such death. (*Armstrong vs. Montgomery St. Ry. Co.*, 26 So. Rep., 349.)

ARKANSAS.—Carriers—Personal Injuries—Evidence—Conclusions of Fact—Admissibility—Relevancy—Res Gestæ—Declarations After Injury—Trial—Prejudicial Instruction—Street Railroads—Trespassers—Degree of Care.

1. In an action to recover for injuries sustained while attempting to board a moving street car, the question, "what difficulty would you have had in getting on if it had remained going as it was when you started on it?" is inadmissible, as calling for the decision of a question which is within the exclusive province of the jury to determine.

2. Testimony of a witness in an action against a street railway company for damages for personal injuries, to the effect that he did not think it was dangerous to get on certain cars by the front platform, when they were running slowly, is inadmissible as determining a question within the exclusive province of the jury.

3. In an action by plaintiff, a boy 10 years of age, against a street car company for damages for personal injuries, evidence that boys had ridden on defendant's cars at different times without permission and at other times by invitation, and without paying fare, is incompetent, as not tending to prove that plaintiff was entitled to ride on the car he attempted to board at the time he was injured.

4. A statement by the motorman of the defendant company that it was due to his (the motorman's) own carelessness that plaintiff got hurt, made after the injury was complete, and plaintiff had been removed from where he had fallen, and was sitting in the car, and made with the obvious purpose of showing that the motorman was guilty of no intentional wrong, is no part of the *res gestæ*, and is inadmissible.

5. Testimony by a witness to the effect that he could not repeat the exact words used by plaintiff after the injury had occurred, but the impression left on his mind was that it was plaintiff's own fault, is properly excluded.

6. Where one of the defenses to an action against a street railway company was that the injury was due to plaintiff's own negligence, and not to any negligence on the part of defendant, and evidence was adduced to support this defense, and instructions were given upon it, an instruction that the only valid defense in the action was based on the theory that defendant's motorman had not invited plaintiff to ride, and for the jury to exclude from their consideration and decision the question whether, admitting the invitation to have been given, the plaintiff was guilty of such contributory negligence as would defeat his recovery, is highly prejudicial to the defendant.

7. Employees of a street railway company are under no obligation to keep a lookout to prevent boys, endeavoring to ride without permission and paying fare, from entering its cars while in motion, and owe them no duty save not to injure them wantonly.

8. A boy ten years of age, riding upon a street car without paying fare, by invitation of a motorman in charge of the same, who has authority to receive and let off passengers, is not a trespasser.

9. An invitation of a motorman to a boy to ride on the car is an act within the scope of his employment, for which he is responsible to his master, and if the boy accepts it innocently he is not tres-

passer, and it is the duty of the company to extend to him the diligence due to passengers of his age and discretion.

10. In entering, riding upon, and leaving street cars a boy ten years of age or over is bound to exercise prudence equal to his care, knowledge, and experience, and to that extent is held responsible in law for acts or omissions contributing to his own injury. (*Little Rock Traction & Elec. Co. vs. Nelson*, 52 S. W. Rep., 7.)

ILLINOIS.—Peremptory Instructions—Waiver—Injuries to Passengers—Instructions—Questions for Jury.

1. A motion made at the close of plaintiff's evidence to find for defendant is waived where it is not renewed at the close of the evidence, except as it is included in a series of instructions asked by defendant.

2. An instruction that a railroad company should exercise the highest degree of care, consistent with the practical operation of the road, to provide for the safety of passengers, is applicable in an action by a passenger of a grip car for injuries sustained by the sudden flying back of a brake lever, where there was evidence that the brake was in bad order.

3. In an action by a passenger on a grip car for injuries caused by a sudden flying back of a brake lever, his failure to obey the gripman's request to stand back was not negligence per se, where the car was crowded, and he was not informed of the danger. (*West Chicago St. Ry. Co. vs. Johnson*, 54 N. E. Rep., 334.)

ILLINOIS.—Action for Negligence—Personal Injury—Instructions.

1. In an action for personal injuries, an instruction authorizing a verdict for plaintiff on condition that she was injured because of defendant's negligence, "without negligence or fault on her part," is equivalent to requiring proof that she was in the exercise of ordinary care.

2. An instruction that the jury may disregard the entire testimony of a witness, when it is palpable that he has intentionally testified falsely as to some material matter, and is not corroborated by other evidence, could not mislead them to suppose that they should not disregard the testimony of a witness intentionally falsifying if there were others of the same kind who testified in the same way.

3. The jury were told that they were to consider all the testimony; that it was plaintiff's duty to establish her case by a preponderance of the evidence, and a verdict for defendant was directed if the evidence was equally balanced, if it preponderated for defendant, or if they were in doubt as to the preponderance; that the burden of proof was not on defendant, and, if the preponderance did not show an act alleged essential to recovery, their verdict should be for defendant. They were also told to consider all the evidence, and if it preponderated for defendant, or if they were unable to decide, they should find for defendant. *Held*, that the jury could not have understood an instruction that a "preponderance of the evidence" does not necessarily mean the greater number of witnesses, but that such evidence as produces conviction in the minds of the jury will constitute such preponderance, to mean that they might disregard the evidence for defendant.

4. From an instruction to a jury, in relation to estimating damages for pain and suffering due to a personal injury, and the future consequences reasonably certain to result, that they might "themselves make such estimate from the facts and circumstances in proof, by considering them in connection with their knowledge, observation, and experience in the business affairs of life," it could not be inferred that they might consider injuries outside the evidence, of which they might individually know. (*North Chicago St. Ry. Co. vs. Fitzgibbons*, 54 N. E. Rep., 483.)

LOUISIANA.—Injury to Person on Track.

The plaintiff in a suit for damages against a railroad company for injuries caused by defendant's car running over him, shown to have been alongside or in a position close to the track, with his legs across the nearest rail, and in that condition receiving his injuries, must, in order to recover, show with reasonable certainty that, notwithstanding his gross imprudence in thus exposing himself to peril, the defendant's motorman could, by the exercise of ordinary care, have averted the accident. 2 *Thomp. Neg. p.* 1105, sec. 1; *Id.* pp. 1157, 1158; *Pierce, R. R. p.* 330; *Patt. Ry. Acc. Law*, pp. 51, 55, 61; *Railway Co. vs. Ives*, 12 *Sup. Ct.* 679, 144 *U. S.* 429, and line of authorities there cited; *McGuire vs. Railroad Co.*, 16 *South. 457*, 46 *La. Ann.* 1543. (*Kramer vs. New Orleans City & L. R. Co.*, 26 *So. Rep.*, 411.)

MARYLAND.—Master and Servant—Liability of Master for Torts of Servant—Willful and Wanton Acts—Instructions.

1. A master may be held liable for an act of his servant, though willfully or wantonly committed, when it was within the scope of his employment, and done in the performance of the master's business.

2. Whether an act of a servant was within the scope of his employment, and done in the course of his service, and for the master's benefit, is usually a question of fact for the jury.



3. The mere fact that a plaintiff suing for a personal injury resulting from the alleged negligent act of defendant's servant testifies that, in his opinion, the servant acted willfully and maliciously, or even feloniously, does not entitle the defendant to an instruction directing a verdict in his favor.

4. Where no reference is made to the pleadings in the prayers for instructions, the correctness of such prayers must be determined solely by the evidence. (Baltimore Consol. Ry. Co. vs. Pierce, 43 Atl. Rep., 940.)

MARYLAND.—Crossing Track—Failure to Stop and Look—Instructions—Contributory Negligence—Duty of Motorman.

1. The failure of a pedestrian to stop and look before crossing the tracks of a street railway will not, under all circumstances, constitute such contributory negligence as will prevent recovery.

2. Negligence on the part of plaintiff will not defeat his right to recover, unless it is such that but for it the misfortune could not have happened; nor if the defendant, by the exercise of care on his part, could have avoided the consequences of such negligence.

3. The court may modify a request of defendant to charge that plaintiff cannot recover if she contributed to the injury, by adding, "unless the motorman saw, or could reasonably have seen, the peril of the plaintiff, and failed to exercise ordinary care to avoid the accident."

4. The question of negligence, in cases of personal injuries from street railroads, is primarily one for the jury; and it is only when the facts are undisputed, or where but one reasonable inference can be drawn from them, that the question becomes one for the court.

5. Where a track occupies nearly the entire bed of the street, leaving only six feet between it and the curb, so that one, in crossing the street, would reach the tracks in a few steps after he came into the view of the motorman, and plaintiff is injured, while crossing, by a car approaching at the rate of ten or eleven miles an hour,—so fast that the motorman was unable to stop the car after discovering her,—she may recover, although negligent, if the jury find that the motorman should have slackened his speed and had his car well under control in approaching the crossing, and kept a sharp lookout for persons about to cross the track. (Baltimore Consol. Ry. Co. vs. Rifcowitz et al., 43 Atl., 762.)

MASSACHUSETTS.—Defective Roads—Evidence—Notice of Injury.

1. In an action against a street railway company for personal injuries caused by defendant's failure to construct its road to the road commissioner's satisfaction, as required by Pub. St. c. 113, sec. 32, the testimony of an assistant commissioner who had charge of the locality where the accident happened, that he saw the work and was satisfied, is admissible to show that the work was done to the commissioner's satisfaction.

2. Pub. St. c. 52, sec. 19, requiring notice of an injury in a highway to be given within thirty days to persons by law obliged to keep the highway in repair, is applicable where an injury is occasioned by a street railroad company's failure to keep its road in repair as required by chapter 113, sec. 32. (Maloney vs. Natick & C. St. Ry. Co., 54 N. E. Rep., 350.)

NEW JERSEY.—Frightening Teams.

Where an electric car, running upon and along a public highway at the ordinary and usual rate of speed, and without lessening the same, runs into and through a pool of water on the tracks of the railway, thereby throwing the water up, out, and in front of the car, and up, out, and upon the front and sides thereof, and causing, by so running through such water, an unusual, loud, roaring, and hissing noise, by reason of the water being gathered and hurled around and through the trucks and wheels of the car, and throwing therefrom, and so causing a horse driven by the plaintiff along the highway to become frightened and uncontrollable and to run away, throwing the plaintiff from his carriage and injuring him, a case is presented which requires its submission to the jury, upon the question whether the railway company, by its servants operating such car, has exercised reasonable care to protect the plaintiff from injury in his use of the highway. The case of McCann vs. Traction Co., 36 Atl. 888, 59 N. J. Law, 481, followed, and the principles established applied. (Ayars vs. Camden & S. Ry. Co., 43 Atl. Rep., 678.)

To the Eleventh Annual Convention of Railroad Commissioners:

At the ninth annual convention of Railroad Commissioners, held in St. Louis in May, 1897, the following resolution was passed:

*Resolved*, That a special committee of three be appointed by this convention to prepare a form of classification of the construction expenses and operating expenses of electric roads, to correspond as far as practicable with the forms approved by this convention, and adopted by the Inter-State Commerce Commission for steam roads, and that said committee be authorized to invite the co-operation and assistance of the Association of American Railway Accounting Officers; also of the National Street Railway Association, or any other persons possessing expert knowledge appertaining to the subject, and to report the result of their proceedings to the next annual convention of this body.

The persons appointed to carry out the purposes of this resolution were: William O. Seymour, of Connecticut; Ashley W. Cole, of New York, and R. S. Kayler, of Ohio. The committee appointed by the Association of American Railway Accounting Officers to co-operate with the foregoing committee were:

H. M. Kochersperger, Comptroller of the New York, New Haven & Hartford Railroad Company; M. Riebenack, Assistant Comptroller of the Pennsylvania Railroad Company; H. D. Bulkley, Comptroller of the Baltimore & Ohio Railroad Company. The committee as thus constituted, met in New York City in April, 1898, and mapped out its work, closely modeled after the forms of the classification of the construction and operating expenses of steam roads, but the items chargeable under each head of the various accounts were not completed, and we found it impossible to perfect it in time to present to the tenth annual convention, held in Washington in May, 1898. We therefore reported progress, and asked for an extension of time for the completion of the work, which the convention readily granted. At the time of this meeting in New York City it was learned that an organization was in existence known as "The Street Railway Accountants' Association of America," which had been engaged for two years preparing such a classification as we had been instructed to prepare. In accordance with the terms of the resolution appointing us, we sought and obtained the co-operation and assistance of this organization, to which we are indebted for the form herewith presented for your consideration and adoption. It was found that the form prepared by the street railway accountants was so much more advanced in its preparation, so complete and full in its details, and so well adapted for its purpose, owing to the familiarity of those who prepared it with street railway accounting, that we deemed it wise to abandon the work which we had commenced and advise the indorsement and adoption of the form prepared by them. Several slight modifications in the form have been made at the suggestion of the railway accounting officers, and as it is now presented it is unanimously approved and recommended to this convention by your committee and the railway accounting officers associated with us. Emanating from their own accounting officers, the form is more likely to be universally adopted and used by the street railway companies than if prepared and submitted by those entirely outside of their organization, especially if they are assured by our action that it will be accepted and approved by the various State Commissions to which they are required to make annual reports. Your committee desire to publicly express their sincere thanks to the committee of the Street Railway Accountants' Association of America, who are the authors of this classification, and whose names, positions and addresses are prefixed to this report, for the cordial and generous manner in which they have contributed the results of their laborious and extended deliberations for our consideration and adoption; also for the valuable assistance rendered by J. D. Green, auditor of disbursements of the Pennsylvania Railroad, who represented Mr. Riebenack upon the committee; to Col. N. H. Heft, superintendent of electric construction on the New York, New Haven & Hartford Railroad Company, who kindly gave us the benefit of his expert knowledge of electrical matters; to Col. Charles R. DeFreest, recently clerk of the railroad commissioners of New York, whose assistance and advice were much appreciated; to Henry F. Billings, clerk of the railroad commission of Connecticut, who kindly consented to officiate as stenographer of the committee; and, finally, to the committee of the Association of American Railway Accounting Officers, who were associated with us, without whose advice and assistance no good thing can be accomplished in devising correct methods of railway accounting.

Respectfully submitted for the committee,

WM. O. SEYMOUR, Chairman.

### Indorsement of Standard System of Accounting

At the eleventh annual convention of State Railroad Commissioners, held in Denver, Aug. 10, the committee on classification of construction and operating expenses of electric railways made the following report:

This indorsement was the result of the meeting held by the committee in New York on July 11, and reported in the last issue on page 536. To the report was appended the standard system of accounting of the Street Railway Accountants' Association of America, with the slight changes mentioned in the August issue.



## Seventeenth Annual Convention of the New York State Street Railway Association

The New York State Street Railway Association will hold its seventeenth annual meeting at Ithaca, N. Y., on Tuesday and Wednesday, Sept. 12 and 13. A most attractive programme has been arranged for the meeting, and a large attendance of both street railway managers and representatives of manufacturing companies is assured. Ithaca is well fitted for a convention city. It possesses good hotel accommodations and an excellent meeting place, while Cornell University offers an interesting field of study to those interested in electrical development and scientific matters in general. The faculty of that institution have expressed much interest in the coming convention, and the programme of the entertainment includes an inspection of the college buildings and the several departments, with a short description of each department by the professor in charge.

The entertainment of the delegates will also include a trolley ride to the picturesque environs of Ithaca, including a trip on Cayuga Lake, with luncheon served on the boat, a special entertainment and band concert at Renwick Park, and the customary banquet on the evening of the first day.

Ithaca possesses unusual scenic attractions, some of the natural beauties in the immediate vicinity rivaling anything found elsewhere in the East. Ithaca Gorge in itself draws hundreds of visitors each year, its many water falls and glens presenting a panorama seldom equaled. A few of the falls easily reached from the city are Triphammer Falls, the upper fall of the gorge; Ithaca Falls, 140 ft. high and nearly 200 ft. wide; Enfield or Lucifer Falls, 150 ft. high, and Taughannock Falls, 215 ft. high, this being the highest fall in the State. From this flow of water are obtained the water powers of Cornell University and the Ithaca Street Railway Company.

Cayuga Lake is a beautiful body of water and is as changeable in its moods as the ocean, at times being smooth as glass, again rippled with tiny waves, and at times, during high winds and heavy storms, its shores are lashed with white caps and breakers. At its head the street railway company has laid out and developed Renwick Park, now one of the most popular resorts of its kind in the State.

These natural attractions, together with the University buildings and grounds, are well worth in themselves a trip to Ithaca, and viewed as they will be under the thoughtful guidance of the reception committee, the delegates to the Ithaca meeting will long remember with pleasure, this occasion.

But the entertainment features of the convention will not be permitted to interfere with the business side. The officers of the association are very anxious that the meeting shall be of the greatest possible practical value, and to this end have sent the following list of every-day subjects to every street railway company in the State with the request that a representative make a selection therefrom and prepare a paper thereon. Should any subject of interest not embodied in the list suggest itself, any company is invited to adopt the same and send a paper upon that topic. The list suggested is as follows:

- Rail Welding.
- Track Bonding.
- The Third Rail.
- Storage Battery.
- The Repair Shop.
- Induction Motors.
- Care of Dynamos.
- Car Mileage Record.
- Indemnity Insurance.
- Municipal Ownership.
- "The Metallic Circuit."
- The Three-Phase System.
- Street Railroads vs. State.
- Loss of Current in Returns.
- General Track Construction.
- Inspection of Car Equipment.
- Transfers, Their Use and Abuse.
- "Receipts from Other Sources."
- Street Railways vs. Automobiles.
- Points on Overhead Construction.
- Long Distance Power Transmission.
- Impracticability of Reduction of Fare.
- Suggestions on Financial Organization.
- Maintenance and Repair of Car Bodies.
- Pleasure Resorts as Traffic Stimulators.
- Signal Systems for Single Track Roads.
- Air and Power Brakes for Electric Cars.
- Care and Inspection of Wheels and Axles.

- Local Railway Employees' Benefit Associations.
- Fuel Economy of Railroad Engines. (Allotted.)
- The Power Station, from an Economic Standpoint.
- How Can We Increase the Efficiency of Employees?
- The Proper Instruction of Motormen and Conductors.
- Compressed and Liquid Air for Street Car Operation.
- Fenders and Other Means for Prevention of Accidents.
- Experiments on Resistance of Rail Bonds. (Allotted.)
- Freight and Express Service on Interurban Electric Lines.
- The Mutual Relations of Municipalities and Street Railroads.
- Statistics of Street Railway Construction and Operation. (Allotted.)

Polyphase Equipment Used in Cornell University; Illustrated by Polyphase Apparatus. (Allotted.)

The presentation and discussion of brief and concise papers (limited to twelve minutes) upon practical subjects like these, will be a highly instructive and prominent feature of the meeting.

In addition, four members of Cornell faculty have consented to contribute papers to be read, as follows:

"Statistics of Street Railway Construction and Operation." Harris J. Ryan, professor of electrical engineering.

"Experiments on Resistance of Rail Bonds." Professor H. H. Norris, electrical engineering department.

"Fuel Economy of Railroad Engines." R. C. Carpenter, professor of experimental engineering.

"Polyphase Equipment Used in Cornell University." (Illustrated by practical exhibit of polyphase apparatus.) Professor I. J. Hotchkiss.

President Rogers has sent to all roads in the State a letter urging upon them the benefit, importance and necessity of having one or more of the practical men from each company in attendance at the convention. He also says:

"It is earnestly hoped that the smaller roads of the State will actively participate in the proceedings of the meeting, particularly in the preparation of papers and the ensuing discussion, also that non-member street railroads will send representatives authorized to join the association."

Mr. Rogers has also extended a very cordial invitation to representatives of all manufacturers and dealers in street railway supplies and apparatus, to participate in the benefits and pleasures of the convention, and urges such concerns to send one or more delegates. Ample space in close proximity to the place of meeting, for the exhibit of supplies, models, etc., will be furnished free of expense to those who desire to avail themselves of the privilege.

## Preparations for the Chicago Convention

A meeting of the general committee having in charge the arrangements for the coming convention at Chicago, of the American Street Railway Association, was held on the 14th of August at the office of J. M. Roach, general manager of the Union Traction Company, at 444 North Clark Street, Chicago. The meeting was attended by the chairmen of all the various committees and was called to order by T. C. Penington, secretary of the association, when, on motion, J. M. Roach was elected permanent chairman. The first business transacted was the filling of the vacant chairmanships of the various committees. The two committees on hotels and entertainments were consolidated and J. M. Roach was elected chairman in place of the late M. K. Bowen. The plans for entertainment and excursions were outlined and approved by all present. The programme includes a reception and dance at the hotel, a visit by rail to the drainage canal, a trolley trip to the parks on the South Side, and to the museum in Jackson Park, a visit by trolley cars to the stock yards, and the regular banquet. For the entertainment of the ladies of the association during the forenoon of each day's session, several carriage drives about the city and a visit in a body to some of the leading department stores, as well as to the public library and art institute on the lake front, will be arranged.

The committee on information and direction was authorized to prepare a book giving a map of the street railway lines of the city, with directions as to how to reach any of the parks or other important places in and about the city, together with a directory of local committees. Sufficient money was pledged by the representatives of the street railway companies present to carry out the programme and to meet all incidental expenses. The committee on space reported that all the space in the Tattersall Building had been engaged by exhibitors and a plan was outlined for securing additional space from the city in the neighboring streets and alleys.

All the committees are at work on their various assignments, and it is the intention of all that the Chicago convention will in its



attendance and interest, as well as in the matter of entertainment, eclipse any conventions that have previously been held.

The Tattersall's Building is 355 ft. x 146 ft. and the interior arrangement is shown in the illustration herewith. The partitions that now cut off the main floor from the floor under the gallery, however, will be taken down, so the entire floor will be open and no exhibit will be hid away from view.

In sending goods to the convention for exhibition purposes, manufacturers should remember the following directions:

All goods should be marked with the consignor's name, and directed to Tattersall's, Chicago, care of H. W. Smith, successor to Anderson Transfer Company, 1618 State Street. Bill of lading or advice that goods have been shipped in his care should be sent to Mr. Smith, giving particulars in regard to shipment. Goods will be delivered to the proper assigned space in the exhibition

### Four Cent Fare Proposition in Milwaukee

On July 31 the City Council of Milwaukee appointed a special committee to confer with the officers of the Milwaukee Electric Railway & Light Company with a view of obtaining, if possible, a reduction in the rates of fare charged, and of bringing about a better understanding and more harmonious relations between the city and the company. To this committee the company has signified its desire to do all in its power to secure these desired results, and offers the following concessions on both sides as a basis of agreement.

The concessions which the company is willing to make are:

1. A gradual and increasing reduction in the rates of fare, until a 4-cent rate is secured by the sale of commutation tickets.



INTERIOR OF CONVENTION HALL, CHICAGO

hall. All goods should be shipped early to insure delivery in time and all charges prepaid. All articles intended for the exhibition must be delivered at the building by the agent or owner, and at his expense, but the local committee has made arrangements with H. W. Smith (successor to Anderson Transfer Company) to haul and deliver all shipments to and from the building at low rates if directed in his care. All electrical connections for power and extra lights must be made at the expense of the exhibitor. The committee on exhibits will make contracts with carpenters, electrical workers and laborers at regular prices, so the exhibitors will not be overcharged for lumber, labor, etc.

Friday, the 20th, has been set apart by the executive committee for the examination of exhibits. No session of the association will be held on that day and no entertainments of any kind will be given by the local committee, so all delegates will have ample time to examine the displays made by the supply-men.

2. The permanent establishment of the transfer system.

3. The extension of the railway lines to the city limits at points necessary for the convenience of the people in the several localities interested.

4. The company is willing, in case the city desires, and has the power to purchase the railways and physical property of the company within the city, to grant an option to purchase on terms to be agreed upon, or, determined by arbitration.

For these concessions the company holds the city should grant the following:

1. Franchises upon certain streets which will enable the service to the public to be improved, and the railway system perfected.

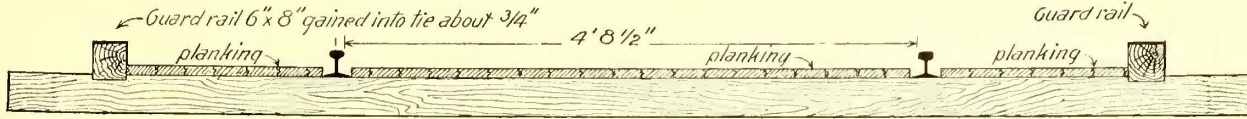
2. An extension of the railway franchises for ten years.

The London County Council will install about 10 miles of underground conduit electric railway.



**Trolley Accident Near Stratford, Conn.**

What will probably prove to be the most disastrous accident which has ever happened on an electric road occurred near Stratford, Conn., on Aug. 6, when a car on the Shelton Street Railway, filled with passengers, jumped the track near the south end



SECTION OF TRACK CONSTRUCTION ON BRIDGE

of a long bridge that crosses a deep ravine about 1½ miles from Stratford. The accident occurred about 3 o'clock in the afternoon, and the car fell about 50 ft. to the valley below. It turned completely over in its descent, and the weight of the motors and truck drove the floor against the top of the car, crushing many passengers. About twenty-eight passengers perished, while several others were severely injured. The Shelton Street Railway is a new line, recently opened between Shelton and Stratford. It is about 9 miles in length, runs along the western shore of the Housatonic River, and connects at Stratford with the systems of

criminally negligent in running the car at a dangerous rate of speed; also that the company was negligent in allowing an imperfect condition of its track on the day of the accident, and in not enforcing the rule as to speed in approaching the bridge. The following recommendations were also made:

"First, that all cars be required to stop before crossing the bridge at Peck's Mill, 30 ft. distant from the bridge, at either end.

"Second, that all trolley bridges have inside guard rails and that the outside guard rail be not less than 8 ins. high and be lined with iron.

"Third, that no man be allowed to act as motorman for a trolley car until he shall have qualified before some competent board of examiners and be licensed therefor.

"Fourth, that the number of working hours of motormen and conductors be reduced, and that they be allowed a reasonable time for their meals.

"Fifth, that the Governor convene the Legislature at the earliest



VIEWS OF WRECKED CAR TAKEN ON THE DAY FOLLOWING THE ACCIDENT

the Bridgeport Traction Company and the Milford Street Railway Company. The car to which the accident occurred was No. 2, of the Milford Street Railway.

From Stratford the tracks follow the highway in a northerly direction, until just before the ravine is reached at which the accident occurred. They then leave the highway and descend a grade of about 3 per cent a distance of some 700 ft. until the southern end of the bridge is reached. The latter crosses what in winter is an ice pond, but which, in summer, during dry weather, is a sort of morass. The track is laid with 4 in. T-rails, with flat head and sides; and 12 ins. outside of each T-rail is the usual wooden guard rail, 6 ins. x 8 ins. This guard is bolted to the ties, but is gained somewhat to fit into the ties, so that its effective height is reduced about an inch. The space between the rails and between the guard rails and the rails is planked for the greater part of the length of the bridge, including the part at which the car ran off the track. The company had ordered steel guard rails, to be laid inside the service rails, but they had not arrived.

The car was a 9-bench open car, mounted on a single truck, with a wheel base of about 7 ft. The depth of wheel flange was about three-quarters of an inch.

The testimony given before the Coroner's Jury seems to indicate that the motorman descended the grade leading to the bridge at a high rate of speed, and that the car commenced to oscillate and sway badly just before it reached the bridge, the cause being either the springing of the track on the embankment, owing to its having been recently built, or to the sudden change from a descending grade to the horizontal track, on the bridge, or both. The wheels jumped the track after the car had run about 40 ft. on the bridge. The car then ran about 30 ft. on the planking, climbed over the guard-rail, and left the bridge about 60 ft. beyond the point where it had left the rails. The evidence showed that when the car left the rails the current was turned off and the brakes set.

The decision of the Coroner's Jury was to find the motorman

possible date, for the purpose of creating a commission with ample power, whose duty shall be to supervise the construction and operation of trolley lines."

**Combination of Special Work Manufacturers**

The names of the constituent companies of the American Switch Company recently incorporated with \$11,000,000 capital were announced last week. They are as follows: Weir Frog Company, Morden Frog & Crossing Works, Johnson R. R. Frog & Crossing Company, Eliot Frog & Switch Company, New York Frog & Crossing Company, Ramapo Iron Works, Cleveland Frog & Crossing Company, Carlisle Manufacturing Company, Paige Iron Works and Pettibone, Mulliken & Co.

The capital is divided equally into 6 per cent preferred stock and common stock. The company, it is said, will have a working capital of \$1,600,000 in cash, and in addition has pig iron and manufactured goods on hand worth \$700,000. Two new plants are to be constructed at once out of the capital on hand, after which, it is stated, there will still be a liberal working capital in the treasury.

**Three Cent Fare Ordinance in Detroit**

The Common Council of Detroit passed, and on Aug. 16, the Mayor signed, an ordinance providing that all street railway companies in that city shall charge no higher rate of fare than eight tickets for a quarter. The city holds that whereby under the old ordinances the companies are authorized to charge "not to exceed 5 cents," the city retains the privilege of regulating the amount charged to a "reasonable rate."

On the same day the new resolution was passed the Detroit Citizens' Street Railway Company obtained from the United States



District Court an order restraining the city from enforcing or attempting to enforce the new ordinance. The restraining order is returnable Sept. 4, when a permanent injunction will be asked for.

### Consolidation of Albany and Troy Systems

Anthony N. Brady is authority for the statement that a consolidation of the street railway systems of Albany and Troy, N. Y., will be perfected within a few days. It is further stated that the consolidation of the Albany and Troy systems will be followed by the absorption of the Troy & New England Railroad Company, and also street railways in Saratoga, Rensselaer, Washington and Warren Counties, and in Vermont, which will give the consolidated company a monopoly of street car traffic from Albany to Lake George, on one side of the Hudson, and from Albany and Troy to Sand Lake, New York, and Bennington, Vt., on the other. It means, too, that the new company will be a powerful rival for the local business, so long enjoyed by the New York Central and Delaware & Hudson Canal Company's systems, which has made what is known as the Albany and Troy Belt Line one of the best, if not the best paying piece of steam railroad properties in the country.

The Albany Railway Company controls and operates all the street railroads in the Capital City, and its road to Troy has been particularly profitable. The Troy City Railway owns all the street railways in Troy, with lines to Green Island, Cohoes, Waterford, Lansingburg and Albia. The Troy & New England Railroad is a continuation of the Albia branch and runs to Sand Lake and Averill Park, two summer resorts largely patronized by residents of Albany and Rensselaer Counties. Ex-United States Senator Murphy and Anthony N. Brady are largely interested in the Troy and Albany roads, and they and their friends control the Troy & New England.

The Troy City Railway is capitalized at \$4,000,000, of which \$2,000,000 is in 5 per cent gold-bearing bonds. The Albany Railway has \$2,000,000 in 5 per cent bonds, and \$1,750,000 in common stock. The Troy & New England Company is capitalized at \$500,000.

### End of Street Railway Contests in Atlanta in Sight

The bitter fight over franchises in Atlanta, Ga., and its development into proposed municipal ownership, seems about to reach a settlement.

The electric railway committee of the City Council, after giving a hearing, which lasted several weeks, to the rival claimants—the Collins Park & Belt Railroad Company, and the Atlanta Railway & Power Company, has recommended an ordinance which will be far-reaching in its effects. This ordinance, which was passed by the City Council on August 21, after a long and heated session, proposes to regulate and govern the street railways, in a manner that has never before been attempted in Atlanta. It also looks to the leasing of all the lines of the Atlanta Railway & Power system after the expiration of its franchises in 1921, at a rental of 5 per cent of the gross receipts, and also the payment of the same tax by any other system then in existence. By their acceptance of the franchises just granted the two companies they become amenable to the new law.

The principal features of the law are as follows:

Section 4. The City of Atlanta reserves the right to regulate the location of tracks, wires, poles and conduits, and their construction.

Section 5. Any part of the lines of all street railway companies, not exceeding five blocks at any one point, may be used by any other street railway company, upon payment of just compensation.

Section 6. After the expiration of the original grants to the Atlanta Consolidated Street Railway Company all companies shall pay (beginning May 20, 1921) a percentage of their gross receipts, not exceeding 5 per cent per annum.

Section 8. The rate of fare for one continuous trip from 5 A. M. to 12 P. M. shall not be more than 5 cents, and from 12 P. M. to 5 A. M. not more than 10 cents.

The section 6 is the direct outcome of the voluntary offer of the Atlanta Railway & Power Company to pay a part of their net receipts to the city. This offer was declined, as its acceptance entailed a refusal from the city to grant franchises to competing lines.

During the hearing the accusation was made that the application for franchises by the Collins Park & Belt Railroad Company was for speculative purposes, and made in order to sell their electric light plant to the Atlanta Railway & Power Company. The

Collins Park road is required, on its acceptance of franchises granted them, to give the city a bond for \$40,000 that work will begin in four months, and the system completed in twelve months. Their offer of \$50,000 toward the construction of a new bridge was accepted.

One of the most interesting features of the new law is an amendment made to section 6, with the object of preventing the two systems from consolidating. Its substance is as follows:

"Should the two systems now competing consolidate, unite or by any means direct or indirect, have the same or reciprocal management, or any understanding as to the operation of the two systems in unison, the 5 per cent tax on gross receipts shall at once become effective on both roads." It is provided, however, that a reciprocal use of transfers between the two lines may be permitted without subjecting the companies to the tax, until 1921.

### Consolidation of Machine and Tool Manufacturing Interests

A new company, formed by the consolidation of the Niles Tool Works of Hamilton, Ohio; the Pond Machine Tool Company, of Plainfield, N. J.; Bement, Miles & Company, of Philadelphia, and the Philadelphia Engineering Works, was incorporated at Trenton on Aug. 14. The company is known as the "Niles-Bement-Pond Company," and has a capital stock of \$8,000,000, \$5,000,000 of which is common and \$3,000,000 6 per cent cumulative preferred. The four companies included practically control the heavy machine tool trade, including the manufacture of gun carriages, in this country, employing together over 3000 men. The temporary offices of the company are with the Corporation Trust Company in Jersey City, and the New York offices will probably be at 136 Liberty Street.

The directors of the new concern are: Alexander Gordon, president of the Niles Tool Works Company; Charles A. Moore, of Manning, Maxwell & Moore; Clarence S. Bement and Frederick B. Miles, of Bement, Miles & Company; Gordon Shillito, Thomas T. Gaff and Daniel H. Holmes, of Cincinnati; Frederick W. Gordon, of Philadelphia; George T. Reiss and James P. Cullen, of the Niles Tool Works Company; E. C. Burke, of Cleveland, Ohio; Walter L. Clark, of the Niles Tool Works Company; A. C. Stebbins, of the Pond Machine Tool Company; W. S. McKinney, of Pittsburgh, and Robert C. McKinney. Officers—President, R. C. McKinney; first vice-president, James P. Cullen; second vice-president, A. C. Stebbins; third vice-president, Walter L. Clarke; treasurer, Charles L. Cornell, of the Niles Company; secretary, E. N. C. Davis.

### Trolley Contact Spring Case

On Aug. 1, the General Electric Company secured in the United States Circuit Court, District of New Jersey, a decision against the Rahway Electric Light & Power Company, of Rahway, N. J., in its suit for alleged infringement of the Anderson patent, No. 412,155. This patent covers an invention for the arrangement of certain metallic conducting brushes intervening between the end of a trolley wheel and the frame or fork in which the wheel is journaled, for the purpose of maintaining a good electric connection against them in the ordinary system of overhead underrunning trolley.

The defense made by the defendant was, lack of invention, a complete anticipation, lack of patentable novelty in view of the prior art, and entire lack of infringement on the defendant's part. The court, after very fully reviewing the case, decided that the Anderson patent, now owned by the General Electric Company, and dated Oct. 1, 1889, antedates other patents granted for spring contact devices on underrunning trolleys, and therefore gave judgment for the complainants.

### Consolidation of Electrical Directories

It is announced that the E. L. Powers Company, of New York, has secured control of the "Electric Railroad List of the World," formerly published by the "Railroad Gazette," and has consolidated this list with the "American Street Railway Directory." By means of this combination the new publication will have the combined circulation of both directories, its scope enlarged, and the data improved in point of accuracy and completeness.



## NEWS OF THE MONTH

A recent compilation shows that the tramway companies of Great Britain are using on roads now in operation, and have ordered for roads constructing, from 2500 to 3000 American electric motors, and nearly or quite 40,000 h.p. of American electric railway generators.

The American Mica Company, which has a capital stock of \$3,500,000, and which will control the output of mica in the United States, has been incorporated under the laws of New Jersey.

C. B. Wisner, secretary of the Sills Mica Company, of Chicago, when asked regarding the new corporation, stated that besides his own company the Eugene Munsell Company, of New York, and the American Mica Company, of Boston, are interested.

The Twenty-eighth and Twenty-ninth Street Cross Town line of the Metropolitan Street Railway Company is now being operated entirely by compressed air cars from the power station at the foot of West Twenty-fourth Street.

A cablegram from Glasgow announces that the Glasgow Tramway Committee on Aug. 15 accepted the tender of the Edward P. Allis Company, of Milwaukee, for the engines for its new power plant. It is said the order amounts to £114,544.

At a meeting on Aug. 16, the directors of the Brooklyn Rapid Transit Company passed resolutions complimenting President Rossiter upon his able management of the road and the masterly way in which he handled and suppressed the recent strike.

A newspaper special dispatch from Chicago reads as follows: "John M. Roach, who has been president of the Chicago Consolidated Traction Company and also general manager of the Chicago Union Traction Company, has resigned his position as president of the Consolidated Company and Charles T. Yerkes takes his place. It is said Mr. Yerkes intends to give his active attention to the Chicago Consolidated Traction Company. He has also taken into the board with him John R. Walsh, president of the Chicago National Bank, and Harvey T. Weeks, a retired capitalist and active politician, who during the days of the elder Carter Harrison was the right-hand man of the Mayor." It is stated in addition that Warren F. Furbeck, vice-president of the Consolidated Company, has also resigned and has been succeeded by L. S. Owsley.

Albert L. Johnson has given out the following interview:

"We hope to get a franchise soon to build and operate a conduit electric road from the heart of London to Brighton. Our surveys and specifications are about completed, and by the latter part of September everything will be in shape to lay before the controlling powers of London. We shall offer the people of the British metropolis very great inducements to give us the franchise we seek. There is nothing like the American sub-trolley service there, and we propose to build and equip a road in first-class style and carry passengers from London to Brighton for sixpence, which is twelve and one-half cents of our money. The present rate of fare between those two points is equivalent to \$1.50 of American money."

The distance from the city limit of London to Brighton is 45 miles. From the city limits to the heart of London is about 7 miles more, so that the American syndicate offers to carry passengers 52 miles for sixpence.

The Board of Railroad Commissioners has made arrangements for a test of brakes for street surface railroad cars. Twenty-two permits have been issued for that purpose, and each person or company receiving a permit is allowed to equip with brakes one of the cars of the Metropolitan Street Railway Company, and the tests will be made, three or four on one day at Lenox Avenue and 146th Street, New York City. The first series of tests were made on Tuesday, Aug. 29, and Wednesday, Aug. 30, between the hours of 9 A. M. and 5 P. M. On these days from five to seven brakes were tested. Notice of the dates of tests to follow will be given in the daily newspapers and in the street railway publica-

tions. An invitation to be present is extended to those who are interested in the operation of street surface railroads.

An illustration of the way in which the investing public is rapidly absorbing street railway and electric lighting securities may be obtained from the fact that the United Electric Securities Company, of Boston, has, under date of Aug. 1, called for redemption at 103 and accrued interest over \$600,000 of its collateral trust 5 per cent bonds outstanding. These bonds have been secured by underlaying 6 per cent first mortgage bonds of electric railway and lighting companies, which have now been sold at a substantial advance over the prices at which they were rated as collateral, and the proceeds of these sales are to be used to retire the bonds as above stated.

It is semi-officially announced that Charles P. Clark, president of the New York, New Haven & Hartford Railroad, may, on account of poor health, find it necessary to retire from that office, and his resignation is expected at the October meeting. This announcement will be received with no less regret in electric railway circles than in the steam railroad world, for it is largely due to Mr. Clark's interest and faith in the application of electricity to heavy passenger transportation problems that the experiments with the third rail and overhead systems, which have resulted in so many valuable developments, have been carried out on the N. Y., N. H. & H. R. R. It is stated, however, that Mr. Clark will still retain his position as a director of the road.

It is further announced that John M. Hall, the present vice-president of the system, will be elected to the presidency on the retirement of Mr. Clark.

The Birmingham Railway & Electric Company has voluntarily increased the wages of its conductors from 15 to 17½ cents an hour, and motormen from 12 to 15 cents an hour. The increase applies only to those who have been in the employ of the company one year or over.

The Birmingham Traction Company has voluntarily increased the wages of its employees. New motormen will receive 13 cents an hour for the first six months' service, 14 cents for the second and 15 cents thereafter. In the same manner the conductors will get 14, 15 and 16 cents per hour, according to the length of service. Heretofore motormen have been receiving 13 cents and conductors 14 cents. The company has also posted a notice that a ten-day vacation on full pay will be given in October to the motormen and conductor who shall have made the best record before that time. A second prize will also be offered.

The Little Rock Traction & Electric Company has increased the wages of motormen and conductors, who have been in the company's employ two years or more, 3 cents an hour.

The Denver Tramway Company, on Aug. 12, gave the women of the Old Ladies' Home of that city a free ride about the city. The ladies were taken to the City Park, where the company had provided luncheon for its guests.

The Derby Street Railway Company has notified its motormen and conductors who have been in the company's employ not less than five years that they will receive \$2.50 a month increase; when they have been in the service ten years there will be another increase of \$2.50, and then an increase of the same amount for each succeeding five years.

Corporation Counsel Robertson, of Hartford, on Aug. 8, rendered an opinion that street railways may sub-lease their lines for a freight business provided they own the cars used and that they are run by their motormen. He states that all street railways have a right to carry freight, but as to sub-letting their property, unless their charter gives them permission, they cannot do it except under the conditions named.

The trolley express between Manchester and Hartford was boycotted so persistently by the merchants of the former place that it has been discontinued.



One of the buildings of the electric light plant of the Washington Traction & Electric Company was recently destroyed by fire. The loss is estimated at \$50,000. The building was used for the storage of electrical appliances, and for stable and office purposes.

The Indianapolis Street Railway Company will erect a large car plant and repair shops on West Washington street. The new buildings will be 200 ft. x 200 ft., and will be fully equipped with the necessary machinery and facilities for building street cars complete, with the exception of motors and trucks. Life guards and other supplies will be manufactured. It is understood these shops will be able to fill orders from outside companies as soon as the needs of the Indianapolis Street Railway Company have been supplied. In addition to the new plant the company has let contracts for a new car barn 100 ft. x 180 ft., on Louisiana Street. This will have storage capacity for fifty cars.

The Mayor of New Albany has appealed to the Supreme Court to compel the operation of the New Albany Railway, which was recently discontinued.

Flint & Hanlon, contractors, have commenced the work of lowering the elevated street railway of Sioux City, now the property of the Sioux City Traction Company. About 1500 ft. of this structure will be taken down at this time. The remainder will be lowered some time next year, and the material will be used in the construction of steel bridges.

The Cedar Rapids & Marion City Railway Company has put in effect a new scale of wages. All conductors who have been on a regular run for one year have been given an increase of 20 cents a day; motormen who have been on a regular run for two years receive an increase of \$1 a month, and motormen having regular runs for five years past receive an increase of \$2.50 per month.

The Detroit Electric Railway Company has refused the demand of the executive board of the railway employees for an increase of 4 cents per hour in wages. There has been a call for a meeting of the employees, and a strike is threatened.

Judge Lillibridge, of the Circuit Court, July 27, delivered a decision permanently enjoining the street railway companies of Detroit from carrying freight over their lines within the city. Hitherto the cars have carried freight over the city lines, although there has been no specific authority for so doing.

The report of the various street railway companies operating in St. Louis, for the second quarter ending June 30, as to the number of trips made and passengers carried is as follows:

	Trips.	Passengers.
Lindell Railway.....	284,856	6,470,246
St. Louis & Suburban.....	41,669	3,244,924
Union Depot.....	201,024	7,071,668
Citizens' Railway.....	78,970	2,375,986
Cass Avenue.....	153,534	2,611,273
Jefferson Avenue.....	36,916	382,496
Missouri.....	181,204	4,164,153
Southern Electric.....	50,346	1,688,771
St. Louis Railroad.....	247,140	3,274,000
Peoples' (April 1 to 11, inclusive).....	6,349	97,350
St. Louis Traction Co., Peoples' Div., April 12 to June 30.....	44,329	766,877
Total.....	1,326,337	32,227,686

The officials of the Wellston, Creve Coeur Lake & St. Charles Railroad Company, of St. Louis, celebrated the completion of the line to the company's grove at St. Charles Rock and Lucas Lane, by giving an entertainment at the grove, Aug. 12.

The Metropolitan Street Railway Company, of Kansas City, is planning to build large shops for the purpose of manufacturing many of its own supplies including iron poles, fenders, etc.

The electric light companies of Hoboken, Elizabeth and the People's Light and Power Company, controlling the electric light plants in Newark, the Oranges, Montclair, Jersey City, Bergen Point and neighboring towns and villages, have been consolidated. The new company will be known as the United Electric Company of New Jersey. The consolidation of the electric light properties is looked upon as a step in the ultimate consolidation of the electric railway interests with the gas and electric light companies in that section of the State. Bernard Shanley, John D. Crimmins and the Widener-Elkins syndicate are interested in the consolidation.

The Plainfield Street Railway Company and the Brunswick Traction Company have entered into an agreement for issuing transfers to each other's lines at Dunellen.

The South Orange Avenue car barn of the North Jersey Street Railway Company, of Newark, was destroyed by fire recently. Two parlor cars were destroyed, together with five snow sweepers, seven new cars for its Orange and Passaic line and sixty-two other cars. The loss is estimated at \$140,000. The fire is supposed to have been caused by lightning entering the building on the trolley wires. The power house escaped serious damage.

The Canandaigua Lake Transportation Company and the Canandaigua Electric Light & Railroad Company have arranged a special feature known as "Bargain Days." On Monday and Thursday afternoons of each week the companies have arranged to carry passengers on both boat and railway at a greatly reduced price. The privilege of stopovers is also allowed.

The Augusta Railway & Electric Company will construct a park at Summerville. The proposed park will be a spacious affair of fifteen acres, situated on the Wrightsville Road in the vicinity of the old Camp Mackenzie. It will be laid off in grass plots interspersed with fountains and beds of various flowers, and the walks to be lined with shade trees. A large two-story pavilion will also be provided. The lower, or ground story of this pavilion, will be used as a car house, where will be kept an extra supply of cars, so that large crowds can easily be handled. The upper portion will be fitted up as a first-class dance pavilion of the latest design. The construction of the park is expected to begin at an early date.

The Lewiston, Brunswick & Bath Street Railway Company, of Lewiston, and the Maine Central Railroad are engaged in a rate war. The Maine Central has reduced its rates so as to conform with those of the electric railway, and an interesting war will probably be the result. The electric railway rates will probably be again cut.

The New Orleans Traction Company recently donated the receipts of one night at West End to the Charity Sewing Room of New Orleans.

President Vreeland, of the Metropolitan Street Railway Company, of New York, has granted a three days' vacation with full pay to all the conductors and motormen of the system who remained loyal during the attempted strike on July 19-20. This privilege is equivalent to a gift of from \$20,000 to \$25,000 from the company to the men.

The Brooklyn Rapid Transit Company has fixed the rate of pay of motormen in its employ as follows: Motormen on surface cars, \$2 per day; bridge train motormen, \$2.25 per day, and regular elevated motormen \$2.50. The elevated motormen are composed chiefly of locomotive engineers, who accepted positions as motormen when the Fifth Avenue branch was equipped with electricity. These men suffer a decrease of \$1 per day in wages.

Owing to the failure of the employees and the officials of the Chippewa Valley Electric Railroad Company, of Eau Claire, to come to an agreement on a scale of wages, the men went out on strike, and on Aug. 6 the company was forced to discontinue the operation of its cars. Many obstructions were placed on the tracks and mobs threatened the street railway property in various parts of the city.



The Milwaukee Electric Railway & Light Company has voluntarily increased the wages of employees in the company's service five years from 19 to 20 cents an hour.

The question of municipal ownership of street railways and conduits bids fair to become one of the vital issues before the Council of Richmond. It is stated the following resolution will soon be introduced: "Be it resolved by the Council of the City of Richmond, That the committee on charter changes is hereby instructed to report to this body amendments to the charter of the city of Richmond, as follows: 1. Granting power to the city to construct, or acquire by purchase, maintain and operate street railways for the carriage of passengers and freight for hire and reward, and in furtherance of such powers to issue bonds and secure the same upon such franchise, trackage, rolling stock, &c. 2. Granting power to the city to construct, maintain rent or lease underground conduits within the city of Richmond for the conduct of telephone, telegraph and other electrical conductors, and in furtherance of such powers to issue bonds and secure the same upon such conduits."

The Memphis Street Railway Company has increased the wages of motormen and conductors who have been in the company's employ one year or over from 14 to 15 cents an hour.

One of the cars of the Nashville Street Railway, while passing over the Cumberland River bridge, was thrown into the river, a distance of twenty-five feet, by a span in the bridge giving away. Fortunately very few people were injured and the car and equipment suffered little damage, considering the severity of the accident.

A daring robbery took place shortly after midnight, July 31, at the car barn of the Newport & Fall River Street Railway Company, in Portsmouth. Five masked men entered the barn, subdued and robbed the employees who were there, and then entered the office, emptying the money locker and making two unsuccessful attempts to blow open the safe. One of the employees, who was bound, after several hours succeeded in freeing himself and tried to telephone for assistance, but found that the wires had been cut. It was found necessary to dispatch cars to Newport and Fall River before the authorities could be notified. It is said that the robbers secured about \$500.

The Allentown & Lehigh Valley Traction Company has decided to comply with the request of its motormen and conductors for an increase in wages. The most cordial relations exist between the men and the management, and the decision to increase the wage scale was largely influenced by the respectful manner in which the request was made. The old rate was 15 cents an hour for both motormen and conductors. The new scale gives 15 cents an hour for the first year, 16 for the second and 17 thereafter. This places the employees of this company among the best paid street railway men in Pennsylvania.

### New Company for the Manufacture of Heavy Electrical Apparatus

A meeting of the stockholders of the Scott-Janney Electric Company, recently incorporated at Trenton, with a capital of \$30,000,000, was held in Philadelphia, Aug. 21. This company is organized for the purpose of manufacturing, on a large scale, electrical apparatus and supplies, including alternating and direct current apparatus, motors, dynamos, etc., up to 2000 volts capacity, arc lamps and transformers, under patents granted to Gordon J. Scott, and will come into direct competition with the General Electric Company and the Westinghouse Company. The company has in operation a large manufacturing plant at Twenty-second Street and Washington Avenue, Philadelphia.

The Scott direct current railway system differs materially from the ordinary systems, and for it the following claims are made:

First.—It can be applied to any of the existing railway motors.

Second.—When so applied will enable the existing motors to do more efficient work.

Third.—It will enable present motors to start and accelerate a car or train of cars to maximum running speed from 30 to 40 per cent faster than at present without taking any more current, or will start them as fast with from 20 to 30 per cent less current.

Fourth.—This system does away with all jerking of cars or trains even while starting very quickly.

Fifth.—This system when used in connection with Scott railway motors, which are of a new type and very light, efficient and powerful for the size, will return 20 to 30 per cent more work at the car wheels than any other motors.

Sixth.—It makes no difference whether one or one hundred cars are in one train, as all motors in such train can be controlled from any car by fractions of a revolution, or by fractions of a pound at periphery of car wheels.

Seventh.—Any trolley system, overhead, underground, surface contact or third rail, will need only 65 to 70 per cent of the copper necessary with existing railway systems, or those which will use any other system of driving and control.

A. Langstaff Johnston, consulting engineer, has examined the workings of the system in detail, and has reported most favorably upon its merits.

The Scott-Janney Company also proposes to introduce what it calls a gaso-electric system, which it is announced contains all the advantages of an independent and self-contained motive power, secured by compressed air or storage batteries without their attendant dead weight and complicated machinery, and at greatly reduced cost for installation and maintenance.

The following officers for the year were elected: Frank Le Bar, Philadelphia; Henry A. Sage, Ogdensburg, N. Y., president of the Ogdensburg Heat, Light & Power Company; Gordon J. Scott, Philadelphia; General Frank Reeder, Easton, Pa.; Robert Alexander, Philadelphia; William B. Hill, director of the People's Trust Company, New York; Edward A. Abbott, Concord, N. H.; J. F. Tapley, New York; James B. Dill, director of the Trust Company of America, New York, and the Federal Steel Company; W. H. Wolverton, treasurer of the Bell Telephone Company, New York; Charles W. Drake, former vice-president of the Missouri Pacific Railway Company and a director of the American Trust Company, New York; Allen D. Laney, of the banking firm of Lathrop R. Bacon & Company, New York; T. Quincy Brown, president Atlantic National Bank, Boston; Daniel O'Day, of the Standard Oil Company, New York; Charles Watson, chief engineer American Sugar Refineries Company, New York; C. W. Ogden, New York; Frank R. Hansen, New Jersey; George H. B. Martin, New Jersey; William S. Janney, R. F. Lopez and Charles F. Walter, Philadelphia.

### Recent Electric Roads in England

It is reported that the projected Isle of Thanet electric road will soon be built. This new line, which will be 10 miles long, will pass through Ramsgate, Margate and Broadstairs, three of the most popular English seaside resorts. The contract will probably be worth £30,000. Orders have just been sent the Edward P. Allis Company, of Milwaukee, for two 300-h.p. engines. Additional orders will also be placed with this concern.

Among English trolley lines equipped with American electric appliances is the Staffordshire Tramways Company. The Potteries Electric Traction Company, which is an extension of that line, is now nearing completion. The electrical part of the contract is worth about \$100,000. The American Tube Works and Morris Tasker, of Philadelphia, supplied 1450 tubular steel poles.

Three horizontal compound condensing engines of 350 h.p. each were furnished by the McIntosh, Seymour & Company, of Auburn, N. Y. The General Electric Company made the generators. The motor trucks came from the Peckham Motor Truck and Wheel Company, of Kingston, N. Y. The insulators were ordered from the Albert & J. M. Anderson Manufacturing Company, of Boston, and all the copper was supplied by the Washburn & Moen Manufacturing Company, of Worcester, Mass.

The August issue of "Cassier's Magazine" is a special number devoted exclusively to electric railways. It contains about eighteen long articles on live street railway questions, written by as many different engineers, each an expert on the particular subject treated in his paper. Among the topics discussed are: "The Latest Developments in Electric Conduit Railways," by F. S. Pearson; "Electric Tramways in Great Britain," by Robert W. Blackwell; "Building an Electric Railway," by Lemuel W. Serrell; "Overhead Construction," by J. G. White; "The Development of the Tram Car," by John A. Brill; "Rails and Rail Joints," by M. K. Bowen; "Light Electric Railways," by Dr. Louis Bell; "The Multiple Unit System for Electric Railways," by Frank J. Sprague; "The Selection of Rolling Stock," by C. F. Uebelacker; "Storage Batteries and Electric Railways," by Herbert Lloyd; "Electric Railways in America," by W. J. Clark, etc.



### Pennsylvania Street Railway Association

At a meeting of the Executive Committee of the Pennsylvania Street Railway Association, held recently, it was decided to postpone the eighth annual meeting of the association from the first week in September to Wednesday and Thursday, Oct. 4 and 5.

The meeting will be held at the Stevens House, in the City of Lancaster. Papers and addresses of interest to members of the association will be read and delivered at the first day's session, while the second day will be occupied with a series of entertainments of interest and attraction to members and visitors in attendance at the meeting.

### Foreign Exports From America

The official figures of the foreign trade movement for the fiscal year ending June 30, 1899, have just been completed by the Treasury Bureau of Statistics, and show a very satisfactory improvement, both in gross and in detail. The total exports for the year amounted to \$338,667,794, as against \$290,697,354 in 1899. The greater part of this large increase is shown in the classes of manufactured iron and steel, which increased from \$70,406,885 in 1898 to \$93,715,951 in 1899. The differences in certain of the important detailed classifications appear in the following table:

	1898.	1899.
Cars and carriages .....	\$3,424,419	\$4,106,284
Copper ingots .....	31,075,636	34,476,343
Electrical and scientific apparatus....	2,770,803	3,309,180
Steel rails .....	4,613,376	5,298,125
Steel wire .....	2,593,306	3,891,180
Builders' hardware and tools .....	6,428,332	7,842,372
Electrical machinery .....	2,052,504	2,736,110
Metal working machinery .....	4,618,683	6,491,586
Pumps and pumping machinery .....	2,023,034	2,710,654
Locomotive engines .....	3,883,719	4,728,748
Miscellaneous machinery .....	13,336,930	18,722,251
Iron pipes and fittings .....	3,092,016	5,874,228

### Annual Report of Brooklyn Rapid Transit Company

President Rossiter, under date of Aug. 21, has transmitted to the stockholders of the Brooklyn Rapid Transit Company the annual report of the company for the year ending June 30, 1899. Mr. Rossiter fully reviews the growth of the system, and after giving the cost of consolidation of the different properties now included and the results expected to be obtained from these consolidations, he says in part:

"It can now be said of the Brooklyn Rapid Transit system that in mileage of track it is the largest street railway system in the world, comprising 504 miles, or more than twice the trackage of the Metropolitan Street Railway Company, of New York, nearly 400 miles more than the Manhattan Elevated Railway Company, of New York, 60 miles more than the Union Traction Company, of Philadelphia, and 173 miles more than the Boston Elevated Railway Company, including the old West End Company. In amount of passenger earnings it surpasses every street railroad system in the world with the exception of the Metropolitan Street Railway Company, of New York."

The combined reports of all the companies now included in the Brooklyn Rapid Transit Company (comprising the Brooklyn Heights, Brooklyn City, Brooklyn, Queens County & Suburban, Brooklyn Union Elevated, Nassau Electric, Kings County Elevated, Brooklyn & Brighton Beach, Sea View Railroad and Prospect Park & Coney Island), give for the

Year ending June 30,	1897.	1898.	1899.
Receipts from passengers.....	\$9,343,261	\$9,877,001	\$11,035,216

The table given below gives the operating statement of the Brooklyn Heights Company during the year ending June 30, 1899. The figures do not include the figures of the acquired companies prior to the time of acquisition. The method of operation is to have all the companies leased to the Brooklyn Heights Railroad Company, which is the operating company, and the income of the Brooklyn Rapid Transit Company consists of the surplus profits of the Brooklyn Heights Company, and such moneys as it may receive from the stocks and bonds held by it. The figures given below include the reports of the Brooklyn Heights, the Brooklyn City, Brooklyn, Queens County & Suburban, and the Sea Beach Railway for the entire year, and the Brooklyn Union Elevated and the Nassau Electric for three months only of the fiscal year. For purposes of better comparison the figures of the leased companies for the corresponding period of the preceding year are combined

with those of the Heights Company, although they were not at that time, of course, a part of the Brooklyn Rapid Transit system.

### OPERATING STATEMENT, BROOKLYN HEIGHTS RAILROAD COMPANY

	Year ending June 30,	1898.	1899.
Gross earnings.....		\$6,616,361	\$7,412,435
Operating expenses .....		4,232,206	4,669,371
Net earnings .....		2,384,155	2,743,064
Income from other sources.....		*185,459	13
Gross income .....		2,569,614	2,743,077
Fixed charges .....		2,482,349	2,289,909
Surplus .....		\$87,265	\$453,167
Per cent operating expenses to gross earnings...		63.9	62.9

\*Includes income from guarantee fund (\$181,370), which in the succeeding year was paid directly to Brooklyn Rapid Transit Company, and did not pass through operating company's account.

### INCOME ACCOUNT, BROOKLYN RAPID TRANSIT COMPANY

Year ending June 30, 1899.

Receipts.	
From interest on bonds and loans.....	\$188,395
From profit on bonds sold.....	182,001
From miscellaneous .....	425
From Brooklyn Heights R. R. Co.'s surplus...	471,555
	\$842,375
Expenses.	
For interest .....	\$338,261
For taxes and miscellaneous expenses.....	41,565
	379,826
Surplus for year.....	\$462,549
Accumulated surplus prior to June 30, 1898....	215,579
Total surplus June 30, 1899.....	\$678,128
Deductions from Surplus.	
For new equipment and construction on railroad properties .....	\$300,482
For extinguishing old deficiencies of B., Q. C. & S. R. R. Co. accrued prior to its acquisition by B. R. T. Co.....	321,174
Direct to profit and loss.....	1,931
	623,587
Surplus carried forward.....	\$54,541

### Plant for the Manufacture of Electric Brakes

The Hubbard Brake Company is the name of a new concern formed for the purpose of manufacturing and introducing throughout the United States an electric brake of new design, patented by M. G. Hubbard, whose mechanical ability is well known through his connection with the McGuire Manufacturing Company, of Chicago, as engineer. He was the inventor of several of the McGuire specialties, including a snow sweeper, truck, etc. The officers of the new company are: M. G. Hubbard, president and general manager; George E. Pratt, vice-president; Charles Gilpin, secretary and treasurer. Mr. Pratt has handled high-grade street railway supplies for many years, and is well known throughout the trade. Mr. Gilpin is secretary and treasurer of the Andover Iron Company, and is interested in other iron and railroad enterprises.

The company's works are located in Chester, Pa., near the freight station of the P. W. & B. Railroad, on Sixth Street. Machinery is being installed, and it is expected the works will be in operation by September 1. The company is well backed financially, and it begins operations with a number of orders on hand.

The electric brake to be manufactured has been thoroughly tested under practical conditions, and has shown excellent results. It is claimed for the device that stops can be made easily and quickly without jerking or jarring; it will prevent flat wheels; its first cost is not high, and the maintenance charges are very small; it can be operated by any motorman and from either end of the car, a small controller handle being provided for the purpose; there is no undue strain on car body or truck, as in some air brake systems, and no extra strain on the car axles, as in some disk or axle brakes.

The Hubbard Brake Company is equipping cars at Spring City, Pa., with this brake.



### Street Railways in Foreign Cities

An interesting investigation upon the operating conditions of street railways in different foreign cities has recently been conducted by the Royal Trust Company, of Chicago. The information was secured by direct correspondence during the last three months with the United States Consuls, resident in the different cities, so that it can be relied upon as being up to date.

Of thirty-seven cities in various parts of the world about which information was obtained eight own and operate the transportation lines, four own the lines and lease them to companies which operate them, and in three others provision is made for municipal ownership at some future date. In eight cities passengers are permitted to stand in the aisles; in the others it is forbidden.

In a few cities, Cork, Prague and Marseilles, there is a uniform 2-cent fare, but in most cases the fare varies with distance traveled. Where information regarding franchises could be obtained an interesting variety of terms will be noticed. The data are grouped under the cities as follows:

*Basle, Switzerland*, electric transit. All lines built, owned and operated by the city. Fare, 2 cents for short and 4 cents for longer distances. Passengers allowed to stand in aisles and on platforms.

*Belfast, Ireland*, horse cars. Fare, 2 cents a mile. Standing in aisles or on platforms not allowed. Company has fourteen-year franchise and pays no bonus, but has to pave and repair middle of streets traversed by its lines.

*Berlin, Germany*, electric, steam and horse cars, also elevated (steam) belt line. Fare, 2½ cents for two miles and 1 cent for every additional mile. No passengers allowed in aisles, but a designated number are allowed on each platform. Companies have to pave and repair streets through which their lines run and pay a substantial bonus to the city.

*Berne, Switzerland*, steam and compressed air traction. Fare, 2 cents a mile. No one is allowed to stand in the aisles. Fixed numbers are allowed on platforms. City is negotiating for purchase of the company's lines.

*Brussels, Belgium*, electric—underground and overhead trolley—horse and steam traction. Fares from 2 to 12 cents, according to distance. No one is allowed to stand in the aisles. Cars generally divided into two compartments—first and second class.

*Buenos Ayres, Argentine*, electric, steam and horse traction. Underground electric line being constructed. Lines owned by British companies. Fares, 10 and 20 cents (paper). Two postmen and one policeman allowed on front platform (free); three passengers allowed on rear platform. Companies pay 6 per cent of gross receipts to city.

*Calcutta, India*, horse cars, but to be changed to electric cars soon. Fares, 2½ to 4½ cents. No passengers taken on after seats are occupied. Franchise runs twenty-five years; company pays a fixed amount per mile per annum and keeps middle of street in repair.

*Cape Town, South Africa*, electric trolley cars. Fare, 6 cents for three miles. Passengers stand on front and rear platforms, but not in aisles. Cars are "double-deckers," made by Brill, Philadelphia. Company has twenty-five years franchise; cannot learn that it cost anything.

*China*, there is not a street car in all China.

*Christiania, Norway*, one electric line (five miles) and one horse car line (four miles). Other lines under construction. City intends to buy the lines as soon as franchises expire. The city is now building a short line as a public enterprise. Fares, 2¾ cents. Fixed numbers allowed to stand on platforms, but none in aisles. Companies made no direct payment for their franchises, which expire in 1924, but pay taxes on their property like other corporations. Cars are "double-deckers."

*Copenhagen, Denmark*, horse and electric traction. Fare is 2¾ cents for any distance. When all seats are taken no more passengers are taken on, and conductors are heavily fined if they exceed the licensed number. Amalgamated Company pays the city a certain percentage of gross earnings.

*Cork, Ireland*, electric lines. Fare, 2 cents for any distance. Passengers not allowed in aisles or on platforms. Company's franchise is unlimited; it pays nothing directly, but paves the middle of the street and furnishes electric light to city at reduced rates.

*Dublin, Ireland*, electric traction. Fare, 1 cent a mile; minimum fare, 2 cents. Cars are "double-deckers." Passengers not allowed in aisles except in rainy weather. Company pays city \$2500 a year per mile of its line for right of way and also has to pave between its tracks and one foot on either side. Franchise runs forty years, with provision that city may buy the line after twenty years, paying actual market value of machinery and plant. In case of disagreement on price, the board of trade is to be the referee.

*Edinburgh, Scotland*, horse and cable cars. In six months the entire system will be cable. City owns entire system, which is operated by a lessee company. Fare, 2 cents a mile, except certain popular routes, for which the fare is 2 cents, although longer than a mile. Workmen's tickets between the hours of 5 and 7 A. M. and 5 and 7 P. M. daily, and Saturdays from 1 to 3 P. M., at 2 cents for two miles and 1 cent for each additional mile. No passengers taken on after all seats are occupied.

*Florence, Italy*, electric and horse traction. City owns the lines and leases them to private companies. Fares, 2 cents from outskirts to center of city and 3 cents across city. Passengers allowed on platforms, but not in aisles. Lessee company has a fifty-year franchise and guarantees the city at least \$12,000 a year revenue, besides contributing \$400 a year to a provident institution for street car employees and \$300 to a cabmen's society. Profits over 7 per cent are shared by the company and the city.

*Frankfort-on-the-Main*, entire system being changed to electric traction. Fares, 2½ to 5 cents, according to distance. The city recently bought the entire system, paying \$550,000 down and \$75,000 annually for seventeen years. There are twenty miles of lines. Fixed number allowed on platforms; no one in aisles. Considerably reduced rates given to pupils going to school or to private instructors, to swimming baths, to conservatories of music, art schools, etc. Family tickets at greatly reduced rates are issued, provided the husband's income is not over \$25 a month or the wife's not over \$15, and provided there is no son over twenty-one years of age.

*Germany*, there are still a number of cities, of 15,000 to 50,000 population, which have no street railways of any kind—Pforzheim, Trier, Ratisbon, Colmar, Jena, Kaiserslautern, Worms and others.

*Ghent, Belgium*, electric traction. Fares, 3 cents first-class; 2 cents second-class. Passengers allowed in aisles and on platforms. Franchise runs fifty years from Jan. 1, 1898. Company pays city 17 per cent of gross receipts annually, but not less than \$3860 (which amount the company deposits each 1st day of January in advance). Franchise provides for purchase of lines by the city before twenty years or after twenty years. Franchise also fixes minimum wages of conductors and motormen at 78 cents a day, and of workmen at 68 cents, and a maximum day's work in summer at fourteen and one-half hours and thirteen and one-half hours in winter, with an interruption of one and one-half hours for meals.

*Glasgow, Scotland*, has thirty-seven miles horse car service and three miles electric street railway. City owns and operates entire system. Fares, 1 cent for first half mile, 2 cents for two miles, and 1 cent for each additional mile up to six miles (longest route). No transfers given. Rule that no more passengers are to be taken on after seats inside and on top are taken, but rule is not kept. Entire system is to be made electric by 1901.

*Havre, France*, trolley cars (Thomson-Houston). Fares, 3 cents first-class, 2 cents second. Passengers on front platform pay second-class fare and those on rear platform pay first-class. Transfers, 1 cent extra. No one allowed in aisles. Franchise runs fifty years from 1893. Company pays city 2½ per cent on its gross receipts, but not less than \$3500.

*Kingston, Jamaica*, electric traction. Fare, 4 cents within any section—city is divided into three sections. Fare through three sections is 12 cents. Three front seats in each car are reserved as first-class, and fare is 6 cents instead of 4 cents. Tickets sold at reduced rates. Franchise runs thirty years. Company pays government 4 per cent of gross earnings and maintains streets it occupies to eighteen inches on each side of tracks. Passengers allowed in aisles and on platforms. Market cars run before 9 A. M. and after 5 P. M. for country people carrying produce—fare, 3 cents.

*Liverpool, England*, electric and horse cars, also lines of omnibuses. City owns all the transit lines. Fares, 2 cents for each "stage" or zone and 4 cents for entire three stages, four miles. Passengers allowed to stand in aisles and on platforms.

*Lyons, France*, electric, steam and horse traction. On steam lines locomotive draws trains of three long cars. Fares, for first-class (cushioned seats), 4 cents; second-class, 2 cents. Fourteen persons allowed on front platform and same number on rear. Nobody allowed to stand in aisles. Only one door in car for both entrance and exit. General tramway company pays \$16,000 fixed annual tax and also 10 per cent on all receipts in excess of \$2,000,000. Franchise provides for purchase by city after forty years.

*Maracaibo, Venezuela*, horse cars. Three companies. Oldest one pays 3½ per cent a month profit on its capital. Fare, 5 cents. Rule against passengers standing, but not heeded. Companies paid nothing, directly or indirectly, for their franchises, which have five years yet to run.

*Marseilles, France*, overhead trolley system being installed on all lines. Uniform fare of 2 cents. Company paves between



tracks and fourteen inches each side; also pays city small annual fee of \$19,300; and when gross receipts aggregate \$1,400,000 a further fee will be paid, as follows: For the next \$200,000, \$7720; for the following \$200,000, \$9650; for the subsequent \$200,000, \$11,580; and \$12,000 for every additional \$200,000. Electric trains are limited to four cars, not exceeding 118 feet, and speed is limited to twelve and one-half miles an hour. Franchise expires in 1950, when the State becomes owner of the company's tracks and other property located on the public domain. During the last five years of the concession, should it appear that the operating company fails to maintain the property in good condition, the State reserves the right to seize all the company's revenues, for the purpose of keeping up the same. The State will have the right to take all rolling stock, tools and similar movable property at a valuation fixed by experts, but will be under no obligation to buy more than suits its purposes or wishes. Upon the termination of the concession, should the State deem it useless to continue the operation of certain lines, the concessionaires will be required to remove their tracks and restore the streets to their original condition. The State reserves the right to purchase its concession at any time. The price, in such event, will be fixed by the net annual revenue of the seven preceding years, including the fees paid to the city. From the total thus obtained will be deducted the net revenue of the two last profitable years, and the average of the five remaining years will stand as the amount of an annuity, to be paid to the concessionaires during each unexpired year of the revoked concession.

*Mexico (City), Mexico*, cars drawn by mules. Suburban cars are larger and are drawn to outskirts by mules and thence to their destination by small American dummy engines (steam). Company is preparing to substitute electric for animal traction, but will retain the steam lines. Managers of company are Americans. Fares for city are 5 and 6 cents according to distance. Suburban fares are 12 to 30 cents. Passengers are allowed in aisles and on rear platform, but not on front platform.

*Munich, Germany*, electric, steam and horse cars. All lines are owned by the city. Fares, 2½ to 6 cents on horse cars, according to distance. Passengers not allowed to stand in aisles, but limited number allowed on both platforms.

*Naples, Italy*, horse cars and electric trolley cars. Fare, 2 cents on two back seats and 3 cents on cushioned seats; 2 cents to stand on front platform, 3 cents on rear platform. Company has fifty-year franchise; pays percentage of net profits to the city. Electric cars made in Schenectady, N. Y.

*Paris, France*, thirty-three lines of omnibuses drawn by two horses (with twenty-six to thirty places), fourteen lines of omnibuses drawn by three horses (with forty places), three lines of steam tramways, twenty-three lines of horse tramways, four lines of compressed air and electricity. All of the lines are controlled by one company, which has an exclusive franchise dated 1866 and expiring 1910. In 1896 the omnibus lines carried 129,000,000 passengers out of a total of 240,000,000 for all lines. Cars and omnibuses are "double-deckers." Inside fare, 6 cents (entitles passenger to transfer ticket); fare on top and on platforms, 3 cents. Passengers not allowed in aisles.

*Prague, Austria*, electric and horse cars. Lines all owned by the city. Fare, 2 cents. Passengers allowed in aisles and on platforms.

*Rheims, France*, horse cars; but change to electric traction is in progress. Fares, 3 cents for first-class and 2 cents for second-class. One cent extra for a transfer. Number of passengers on a car fixed by law. Franchise expires in 1945, and provides that from the net profits each year the company is entitled first to receive 5 per cent upon its invested capital, while the city is entitled to 25 per cent of any surplus above the 5 per cent. The remaining surplus goes to the company, except that after the company has carried three millions of passengers the city is to receive \$1.15 for every additional thousand passengers carried.

*St. Petersburg, Russia*, horse cars, single track. Principal line bought by city last September, and being operated by city at a profit. The city has suits pending to obtain permission of other lines, when electric traction will be installed. Cars are "double-deckers." Fares, 2½ and 3 cents. A dozen different lines but no transfers. Passengers allowed in aisles and platforms. Cars slow down but seldom stop for passengers to get on or off.

*Stockholm, Sweden*, horse and steam traction. Fare, 2¼ cents. Five persons allowed on front platform, six on rear and ten inside. Company's franchise runs forty years from 1876. Company is taxed 5 per cent on its income.

*Stuttgart, Germany*, electric traction. Power furnished by a separate electric lighting company. Fares, 2-1-3 to 6 cents, according to distance. Cars are limited to a fixed number of passengers, but exceptions are made in case of storm, after theater, last night car, etc. Company pays city 2½ per cent of gross receipts.

*Sydney, Australia*, electric, steam and cable traction. All lines owned and operated by the government of New South Wales. Fare, 2 cents a mile. Laws against overcrowding are disregarded.

*Tegucigalpa, Honduras*, no street car in the country and only one railroad, fifty miles long.

*Toronto, Canada*, electric traction. Fares, 5 cents; after midnight, 10 cents. Tickets, six for 25 cents, or twenty-five for \$1. Also tickets good from 6 to 8:30 A. M. and 5 to 6:30 P. M., eight for twenty-five cents. Sunday tickets, seven for 25 cents. School children's tickets, ten for 25 cents. Children under nine years, (not in arms), half fare. Passengers allowed in aisles and on platforms. Company's franchise given for twenty years with a renewal of ten years. Company pays city \$800 a year for every mile of single track; also pays 8 per cent of gross receipts up to \$1,000,000 and 10 per cent above \$1,000,000. Company is also taxed upon its plant, poles, etc., except track.

*Victoria, British Columbia*, electric trolley cars. Fare, 5 cents. Passengers allowed to stand in aisles and on platforms. Franchise given for fifty years, for which the company pays nothing, either in the way of taxes or bonus.

*Winnipeg, Manitoba*, electric trolley line. Fare, 5 cents. Passengers taken on regardless of seating capacity. Franchise granted 1893 for thirty-five years without bonus or conditions, except that after eleven years the company must pay the city 5 per cent of its gross earnings and pave its track (8 ft.) uniform with pavement laid by the city.

### Westinghouse Electric Company Abroad

The plans for the erection of a large factory for the construction of electrical machinery in England by Mr. Westinghouse, as outlined in the STREET RAILWAY JOURNAL last month, seems to have attracted the liveliest sort of interest among English manufacturing circles. London "Engineering" publishes a long editorial on the subject, in which it advises the English manufacturer to consider well the growing competition of American manufacturers, which competition has increased owing to the readiness with which the American manufacturer introduces improved methods and tools to facilitate his work. It regards the establishment of the proposed works in England by Mr. Westinghouse as a most important step in the history of manufacturing in England, and as beneficial to the English manufacturer in that he will be able to study American methods close at hand. The adoption of these methods is regarded as essential to the maintenance of English prestige.

In a recent interview with Mr. Carnegie on the subject, published in the London "Daily News," that prominent operator says that, if permitted by the British workman to introduce American methods, the success of Mr. Westinghouse in his Manchester establishment will be undoubted. He also adds, apropos of the increasing use of electric power, that at the Carnegie works in Pittsburgh all kinds of motive power are being discarded in favor of electricity.

### Company for Making Veneer

The Seguire-Axford Veneer Company is the name of a new corporation organized to manufacture veneer for street car and railroad car ceilings, sides, backs, ends and seats, and in fact all the articles for which veneer can be used. The manufacture of veneer for car use will form a very large proportion of the company's business, and it will make a specialty of this class of work.

The general manager of the company is W. P. Seguire, who for many years was connected with the Frost Veneer Seating Company, and who is a well-known expert on the subject of the manufacture and use of veneer. Associated with Mr. Seguire are E. K. Seguire and William Baldwin Axford. The company's factory and office are located on Pacific Avenue, Jersey City, N. J., and its cutting mills are at Harriman, Tenn. The company will also make a specialty of the manufacture of wood tiling.

The Hipwood-Barrett Car & Vehicle Fender Company, of New York, has just recently opened in Chicago, a branch office in the Marquette Building, room 449. All the western business will be handled from this office, which is under the management of George E. Weiler. The office has already had credited to its efforts orders from the Montreal Park & Island Railway Company, of Montreal, and also from the Metropolitan Street Railroad Company, of Kansas City.



### Large Power Station in Colorado

One of the latest power plants to be placed in operation in the West is now running at La Bella, Col., and will be used to operate the Florence & Cripple Creek and Golden Circle railroads, and to supply power, water and light to the mines, mills, samplers, etc., of the Cripple Creek District. The building proper covers a space of about 10,000 sq. ft. and is 50 ft. high.

In the boiler room are to be found six large boilers of the Babcock & Wilcox type, arranged in three batteries. These are of 3000 h.p. capacity under normal conditions, and should the service require, they can deliver, readily, steam for 4500 h.p. The boilers are arranged in a very novel manner, for instead of being constructed directly upon masonry foundations, as would ordinarily be done, they are mounted on elevated steel beams and a space is thus left underneath all of them. Instead of carrying the smoke and gases to the stack over the boilers, in the usual way, they are carried downward into this basement space left beneath, and thus taken to the stack. The space above the boilers is thus left perfectly clear and nothing is visible in the boiler room to indicate the presence of a flue. The heat and the obstruction of the large flue is thus done away with in the boiler room. The space above the boilers is entirely clear for the steam pipes and valves and these are readily accessible. A further use is made of the basement under the boilers in the handling of ashes. Instead of drawing the ashes from the fires into the room, they are dropped into the basement to an ash conveyor and are carried directly to the cars on the track on the outside of the building. The stokers are of the Babcock & Wilcox type, having an endless chain grate.

Extending the full length of the building and adjoining both the boiler room and the pump room is the engine room, this room is 110 ft. long and 45 ft. wide and contains a large compressor and three large engines, driving electrical generators. The combined engine capacity is 3000 h.p. Over the entire engine room spans a powerful traveling crane; by a novel design this crane is made to extend out of the building and overhang the railroad track and wagon road so that any piece of machinery is readily transferred to any portion of the engine room. One of the conspicuous features of the engine room is the large compressor, this is of the Ingersoll-Sargent make and is driven by an Allis Corliss engine. The compressing cylinders and the steam cylinders are both compound and the steam cylinders are condensing. The high pressure air cylinder has a diameter of 22 ins., while the low pressure cylinder has a diameter of 40 ins., both having a stroke of 48 ins. The capacity of the compressor being some 5000 ft. of free air per minute, fifty drills could be operated, and even at the high altitude of 10,000 ft. above sea level, thirty-five drills can be operated.

Adjoining the compressor are the large engines coupled to the huge generators of electricity. The electric power will be used to operate the Florence & Cripple Creek Railroad from Alta Vista to Cripple Creek and the Golden Circle Railroad from Victor to Cripple Creek via Vista Grande. The surplus power will be used to operate the hoists, pumps, compressors, crushers, etc., in mines, mills, samplers, etc., throughout the district. The engines are of the horizontal compound condensing type and were built by McIntosh, Seymour & Company, of Auburn, N. Y. The normal capacity of each engine is 750 h.p.; they are, however, capable of supplying 1100 h.p. each when occasion demands. The main shaft of the engines carries the electric generators, this shaft being 16 ins. in diameter. The generators were built by the General Electric Company, of Schenectady, N. Y. These machines are of the latest type and generate a three-phase alternating current of 6600 volts at 3600 alternations per minute. This is reduced to 440 volts by transformers.

### Test of Kinetic Motors

A test of a new double truck motor car, recently built by the Kinetic Power Company, was made Aug. 17, on a 7½-mile branch of the Long Island Railroad, near Babylon, N. Y. The trial was witnessed by a number of foreign consuls, who had expressed an interest in the system, together with the representatives of several of the technical papers. The road upon which it was conducted is part of the "Garden City extension" of the Long Island Railroad, formerly operated by steam locomotives, but now operated by the Kinetic motor car mentioned, which makes several trips daily.

The car was recently built by the Jackson & Sharp Company, and one truck is equipped with two 8 in. x 12 in. cylinders, while the other truck is an idle one. The reservoir, or boiler, is carried under the car body between the trucks, and is stored with hot water at a pressure of about 160 lbs., from a stationary boiler before starting. A small fire is carried to make up for the heat

lost by radiation, and the steam is exhausted into a condenser, located on the roof. The steam pressure is reduced to about 30 lbs. before being admitted to the cylinders. On trial the car ran the length of the route, 7½ miles, in fifteen minutes, though faster time than this has been made.

After the trial the visitors were afforded an opportunity of riding over the local street railway system in Babylon, which is also operated by Kinetic motor cars.

### Stillwater-Mechanicville Street Railroad Company

The Westinghouse Electric & Manufacturing Company has completed the electrical equipment of the Stillwater-Mechanicville Street Railroad Company. The power house is at the northern end of the line at Stillwater, whence the tracks are run southward, following the Hudson River 9 miles through Mechanicville to Waterford, forming a junction with the Troy City and Albany lines. The railroad passes through an extremely picturesque country, attracting much traffic from the lovers of nature, and is a favorite route for excursion and pleasure parties from Albany and Troy. The track is mainly level, the maximum grade being 7 per cent for 400 yds. The roadbed is first-class, 90-lb. girder rails being used in the town sections, and 75-lb. T rails on the country roads.

Power is obtained from the Hudson River. A wooden dam at Stillwater gives a 7-ft. head, the water being piped to the power house to operate two 250-h.p. Leffel turbines, which run at 500 r.p.m. The turbines are both geared to the same shaft, revolving the shaft at about 160 r.p.m. Under this shaft is direct connected a 250-kw. Westinghouse direct current "engine type" generator, 550 volts. At the other end of the shaft is a friction clutch, which, when occasion requires, direct connects the generator to a 250-h.p. steam engine. The steam power is for use when the flow of water in the Hudson is insufficient to operate the turbines. A booster is installed to raise the voltage at the southern end of the line. All the cars have Westinghouse electric motors, the smaller cars have two 25-h.p. motors. There have recently been added four open and three closed cars to carry eighty passengers; these larger cars are equipped with two 35-h.p. Westinghouse motors.

### Electric Railway Contracts in England

A contract has been signed with the British Thomson-Houston Company, Ltd., covering the electrical equipment, engines, cars, trucks, etc., for that portion of the London United Tramways upon which it has been resolved to introduce electric traction, in Hammersmith, Chiswick, etc. The contract includes six 250-kw. 550-volt direct-current traction generators and one 500-kw. 94-r.p.m. 5000-volt three-phase generator, driven by vertical Corliss engines; thirteen 75-kw. 5000 volts primary, 330 volts secondary, static oil-cooled transformers; four 200-kw. 500-r.p.m. 550-volt rotary converters; one motor generator set, consisting of a 500-kw. three-phase synchronous motor, direct coupled to two 250-kw. direct-current generators on combination bed plate; two 75-kw. 400-r.p.m. 525-volt direct-current generators for lighting purposes; also complete switchboards for the whole plant, and 100 cars of top-seat pattern, each mounted on two trucks and equipped with two G. E.-58 motors. Series-parallel controllers and magnetic brakes are also included in the contract.

It is intended to have the new service in operation next June.

The Bristol Tramway Company has also recently signed a contract with the British Thomson-Houston Company, Ltd., for four 500-kw. tramway generators coupled direct to vertical cross compound engines of the Corliss type, together with three 30-kw. motor generators, and two 50-kw. lighting machines; also a complete switchboard for this machinery, 150 single-truck double-deck cars complete, each of which will be equipped with two G. E.-52 motor, series-parallel controllers and magnetic brakes.

Other recent orders include thirty G. E.-52 double motor equipments, with electric brakes, for the Sheffield corporation; eight cars with Peckham trucks, G. E.-52 double motor equipment and electric brakes, for the Ashton-Under-Line; eleven cars, with Peckham trucks, G. E.-52 double motor equipments and K-10 emergency stop controllers, and the complete equipment of the Isle of Thanet Electric Railway. This will include about 1000 kw. in generator capacity.

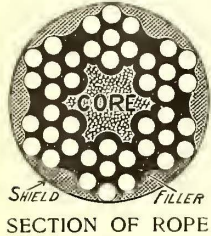
The business of the Vulcanite Fibre Company, of Wilmington, Del., has grown to such an extent that the management has been compelled to add to its already large works. The new building will be a three-story brick addition to the old factory, and will be 135 ft. x 30 ft. Frank Taylor, of this concern, reports that they were never so busy in the history of the company as at present.



### Protection of Wire Ropes

Wire rope for operative purposes is used in so many widely different ways, and is subjected to so many varying conditions, that the preparation of an exterior protective coating for ropes of this nature has presented a serious problem. A dry atmosphere, tending to speedy oxidation, brittleness and consequent peeling off of the coating, presents itself in one location; while in another, a moist atmosphere, or possibly a continuous subjection to water, sometimes impregnated with acid, prevails. In addition, most exposed wire ropes are subject to the extremes of winter and summer.

The illustration herewith presented shows the application of a special coating termed "Wire Rope Shield," which, it is claimed, possesses the requisites of a satisfactory coating, in being tenacious, pliable, lubricating and water and acid proof. The high points of the strands are protected from abrasion by a lubricating film deposit, and a like deposit prevents the chafing of the wires. The satisfactory use of this shield on wire ropes leading from an office building to an extremely wet mine, strongly impregnated with acid, and to dredging machinery constantly subjected to water, indicates its efficiency. The "filler" shown



SECTION OF ROPE

in the illustration is a flexible, cushioned lubricant, protecting the strands from abrasive wear, and reinforcing the work of the shield, in effectually sealing the rope against water soaking, acid or gaseous attacks. The Ironsides Company, of Columbus, Ohio, manufactures this shield and filler.

### Drawings of Electrical Apparatus

The "Electrical World and Engineer," of New York, announces that at the request of the German publisher, it will accept American subscriptions at the German price (20 marks, or \$5, for each portfolio) for Prof. E. Arnold's two portfolios of working drawings of electrical apparatus.

The portfolios are sold separate. One contains sixty-four sheets 16 ins. x 21 ins. in size, of dimensioned drawings of direct-current dynamos and motors; and the other forty-eight sheets of the same size, giving dimensioned drawings of single and polyphase alternating current machines and transformers. The drawings show the machines of the leading manufacturers of Europe, more than twenty firms being represented.

Subscriptions will be received until Sept. 15. The portfolios will be delivered within a month later.

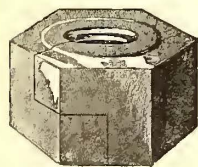
### The Victoria Hotel

In the Victoria Hotel delegates to the convention will find a pleasant home during their stay in Chicago. It is adjacent to convention headquarters and centrally located on Michigan Avenue facing the Lake Front Park, where a fine view and a cool lake breeze add to the attractions of its rooms. The cuisine and service throughout are unexcelled.

The Victoria is conducted on both the American and European plans and makes special rates for delegates.

### Elastic Self Locking Steel Nut

Numerous ingenious arrangements for securing a self-locking nut for bolts have been suggested, but few of these have been successful in procuring the desired results under all conditions of strain and vibration. The National Elastic Nut Company, of Milwaukee, Wis., however, is now placing on the market what it calls an "elastic" nut, and which it claims will positively lock itself on the bolt wherever placed, and never work loose.



SELF-LOCKING NUT

This result is obtained, it is stated, by the peculiar construction of the nut, which, instead of being punched from a solid bar, as is usually done, is made by bending a flat thin bar around into a ring, and then pressing this ring into the form of a nut, which is done by special machinery. The nut is tapped, or threaded slightly smaller than the bolt, so that when put on with a wrench it is dis-

tended a little, and the joint formed by the coming together of

the two ends of the ring opens slightly (about 1-64-in.), developing a constant grip on the bolt which prevents it from unscrewing.

### Recent Work of the Falk Company

The Falk Company, of Milwaukee, Wis., reports that its construction department has been extremely busy this season. Some of the work done has been the completing of the Oshkosh & Neenah Railway, owned by the Citizens Traction Company, of Oshkosh. The line embraces 17 miles of track and overhead work. The Falk Company had the contract for the complete construction, including grading, power house, etc., and the furnishing of all material and machinery. George Kobush, of the St. Louis Car Company, is president of this company. The Falk Company also laid the greater part of the existing track in Oshkosh. In Kansas City, Mo., this company has completed laying the 2 miles of track in Grand Avenue, where a 9-in. rail is laid in concrete beam and with asphalt pavement. It has also nearly completed the construction of the Northeast Electric line in Kansas City, which is 8 miles long and is partly laid with concrete beam and partly with tie construction, and asphalt paving.

The company has also recently secured a contract for track construction of the Third Street line in Kansas City, Kan., 2¾ miles in length. All of the track mentioned in the two cities is cast-welded. In addition contracts have been secured and work will be commenced soon on the welding of 7 miles of track for the new East Side Electric Railway in Kansas City, Mo.

The special work department of the Falk Company was crippled by its recent fire. However, the new buildings upon which work was begun immediately, are nearly completed and will be turning out work within sixty days. These new buildings are all modernly equipped throughout. All machinery will be operated by electric motors. In addition to the Third Avenue welding now nearly completed in New York, the company has the contract for welding 5000 joints for the Union Railway Company, of New York, also the contract for welding the lines of the North Hudson Railway Company in Hoboken, N. J., 2000 joints for the Canton & Massillon Street Railway in Ohio, and is beginning the work of welding 6000 joints in Washington, D. C., for the Anacostia & Potomac River Railway.

The company's gear and pinion department has been running night and day for weeks, and in addition to its large American business, has also secured a number of good contracts abroad, among these being a second order from the Société de Anonyme des Tramways de Cairo.

### Reorganization of a Prominent Boiler Company

The National Water Tube Boiler Company, of New Brunswick, N. J., is now in a better condition than ever before to supply the increasing demand for its type of boilers. A reorganization of the company has recently been effected, new capital introduced and the new owners will spare no efforts to sustain and even increase the enviable reputation enjoyed by the former company for careful and painstaking workmanship and excellency of materials employed in all departments of the plant. Mr. Schenck, the former manager, will continue to act in that capacity. He is thoroughly acquainted with the workings of the business, as a result of his wide experience, and will no doubt do much to improve the condition of the concern.

The new directors of the company are: Hugh McKeag, Philip Weigel, Jr.; Robert J. Smith, P. M. Welsh, P. G. Polhemus, C. A. Schenck and Hugh Boyd. The officers are: President, Hugh McKeag; vice-president, P. G. Polhemus; secretary and manager, C. A. Schenck; treasurer, Philip Weigel, Jr.

### Personal

MR. ROBERT O. HARRIS has resigned the position of counsel for the Massachusetts Electric Companies.

MR. E. H. JENKINS has been elected president of the San Antonio (Texas) Street Railway Company, vice W. H. Weiss, resigned.

MR. P. A. B. WIDENER has resigned from the presidency of the board of managers of the Philadelphia National Export Exposition.

MR. A. C. GARDINER, treasurer of the Dartmouth & Westport Street Railway Company and secretary and treasurer of the



Union Street Railway Company, of New Bedford, has resigned both positions, to take effect Sept. 1.

MR. ARTHUR WARREN, manager of the advertising department of the Westinghouse Electric & Manufacturing Company, returned from Europe on Aug. 5.

MR. GEORGE F. SIEBEL will have charge of all the street railway companies centering in Taunton, Mass., that are owned by the Massachusetts Electric Companies.

MR. E. S. DIMMOCK has been appointed general manager of the Bay Cities Consolidated Railway Company, of Bay City, Mich., in place of Mr. S. L. Nelson, resigned.

MR. JAMES H. WILSON, president and general manager of the Mobile Light & Railway Company, Mobile, Ala., has been taking a short vacation at Asbury Park, N. J.

MR. C. N. DUFFY, formerly treasurer of a number of street railway properties in St. Louis, has, it is reported, accepted a position in Chicago under Mr. D. G. Hamilton.

MR. H. R. FEHR, of Easton, Pa., has accepted the position of superintendent of the Easton, Palmer & Bethlehem Electric Railway. Mr. Fehr has been city engineer of Easton since 1891.

MR. BROOKS CLARKE, formerly connected with the Atlanta Consolidated Street Railway Company, Atlanta, Ga., is now with the Macon Consolidated Street Railway Company, Macon, Ga.

MR. WILLIAM B. GIVEN, receiver of the Pennsylvania Traction Company, of Lancaster, Pa., has been appointed a Commissioner from the State of Pennsylvania to the Paris Exposition of 1900.

MR. F. A. BARR has succeeded Mr. F. W. McClement as manager of the Winston-Salem Railway & Electric Company, of Winston, N. C. The property has recently passed into the hands of new owners.

MR. F. A. HUNTRESS, manager of the Halifax, N. S., Tramway Company, has returned from a trip to the West Indies, where he has been looking over the field, with a view to securing street railway franchises.

MR. C. W. FOOTE has resigned the superintendency of the Zanesville Electric Railway, to take effect Sept. 1, and has accepted the general managership of the Cincinnati & Miami Valley Traction Company.

MR. JOHN C. DOLPH, general sales agent of the Sterling Varnish Company, returned Aug. 4 from a four months' trip to Europe, during which time he has largely extended the business of his company abroad.

MR. NATHAN E. CAPEN has been elected superintendent of the Easton, Palmer & Bethlehem Street Railway to succeed W. E. Cox, who resigned July 1. Mr. Capen was formerly assistant superintendent of the road.

MR. N. W. L. BROWN, superintendent of construction, Atlanta Railway & Power Company, Atlanta, Ga., has resigned this position, which he has held for many years, to go into the cotton seed oil business in Alabama.

MR. ISAAC L. RICE has been forced to resign his position as president of the Electric Storage Battery Company owing to pressure of other duties. He has been succeeded by former First Vice-President George H. Day.

MR. GARRETT A. HOBART, having sold his holdings in the Paterson (N. J.) Street Railway Company, has handed in his resignation as president of the company. It is understood that Mr. David Young will succeed him.

MR. R. F. FOX, general manager of the Wilmington, Del., City Railway Company, has resigned. Mr. Fox will be succeeded by Joseph C. Lugar, formerly superintendent of the Roxborough, Chestnut Hill & Norristown Railway Company, of Philadelphia.

MR. A. E. WORSWICK, chief engineer in charge of the construction of the Mexico City electric lines, in behalf of Wernher, Beit & Co., of London, arrived in New York, on Aug. 11, from Mexico, joining here Mr. W. B. Rommel, who arrived from London on Aug. 8.

CAPT. ROBERT McCULLOCH, who for many years was manager of the St. Louis street railway system, owned by the National Railway Company, of Chicago, has severed his connection

with this system, and, it is announced, will accept a position at Chicago under Mr. D. G. Hamilton.

MR. H. C. BENAGH, who has been superintendent of the Savannah, Thunderbolt & Isle of Hope Railway Company, of Savannah, Ga., and who has left this position to go to Nashville, was presented on the eve of his departure with a handsome silver tea service of six pieces by his former employees.

MR. SALVADOR POTIS, for many years chief engineer of the West Chicago Street Railway Company, has recently been selected chief engineer of the Illinois Telephone Construction Company, and will have full charge of the work of laying conduits and installing exchanges; his local office being at 746 The Rookery, Chicago.

MR. W. J. JOHNSTON, formerly proprietor of the "Electrical World," left New York recently. He intends to make a tour around the world, spending some time in Hawaiian Islands, Japan, China, India, Egypt, etc., and a visit to Manila is also in his itinerary.

MR. A. K. BAYLOR has resigned his position with the British Thomson-Houston Company, but will be for some time yet to come in close touch with its management in completing various contracts which have been taken during his incumbency. Mr. Baylor is now in America, but will return to London early in September.

MR. WILLIAM C. WHITNEY has returned to New York after a six weeks vacation trip, where he appears to have regained his health completely. He states that while abroad he heard of the so-called strike on the Metropolitan system, but had no uneasiness about it, realizing the system was left in hands entirely competent to manage it.

MR. GEORGE E. PRATT, who has been representing for some time past the Ajax Metal Company, with headquarters at Philadelphia, is now connected with the Hubbard Brake Company, a new concern recently formed for the manufacture of an electric brake of novel design, and which is briefly described in another column of this issue.

MR. C. A. INGLE has resigned his position as general manager of the Taunton Street Railway Company, of Taunton, Mass. He has accepted a position with the Pratt & Whitney Machine Company, of Hartford, Conn. On the last day of his services with the old company Mr. Ingle was presented with a gold watch and chain by his former employees.

MR. H. S. KEMP has accepted the place of superintendent of maintenance with the Staten Island Electric Railroad Company, in place of Mr. J. H. Sims, resigned. Mr. Kemp held a similar position with this company, but resigned about a year ago to become Eastern representative for the Gold Car Heating Company, which position he now leaves to return to Staten Island.

MR. AUSTIN E. SMITH, manager, treasurer and director of the Springfield Street Railway Company, of Springfield, Mass., died very suddenly on Aug. 8. Mr. Smith has been connected with this company for over twelve years, having entered its employ first as cashier. He rapidly rose to positions of greater responsibility until at the time of his decease he held the three offices mentioned above.

MR. GEORGE A. THOMSON, who was formerly connected with the Short Electric Railway Company, the Forest City Electric Company and other well known Western concerns, has been appointed Eastern representative of the Adams-Bagnall Electric Company, the well-known arc lamp manufacturers, in place of C. W. Phipps, resigned, and is now established at the company's New York office, 222 Havemeyer Building.

MR. W. B. ROMMEL, engineer with Wernher, Beit & Co., of London, arrived in New York on Aug. 8, and remains here until about the middle of September. While in this country he will purchase apparatus and material for the electrical equipment of the Lisbon (Portugal) tramway. Mr. Rommel will reside in Lisbon for a period of three years or more, having undertaken the management of the Lisbon tramway system. He is accompanied on his American trip by Mrs. Rommel.

MR. H. H. VREELAND, president of the Metropolitan Street Railway Company, of New York City, on Aug. 12, gave the heads of departments of his system an outing on the grounds of the Tonetta Outing Club, near Brewsters, N. Y. The party arrived on special cars, and were taken in carriages to the club grounds at Tonetta Lake, where a clambake was prepared. A sail on the lake was followed by a drive of three miles to "Rest Awhile," the country home of Mr. Vreeland, where the party was received by Mrs. Vreeland and several young ladies. Luncheon was served on the piazza and lawn.



MR. CHARLES N. BLACK, who has been for several years connected with the Brush, Walker and Westinghouse interests, has retired from the service of the Westinghouse Company in order to engage with Ford, Bacon & Davis, the well known consulting engineers of New York city. Mr. Black is well known as one of the ablest designers of arc lighting machines in the country, one of his prominent achievements in this direction being the design of the 125-h.p. Brush arc machine, which has made a remarkable record throughout the country, and has been installed in large numbers in Brush stations. Mr. Black is a graduate of Princeton University, class of 1888.

MR. OSCAR T. CROSBY, who has been delayed in this country for several weeks longer than expected on account of the organization of the Washington Traction Company, sailed for England on the St. Louis Aug. 9. He will be at the Savoy Hotel, London, for some weeks, and will then travel quite extensively. He is particularly looking forward to an extended sojourn in Africa, where he may penetrate some of the regions rarely visited by tourists, including Abyssinia and the Soudan. It is Mr. Crosby's intention on returning to this country, six months or more hence, to devote his entire time to sociology and other studies in which he has long been interested.

MR. W. F. FURBECK, who has been long associated with Mr. Charles T. Yerkes in his street railway interests in Chicago, has resigned the position of private secretary to Mr. Yerkes, and will probably also resign all other positions he now holds with the street railway companies. Mr. Furbeck is a director and vice-president of the North Chicago Street Railway Company, vice-president of the Chicago Consolidated Traction Company and also a member of the executive board of the Lake Street Elevated Company. He intends to engage at once in the banking business.

DR. J. S. LAWRENCE, president of the Charleston Consolidated Railway, Gas & Electric Company, of Charleston, S. C., died at Capon Springs, W. Va., on Aug. 5. He had been ill for several months, and had recently returned from a trip to Europe in an unsuccessful effort to regain his health. Dr. Lawrence was a resident of Washington, D. C., for many years, until in 1896 he secured control of the horse car lines in Charleston, S. C., and converted them into a large and excellently equipped system, ranking among the best in the South. In 1897 he built the Charleston & Seashore Railroad and founded one of the largest amusement parks in the country on the Isle of Palms. These properties were both very successful financially, and in the early part of this year he consolidated all of the street railroad, gas and electric light properties.

MR. GEORGE HENRY WHEELER, formerly president of the Chicago City Railway Company, died very suddenly on Aug. 11, at Plattsburg, N. Y. Mr. Wheeler had been one of Chicago's

leading business men for over forty years, and had been closely identified with several important local enterprises. He was born at La Porte, Ind., on August 1, 1841. He moved with his parents to Chicago in 1849, and his early education was obtained in the public schools of that city. After taking a college course at Racine, Wis., he returned to Chicago in 1860, and entered into business with his father. He became connected with the Chicago City Railway Company in 1891, and in that year was elected its president. He continued as the executive

head of the entire system until about three years ago, when he was forced to retire by failing health. Mr. Wheeler was a member of the Chicago and Union League Clubs; also a prominent figure in the Board of Trade; a director in the World's Columbian Exposition in 1892-3, and a director of the Continental National Bank.

MR. HENRY M. RANSOM, who is one of the youngest, yet one of the most popular and more successful salesmen, in the

street railway industry, has left his position with the Consolidated Car Heating Company, to take the office of purchasing agent for the International Traction Company, of Buffalo. Mr. Ransom was born in 1870 in Albany, and was educated at the Albany Boys' Academy. He entered the employment of the Ransom Stove Company at the age of eighteen, and in 1893 held the position of shipping clerk. In that year he went with the Consolidated Car Heating Company, of Albany, representing that concern in the electrical branch of its business. At that time electrical heaters were practically unknown to roads in general, the Consolidated Company having its heaters on but four roads, operating from one to sixteen cars. At the present time in the territory alone just left by Mr. Ransom Consolidated heaters are used on over 200 roads, the total number of cars equipped being over 5000.

## AMONG THE MANUFACTURERS

ROGER W. BABSON, banker and broker, of Worcester, Mass., is making a specialty of Massachusetts street railway bonds.

THE ELECTRIC STORAGE BATTERY COMPANY, of Philadelphia, has removed its New York office from 20 Broad Street to the fifteenth floor of the American Surety Building, 100 Broadway.

THE JOSEPH DIXON CRUCIBLE COMPANY, of Jersey City, is out with another handsome brochure, finished in colors, describing graphite and its uses. Graphite makes an excellent lubricant for engine bearings and valves.

THE AMERICAN ELECTRICAL WORKS, of Providence, R. I., is sending out invitations for its annual clam bake. The invitations are engraved on thin sheets of copper, and announce that the twenty-first annual clam dinner will be held at Pomham Club, on Saturday, Sept. 9, 1899.

THE PACKARD ELECTRIC COMPANY, of Warren, Ohio, the well-known manufacturers of incandescent lamps and transformers, announce that Messrs. Mayer & Englund, of 10 South Tenth Street, Philadelphia, Pa., have taken the agency for its incandescent lamps for the street railway field.

THE ELECTRIC STORAGE BATTERY COMPANY, of Philadelphia, announces by card that its New York office has been removed to the American Surety Building, 100 Broadway. At the bottom of the card announcing the change is the very significant statement: "160,000-h.p. hours are stored daily in chloride accumulators."

THE AMERICAN ENGINE COMPANY, of Bound Brook, N. J., has just received an order from the Hollingsworth & Whitney Company, of Waterville, Maine, for the entire engine equipment of its new mill, consisting of two special 300-h.p. double engines and a 125-h.p. engine, and also a complete 75-kw. electric generating plant.

THE LORAIN STEEL COMPANY, through its Chicago representatives, Littlefield & Mysenburg, has secured the order for 100 Dupont trucks for the Indianapolis Street Railway Company, at Indianapolis, Ind. The western agents report that this truck is becoming more and more popular and that business in the western territory is extremely promising.

THE EDWARD P. ALLIS COMPANY, of Milwaukee, Wis., describes recent improvements in its well-known system of engines in a handsomely prepared pamphlet of 183 pages. The more prominent types of its latest horizontal and vertical engines are shown in full page engravings. To purchasers of apparatus for power plant the catalogue will be of great value.

THE BULLOCK ELECTRIC MANUFACTURING COMPANY'S bulletin, No. 2734, for August, is devoted to "Bullock Engine Type Generators." These are designed to meet the demand for a slow rotative speed machine for direct connection to either steam or gas engines or water wheels. Any one interested in apparatus of this kind should send for this August bulletin.

MARLIN & COMPANY, Inc., of Pittsburgh, Pa., are receiving a rush of orders for their specialties consisting of exhaust heads and pipes, portable tanks for storage of oil, ice cans, filters, cornices and skylights, etc. The Marlin exhaust head especially is receiving attention from steam engineers and is being sold in all parts of the country. This apparatus was fully described in the STREET RAILWAY JOURNAL for April, 1899.



GEORGE HENRY WHEELER



THE CENTRAL ELECTRIC COMPANY, of Chicago, has just received a heavy stock of the Standard trolley wheels as made by the Central Union Brass Company. These wheels are finely finished, ample in size and are claimed to give lasting service from fact of excellent metal used in their construction, combined with the peculiar arrangement of strengthening webs. Easy running is secured by use of the best grade of graphite bushings.

THE BERLIN IRON BRIDGE COMPANY, of East Berlin, Conn., has the contract for erecting the new car barn for the New Bedford, Middleboro & Brockton Railway Company. In connection with the car barn there will be an engine and boiler room of the same construction. The Syracuse Construction Company has also placed the order for its bridge over the D. L. & W. R. R. at Syracuse, N. Y., with the Berlin Iron Bridge Company.

LEONHARDT WAGON MANUFACTURING COMPANY, of Baltimore, Md., reports that it never has been so busy as during the last seven months in building its special lines of tower and emergency wagons, both for foreign and domestic orders. These wagons are growing steadily in favor with the trolley lines in all sections of the globe, as is demonstrated by receipts of duplicate orders and the complimentary testimonials sent in unsolicited.

GEORGE W. LORD, of Philadelphia, the manufacturer of Lord's boiler cleansing compound for reducing scale, is running his factory to its fullest capacity to keep up with orders in hand. These compounds are being rapidly introduced in various countries as well as in the United States. Among recent orders is one from Brazil for 10 tons, this being the third order from the same party. Mr. Lord would be pleased to correspond with any one having trouble with their boilers from scale or other causes.

ROBERT H. DERRAH, of Boston, the well known expert in arranging trolley excursions, is meeting with great success in his new venture in Boston. Mr. Derrah makes arrangements with the different street railway companies in suburban Boston for running special excursion cars three or four times a week, and these have been very well patronized. On these tours everything is done to make the excursionists comfortable, and they are relieved of all care or anxiety regarding connections, refreshments, etc.

ELMER P. MORRIS & COMPANY, of New York, in line with their policy to add to their list of agencies, the best materials in the street railway field, have made arrangements for handling the products of the Wagenhals Manufacturing Company, of Cincinnati; the Mundel Electric Works, of Springfield, and the Spiral Journal Bearing Company, of St. Louis. Mr. Morris reports a very heavy business during the past month, the demand for poles and bonds being especially good. Several large orders from foreign countries have also been filled.

THE BUFFALO FORGE COMPANY, of Buffalo, N. Y., has published a pocket edition of its general catalogue describing the many specialties handled by this concern. These include horizontal and upright steam engines, mechanical draft, heating, ventilating and drying fans and apparatus, blowers and exhausters, blacksmith drills, punches, shears and cutters, stationary, portable and heating forges, etc. The book contains over 398 pages, and its value is greatly increased by the numerous cuts which are given in conjunction with the descriptive matter.

THE CHARLES SCOTT SPRING COMPANY, of Philadelphia, whose works were destroyed by fire a few months ago, has been hard at work completing a new factory, and announce that this is now rapidly nearing completion. Additional ground has been added to the spring plant, covering about 55 ft. x 155 ft. A new machine house, 35 ft. x 200 ft., has also been built. With these increased facilities the company will be better able to supply its well known line of flat and spiral springs than ever before, and an excellent business is expected during the coming months.

FRED. M. LOCKE, of Victor, N. Y., manufacturer of the well known Locke insulator, has been successful in his legal controversy over the validity of his patents. Mr. Locke filed his application for letters patent in February, 1897, and on August of the same year, Mr. Boch, of the R. Thomas & Sons' Company, East Liverpool, Ohio, filed an application for the same thing. Interference proceedings have been pending since September, 1897, but the Patent Office has just decided that Mr. Locke was the first to conceive and reduce to practice the invention in issue.

THE BABCOCK & WILCOX COMPANY, of New York, has sold to the Manhattan Elevated Railway Company, of New York city, the boilers required for its new electric generating

plant, which will furnish electric current for operating its entire elevated railway system in New York city. The boiler equipment will consist of sixty-four 520-h.p. Babcock & Wilcox all wrought steel boilers, capable of carrying a working pressure of 200 lbs. per sq. in. The boilers will be fitted with Roney automatic stokers, manufactured by Westinghouse, Church, Kerr & Company. This is the largest single order ever placed for stationary boilers.

THE large increase in English orders that has come to the Bullock Electric Manufacturing Company, has necessitated the sending of B. W. Spellmire, the company's engineer of tests, to the London headquarters of the company. Mr. Spellmire will superintend the installations of Bullock machines in the territory mentioned, the first installation being in the large printing establishment of Cassell & Company, London; the Nottingham "Guardian," Nottingham; Birmingham "Daily Post," Birmingham; Manchester "Evening Chronicle," Manchester, and the Belfast "Evening News," Belfast.

AMONG RECENT ORDERS received by the Ridgway Dynamo & Engine Company for McEwen engines and Thompson-Ryan generators, are three 75-h.p. tandem compound engines direct connected to three 50-kw. generators, purchased by the Treasury Department for lighting the United States Court House and Post Office Building at Cincinnati, Ohio; two 250-h.p. engines direct connected to two 150-kw. generators for the Berwind-White Coal Mining Company, Philadelphia, Pa., for its mining operations at Windber, Pa. This will make a total of fourteen engines and ten generators of this make installed by these same people at Windber, Pa., within the last two years.

THE GOLD CAR HEATING COMPANY AND THE GOLD STREET CAR HEATING COMPANY, of New York, report that the number of orders which they have taken during the past few months are of such magnitude as to surpass all their former records. It is a certainty that the improved Gold electric heaters have struck a popular cord among railway officials. Prominent among the orders for electric heaters which have been taken recently is one from the Boston Elevated Railway Company, formerly the West End Street Railway Company, of Boston, which has awarded the contract for electric heaters for its 100 new cars to the Gold Car Heating Company.

WILBUR B. DRIVER & COMPANY, of New York, have published for the convenience of the engineering trade a neat booklet containing valuable resistance and capacity tables for "Climax" resistance wire. It is claimed that this wire has forty-eight times the resistance of copper, while German silver has only sixteen times and ordinary steel wire about eight times the resistance of copper wire of the same diameter. Its low temperature coefficient fits it for any use to which German silver can be applied, and its high specific resistance renders it an economical substitute. Its chemical properties make it available for rheostat work where German silver is useless on account of its brittleness caused by heating and cooling.

WESTINGHOUSE, CHURCH, KERR & COMPANY, of New York, deserve the credit for producing one of the most artistic catalogues of the season. This is printed on the finest of tinted paper, and the pages are illustrated with artistic drawings of private residences and hotels where electric lighting is provided by the Westinghouse Company's engines and generators. The catalogue is published with the view of calling attention to what has been accomplished by the Westinghouse Company in the way of electric light and power installations in hotels, private residences, etc. A number of the installations include apparatus for lighting houses, stables and grounds, and also for furnishing power to operate pumps, elevators, ventilating fans, ice cream freezers, dairies, laundries, etc.

ONE OF THE MOST VALUABLE points relating to the use of belts is not often enough realized, or, at best not emphasized; this is the fact that the more belt surface running in contact with the pulley the more power there is transmitted by the belt. In running a belt tight only about half of the pulley surface is in contact with the belt, therefore if a belt can be made to run without slipping it can be run slack and much power will be gained. The Cling-Surface Manufacturing Company, of Buffalo, N. Y., reports that it is adding scores of belts every week to the number already running slack through the use of Cling-Surface, and of the daily letters received acknowledging this, one from Alhambra, Cal., says: "After thoroughly testing Cling-Surface I find that I can run with a slack belt and get more power by far than I could with a tight belt before using Cling-Surface."

WENDELL & MACDUFFIE, of New York, general supply agents, have received orders since the first of August for fifty



snow plows and sweepers, as follows: Twenty-two plows to the Boston Elevated Road; five plows to the Brooklyn Heights Railroad Company; eleven sweepers and one plow to the North Jersey Street Railroad Company; five plows to the Bridgeport Traction Company; eight plows to other roads. This firm is doing an extraordinary business in this line this year, and orders are being placed much earlier than usual. This is accounted for by the fact that some of the roads were caught short of snow equipment last year. The above orders will tax the capacity of the Taunton Locomotive Manufacturing Company, who are the manufacturers of the above plows and sweepers, and railroad managers would do well to place their orders at once if they contemplate purchasing snow equipment.

THE STAR BRASS WORKS, of Kalamazoo, Mich., manufacturers of the Kalamazoo long distance trolley wheel, are meeting with marked success in the sale of their wheels and harps. The demand has been so great that they have been compelled to more than double their facilities within the past year, and have increased their capital stock from \$10,000 to \$20,000. The increased orders from the leading roads of the country, together with the additional new business must certainly be very gratifying to them. The company's officials credit their success to the fact that they aim to manufacture a superior article, judiciously advertise it and secure only the most capable salesmen to handle their goods. The Western Electrical Supply Company, of St. Louis, Mo., is their western and southwestern representative, the home company handling the north and east exclusively.

THE HARRISON SAFETY BOILER WORKS, of Philadelphia, report recent sales of Cochrane feed-water heaters and purifiers as follows: Bethlehem (Pa.) Steel Company, 12,000 h.p.; Pennsylvania Light & Power Manufacturing Company, Phila., 3000 h.p.; Waterbury Rope Company, New York, 850 h.p.; Durham Iron Works, Riegelsville, Pa., 600 h.p.; Blodgett Estate, Boston, 300 h.p., special; Thorley Building (Pabst Brewing Company), New York, 300 h.p.; Pittsburgh (Pa.) Brewing Company, 600 h.p.; E. P. Allis Company, Milwaukee, Wis., 200 h.p.; American Nut & Bolt Works, Cleveland, Ohio, 350 h.p.; Peoples Independent Rice Mill Company, Crowley, La., 350 h.p.; Plaza Hotel, New York, 300 h.p., special; International Paper Company, Franklin Falls, N. H., 350 h.p.; Providence (R. I.) Machine Company, 250 h.p.; Lorain (Ohio) Street Railway Company, 850 h.p.; Warden Power Building, Phila., 1000 h.p. Many orders for Cochrane separators have also been received.

THE PROVIDENCE ENGINEERING WORKS, of Providence, R. I., has recently acquired the entire equipment and business of the Providence Steam Engine Company as well as the domestic business of the Rice & Sargent Engine Company. The works of the company occupy the block bounded by South Main, Pike, South Water and Bridge Streets, with water frontage on the Providence River, and are amply equipped with cranes, tools and other facilities for turning out its product with promptness and of the highest degree of excellence. The shop methods in use are based upon the highest American standards, and include not only extensive use of gages, jigs and fixtures, but a rigid system of inspection of work. The business of the new company consists of the manufacture of the Rice & Sargent engine and the improved Greene engine, for both of which it is the sole builder. The design and construction of general machinery will also be engaged in. The officers of the company are as follows: R. A. Robertson, president; W. Fred Reynolds, vice-president; Richard H. Rice, treasurer.

AMONG the recent orders received by Broomell, Schmidt & Company, Ltd., York, Pa., manufacturers of the American Fuel Economizer, are the following: For Hillingsworth & Whitney Company, Waterville, Mo., two large economizers, two induced draft fans, with 14 ft. wheels, direct-connected engines, together with about 150,000 lbs. of steel smoke breechings, dampers, stacks, etc.; Iukens Iron & Steel Company, Coatesville, Pa., two American fuel economizers, two induced draft fans, with 12-ft. wheels and direct-connected engines, also about 80,000 lbs. of smoke breechings, dampers and connections; Weston Electrical Instrument Company, Newark, N. J., for the power house of its new works at Waverly, two American fuel economizers, with metallic casing, connections, etc.; Vacuum Oil Company, Rochester, N. Y. (third order), one American fuel economizer for utilizing waste heat from oil stills; Monterey Electric Light Company, Monterey, Mexico, one American fuel economizer complete, with metallic casing, induced drafts, fans, etc. The York Light, Heat & Power Company, York, Pa. has closed a contract with Broomell, Schmidt & Co., Ltd., for two 250-h.p. American water-tube boilers complete, with induced-draft fans, settings, etc.

AMONG the more important sales made by the Bullock Electric Manufacturing Company, of Cincinnati, during July, are the following: Union Depot, Dayton, Ohio, two 50-kw. engine type generators; Fuller Construction Company, New York city, four 50-kw. engine type generators; Wilson Aluminum Company, Holcomb Rock, Va., one 60-kw. belted generator; Warren K. Blodgett, Boston, Mass., one 150-kw. belted generator; American Type Foundry Company, Cincinnati, Ohio, twenty-five slow speed motors for direct connection to type machine; D. E. Whiton Machine Company, New London, Conn., one 30-kw. belted generator; United States Government, San Francisco, Cal., one 30-kw. belted generator; Pullman Palace Car Company, St. Louis, Mo., one 12½-kw. belted generator, one 25-kw. engine type generator; "Daily Mail," London, Eng., two 50-h.p. printing press equipments, Bullock "Teaser Control System;" Aldrich Mining Company, Brilliant, Ala., one 30-kw. belted generator; Missouri Lead & Zinc Company, Joplin, Mo., one 20-h.p. motor; Boston News Bureau, Boston, Mass., one 9-h.p. belted motor, 900 r.p.m.; Hanover Manufacturing Company, Bethlehem, Pa., one 10-h.p. belted motor; Southern Electric Company, St. Louis, Mo., one 12½-kw. belted generator; Vulcan Metal Refinery Company, Sewaren, N. J., one 17½-kw. belted generator.

THE MCGUIRE MANUFACTURING COMPANY, of Chicago, is working to its full capacity, particularly in the snow sweeper and car heating departments. It has just secured contract for sixty of its No. 39 double trucks for the San Francisco & San Mateo Railway, of San Francisco, Cal., this being the entire equipment. It is now delivering the 300 trucks for the Northwestern Elevated Railway Company, of Chicago. It also has orders from the Toledo Traction Company, Toledo, Ohio; Central Railway Company, Peoria, Ill.; Consolidated Traction Company, Pittsburgh, Pa.; Rochester Railway Company, Rochester, N. Y.; Monongahela Street Railway Company, Pittsburgh, Pa.; Madison Electric Railway Company, Madison, Wis.; Cripple Creek District Railway Company, Cripple Creek, Col.; Suburban Rapid Transit Company, Pittsburgh, Pa.; South Bend Street Railway Company, South Bend, Ind.; Peoria & Pekin Terminal Railway, Peoria, Ill.; Chicago City Railway Company, Chicago; W. L. Mellon, Pittsburgh, Pa.; Black River Traction Company, Watertown, N. Y.; Metropolitan Street Railway Company, Kansas City, Mo.; Indiana Railway Company, South Bend, Ind.; Canadian General Electric Company, Toronto, Ont.; Star Electric Company, Dubuque, Ia.; Bethlehem & Nazareth Passenger Railway Company, Nazareth, Pa.; St. Joseph & Benton Harbor Electric Railway Company, St. Joseph, Mich.; Tacoma Railway & Power Company, Tacoma, Wash.; Metropolitan Street Railway Company, New York, N. Y.

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### New Publications

Granite State Scenery In and About the Capital City. Published by the Concord Street Railway Company, Concord, N. H.

This is a very tasteful book of views, larger than is usually attempted by the street railway companies, and it gives a large number of very tasteful illustrations of the city of Concord. It is issued, of course, to interest citizens of and visitors to that city in the features of interest about it, and is written and published in a most attractive way.

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### Trade Catalogues

Engine Catalogue. Published by Edward P. Allis Company, Milwaukee, Wis. 184 pages. Illustrated.

Resistance Wires. Published by Wilbur B. Driver & Company, New York city. 16 pages. Illustrated.

General Catalogue. Published by the Buffalo Forge Company, Buffalo, N. Y. 398 pages. Illustrated. Pocket edition.

The Sturtevant Engine Catalogue 103. Published by The B. F. Sturtevant Company, Boston, Mass. 44 pages. Illustrated.

The Pittsburgh Feed Water Heaters and Purifiers. Published by James Bonar & Company, Pittsburgh, Pa. 40 pages. Illustrated.

The Lighting of Private Residences and Hotels. Published by Westinghouse, Church, Kerr & Company, New York. Illustrated.

Some Recent Installations of Worthington Condensing Apparatus. Published by Henry R. Worthington, New York. 30 pages. Illustrated.





MAP SHOWING  
THE ELEVATED R.R. SYSTEM  
CITY OF CHICAGO.

- LEGEND.
- Union Elevated Railroad Co.
  - Calumet Consolidated Elevated Railroad Co.
  - Metropolitan West Side Elevated R.R. Co.
  - South Side Elevated Railroad Co.
  - Lake Street Elevated Railroad Co.
  - South Branch Elevated Railroad Co.

ENGRAVED FOR THE  
STREET RAILWAY JOURNAL  
AND  
AMERICAN STREET RAILWAY INVESTMENTS  
BY  
AMERICAN BANK NOTE COMPANY,  
NEW YORK.

# MAP OF CHICAGO

SHOWING THE LINES  
OF THE

## Surface Railway Companies.

- CHICAGO UNION TRACTION CO.
- CHICAGO CITY RAILWAY CO.
- CHICAGO CONSOLIDATED TRACTION CO.
- CALUMET ELECTRIC STREET RAILWAY CO.
- PULLMAN STREET RAILWAY CO.
- CHICAGO GENERAL RAILWAY CO.
- SOUTH CHICAGO CITY RAILWAY CO.
- CHICAGO ELECTRIC TRACTION CO.
- SUBURBAN RAILROAD CO.
- NORTHERN ELECTRIC RAILWAY CO.