Street Railway Journal

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THE ELECTRIC RAILWAY SYSTEMS OF QUEBEC, CANADA

On July 1, 1899, the Quebec District Railway, or, as it is now known, the Q., M. & C. Railway, meaning the Quebec, Montmorency & Charlesvoix Railway, successfully completed its second year of operation, notwithstanding the many and varied difficulties, perhaps greater and more serious in their nature than usually confront a street railway company.

The first of these difficuties is the hilly—indeed, one might almost say mountainous—nature of the city. To those who have not had the pleasure of viewing this quaint

VIEW OF LOWER TOWN, QUEBEC

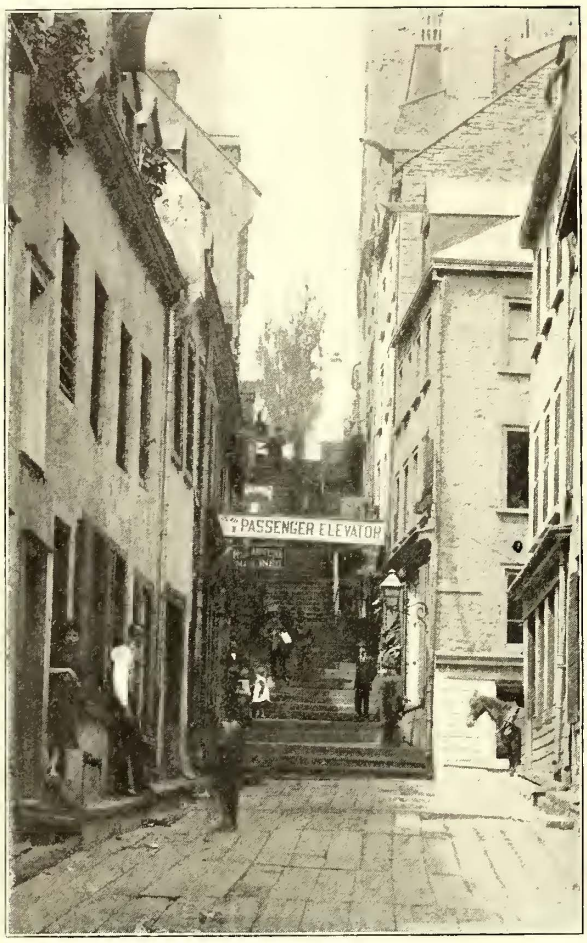
battleground where French power made its final and unold city, rich in olden time relics, with its population of French Canadians, its grand citadel and the old wall of fortification encircling the Upper Town, extending along the very brow of the hill, it will be difficult to fully comprehend the nature of the exacting conditions under which an electric railway is operated in this city.

The Upper Town has grown, expanded and pushed out beyond the fortifications, the new portion being principally residential. Here are the famous Plains of Abraham, the successful stand for the disputed possession of Canada. The Lower Town, situated at the water's edge, lying around the base of the hill—indeed precipice in many places—is perfectly level, and is the chief business district. The Upper Town, on the other hand, possesses many grades, the maximum track elevation above the Lower Town being 320 ft., which must be reached in one way or another.

To overcome the difficulties presented by these hills several methods are adopted, it being obviously impossible to ascend directly even for a horse slightly loaded. One street, Cote St. Abraham, ascends the hill obliquely, and though very steep is yet feasible, and here is located one cross-town route; a profile of the grades encountered is given on page 498. On this hill the heaviest grade is at Crown Street, one of 14.15 per cent—the heaviest traversed by the cars in Quebec—with, moreover, a 40-ft. radius curve at the top, half of it being on the grade.

It was necessary, however, to provide another cross-town route at the other end of the city, but here it was im-

possible to ascend the streets. After much thought had been devoted to the subject, a trestle, a side elevation of which is given, was finally adopted—the alternative being an elevator to raise or lower the loaded car—and constructed in a convenient location. This trestle ascends the first portion of the hill obliquely with a grade of 7 per cent. On reaching a certain point, where the trestle meets one of the cross streets, a curve was located on a level section on the trestle, after which the grade is 11 per cent for 300 ft., then 4 per cent till the Upper Town is finally reached.



TYPICAL STREET IN THE OLD QUARTER OF QUEBEC

The second hindrance, and a most important one in Northern countries, is the handling of the snow, which falls very heavily in these regions. Snow of itself is bad enough, but snow and hills combined are enough to dishearten the most optimistic of managers. Nevertheless, the regular runs are performed with, perhaps, much shorter intervals of stoppage than in larger cities further south, where they are unprepared to cope with such a difficulty. For instance, the snow fall last winter was 120.6 ins., the largest on record, and of this 44.6 ins. fell in March alone, yet there was no interruption in the regular service. This record was achieved by the diligent and continued use of sweepers, levelling plows and numerous box sleighs. Though there are but 18 miles of track, six snow sweepers are ever ready for operation.

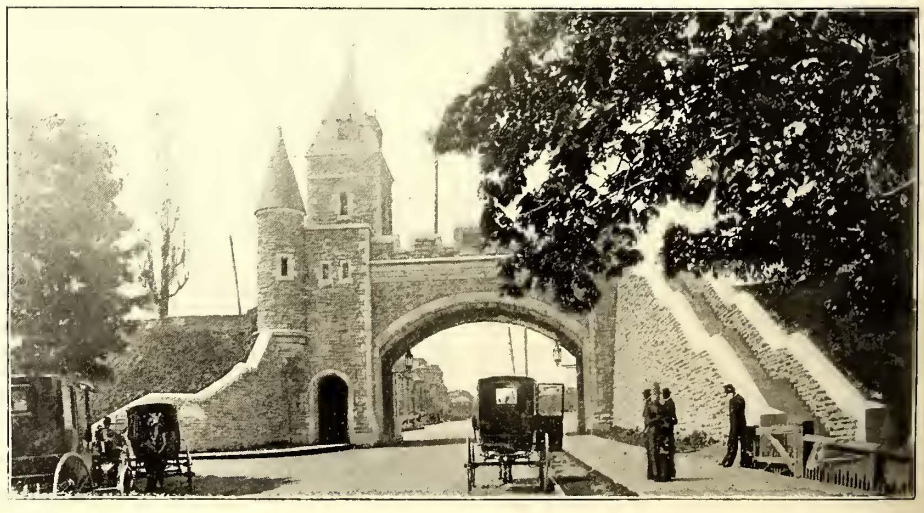
When a snow storm occurs in the daytime the load upon the sweeper motors is very much greater than during night storms, for to prevent interference with the regular service it is necessary to run the sweepers in the same direction as the cars; that is, up hill on one track of a double-track road. On the other hand, during a night storm it is the practice for the sweepers to sweep down one track, return the same way, and then clear the remaining track also down grade. Meantime, levellers drawn by horses are also at work throwing the snow still farther from the track, whence it is removed in box sleighs.

The total equipment for the disposal of snow consists of six sweepers, each equipped with two standard 12 A 30-h.p. Westinghouse motors for traction purposes, and another motor of the same type placed in the cab for revolving the brooms, several horse-drawn levellers and numerous box sleighs. No 12 B. & S. copper wire is used as a fuse on the sweepers' motors, and will not blow before 230 amps. are drawn by the two traction motors.

CAR SERVICE

There are two principal routes, one in the Lower and one in the Upper Town; the schedule running time on both is at the rate of 8 miles an hour, and the average car mileage per day 106 miles; the headway on the principal streets is five minutes. Besides these two routes, there are two cross-town lines on which free transfers are issued from the main lines. Open cars are not used on these cross-town lines, on account of the excessive current required by the motors in ascending the heavy grades with ordinary loads and the greater danger of open cars becoming overcrowded. In ascending all heavy grades the motors are run in parallel, and in most cases momentum is secured before entering the grade, to aid the ascent, but on one grade of 11 per cent at the summit of the trestle previously mentioned power is shut off to pass around the curve at the foot of the grade. Extreme caution is exercised in descending heavy grades, the speed not being permitted to exceed 4 miles an hour, an ordinary walking pace.

In a city such as Quebec the braking system should be of special interest, yet nothing but ordinary brake shoes, the average life of which is three months, are used. These shoes are made of a specially soft cast iron, with the flanges perforated to permit the mud to percolate freely, and are supplied with a brake leverage of 10 to 1. Under these conditions it may be not a little surprising to find that skidding is very uncommon; in fact, the average number of wheels worn flat is only 14 per cent out of the total num-



CITY GATE

ber of worn out wheels, and these are mostly due to a slippery track in winter.

The wheels are 33 ins. in diameter, with a 4-in. axle, weigh 425 lbs. each, and are manufactured at the Rochester Car Wheel Works; the average life is 24,834 miles, including those worn flat, though no less than six pair have reached as high as 49,720 miles. Of the total number of wheels removed since July 20, 1897, 56.5 per cent were worn out; 15.55 per cent were worn flat, due to skidding; 4.44 per cent were replaced, due to chipping flanges, and 3.33 per cent were loose on the axle. One detriment to the life of the wheels on the Lower Town route is a certain quality of mud or grit which collects on the brake shoes, and there cakes to such extreme hardness that it is only possible to remove it with a cold chisel. This not only shortens the life of the wheels, but renders braking very difficult.

The summer service consists of forty-four cars per day, and the winter service of twenty-five cars per day.

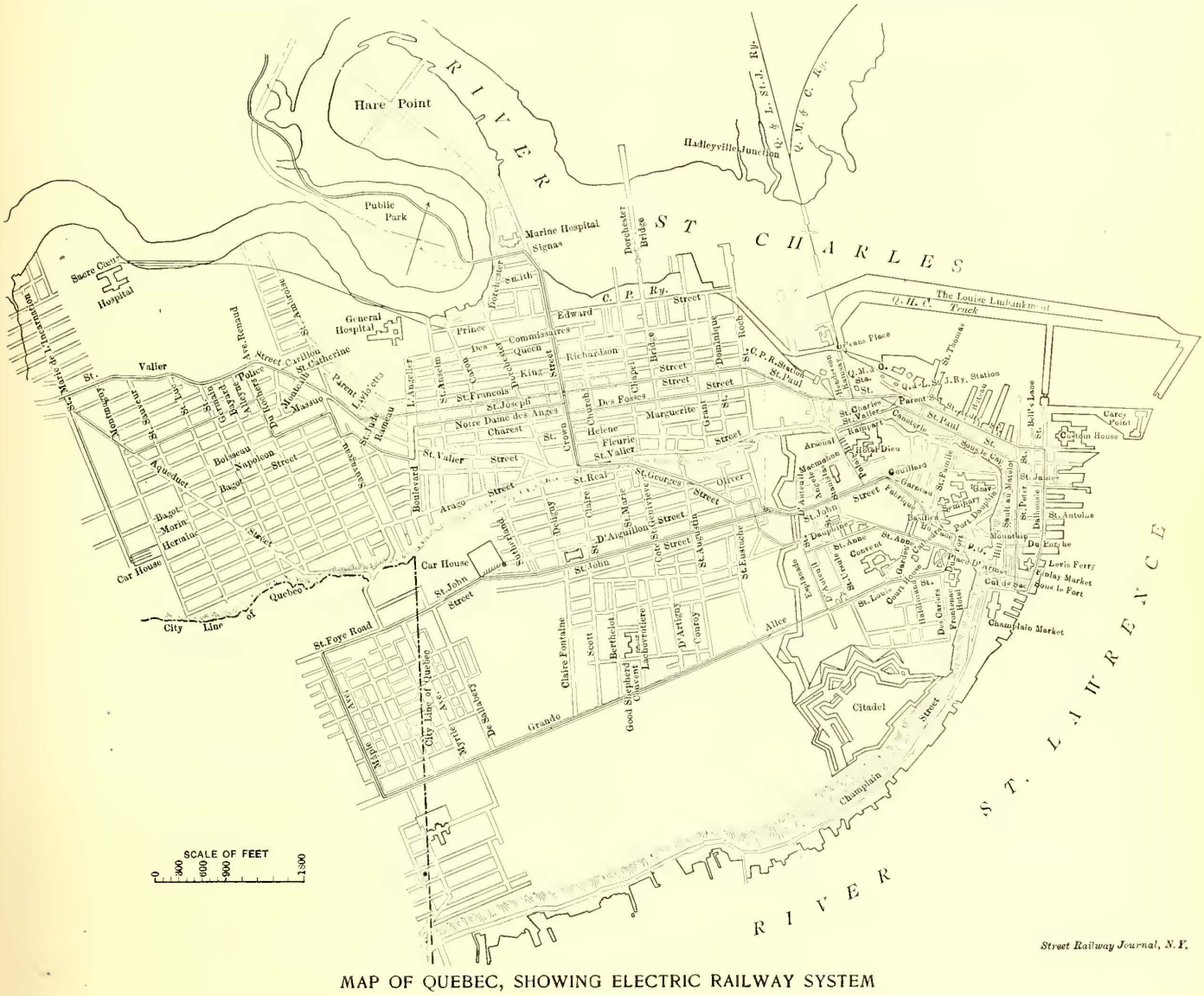
ROLLING STOCK AND EQUIPMENT

The rolling stock consists of thirty-eight closed and twenty-four open cars and the six sweepers previously mentioned, the closed cars, of course, performing the greater service. These standard closed cars are very solid in their construction, and were built by the Ottawa Car Company, of Ottawa, Ont. The car body measures 18 ft. in length, with closed vestibules at each end and double sliding doors. The length over all is 28 ft. Each is capable of seating thirty passengers, and weighs fully equipped 7½ tons. The interior is very attractive, being finished in natural cherry, with birds-eye maple ceilings, and is brilliantly lighted by three clusters of four lamps each, set in brass fixtures. Each car is furnished with two electric reflector headlights, one at each end. The temperature of the interior is maintained uniform at 55 degs. F., or thereabouts, even in the coldest weather, by means of four electric heaters located under the seats, each consuming 1.1 kw. per hour.

The open cars are of the same dimensions as the closed cars, but have a seating capacity of fifty, and weigh 8 tons each, fully equipped, the average weight being 16,700 lbs. from an actual test. The bodies and side posts are of seasoned oak, with ceilings of birds-eye maple, and all handles and fixtures are solid brass.

Fares are collected from each passenger by a Coleman fare box. Sterling registers are also used. All car bodies are mounted on standard Taylor double side-braced trucks, having a 7-ft. wheel base.

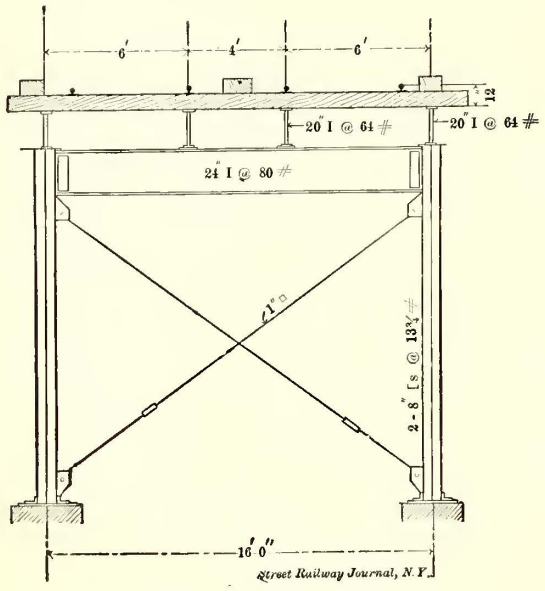
The motor equipment is Westinghouse throughout, and was supplied through Ahearn & Soper, of Ottawa. Two 12 A 30-h.p. motors are used on each car, and are regulated by series parallel controllers of the 28 A type. The gear ratio is 4.85. The fuse is No. 14 B. & S. copper wire, which will carry 175 amps. for a short time, such as may be required in ascending one of those short, steep grades so common in Quebec, or 150 amps. indefinitely in the winter.



MAP OF QUEBEC, SHOWING ELECTRIC RAILWAY SYSTEM

During the winter months the open car motors are transferred to the sweepers, which, as stated, require three each—two for driving the car and the other in the cab for operating the brooms, to which it is connected by chain gearing. No. 12 B. & S. copper wire is used as a fuse in all sweepers, being capable of carrying 230 amps for a short time without blowing, which amount is sometimes required in winter during a big storm. The total motor equipment consists of sixty-two double sets of motors and controllers.

A test was made recently to ascertain the current consumption in ascending the heaviest grade—one of 14.15 per cent, 90 ft. long, with a 40-ft radius curve at the summit, half of which is on the hill. It is customary to throw the power completely off the moment the car enters the curve, and as the car commences to lose momentum the power is thrown on again. Under the most favorable summer conditions the maximum current drawn by the two motors during the ascent until the curve was reached was 65 amps. at 520 volts, then after being turned off on reaching the curve and again thrown on the maximum reading was 130 amps., still at 520 volts. The average



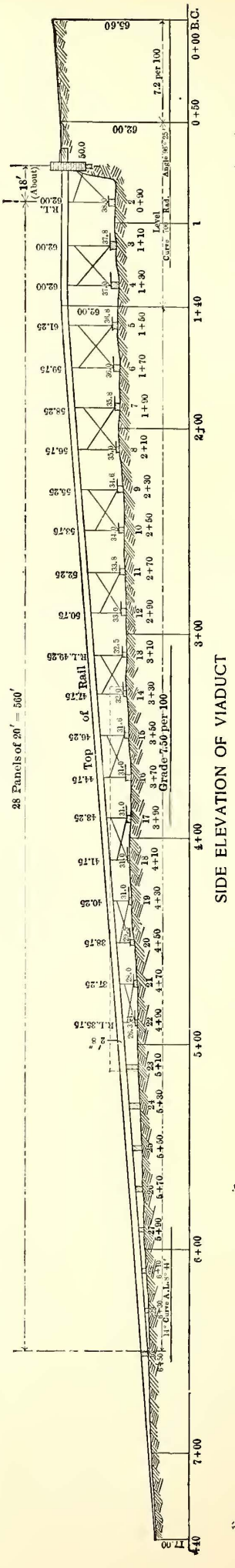
SECTION OF VIADUCT

speed of the car was 4.5 miles per hour, and the estimated weight 9 tons. Under average winter conditions the current consumption rises to nearly 100 amps. on the grade, and to about 195 amps. on rounding the curve.

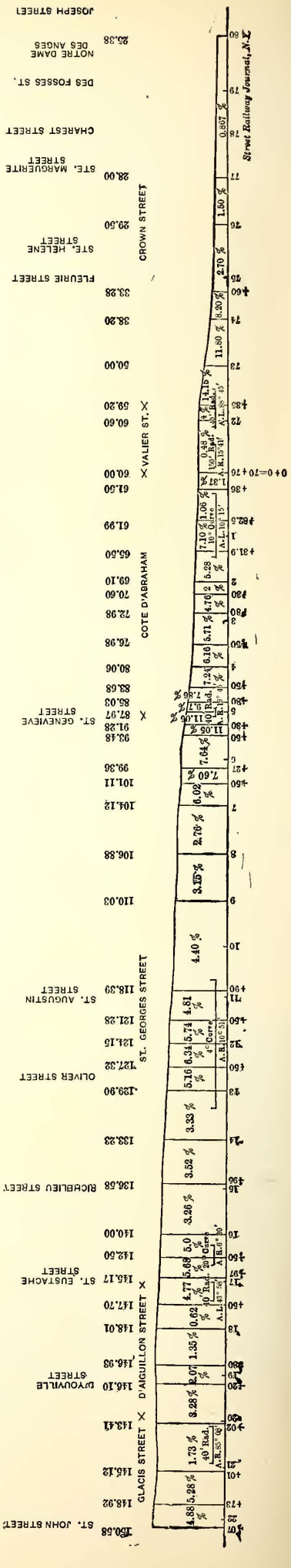
In descending all heavy grades the motormen are obliged to come to a standstill at the top to ascertain if the brakes are in good working order, after which the speed down grade must not exceed 4 miles per hour, so that a stop may be made, if necessary, on the hill. As all excessively steep grades are short, the time lost in going slow is very small.

The average power consumed in summer, as obtained by the integrating wattmeter in the station, is 8.3 kw. per car per hour, the average for the whole year being about 9.5 kw. per car per hour. The average mileage per car per day is 106.

The trolley wheel is of soft brass, 4¼ ins. in diameter, and as it is carefully greased every day it seldom leaves the trolley. Its average life is 10,000 miles, or about 95 days. Commutators run 25,000 miles before being sent to the lathe. The greatest wear on the commutator has been a decrease of 3-16 ins. in the diameter, the average has been ⅛ in. The brushes used are of the Le Valley Vitae manufacture.



SIDE ELEVATION OF VIADUCT

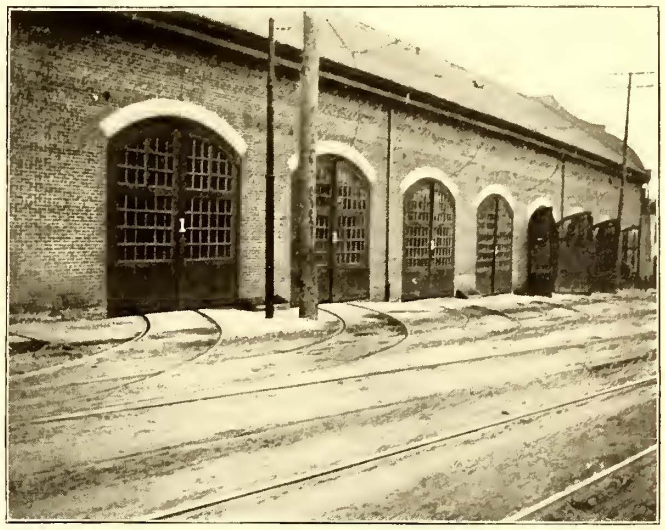


PROFILE OF PART OF CROSS TOWN LINE

ROADBED

Double tracks are used in all streets wide enough to permit them. The roadbed is of the standard construction, with ties on well tamped beds 2 ft. between centers. During the process of laying asphalt pavements, since the inception of the street railway, concrete has been thoroughly tamped around the ties, and the usual method of placing paving blocks inside and outside the rails has been

SWEEPER AND TOWER WAGON



ENTRANCE TO CAR HOUSE

adopted. English T-rails, weighing 72 lbs per yard in 32-ft. lengths, are used almost exclusively. They are double bonded at each joint with two No. 00 copper wires, and cross bonded every fifth rail. The ends of the bond wires are tinned and are connected to the rails by Eclipse bonding caps, supplied by the Ohio Brass Company. Four ground returns, of 500,000 c.m. each, run on poles from the station. Three of these are connected to the nearest

STANDARD CLOSED CAR

CURVE AT TOP OF AN 11 PER CENT GRADE

heavy traffic rails, a short distance away; the remaining wire is connected into the Upper Town rails. The object of the latter is to reduce the drop in the rails, as there are only two single-track lines connecting the Upper and Lower Town lines.

The following is a list of the longest grades over 8 per cent, over which the cars operate.

Ninety feet of 14.15 per cent, with a 40-ft. radius curve at the top, half on the hill;

Three hundred feet of 11 per cent (on trestle), with a curve of 70 ft. radius at the bottom;

Seventy-five feet of 9.7 per cent, with curves at top and bottom, and

Three hundred feet of 8 per cent, on which there is a 40-ft radius curve, connecting with 400 ft. of 4 per cent grade.

In two separate portions of the city reverse curves are required. Of these one has a 40-ft. radius on the entrance curve, but the reverse curve has a 34-ft. radius. This was necessary to round a shorp corner into a very narrow street.

OVERHEAD CONSTRUCTION

Tubular poles, 28 ft. long, and weighing 700 lbs., and spaced 90 ft. apart, are used throughout. The overhead appliances are of the "Dirigo" type, and the trolley wire is No. 00. Four feeders, each of 500,000 c.m., run from the station, which is approximately in the electrical center of distribution. Lightning arresters of the Wurts non-arcing railway type are situated on the poles wherever the feeders tap the trolley.

At one point, where the railway crosses a drawbridge spanning the St. Charles River, which is navigable for small ships, it became necessary to place the feeder either under the river or at such a height that it would clear the masts of all passing ships. The latter course was adopted,

and two poles, each 150 ft. high, were placed on each bank, the feeder crossing on top. Each pole is built up of two separate pieces spliced together and the whole well guyed. For the ground return here a No. 0000 bare copper wire crosses the river on the bottom, and is connected to the bridge rails and to the rails on the opposite side of the river.

CAR HOUSES, REPAIRS, ETC.

There are two car houses. The main car house, which is the one illustrated, is a one-story brick structure 210 ft. wide x 120 ft. long, contains fourteen tracks, and has a capacity of fifty cars. There are seven pits, with the usual hydraulic jacks, etc., for motor handling. Opening out from the pits is a machine shop where motors may be repaired, and in which all the machine work in connection with the road and equipment repairs is performed. Situated under the car shed are the storerooms, blacksmith shop and oil room. This latter is a fireproof vault. On the ground floor are the superintendent's and engineer's offices and the employees' room, where orders are given, and where an employee may come and spend a sociable evening.

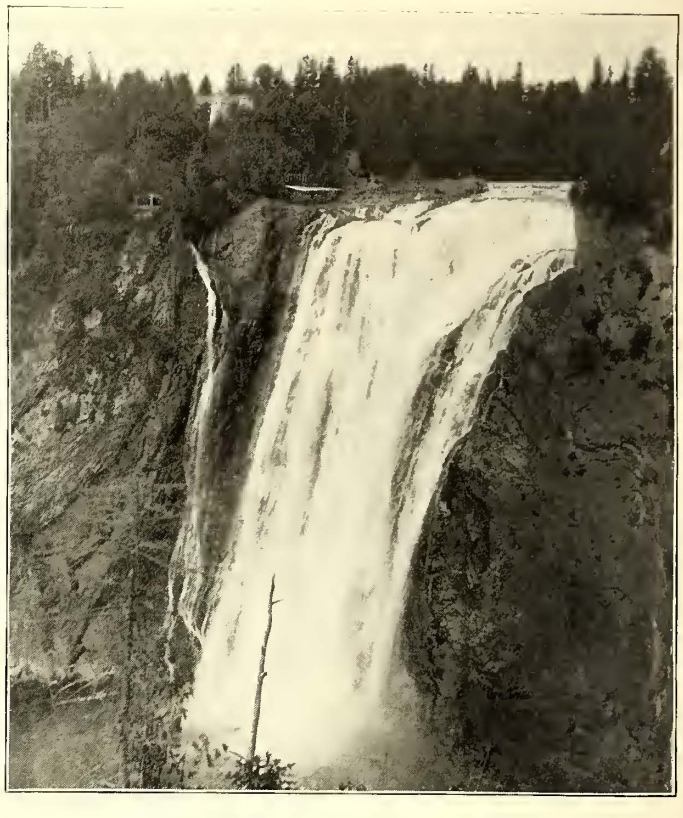
The remaining car shed is also of brick, and is 310 ft. long x 60 ft. wide. It is used only for storing cars, and contains three tracks, with a capacity of twenty-five cars.

Every night each car is overhauled, the gears and trolley wheels are greased, the commutators are examined, the controllers are thoroughly cleaned, the tips are sandpapered and oiled, the brake shoes and nuts are examined, and the car is washed. Trifling repairs are done on the spot by the inspectors. It requires but three or four men to overhaul all the cars necessary for operation, and the perfect condition of the equipment more than repays the company for the expense incurred. Should a car wheel be worn flat, due to skidding, it is at once removed and replaced.

The repair staff consists of: Day staff—One foreman, two mechanics, one electrical mechanic, one blacksmith, one carpenter, one painter, one laborer. Night staff—One foreman, three greasers and repair men and two cleaners.

Some of the results noted by this system might almost be known as "records," for during the two years' operation only one armature has been burnt out, and only two armatures have been destroyed by worn bearings; no controller has yet been destroyed, and the covers are as good as new; no gear or pinion has yet been destroyed or replaced, and the braking is perfect, one special feature being the noticeable ease with which the motormen stop a car on a grade.

The patrol wagon makes a complete circuit of the whole line once a week, attending to any repairs necessary and testing the span wires for insulation. As a result there has as yet been only one break in the trolley line.



MONTMORENCY FALLS, SHOWING DAM

SNOW SCENE

Taking the eleven months of the last year's operation, the last month's accounts being not yet completed, for the year ending June 30, 1899, the total number of car miles was 914,926, and cost of maintenance $87,008, or .095 per car mile. Of this amount .016 per car mile was chargeable to snow removal. This amount may be better appreciated when one understands that this sum means that every car must earn $1.70 a day to pay the expenses of the snow removal alone. Payment of all unsalaried employees amounted to .064 per car mile, and was by far the greatest item. The cost of maintenance of electrical equipment was .0019 per car mile; that of car bodies and trucks, .0050 per car mile, and that of ways and buildings, .0081 per car mile.

POWER DEVELOPMENT, POWER HOUSE AND SUBSTATION

This electric railway, together with all electric lights and motors used in Quebec, is operated from water power developed at the celebrated Montmorency Falls, 7 miles distant from the city.

The total height of the fall is 267 ft., down which the water falls perpendicularly in a beautiful white, foaming turmoil of water to the rocky chasm beneath. An im-

mense concrete dam, 250 ft. wide, has been constructed across the river, 100 ft from the brink of the falls, which, though in no manner despoiled of their beauty, are yet turned to some industrial account. A cribwork wing dam has also been erected, containing several large openings in the bottom acting as water passages, permitting the water to enter the forebay free of all rubbish, which is left floating on the surface, and also free of frazil ice, that bugbear to Canadian water power development, this being completely swept away and over the falls by the swift current outside the forebay. The entrance to the penstock is in the gate house, situated at one end of the dam, whence the water flows in the huge enclosed steel pipe, 8 ft. in diameter, to the power house, 2560 ft. distant, following a sinuous path under the very brow of the hill.

The power house, a one-story limestone structure, 150 ft. long x 50 ft. wide, is located on the side of the hill, 208 ft. below the brink of the falls; the actual working head, however, is only 195 ft., the remainder being destroyed by frictional loss. The equipment consists of four 52-in. water wheels, each delivering 1000 h.p. at 286 r.p.m., built by the Stilwell-Bierce & Smith-Vaile Company, of Dayton, Ohio, the speed being regulated by four Geisler electro-mechanical governors, which raise or lower the cylindrical wheel gate, controlling the admission of water to each wheel. Each wheel is direct-connected to a 600-kw. two-phase S. K. C. alternator, generating current at a frequency of 66 cycles per second, and at a pressure of 5500 volts, at which it is transmitted direct, but is reduced by line drop to 5000 volts at the substation. Two 30-kw. bi-polar exciters, direct-connected each to a 11-in. wheel, rated at 50 h.p. at 1200 r.p.m., furnish current for the generator fields.

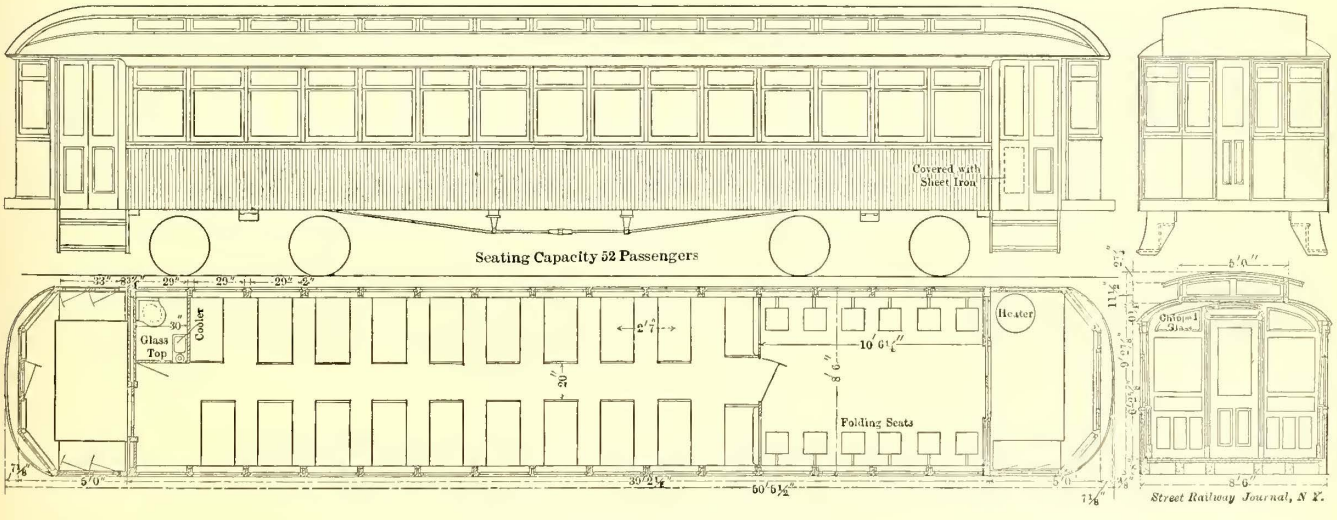
From the wheels the water passes into a discharge tank, whence a certain quantity is delivered to a cotton mill situated some distance below, the head being sufficient to operate 1000 h.p., the amount contracted for.

From the power house the current is transmitted to the substation by means of two separate pole lines, each carrying eight wires—four from each machine. The generators are not coupled in parallel at the power house, but are run separately, this being found necessary on account of the violent fluctuations of the street railway load affecting the city lights when all were operated in parallel. The machines, however, not running the railway load are coupled in parallel at the substation for the incandescent lighting and power service.

The substation, situated in Quebec near the St. Charles River, is a two-story limestone structure, containing the office of the lighting and power department, besides the electrical installation, testing and storerooms. For lighting and power purposes in the city the pressure is reduced to 2000 volts by step-down transformers of the Stanley make. For arc lighting two 200-kw. two phase S. K. C. synchronous motors are each coupled direct to two 125-light Brush arc machines.

INTERIOR OF CHURCH OF ST. ANNE DE BEAUPRÉ

For the street railway load there are two motor-generators, each consisting of two separate machines direct-connected by an insulating leather coupling. The alternating current side is a 600-kw. two-phase S. K. C. synchronous motor running at 286 r.p.m., and operating under a pressure of 5000 volts direct from the line; the direct current side is a six-pole 450-kw. Canadian General Electric generator, delivering current to the street railway at 550 volts. Each motor-generator is started and brought up



CAR FOR HIGH SPEED RAILWAY

to the speed of synchronism by a 30-h.p. two-phase S. K. C. induction motor, after which the synchronous motor takes the load. Two 30-kw. Bullock exciters direct-connected to two S. K. C. induction motors are used for exciting the fields.

The switchboard is of the standard General Electric railway type, consisting of five white marble panels. A Thomson integrating wattmeter is placed on this board, and the amount of power consumed by the street railway may thus be accurately determined. Formerly the street railway was a distinct and separate company and purchased power from this station at a certain contracted price per kw. hour, this leading to the introduction of the wattmeter.

SUBURBAN EXTENSIONS

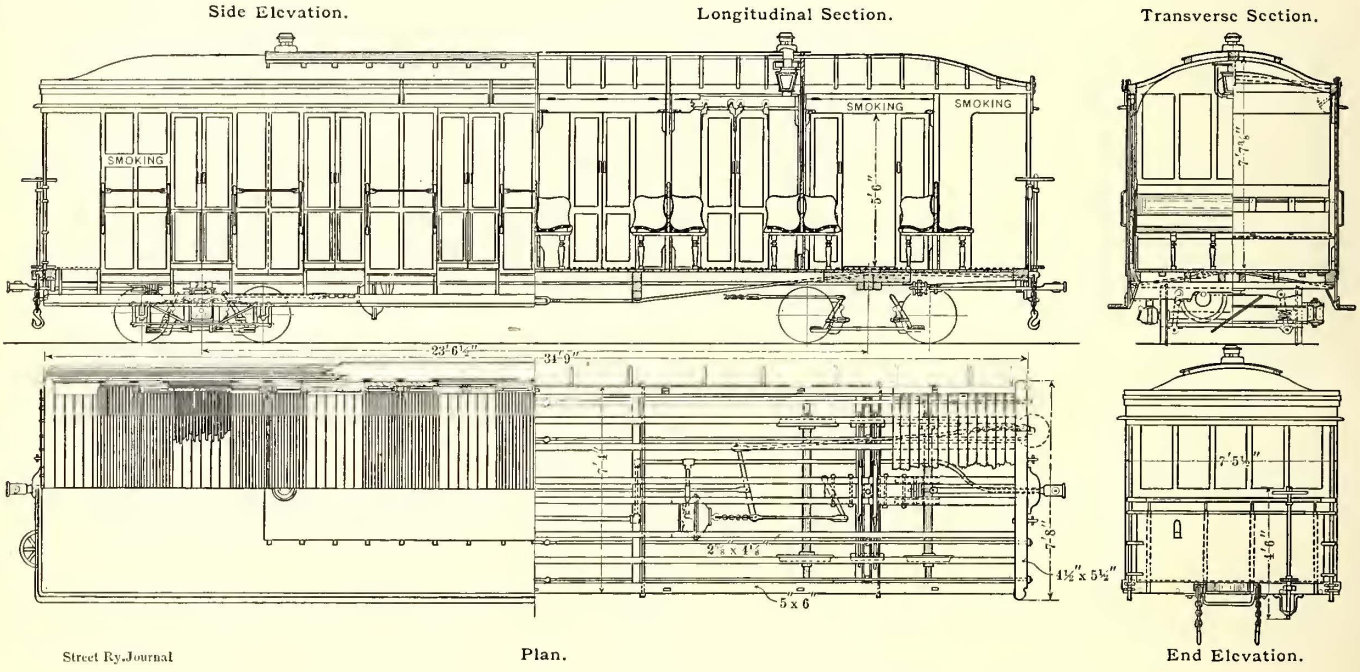
The Q., M. & C. Railway Company, besides running the Quebec city system and supplying the street and residential lighting and power, operates a steam railroad 21 miles long, from Quebec to St. Anne de Beaupré, a celebrated Roman Catholic shrine, this, in fact, being its original business. This latter road will shortly be converted to electricity, the main line being extended 9 miles, making a 30-mile run, and a branch line of 6 miles to be constructed. The total length when completed will be 36 miles, all of single track.

The same roadbed will be used, the 56-lb. rails being bonded with two No. 00 copper bonds. The overhead construction will be standard, wooden poles, of course, being used. There will be two trolleys side by side, in multiple, each with a No. 0000 copper wire. No feeders are required, as the size of the trolley wire will keep the drop within bounds.

The road will be equipped with 50-ft. cars, double trucked, of a type similar to that used on the Detroit-Ypsilanti road, and are illustrated herewith. Each will provide seating capacity for fifty-two passengers, and will be operated by four 50-h.p. Westinghouse motors, capable of attaining a speed of 50 miles an hour. Two trolley poles, arranged tandem on top of the car, will supply all the power required for starting or running up a heavy grade, without sparking in the least. Each car will be provided with Westinghouse standard air brakes, and will weigh 4 tons, made up as follows: Car bodies, 25,000 lbs.; truck, 12,000; motor and equipment, 10,800.

The ordinary service will be hourly, but during the summer months it is thought that it will be necessary to reduce it to half-hourly on account of the rush of pilgrims to the shrine at St. Anne de Beaupré.

For supplying power to this road one 600-kw. Westinghouse double generator is to be installed at the Montmorency Falls power house. The direct current side of this will deliver current at 550 volts, feeding directly into the two trolley lines at the power house, and taking care of the first 10 or 12 miles; the alternating current side will generate a two-phase current at a nominal pressure of 400 volts, which, by means of two 125-kw. single-phase transformers using the "Scott connection," will transform to a three-phase at a pressure of 1000 volts, at which it will be transmitted to a substation located 10 miles from the eastern end of the line. Here it will be reduced to a two-phase again, and operate a 200-kw. Westinghouse rotary converter, thus obtaining current at 550 volts to feed that end of the line.



LIGHT RAILWAY CAR USED BY THE SOUTH WALES GOVERNMENT RAILWAYS

The officers of the Q., M & C. Railway Company are: H. J. Beemer, president; E. A. Evans, general manager; W. R. Russell, general superintendent; William Langford, hydraulic engineer; D. E. Blair and Lewis Burran, electrical engineers, in charge of the street railway and the lighting and power departments respectively.

Light Railway Car

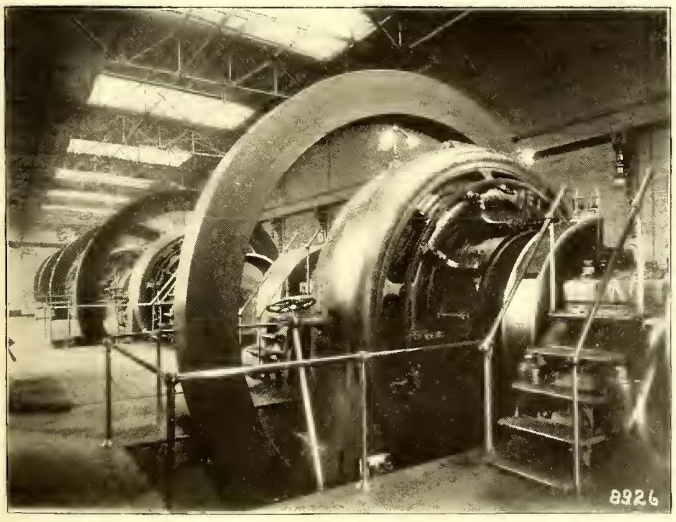
The accompanying diagram shows plan, side elevation and section of the standard car for steam tram or light railway service used by the New South Wales Government upon the steam tramways owned by it. These cars have been in service for from fifteen to eighteen years and seem admirably suited for the work they have to perform. Their seating capacity is seventy passengers, but when heavily loaded and the standing room is occupied they frequently carry 130 to 140 people. The weight empty is 11,200 lbs., including trucks. The latter are, of course, very light and are equipped with cast steel wheels. The drawing is reproduced through the courtesy of W. Thow, chief mechanical engineer of the New South Wales Government.

Some Electrical Features of the Power Station of the Consolidated Traction Company of Pittsburgh

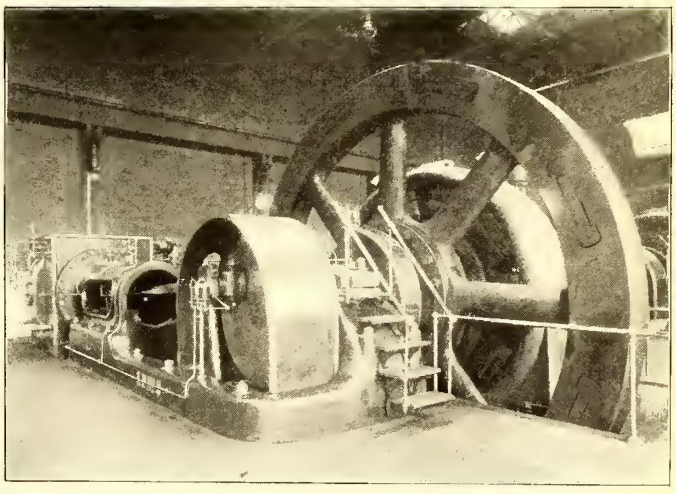
An extended description of the electric railway system of the Consolidated Traction Company of Pittsburgh was published in the STREET RAILWAY JOURNAL for March. This system, as will be remembered, is a most extensive one, and the power station which has recently been completed, includes a number of radical innovations from standard practice. The extent of the subject, and the fact that the station at the time of going to press was not entirely completed, precluded the description of a number of details of interest in regard to the station equipment, and these will be briefly mentioned herewith.

COAL CONVEYOR

INTERIOR OF BOILER ROOM



GENERATOR SIDE OF UNIT



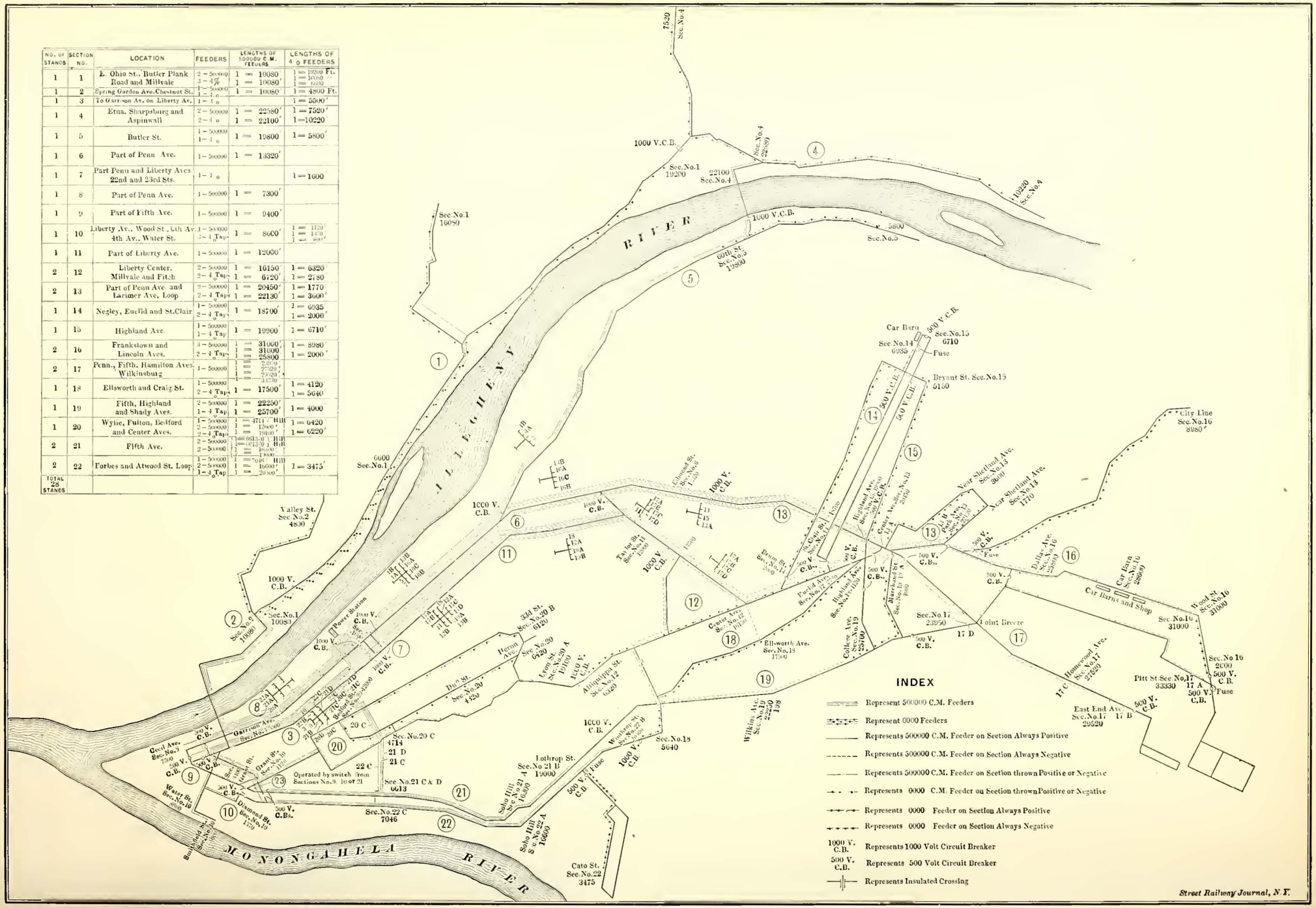
LOW PRESSURE SIDE OF UNIT

The power station is located at Twentieth Street, on the Allegheny River, from which water is obtained for condensing purposes. The tracks of the Baltimore & Ohio Railroad and the Pennsylvania Railroad are close to the station. Coal can be secured from either, or from barges on the river. The station itself is built of Pompeian brick, with Cleveland sandstone trimmings, and measures 275 ft. x 115 ft. The coal is received at the river end of the station. The cars run over a receiving hopper, into which they discharge their load. The coal is being carried by a Meade coal conveyor, with automatic weighing bucket, to a second hopper, or coal storage bin, located over the boilers. The conveyor is driven by a 16-h.p. electric motor, and has a capacity for handling 40 tons per hour. A view of the receiving end of the conveyor is shown in one of the accompanying engravings.

The boiler room contains six batteries of sectional water tube boilers of a special design, made by the Babcock & Wilcox Company, and each battery is provided with a separate unlined iron smokestack. Each stack is 66 ins. in diameter, and rises 147 ft. above the grate bars. The furnace is of the Hawley down-draft type. In order to economize floor space the boilers are made shorter and higher than usual. Each boiler contains about 5000 sq. ft. of heating surface and is made up of eighteen sections of

DIAGRAM OF FEEDERS FOR OPERATING ON THE THREE-WIRE SYSTEM, CONSOLIDATED TRACTION COMPANY—PITTSBURGH

NO. OF STANDS	SECTION NO.	LOCATION	FEEDERS	LENGTHS OF 500000 C.M. FEEDERS	LENGTHS OF 4 0 FEEDERS
1	1	E. Ohio St., Butler Plank Road and Millvale	2 – 500000 3 – 4/0	1 = 10080′ 1 = 10080′	1 = 19200 Ft. 1 = 10080′ 1 = 5600
1	2	Spring Garden Ave. Chestnut St.	1 – 500000 1 – 4/0	1 = 10080′	1 = 4800 Ft.
1	3	To Garrison Av. on Liberty Av.	1 – 4/0		1 = 5500′
1	4	Etna, Sharpsburg and Aspinwall	2 – 500000 2 – 4/0	1 = 22580′ 1 = 22100′	1 = 7520′ 1 = 10220′
1	5	Butler St.	1 – 500000 1 – 4/0	1 = 19800′	1 = 5800′
1	6	Part of Penn Ave.	1 – 500000	1 = 13320′	
1	7	Part Penn and Liberty Aves. 22nd and 23rd Sts.	1 – 4/0		1 = 1600′
1	8	Part of Penn Ave.	1 – 500000	1 = 7300′	
1	9	Part of Fifth Ave.	1 – 500000	1 = 9400′	
1	10	Liberty Av., Wood St., 6th Av. 4th Av., Water St.	1 – 500000 2 – 4/0 Taps	1 = 8600′	1 = 1120′ 1 = 1470′ 1 = 800′
1	11	Part of Liberty Ave.	1 – 500000	1 = 12000′	
2	12	Liberty Center, Millvale and Fitch	2 – 500000 2 – 4/0 Taps	1 = 16150′ 1 = 6720′	1 = 6320′ 1 = 2780′
2	13	Part of Penn Ave. and Larimer Ave. Loop	2 – 500000 2 – 4/0 Taps	1 = 20450′ 1 = 22130′	1 = 1770′ 1 = 3600′
1	14	Negley, Euclid and St. Clair	1 – 500000 2 – 4/0 Taps	1 = 18700′	1 = 6035′ 1 = 2000′
1	15	Highland Ave.	1 – 500000 1 – 4/0 Tap	1 = 19900′	1 = 6710′
2	16	Franklstown and Lincoln Aves.	3 – 500000 2 – 4/0 Taps	1 = 31000′ 1 = 31000′ 1 = 25800′	1 = 8980′ 1 = 2000′
2	17	Penn., Fifth, Hamilton Aves. Wilkinsburg	1 – 500000	1 = 2870′ 1 = 27520′ 1 = 21720′ 1 = 3430′	
1	18	Ellsworth and Craig St.	1 – 500000 2 – 4/0 Taps	1 = 17500′	1 = 4120′ 1 = 5040′
1	19	Fifth, Highland and Shady Aves.	2 – 500000 1 – 4/0 Tap	1 = 22250′ 1 = 25700′	1 = 4000′
1	20	Wylie, Fulton, Bedford and Center Aves.	1 – 500000 2 – 500000 2 – 4/0 Taps	1 = 4717′ Hill 1 = 12000′ 1 = 19100′	1 = 6420′ 1 = 6220′
2	21	Fifth Ave.	2 – 500000 2 – 500000	1 = 6613′ Hill 1 = 4713′ Hill 1 = 16600′ 1 = 1900′	
2	22	Forbes and Atwood St. Loop	1 – 500000 2 – 500000 1 – 4/0 Tap	1 = 7046′ Hill 1 = 16600′ 1 = 20900′	1 = 3475′
TOTAL 22 STANDS					



tubes, each 15 ft. long with three 36-in. drums, 20 ft. long. The boilers are designed to carry a pressure of 200 lbs. to the square inch and were tested under hydraulic pressure to 300 lbs.

The interior of the engine room is of Pompeian brick, and is finished with enameled brick wainscoting with slate cap. It measures 270 ft. x 55 ft.; and is designed to contain eight units, of which six are at present installed. Each unit consists of a 1560-h.p. cross-compound condensing Corliss engine, built by the Pennsylvania Iron Works Company, and connected to an 800-kw. generator. The engines run at 80 r.p.m., and their cylinders measure 30 ins. and 54 ins. x 48 ins. stroke. An automatic oiling system is used for all the bearings. The main supply of oil is kept in a reservoir placed near the roof of the building, and from

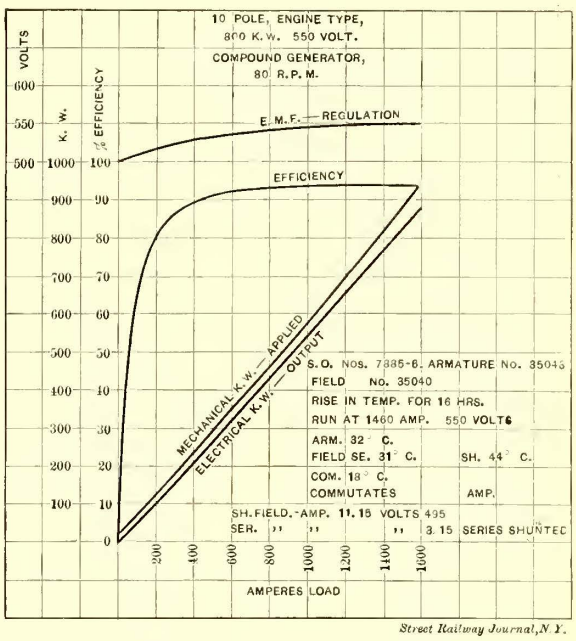
VERTICAL ADJUSTING DEVICE FOR GENERATOR

that point is piped to the different bearings. After passing through the bearings it descends to the basement, from which point it is filtered, and is then pumped back to the tank. An automatic arrangement is provided by which if there is any lack of oil supply in the tank a whistle is blown in the engine room.

The generators are of the standard Westinghouse rail-

VIEW OF POWER STATION

way type, with a nominal capacity of 1460 amps., and actual capacity of considerably more under different conditions, as mentioned later. The generators run at 82 r.p.m. at no load, and give then 500 volts. At nominal load, which is 1460 amps., they are designed to run at 80 r.p.m., and give 550 volts; and at 75 per cent overload they run at 77 r.p.m. The generators are guaranteed to carry 1820 amps. continuously, with a rise of not more than 40 degs.



DATA CURVES OF GENERATOR

Cent. in any part of the machine; and also to carry 2560 amps., which is 75 per cent overload, with not less than 550 volts for a short period. The commercial efficiency of the machine at one-fourth load is 90 per cent; one-half load, 92 per cent; three-fourths load, 93 per cent, and full load, 94 per cent. The output of the machine at different rates of loading is shown diagramatically in the accompanying data curves. The machine is also guaranteed to produce no sparking within the limits of no load and 50 per cent overload, or to require any shifting of brushes between these limits. It is also guaranteed not to buck at the opening of the circuit breaker at 2500 amps. The machine is tested before leaving the works to stand an alternating e.m.f. of 3500 volts. The frame is mounted on an adjustable bed plate, which provides for both a lateral and vertical movement. The former is cared for by regular guide rails; the latter is intended to provide for the wear in the bearings, and is accomplished by means of a large wedge-shaped casting which supports the generator and can be moved in either direction by means of a screw adjustment. This device is illustrated in one of the accompanying engravings.

The generators are over compounded, so that the potential at the terminals increases about 10 per cent from no load to full load. The shunt and series coils are separately wound, and are removable at will. The armature spider is pressed and keyed upon the engine shaft, and may be drawn off when desired, should that ever be necessary,

without interfering with the permanent arrangement of the commutator and windings. The armature windings are made from bars of copper forged into proper shape, on cast iron formers and are insulated with mica and prepared filler board. They are held in the slot by retaining wedges of hard fibre, avoiding the use of bands.

INTERIOR OF ENGINE ROOM—PITTSBURGH

The switchboard, as described in the March issue, is built for the three-wire system, and is of an extremely novel pattern. Although the road is still operated on the two-wire system, the arrangement of the feeders for the three-wire system has been decided upon, and the overhead system is so arranged that a change to the three-wire can be effected without any alteration of the feeders or overhead structure. The method to be employed is, briefly, to operate the down-town sections positive and the suburban sections negative, and provide certain alternate outlaying feeders adjoining each district for transposition from one side to the other. A change, however, to the three-wire system is considered impossible until all the substations now in operation are shut down, and this will prevent a change for some time.

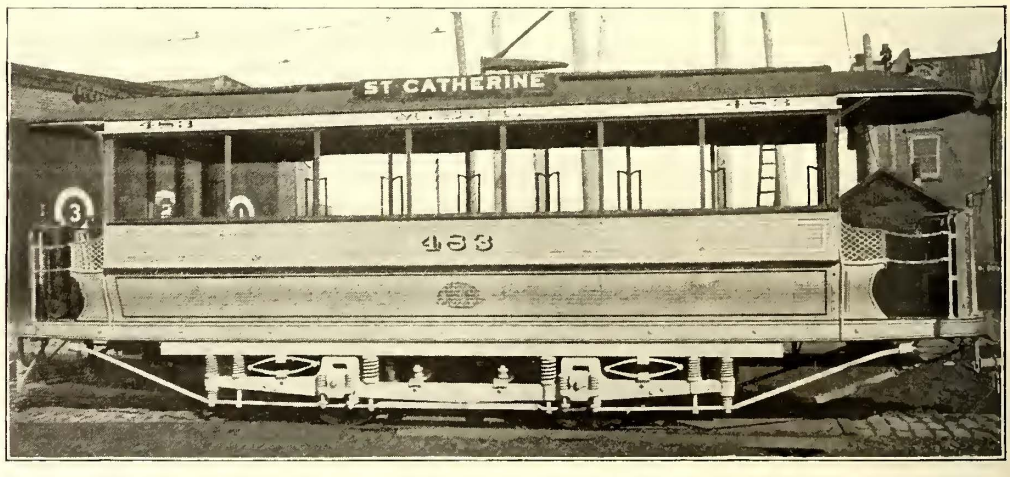
A diagram of the arrangement of feeders for three-wire distribution is shown on page 504. As will be seen, part of the feeders are arranged to be operated positive, part negative and part to connect to either side to balance the system.

The main object in the painting of cars should be to secure a hard, smooth surface which will hold the varnish with the very smallest amount of material; the thinner this surface is the better. From paper at the Boston Convention, 1898.

A Novelty in Car Construction

The accompanying engraving shows a somewhat novel type of open car recently put in service on the lines of the Montreal Street Railway Company. The cars are run on a loop, and the inside of the car is partly closed, the idea being to do away with the wire screens hitherto used, and also to prevent wet seat ends. The cars are fitted with pantasote curtains, which are found very effective in wet weather and on cold days.

The right side of the car, the one not shown in the engraving, is finished similar to an ordinary open car. The photograph is reproduced through the kindness of F. L. Wanklyn, manager and chief engineer of the Montreal Street Railway Company.



NOVEL OPEN CAR—MONTREAL

Life consists of motion, and the more we increase the facilities on the part of mankind to move its individual units from one point of the earth's surface to another point, the more we extend civilization in the higher sense of the term. From address at the Boston Convention, 1898.

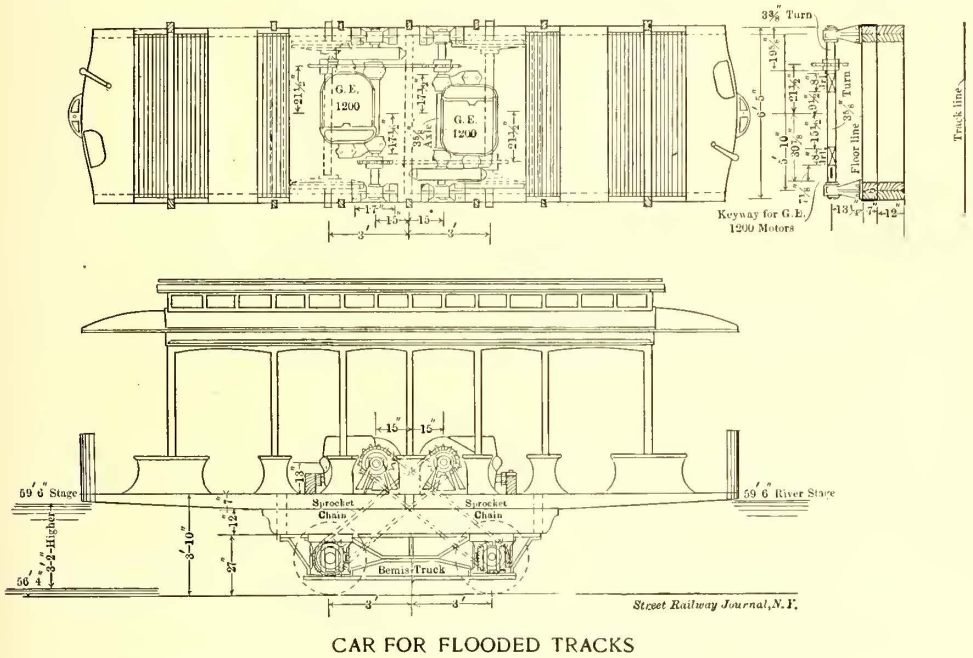
Notes From Cincinnati

The Cincinnati Street Railway Company now controls all the street railway lines operating in the city proper, but permits some of the cars of a suburban line to pass over its tracks to the business center of the city. The system also connects with and receives the passengers at College Hill with the high-speed line that runs between Cincinnati and Hamilton. The double trolley still holds its own, and the grooved type of rail is the standard.

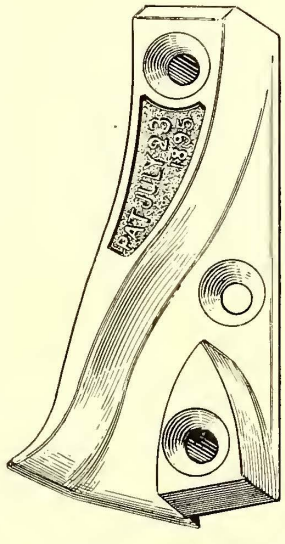
Since the last description in the STREET RAILWAY JOURNAL of the street railway systems of this city the Cincinnati Street Railway Company has bought that portion of the line located between the Zoological Gardens and Fountain Square that was formerly controlled by the Cincinnati Inclined Plane Street Railway Company. Since this purchase the company has abandoned the operation of the inclined plane on which the cars were formerly lifted to the heights, and the cars now reach the top of the bluff by making a detour around it. The company has also absorbed the Mt. Auburn Cable Railway, now known as the Sycamore Street line and which is still operated by cable, being the only remaining cable line in the city. Some recent additions have been made to the power plants, of which there are six still in operation—five electric and one cable—the grades and other conditions being such that a central station is not thought to be practical. Direct coupled units have become the standard for new construction, and the later installations are of this type. In this connection it is interesting to note that this company was among the first to install a direct coupled unit. Its original unit consisted of a Buckeye engine and a Siemens & Halske generator, which are still in operation and giving reasonable satisfaction. During the first year of the service of this unit a great deal was said about the impracticability of direct connection, but the wisdom of the company in its first choice has been fully demonstrated by the results.

Considerable pressure is being brought by the city authorities at Cincinnati against the street railway company to require it to adopt the underground or conduit electric system. To this the company objects for various reasons, chiefly because a good many sections of its trackage are under water during the periods of high water in the Ohio River. The company has recently, at its own expense, made a careful survey of its line and noted the limits of the water level at both the high and low stages, and which are printed in this connection, and which show the depth to which the rails are submerged and also the extreme rise and fall of the water. From this it was found that about 34 miles of the streeet on which the tracks are laid were subject to overflow, and this circumstance, it is claimed, would prevent the operation of the underground trolley.

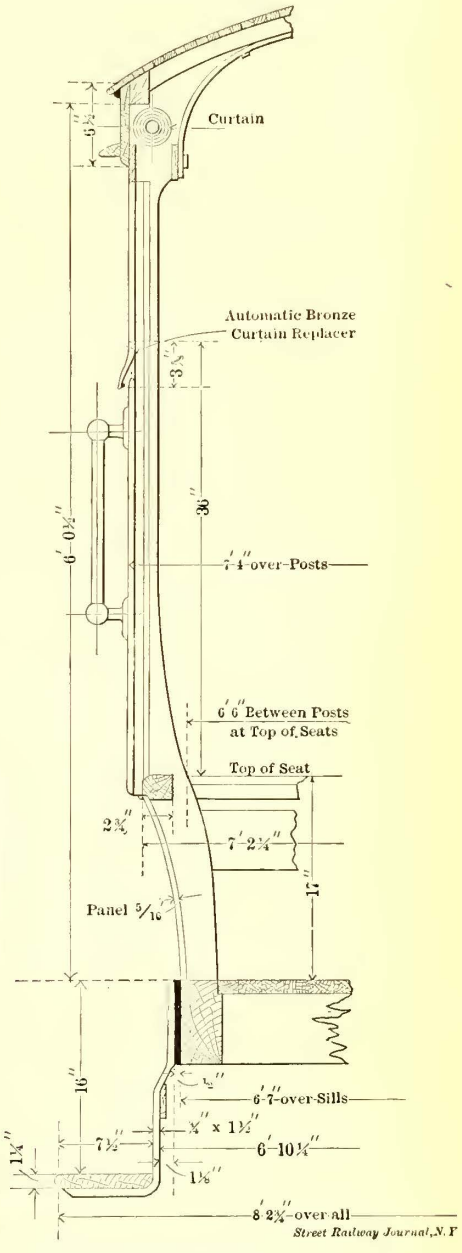
In order to provide for operating the lines over the submerged section of the streets the company has recently designed a train, consisting of a motor and trail car, which will be operated in the stages of high water. The motor car for this purpose is illustrated in the accompanying diagram from which it will be seen that an ordinary open car is employed, but it is raised above the truck by means of beams. The motors are supported on the floor of the car and transmit their power to the axles by means of sprocket chains and gear. It is the intention of the management to increase the weight of the motor car by having a number of discarded motor gears pressed on to the axles. The trail car consists of a nine-seat open car of the same design as the motor car, but without motor. It will be



CAR FOR FLOODED TRACKS



CURTAIN REPLACER



SECTION OF SIDE OF CAR SHOWING CURTAIN REPLACER

raised about 12 ins. above the truck in the same manner, so that it will readily couple to the motor. In connection with this train platforms will be provided on the side of the street at certain locations so that people who are required to patronize the train will have ready access to the cars.

The table showing the portions of the track liable to flood is given below.

Route	Total Length in Feet of Route Under Water When Stage of River is 71'—0½"	Stage of River Necessary to Reach Track at the Lowest Street Level	Stage of River Necessary to Flood Conduit at the Lowest Street Level
East End	25,550	55.92	53.92
Delta avenue	26,200	55.92	53.92
Third and Fifth streets	10,700	56.24	54.24
Chester Park	24,300	57.62	55.62
Sedamsville, to Bold Face Creek only	10,100	57.84	55.84
Colerain avenue	10,600	58.06	56.06
Harrison avenue	13,400	58.65	56.65
John street	7,300	58.65	56.65
Cross Town	5,300	58.65	56.65
College Hill	3,400	59.56	57.56
Clifton and Elm streets	3,400	59.56	57.56
Lock street	1,000	62.06	60.06
Warsaw	3,800	63.99	61.99
Elberon avenue	3,800	63.99	61.99
Fairmount	18,050	64.65	62.65
Seventh street	5,400	64.65	62.65
Clark street	12,400	64.65	62.65
Sixth street	9,000	64.85	62.85
Total	193,700	....	....

A CURTAIN REPLACING DEVICE

All the open cars of the Cincinnati Street Railway system are equipped with a curtain replacing device which was invented by the president of the company. This consists of a brass lug about 4 ins. long, having a curved channel of the same width as the curtain channel in the posts, and is set into the posts on the inner faces about 2 ft. below the top of the post. If for any cause when a curtain is pulled down it leaves the guides, it can be immediately returned to its place by letting it run up outside the posts, when the replacer will turn it back into a proper position, and it can then be drawn down in the ordinary manner. The replacer is held in position by two screws, and is not of sufficient depth to weaken the post. The device is cast in the company's foundry, and finished up in the machine shop, and is a very inexpensive appliance as compared with its advantages.

ILLUMINATED SIGNS

All the cars of the Cincinnati Street Railway Company are equipped with an illuminated sign which can be read in daylight or night time. For their use two stationary plain glass panes are placed in the deck on each side at the middle of the car, and also in the deck lights above the hoods. These are fitted on the outside with grooves or guides, into which the sign proper is slid. The sign consists of a sheet of glass of the same size as the stationary panes, but with the groundwork painted black, leaving the letters outlined; these letters are about 4 ins. in height, and there is a narrow white border around each letter. This makes a sign that is readily read in daylight, and at night it is illuminated by the lamps in the car. These signs can be read for a considerable distance as the car approaches, and are much more satisfactory both to the patrons and operating company than any signs heretofore used.

MOTORS, TROLLEY WHEELS AND BEARINGS

Four types of motors are employed on the cars of this system, the type being adapted to the character of the grades and of the cars. These consist of the General Electric 800 type, the General Electric 1000, the General Electric 1200 and General Electric No. 58. Power for operating the different departments of the repair shop is derived from motors which are made over from the old D 62 type of generators formerly employed. Quite a number of these are in use, and have proved very satisfactory. There are besides twenty small power motors employed about the shops and the different car houses of the system.

The company manufactures its own trolley wheels, the blanks being cast in its brass foundry. These blanks are turned up with automatic tools of special design on a lathe which is operated by an unskilled workman. This man receives only $1 a day, and is able to turn up and finish 125 wheels in that length of time. The wheels are cast from a mixture consisting of eight parts of copper to one of tin.

The company employs bronze bearings for armature journals in preference to babbitt, as it was found that the babbitt would frequently squeeze out from the shell and allow the armature to come down in contact with the fields, and in case of excessive heat would melt.

At one time after the consolidation of the various roads there were fifty-four different types of car axles in use, to suit the various types of motors and trucks. To reduce this number the company selected two types of trucks—the Peckham and the McGuire—and these have consequently been adopted as standard.

REPAIR SHOPS

The new repair shops, which are located at Chester Park (7 miles from the center of the city), and which were illustrated and described in these columns in the issue of February, 1898, are still of ample capacity for all repairs, and are also turning out considerable new work. Thirty new cars have recently been built here, and they are very creditable in design and finish. Some special features in mechanical appliances and methods employed in these shops were published in the June issue.

The different departments of the repair shop are heated by means of the American Blower Company's system, which consists of enclosed fans 140 ins. in diameter and driven by a steam engine. These take the cold air in through a nest of steam pipes, and deliver it through large galvanized pipes to the different parts of the building. Two of these fans are provided for heating the paint shop proper, which is 200 ft. x 300 ft. and 20 ft. high, and during the past winter, with the outside temperature 14 degs. below zero, a temperature of 70 degs. F. was easily maintained in the shops.

In the construction of the repair shop the roof trusses were constructed of wooden beams in preference to metal for the reason, it is claimed, that in case of fire among the cars or in the building the timbers would char and hold up longer under the heat than would a steel structure, which is liable to buckle and give way under excessive heat.

For shifting coal and freight cars about the premises, and for handling the street cars in the yard, an old motor car, with rather a short body, is employed. This car has sufficient power for handling three or four loaded freight cars on a level and around curves, and has proved to be a very convenient and cheap mode of shifting cars.

All transfer tables in the shops and car houses are operated by motors, which take their current from conductors placed below the floor level in slots.

One of the most interesting features of the repair shop is the brass foundry, in which is cast all the brass work required in the operation of the system, including car trimmings, trolley wheels, commutator bars and bearing shells. It is generally supposed that pure copper cannot be cast into commutator bars without there being defects in the

way of blow holes, etc., but in the experience of this company no difficulty is found in making perfect castings, using copper wire scrap. The various parts are cast in groups in a single flask, are afterward separated and trimmed on a band saw, and then smoothed upon an emery wheel.

The twelve forges in the blacksmith department are all constructed on what is known as the down draft system, so that there is no smokestack or flue above the forges. The hood for the down draft is at one side of the forge, and the air is exhausted by a fan located in one end of the shop. This fan is so designed that part of the gases from the furnace are directed into the blast tube and returned to the forge for blowing the fire. By this arrangement the combustion is so perfect that no smoke is ever seen to emerge from the main stack into which the fan discharges its current.

The blacksmith department is provided with a 1500-lb steam hammer, manufactured by the Morgan Engineering Company, of Alliance, Ohio, and the bending tools, shears and punching machines are driven by a motor made over from a D 62 generator, as before described. In this department by the means of the steam hammer the company makes its own dash rods, etc.

Labor Saving Tools and Methods in the Repair Shops of the West Chicago Street Railway Company

The repair shops of this company, which are located at Madison and Fortieth Streets, and which were built in October, 1890, are still among the largest, if not the largest, of any street railway repair shops of the country. The floor space of all the buildings, including that of the wood department, iron department, erecting shop, paint shop, car storage department, and the various offices and auxiliary buildings, aggregates 1,586,552 sq. ft. Here all the repairs of both the cable and electric lines of the system are made. The tool equipment is very complete, and has recently been increased by the addition of new lathes and planers, and by a rail sawing machine, which is illustrated in Fig. 1.

Electric motors have recently been installed for driving the shafting in the different departments, the current being obtained from the trolley line, and the engine and boiler equipments have been abandoned. The rail saw referred to above was recently purchased from the Q. & C. Company, of Chicago, and is utilized not only for sawing rails, but for trimming grip dies and for cutting angle iron or bars of any shape. The bars from which grip shoes are made are first cut up to standard lengths on this saw, several bars being clamped together and cut at the same time. These are then trimmed on the saw by being clamped in groups of six or seven, as shown in the illustration. Formerly this work was performed in a blacksmith's shop, where it was necessary to heat the bars before trimming. Now the work goes on by means of the saw at a greatly reduced cost. In this connection it is interesting to note that the company now manufactures all its own special work, provision being made for erecting under a temporary shed located in the back yard of the machine shop proper. In the construction of crossings a change has been made in the method of abutting the ends of the short rails against the sides of the through rails. Formerly it was the custom to cut off the base of the rail and part of the web, so that the web of the short rail would rest on the base of the main rail. As this gave only a narrow support to the end of the rail, and because it was found to cut into the base, the practice has been adopted of preserving the base of the short rail and causing it to rest upon the base of the main rail. To accomplish this a wedge-shaped piece is cut out of the web next the base, of sufficient depth and length that when the base is bent up after heating, it just fits on the base of the main rail and brings the top of the rail to line, but furnishes a solid support for the end of the short rail.

A double furnace has been installed in the blacksmiths' shop, having doors which are lifted by balance levers, as shown in the engraving Fig. 2. The special feature of this furnace, and one worthy of note, is the location of a 4-in. pipe across the front, just beneath the doors. This pipe is slotted on its upper surface, and conveys a blast of air, which, issuing under pressure through the slot, creates a strong up draft when the doors are opened, and so dissipates the heat that the attendant can stand very near the furnace when the door is open without inconvenience, and with his tongs place new blanks in the furnace or remove those when sufficiently heated.

A brass foundry has also been recently installed, and occupies a portion of what was formerly the iron storeroom. The foundry is 34 ft. x 32 ft., and is provided with four furnaces, as shown in the illustration, Fig. 3. The molding troughs are located on two sides of the room, and the flasks, when the charge is ready for pouring, are arranged as shown in the illustration. A core oven is provided, which stands near the furnace, as shown in the illustration.

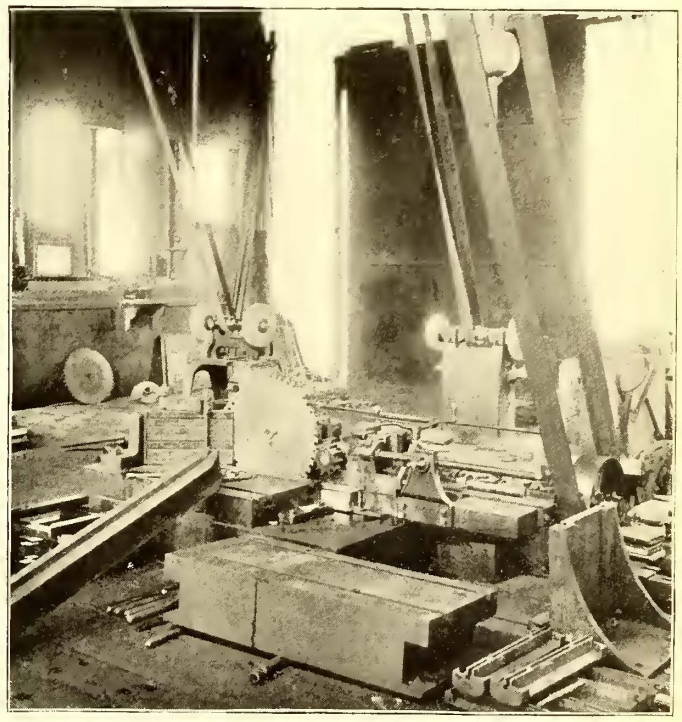


FIG. 1.—METAL SAW

Since the installation of the brass foundry the company manufactures its own brass and copper work of every description, including trolley wheels, trolley harps, overhead switches and car trimmings, as it is now the policy of the company to manufacture all its own supplies, and not to go outside for anything that it is possible to produce in its own shops.

In connection with the machine shop proper a tool room has been partitioned off at one end, in which all the small tools are systematically arranged. This shop is in charge of an attendant who deals out the tools to the workmen on their personal checks, so that a careful record is kept of all tools. In the tool room is located a multiple drill, or rather, a drill with revolving head, which carries tools of

different descriptions to the number of six. This drill is operated by the tool-room keeper, who drills and finishes many of the brass pieces. Here, also, the principal repairs on the registers are made.

Owing to a recent ordinance, requiring that all of the cars of the city be equipped with fenders, the West Chicago Street Railway Company has equipped its cable and electric cars with fenders of its own design and manufacture.

In the matter of motor repairs it is the practice in the motor repair department to renew the motor bearings every sixty days, without waiting for them to be worn down, and at the various depots where light repairs are made in the armature brushes of the General Electric motors they are changed every day and are put to soak in vaseline. By changing brushes a gloss is formed on commutators, and wear is prevented. On one of the electric lines of the West Chicago, quite a number of the Candler self-oiling trolley harps are employed. By the use of these the life of the trolley wheel is greatly lengthened, and they now last on the average of thirty days.

In the motor repair department only four men are employed for making all the armature and field repairs on 400 motor equipments employed on the lines of the West Chicago system proper, and they also take care of the repairs on motors of three or four of the leased lines. Some of the commutators that have been in service for four years have never been turned down. Others have required turning several times. In the opinion of the foreman of the armature department, the damage to the commutator is not from actual wear, but from sparking, due often to the variation in the neutral point of the brushes, but more often to the improper handling of the car. The amount of resistance in the shunt coil, he also claims, has much to do with the flat spots on the commutator. Where two motors are mounted on the same truck with unequal resistance in the shunt coils, it is found that the one with the least resistance receives more current and, consequently, tends to run faster and do more work, hence danger to the commutator and winding is incurred. A remedy is found in mating motors properly.

In repairing armatures of the Westinghouse No. 12 motors, it is customary to wind the armature complete with triple insulated wire. Better success is had than with made up coils. This method gives an opportunity to place additional insulating material in the slots, while the ends are reinforced with a bit of mica, and this method avoids the danger of employing an imperfect coil or injuring the insulation of the coil in putting it in place. The cost of the winding complete (including labor and materials) is found to be only a trifle more than made up coils alone, while the life is materially prolonged.

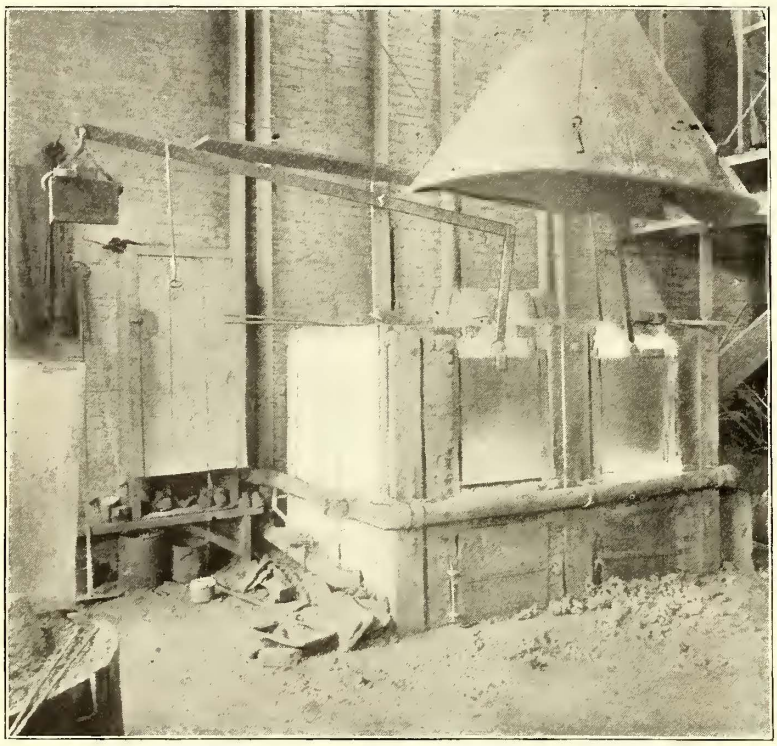


FIG. 2.—REHEATING FURNACE WITH PERFORATED BLAST PIPE FOR COOLING

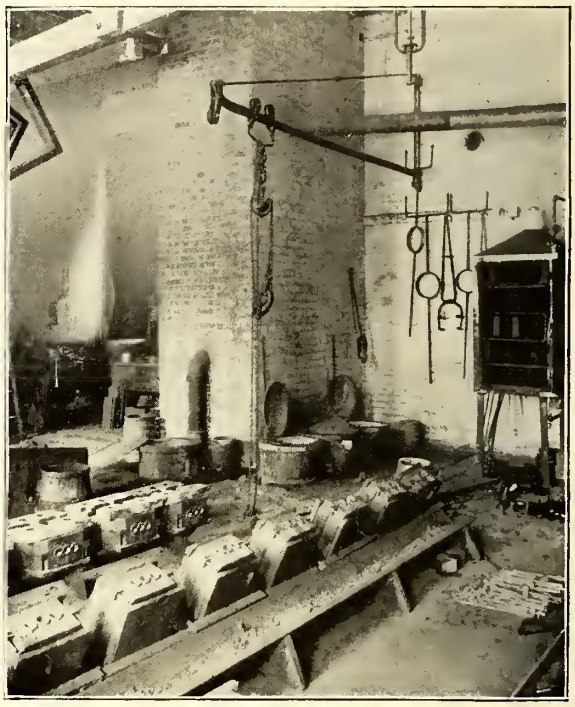


FIG. 3.—NEW BRASS FOUNDRY

Kinks From Indianapolis

In repairing the armatures of the Westinghouse No. 3 motor the chief electrician of the Indianapolis Street Railway Company has adopted the plan of placing a threaded circular plate outside the commutator. After this plate has been attached the space between it and the end of the commutator is filled with plaster of paris, and taped on the outside to hold it in place. This style of ring is found to be giving better satisfaction than those of mica and other material formerly employed, as one ring or plate takes the place of the four which were previously used, and which were all threaded. The single ring or plate, with the single thread, is much cheaper and much more readily adjusted than the former.

AXLE SLEEVE

The practice has become standard with the Indianapolis Street Railway Company to place a sleeve over the axle from the wheel to the gear to which the motor bearings are attached. For this purpose the axle is turned off to a perfect fit for the entire length, when the sleeves, which are provided with an oil hole at the middle and at each end, are slipped in. This arrangement gives a larger wearing and

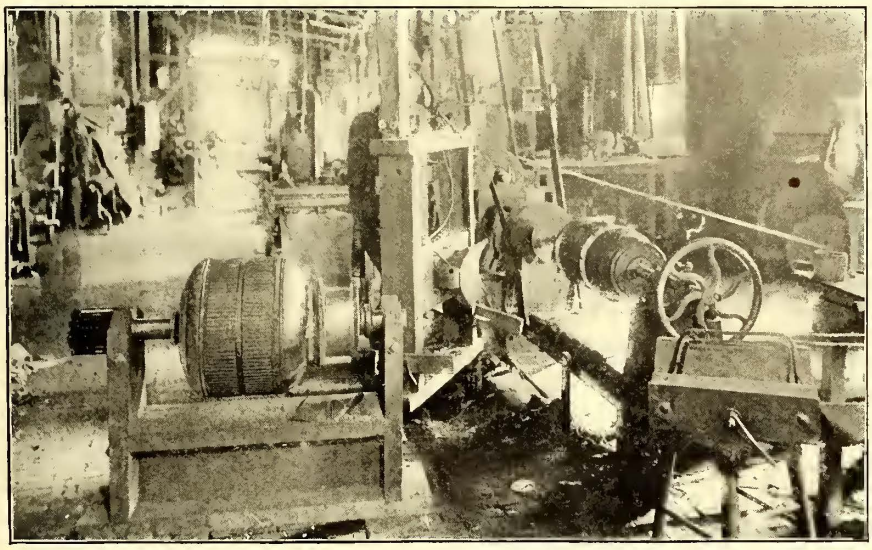
bearing surface, and prevents heating, and, it is claimed, makes the axle run as easily, if not more easily, than the short bearing.

GEAR CUTTING MACHINE

It is the practice in the repair shop to cut gears and pinions from cast steel blanks, bought of manufacturers in Cleveland. The gear cutting machines are of the Gould & Eberhardt type, and there is also a milling machine for cutting the slots in the commutator bars, these being milled in after the commutator is completed.

DEVICE FOR TESTING ARMATURES

The accompanying illustration shows a method of testing an armature while it is still in the lathe, either before or after the binding wires have been put on. For this purpose a laminated field is attached to the side of a swinging gate, as shown. This gate consists of a frame work hinged to a post, so that it can be swung out of the way or brought around so that the field is made to embrace the armature while in position in the lathe. A 3500-volt alternating current is then passed through the field, while the armature is slowly revolved in the magnetic field thus produced. By this means any short circuit or inferior insulation is at once detected; for, in case of any imperfection, the wires will give out a buzzing sound and sparks will be noted between the bars of the commutator. The alternating current for testing this device is obtained from a small motor generator, which is operated from the line current. In connection with this method of testing are a bank of incandescent lamps and other features for regulating the resistance.



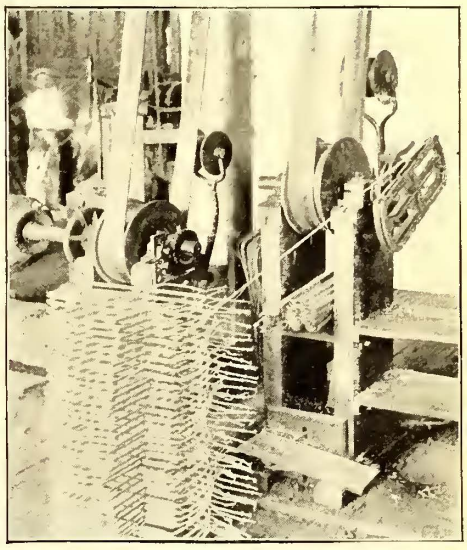
METHOD OF TESTING ARMATURES

INSULATING MATERIAL

Boiled linseed oil is employed for treating the armature and field coils. This is applied the same as an insulating paint, when the armature and coils are baked until they are thoroughly dry, one or two days being required in the process. The armature oven is heated by means of electric heaters.

BENDING FORMS

The accompanying illustration shows a brass form which is employed in a lathe for making the coils for the General Electric 800 motor. These coils are made in a simple loop on this form, and then are placed in a wooden clamp, shown in the previous illustration next to the armature. Passing through each end of the clamp is a rod of the same diameter as the small loop to be formed in the coil. After the coil is in position, the curved blocks are brought firmly together by means of a set-screw, when the two parts of the coil are bent, one in each direction, and with a mallet are made to conform to the curve in the wooden form. In this way all the coils come out with similar bends and loops, and conform to each other perfectly when placed over the core. In the repair shop three expert armature winders are employed, with three helpers, so that the six hands do all the repairs for the 135 motor equipments employed on the system.



BENDING FORMS

BRASS FOUNDRY

The company manufactures all its own brass parts, including trolley wheels, overhead appliances and car trimmings; it also makes its own babbitt metal. In casting the trolley wheels the patterns are arranged in groups of four, so that four complete wheels are formed in each flask. These are afterwards sawn apart, and trimmed and finished up on a lathe.

TAPING ARMATURE COILS

For taping armature coils, a machine is used which was illustrated and described in these columns in the May issue, but not all the coils are taped on this machine. The company has in its employ an expert at hand taping. He is a man who was crippled in the service of the company and is now employed in the taping department. He has designed a wooden form which is placed upon a table and which holds the coil in such position that he is able to pass the roll of tape through the loop very rapidly. With rubber tape the folds stick together slightly so that the roll does not unwind readily, but when using canvas strips he cuts up the tape into suitable lengths and winds it on in sections, making proper splices and knowing from experience just how long the strips should be. The objection to using the taping machine, as claimed by this operator, is that the splices in the tape are not detected, and being wound on the coils make an uneven surface.

Iron Rust as an Insulator

While a gang of men were blasting rock on a highway near Rockland, Me., recently, a large ½-in. cable chain, 30 ft. or 40 ft. long, was thrown over a live trolley wire. The wire was broken away from the clip and came down to within 5 ft. or 6 ft. of the track. A bight of the chain lay on the rail and was left in this position for several minutes, without the slightest sign of a short circuit. The chain was taken off the rail by the men, who expected to see some pyrotechnics, but, much to their surprise, there was not the slightest spark from the breaking of the contact, so great was the resistance in the rust on the chain.

The Status of the Indianapolis Street Railway Company

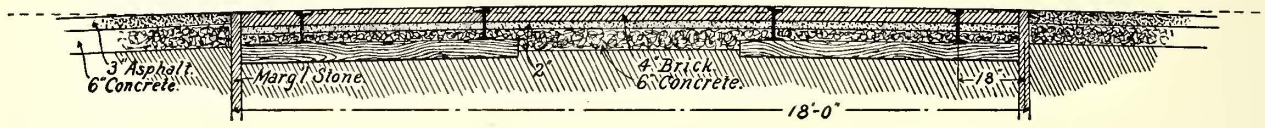
The street railway affairs in Indianapolis, after having been in a very unsettled and unsatisfactory condition for more than six years, owing to litigation between rival companies and between the city and the two street railway companies to whom franchises had been granted, have at last settled down to a satisfactory condition. By an act of Legislature at its last session the way was paved for an amicable adjustment of all the inharmonious conditions, and on April 6, 1899, a new franchise was granted the Indianapolis Street Railway Company, and under the provisions of this document the company has been organized, with the following officers and directors: Hiram P. Wasson, president; Hugh J. McGowan, second vice-president and general manager; J. Augustus Lemke, first vice-president; Joseph S. Neff, third vice-president; W. F. Milholland, treasurer and assistant secretary; Henry Jameson, secretary; C. E. Morgan, 3d assistant secretary and assistant treasurer; directors, Messrs. McGowan, Wasson, Lemke and Jameson, George Brown, Harold B. Hibbard and Randal Morgan.

These officers have assumed control of the street railway affairs of the city.

Under the provision of the act both of the old companies have agreed to surrender all their franchises and rights owned and controlled by them under previous grants from the city and from the County Commissioners and the suburban towns which have now been annexed to the city, and have fully accepted the terms of a new franchise. This franchise is granted for a period of thirty-four years, with the specific statement that the grant is expressly limited to a period of thirty-four years, and must terminate at the expiration of that time; it also requires that the company shall not float any securities to extend beyond the limit of the franchise. One of the provisions of the new franchise is that first-class service shall at all times be provided, and that for the present the overhead electric system shall be employed, but the city reserves the right to compel a change of motive power under the direction of the Board of Public Works and Common Council, provided a superior power shall come into use and be generally adopted in other cities before the expiration of the franchise. There are other stringent measures, which virtually place the company under the direction of the Board of Public Works and the City Engineer.

The new franchise requires that the rate of fare during the period for which the franchise is granted shall be five cents for each passenger over the age of five years, with the right to have transfer privilege over any of the intersecting lines. It also provides that the tickets shall be furnished and sold to passengers by the conductors at the following rates: Six tickets for 25 cents; twenty-five tickets for $1, the transfer privilege going with the tickets as with the cash fare. Some of the further requirements of the franchise are that the company binds itself to pay into the city treasury the sum of $1,160,000 in instalments, which are to be expended for park purposes under the direction of the Public Park Commissioners of the city. The instalments are to be paid as follows: $30,000 on or before the first day of May, 1899, and the sum of $30,000 on or before the first day of May of each year thereafter during the first twenty-seven years of the existence of the franchise; but after the expiration of the twenty-seven years and for the remaining seven years of the existence of the franchise the annual payment is to be $50,000. The above payment is to be in lieu of all license and special taxation, but not to take the place of general taxation. In connection with its property the company binds itself that it will expend, as rapidly as the requirements of the plant and road demand, not less than $1,000,000, and as much more as shall be needed, for adequate and efficient service in buildings, equipment and machinery, and in the purchase of new passenger cars and appliances, as well as new rails and all other necessary materials and labor. The company also binds itself to defend the city and hold the city free and harmless from all damage to any person or persons on account of injury or damage. Another important provision is that the tracks of the company may be used by the suburban lines, so that cars on these lines may reach the center of the city over the company's tracks, under such conditions and at such rental as may be regulated by the Board of Public Works.

Included in the conditions are specifications for lighting, heating and general equipment of the cars in building, life guards, signal buttons, signs and necessary repairs, which can be ordered by the board in case the company fails to keep the rolling stock in good order. The franchise also provides that a sufficient number of cars be operated. Another requirement is that the company shall pave the space between the rails, including the space between the tracks where there are double tracks, and for a distance of 18 ins. on the outside of the outside rails of the track, and shall make all necessary repairs in this space as shall be required by the Board of Public Works, and in connection with this the company is required to keep on deposit to the credit of the Board of Public Works the sum of $1,000, to be known as an emergency fund, and which the board holds the right to use in making immediate and necessary repairs should the company in any way fail to keep this contract regarding paving.



SECTION OF STANDARD TRACK CONSTRUCTION—INDIANAPOLIS

There is also a provision that the company shall execute a bond in the sum of $25,000 to the city, with sufficient securities to insure the faithful performance of the agreements. There are many other important features, but they are too voluminous to be used in this connection. Those interested, however, can get from the city authorities a copy of the franchise, which is known as General Ordinance No. 16, 1899.

Under the paving requirements some of the main streets of the city are at present paved with a combined brick and asphalt surface, and the method of construction is shown in the accompanying illustration. The special features of this are that brick is employed between the rails and tracks for a distance of 18 ins. outside of the outside rail, with a granite border or margin, consisting of a single line of granite blocks placed lengthwise between the brick and the asphalt. This serves to mark a line between the sections for which the city and company are responsible. Brick is also employed in the gutter on each side of the street for a distance of 4 ft. This is to provide a surface that cannot be affected by standing water. The founda-

tions for paved brick and asphalt are to be six inches in depth, as shown in the illustration. The rails shown are of the girder type, but it is understood that in all new construction the city authorities will require the company to use the New York type of grooved rail.

In recent track construction a 62-ft. rail has been employed, with the joints united by the Atlas rail joint, which was the standard with the old company. The track master claims that with this joint he has been able to keep the joints up in better shape than with most any other type of joint used. In attaching these joints to the old rails the old style of fish plates is removed, when the rail is carefully cleaned and the new plates attached. In putting the joint in position the rails are turned up very tight, and the plates are hammered thoroughly with a heavy sledge to bring them to a close fit with the rail. When the new joints are placed, the paving is not finished up until later, or on another day, as it was found that where the plates are tightened up as thoroughly as possible on one day and allowed to remain over night, or for another day or two, another turn may be gotten on the threads. In attaching the new joints to the old rails the old bonds are left when they are found intact, but additional bonds of the horseshoe type are placed in all joints, new holes being drilled in the end of the rails for the purpose.

For riveting the bonds in place a peculiar tool something like a cant hook is employed. This is provided with a bar that reaches the full length of the bond, and which is placed against the head of the bond. This bar is also fitted with a hook, which is attached to the head of the rail, and by pressing down on the long handle a very rigid anvil is provided, so that the lugs are readily riveted in place. By having the heading bar long enough to reach from one lug to another the ends of the rail can be brought well into line, so as to insure proper adjustment when the joint plates are attached.

Most of the special work on the entire system was manufactured by the Indianapolis Frog & Switch Company, and, according to the reports of the track master, is giving excellent satisfaction.

The first order for cars under the new franchise has been given to the American Car Company, and includes twenty-six twelve-seat open cars, which are mounted on double trucks of the Brill maximum traction type. Orders for additional equipment will follow as fast as the needs of the service demand.

The power equipment is also being increased by the installation of a direct-coupled unit, consisting of an Allis engine and a 500-kw. Westinghouse generator. The boiler room is also being enlarged, and two additional boilers of the Babcock & Wilcox type are being installed. In connection with boiler house improvements coal handling devices and conveyors will be installed, and probably some type of smokeless furnaces. For a number of years natural gas has been employed as fuel, but coal is now used. It is interesting to know that some of the Short generators which were installed at the early application of electric power on these lines, and described in our issue of August, 1894, are still running and giving reasonable satisfaction.

It can be shown that the only benefit received by the companies for carrying the mails on street and interurban railways is the compensation allowed by the Government for the same; hence the railways should work with the end in view to make this compensation enough to justify them in looking upon the carrying of mails as a profitable business, and one which should receive their careful attention. From paper at the Boston Convention, 1898.

Overhead Line Construction, III

BY ALBERT B. HERRICK

PROPORTIONING FEEDERS

After the current for the feeders has been determined, as described last month, the next question is the location of the feeding sections and the proper disposition of the copper in order to get maximum potential delivery. This copper may be in one or several feeders. Where it is combined into one feeder the cost of copper, per volt drop, is least. The cost of supporting this feeder is less, and the strains which it imposes on the pole line and the surface it presents to wind pressure, are all in favor of the single feeder. The sub-division of the feeders and the connection of these separate divisions to different circuit breakers in the station is for safety. The sub-division of the feeders may be said to have been originally due to the employment of fuses as safety devices. The action of the fuse required the dividing of the feeding systems up into small independently fed sections, but the modern circuit breaker, being much more prompt in its action, provides ample safety for the electrical machinery. Fuses, if placed between separate feeders on the line, will open when any section is grounded, so that in rewiring or reconstructing old distribution systems it is desirable to inter-connect the neighboring feeders by fuses, and thus get the most effective use of the copper.

In determining the size of feeder it is necessary to first fix upon the voltage drop, the amount of current required and the distance from the station. If the former has been selected the product of the other two gives the distance of current demand, since the ampere feet with a fixed drop for each size conductor has a certain value. The practical application of this to a railway problem will now be considered. It is usually most convenient to locate the feeding points about 500 ft. apart, then the current taken at the first point located, multiplied by the distance of its location to the station, will be the ampere feet at that point. Each point along the road can be located, and ordinates erected to some scale of ampere feet, until the whole road is graphically laid out by these ordinates. The current consumed can be found by the use of the table in the July number of the JOURNAL.

The diagram on page 514 shows the application of this principle of locating feeders to a road 16,500 ft. long, on which the cars are 500 ft. apart with a 12 per cent. drop; ordinates are drawn every 500 ft. or for each car, and their length represents the ampere feet required at each point. To apply this diagram to the case of a road with cars a greater or less distance apart the ampere feet required will be inversely proportional to the car spacing; thus with cars 3000 ft. apart the values in ampere feet will be one-sixth of the values given in the diagram. A column of ampere feet is given in column 15 in the table on the inset, from which the different conductors can be readily selected and applied to find the least feeder cost for this distribution.

It will be seen from this diagram that the feeding sections grow smaller as the distance increases from the station, so also this method of laying out feeders gives each feeder uniform service. The limiting distances for No. 0, No. 00 and 000 feeders, applied to the problem worked out are shown in the diagram. The ordinates below the date line show the current consumed by the cars at each point. This current, multiplied by the distance from the station, gives the ordinates above the date line, which are the ampere feet. With a road in which the feeders traverse short cuts, the problem would have to be arranged so that the distribution takes place from the intersection of the

feeder and trolley, and the distance in feet to the station from this point, would be the feeder length.

The table on the inset page shows all the dimensions of copper wire, and their electrical and mechanical properties, from 1,000,000 c.m. No. 1, B. & S.

The first column of this table gives the diameter of the wire in thousandths of an inch and B. & S. gage.

The second column gives the area of wire in c.m.

The third column gives the outside diameter of the stranded conductors.

The fourth column gives the outside diameter of the triple braided weather proof wire in nearest thirty-seconds of an inch.

The fifth column gives the weight per thousand feet of conductor.

The sixth column gives the weight of triple braided weatherproof per mile of conductor.

The seventh column gives the weight of the bare copper.

The eighth column gives the usual per centage of weight of insulation to total conductor weight.

The ninth column gives the stranding of conductors, as usually employed.

The tenth column gives the breaking strain of these conductors. One-sixth of this should be used for the line strains.

The eleventh column gives the resistance per thousand feet in international ohms at 60 degs. F.

The twelfth column gives the resistance in international ohms per mile 60 degs. F.

The thirteenth column gives the number of feet the wire will carry its full current carrying capacity with 12 per cent drop, 500 volts.

The fourteenth column gives the current carrying capacity of this wire as given by the Underwriter's rules for suspended wire in open air.

The fifteenth column gives ampere feet capacity of conductor with 12 per cent drop.

The sixteenth column gives the weight of wire between 100-ft. spans.

The seventeenth column gives the wind area in square feet presented by each size wire, triple braided 100-ft span.

It will be seen from the table of the weight of wire insulated, that for a dollar in the larger size cables we get more conductivity, since the ratio of the weight of the covering to the weight of the copper grows as the diameter of the wire decreases.

WIRING DIAGRAM FOR SIMPLE TRANSMISSION

Below this table is a diagram from which the correct size of wire to use in power transmission can be determined, from a distance of 1000 ft. to 25,000 ft., and from no drop to 200 volts drop. On the lower margin of this table will be found current in amperes. On the right vertical edge will be found distance in feet. On the left vertical edge will be found volts drop. On the top of the sheet will be found sizes of wire, with a heavy line vertically through the table for for each size of wire.

Any wiring problem within the values given on the diagram can be solved as follows: Suppose we had 200 amps. to carry three miles with 50 volts drop Start at the bottom of the diagram at 200 amps., follow this vertical line up until it intersects the horizontal line from 50 volts on the left hand vertical scale, pass along the radial line from this point until the horizontal line from 3 miles is met. The vertical line passing through at this point will lead upwards until the scale of wire in circular mils is reached, and this will be 67,500 c.m., the value sought. Any three terms of railroad feeder being known the fourth can be determined graphically by this table. For instance, suppose we had 0000 wire and wished to find out how far this would take 100 amps. with 75 volts drop. This problem can be solved by finding the intersection of the 100 amps. and 75 volts lines and passing along the radial line intersecting this point until the vertical line extending from the c.m. scale from 0000 wire is reached. Then the horizontal line intersecting at this point from the scale of feet will give the distance in feet that the current can be carried with this wire and with this loss. The problem of finding the current, having given distance, size wire, and drop, can be solved as follows: First, find the intersection of the wire with the distance, and then pass along the radial line intersecting at this point until the volts drop is reached. Then the vertical line also intersecting at this point with the radial drop line will lead to a horizontal scale in amperes and satisfy the other conditions of this equation. The other required problem, to find the volts drop when the size of wire, current and distance are given, can be worked out in the same way. The conductor length is given in feet single distance and the table should not be used for a metallic circuit; for in that case it shows only half the amount of copper necessary.

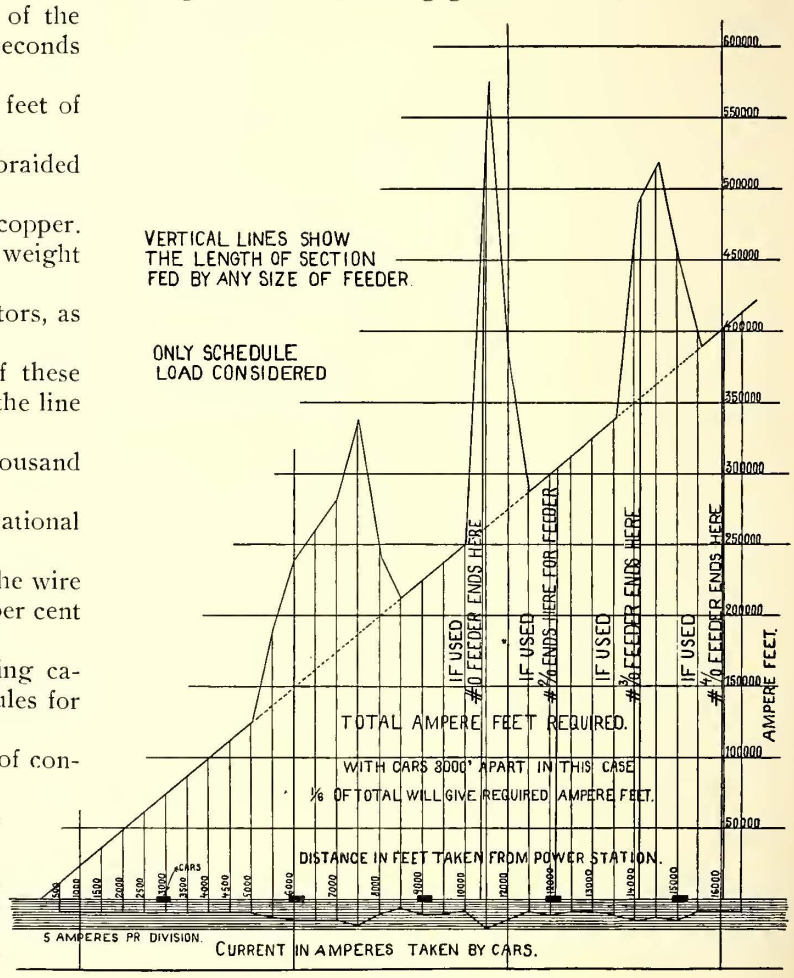
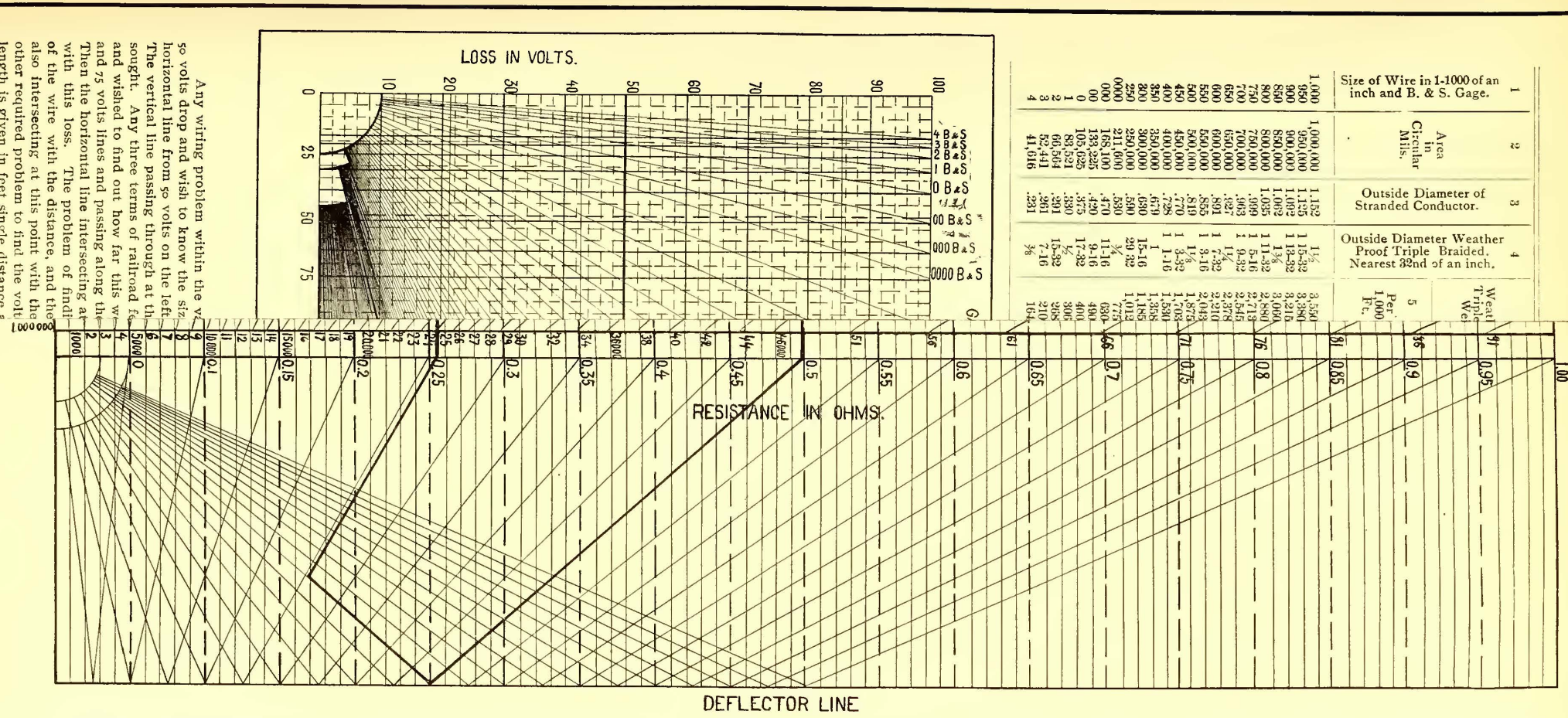


DIAGRAM FOR LOCATING FEEDERS

MULTIPLE FEEDING

Another problem that often arises in railway feeders is to find the multiple feeding resistance of several conductors when the current is delivered at one point. The rule for this is to multiply together two resistances, and divide their product by the sum of their resistances. If another conductor is feeding in multiple with these two and the correct resistance of these three conductors in multiple is sought, the combined resistance of the first two must first be determined, and then combined with the third conductor in the same way. This soon becomes a very involved problem if a number of conductors are considered feeding



1 Size of Wire in 1-1000 of an inch and B. & S. Gage.	2 Area in Circular Mils.	3 Outside Diameter of Stranded Conductor.	4 Outside Diameter Weather Proof Triple Braided. Nearest 32nd of an inch.	5 Weight Per 1,000 Ft.
1,000	1,000,000	1.152	1 1/2	3,550
950	950,000	1.125	1 15/32	3,380
900	900,000	1.092	1 13/32	3,215
850	850,000	1.062	1 7/16	3,060
800	800,000	1.035	1 11/32	2,880
750	750,000	.999	1 5-16	2,713
700	700,000	.963	1 9/32	2,545
650	650,000	.927	1 1/4	2,378
600	600,000	.891	1 7/32	2,210
550	550,000	.855	1 3-16	2,043
500	500,000	.819	1 1/8	1,873
450	450,000	.770	1 3-32	1,703
400	400,000	.728	1 1-16	1,530
350	350,000	.679	1	1,358
300	300,000	.630	15-16	1,185
250	250,000	.590	29/32	1,013
0000	211,600	.530	7/8	775
000	167,100	.470	11-16	630
00	133,225	.420	9-16	490
0	105,625	.375	17-32	400
1	83,521	.330	1/2	306
2	66,564	.291	15-32	268
3	52,441	.261	7-16	210
4	41,616	.231	3/8	164

Any wiring problem within the v
50 volts drop and wish to know the siz
horizontal line from 50 volts on the left
The vertical line passing through at th
sought. Any three terms of railroad fe
and wished to find out how far this w
and 75 volts lines and passing along th
Then the horizontal line intersecting at
with this loss. The problem of findi
of the wire with the distance, and the
also intersecting at this point with the
other required problem to find the volt
length is given in feet single distance a
necessary.

EEDING DIAGRAM

To find the combined resistance of two conductors, the length and size of which are given, follow along the curved line branching from the given length in feet, until it intersects the vertical line indicating the proper size. Then follow the horizontal line at this intersection to the resistance scale. Locate, in the same way, the resistance of the other conductor in multiple with this. Then follow the diagonal line from the highest resistance conductor to the deflector line at the extreme right, then pass along this same line towards the resistance scale until the diagonal line from the lower resistance conductor is reached. Opposite this point of intersection can then be read the resistance of the two conductors in multiple. This multiple resistance can then be used as a single conductor resistance and the resistance of another conductor in multiple with this can be determined by the same method. As an example suppose we had a No. 0 trolley, feeding 5000 ft. in multiple with the No. 0000 feeder of the same length. Follow along the 0 line until the curved line from 5000 ft. is reached; the value on the resistance scale will be .5 of an ohm. Then follow along the 0000 feeder until 5000 ft. is reached, and the reading on the resistance scale will be found to be .26 of an ohm. Pass along the diagonal line from the higher of these two resistances, and continue along this line after it has changed its direction until it has intersected the lower diagonal line from the 0000 feeder resistance. From the point of intersection follow back the horizontal line to the resistance scale and the reading there will be the combined resistance of these two conductors, viz: .17 of an ohm.

TABLE OF SIZES, WEIGHTS, ETC., OF WIRE

1 Size of Wire in Thousandths of an Inch and B. & S. Gage.	2 Area in Circular Mils.	3 Outside Diameter of Stranded Conductor.	4 Outside Diameter Weather Proof Triple Braided. Nearest 32nd of an Inch.	5 Weather Proof Triple Braided Weights. Per 1,000 Ft.	6 Per Mile.	7 Hare Per 1,000 Feet.	8 Per Cent of Insulation to Total Conductor Weight.	9 Stranding Usually Employed. Heavy Type B. W. G. Light B. & S. SIZE OF WIRE. Diam 8 .117	9	10	11	12	13	14	15	16	10 Breaking Strain in Pounds Use 1-6 for Line Strains.	11 Resistance per 1000 Feet. International 5 Ohms at 60° Fah.	12 Resistance per Mile. International 5 Ohms at 60° Fah.	13 Distance Wire Will Carry Full Current Closely With 1% Drop 500 Volts.	14 Maximum Amperes Carrying Capacity Under-Writers Rules.	15 Ampere Feet Capacity of Feeder With 1% Drop.	16 Weight of Wire Between 100 Ft. Spans.	17 Wind Area Presented by Each Wire per 100 Ft. Span in Square Feet.
1,000	1,000,000	1.152	1½	3,550	18,744	3,050	10.3	61	..	..	..	..	80	..	..	..	21,190	.01015	.05359	5,920	1,000	5,920,000	355.0	10.0
950	950,000	1.125	1 15-32	3,380	17,750	2,898	16.6	12	..	..	..	..	..	..	..	..	19,050	.01069	.05644	5,850	960	5,616,000	338.3	10.4
900	900,000	1.092	1 13-32	3,215	10,975	2,745	17.1	..	..	..	..	49	..	..	..	..	18,300	.01126	.05945	5,800	920	5,336,000	321.5	9.9
850	850,000	1.062	1⅜	3,060	16,120	2,593	18.0	..	..	..	..	..	76	..	..	..	.....	.01190	.06315	5,700	880	5,016,000	304.8	9.7
800	800,000	1.035	1 11-32	2,880	15,200	2,440	18.0	..	42	..	..	..	19	..	..	..	15,900	.01273	.00521	5,015	810	4,716,000	288.0	9.5
750	750,000	.999	1 5-16	2,713	14,325	2,288	18.5	..	15	..	..	..	46	..	..	..	15,598	.01355	.07154	5,650	800	4,440,000	271.3	9.2
700	700,000	.963	1 9-32	2,545	13,438	2,135	19.2	..	..	..	..	..	65	..	..	..	.....	.01454	.07677	5,430	760	4,128,800	254.5	9.0
650	650,000	.927	1⅛	2,378	12,656	1,982	19.9	..	..	..	..	..	60	..	..	..	.....	.01564	.08258	5,330	720	3,837,600	237.8	8.8
600	600,000	.891	1 7-32	2,210	11,668	1,830	20.7	..	..	..	..	37	..	..	24	..	12,675	.01695	.08959	5,220	680	3,549,600	221.0	8.6
550	550,000	.855	1 3-16	2,043	10,787	1,678	21.6	..	..	..	..	..	51	..	..	..	.....	.01846	.09746	5,125	635	3,254,376	204.3	8.4
500	500,000	.819	1¼	1,875	9,900	1,525	22.2	..	33	..	..	..	..	..	..	..	10,300	.02034	.10730	5,025	590	2,964,750	187.5	7.9
450	450,000	.770	1 5-32	1,703	8,992	1,373	24.0	..	..	..	..	..	42	..	..	..	.....	.02258	.11922	4,880	545	2,659,600	170.3	7.7
400	400,000	.728	1 1-16	1,530	8,078	1,220	25.4	..	..	..	..	25	..	..	..	..	8,500	.02539	.13368	4,730	500	2,365,000	153.0	7.5
350	350,000	.679	1	1,358	7,170	1,068	27.1	..	..	..	..	12	..	..	25	..	7,400	.02908	.15354	4,590	450	2,065,500	135.8	7.0
300	300,000	.630	15-16	1,185	6,257	915	29.5	..	..	..	..	..	37	..	..	..	.....	.03388	.16888	4,480	400	1,772,000	118.5	6.6
250	250,000	.590	20 32	1,012	5,343	762	32.8	..	7	..	..	..	13	..	..	..	5,205	.04066	.21468	4,420	334	1,476,280	101.2	6.4
0000	211,600	.530	¾	775	4,092	645	30.1	..	..	..	..	14	..	..	6	..	4,708	.04811	.25402	4,000	312	1,248,000	77.5	5.3
000	168,100	.470	11-16	630	3,326	513	22.8	..	..	..	..	..	5	..	14	..	4,200	.06056	.31975	3,780	262	990,360	63.0	4.8
00	133,225	.429	9-16	400	2,587	406	29.6	..	..	..	..	..	6	13	..	..	2,821	.07642	.40349	3,575	229	786,500	49.0	3.9
0	105,625	.375	17-32	400	2,112	322	21.1	..	..	..	..	..	..	6	..	13	2,568	.09639	.50893	3,375	185	624,375	40.0	3.7
1	83,521	.330	½	306	1,616	255	20.0	..	..	..	..	..	..	..	..	19	1,683	.1219	.64363	3,180	156	496,080	30 6	3.5
2	66,564	.291	15-32	268	1,415	203	32.0	..	..	..	6	1	..	..	..	..	1,482	.1529	.80731	3,010	131	394,310	26.8	3.3
3	52,441	.261	7-16	210	1,109	160	31 2	..	..	..	..	6	1	..	..	..	1,174	.1941	1.0005	2,810	110	309,100	21.0	3.1
4	41,616	.231	⅜	164	866	127	29.1	..	..	..	..	..	6	..	1	..	895	.2440	1.2914	2,670	92	245,000	16.4	2.6

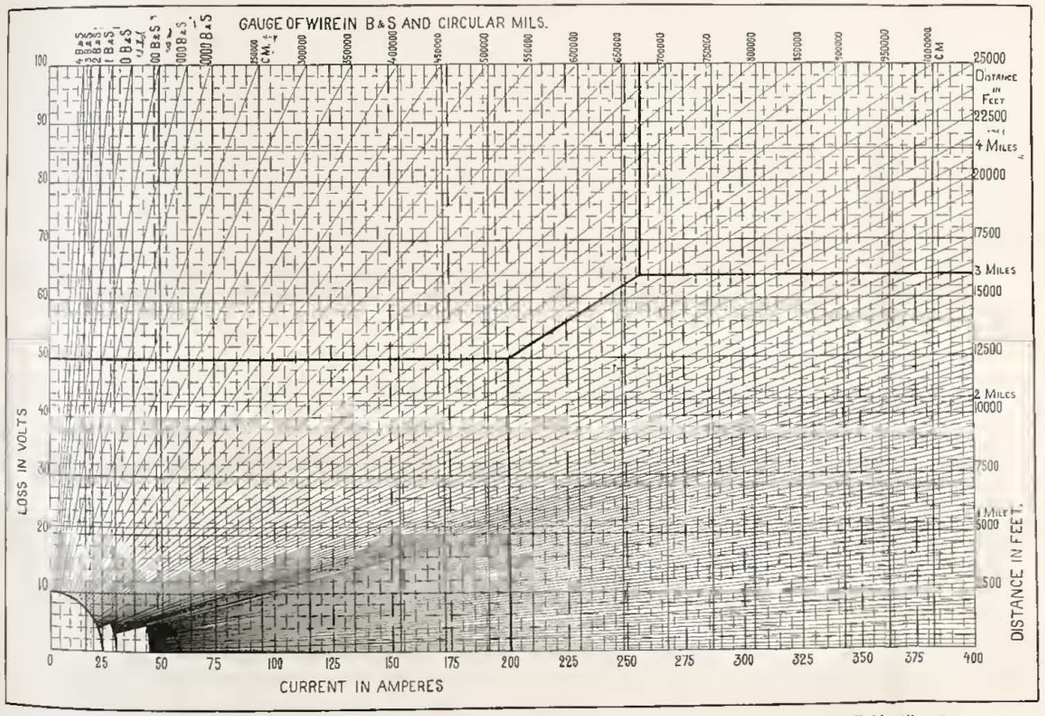
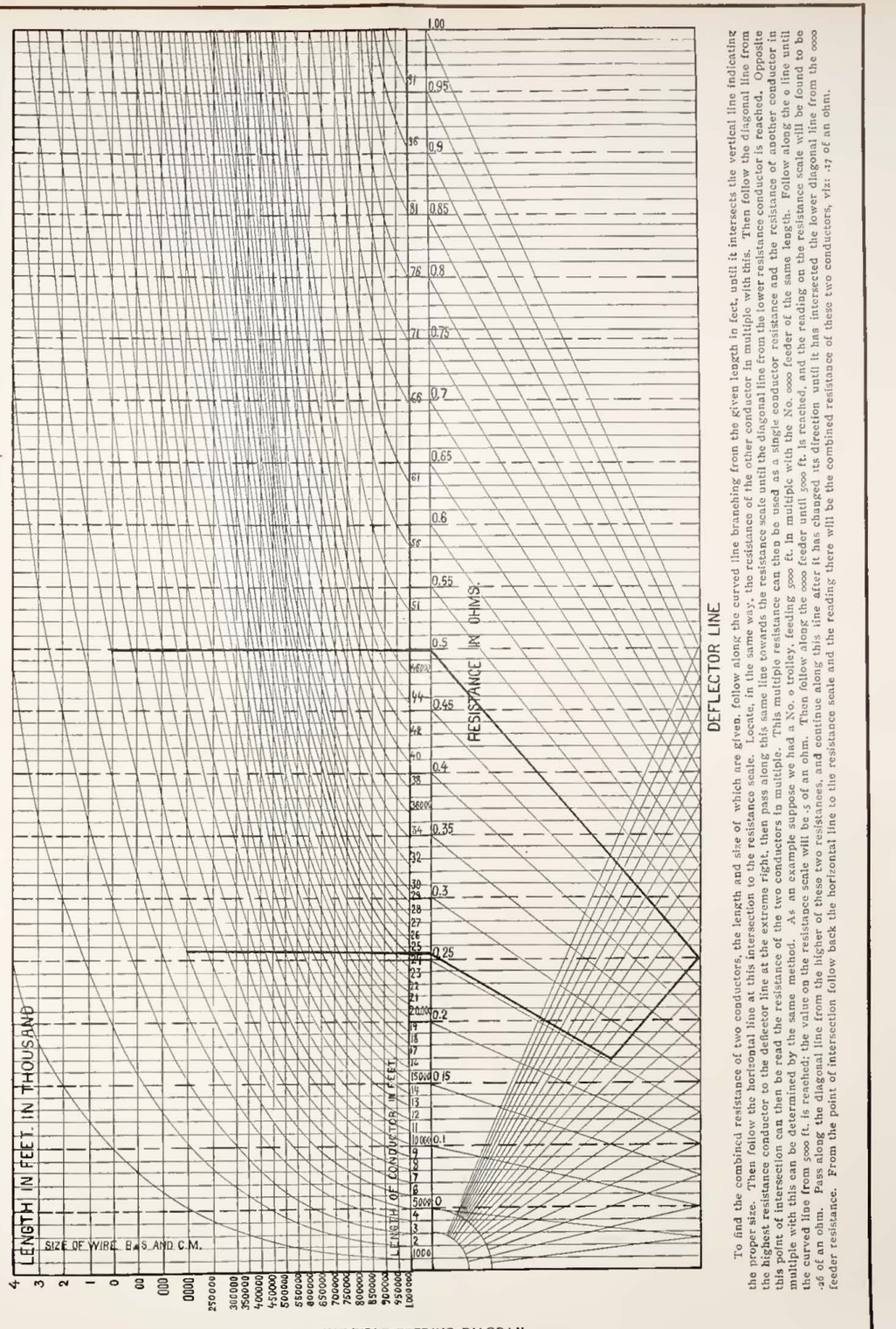


DIAGRAM OF WIRING FOR SIMPLE TRANSMISSION

Compiled by Albert B. Herrick

Any wiring problem within the values given on the above diagram can be solved as follows: Suppose we had 200 amps. to carry three miles with 50 volts drop and wish to know the size of wire. Start at the bottom of the diagram at 200 amps., follow this vertical line up until it intersects the horizontal line from 50 volts on the left hand vertical scale, pass along the radial line from this point until the horizontal line from three miles is met. The vertical line passing through at this point will lead upwards until the scale of wire in circular mils is reached, and this will be 67,500 c.m., the value sought. Any three terms of railroad feeder being known the fourth can be determined graphically by this table. For instance, suppose we had 0000 wire and wished to find out how far this would take 100 amps. with 75 volts drop. This problem can be solved by finding the intersection of the 100 amps. and 75 volts lines and passing along the radial line intersecting this point until the vertical line extending from the c.m. scale from 0000 wire is reached. Then the horizontal line intersecting at this point from the scale of feet will give the distance in feet that the current can be carried with this wire and with this loss. The problem of finding the current, having given distance, size wire, and drop, can be solved as follows: First, find the intersection of the wire with the distance, and then pass along the radial line intersecting at this point until the volts drop is reached. Then the vertical line also intersecting at this point with the radial line will lead to a horizontal scale in amperes and satisfy the other conditions of this equation. The other required problem to find the volts drop when the size of wire, current and distance are given, can be worked out in the same way. The conductor length is given in feet single distance and the table should not he used for a metallic circuit; for in that case it shows only half the amount of copper necessary.



MULTIPLE FEEDING DIAGRAM

To find the combined resistance of two conductors, the length and size of which are given, follow along the curved line branching from the given length in feet, until it intersects the vertical line indicating the proper size. Then follow the horizontal line at this intersection to the resistance scale. Locate, in the same way, the resistance of the other conductor in multiple with this. Then follow the diagonal line from the highest resistance conductor to the deflector line at the extreme right, then pass along this same line towards the resistance scale until the diagonal line from the lower resistance conductor is reached. Opposite this point of intersection can then be read the resistance of the two conductors in multiple. This multiple resistance can then be used as a single conductor resistance and the resistance of another conductor in multiple with this can be determined by the same method. As an example suppose we had a No. 0 trolley, feeding 5000 ft. in multiple with the No. 0000 feeder of the same length. Follow along the 0 line until the curved line from 5000 ft. is reached; the value on the resistance scale will be .5 of an ohm. Then follow along the 0000 feeder until 5000 ft. is reached, and the reading on the resistance scale will be found to be .26 of an ohm. Pass along the diagonal line from the higher of these two resistances, and continue along this line after it has changed its direction until it has intersected the lower diagonal line from the 0000 feeder resistance. From the point of intersection follow back the horizontal line to the resistance scale and the reading there will be the combined resistance of these two conductors, viz: .17 of an ohm.

in multiple arc. In order to facilitate the calculation of the railway engineer another chart is given at the right of that previously described, which graphically solves these problems of the resistance of conductors in multiple. The heavy vertical line near the centre of the chart is laid out on one side to a scale in feet, and on the other side to resistances. In order to find the combined resistance of two conductors, the length and size of which are given, follow along the curved line branching from the given length in feet, until it intersects the vertical line indicating the proper size. Then follow the horizontal line at this intersection to the resistance scale. Locate, in the same way, the resistance of the other conductor in multiple with this. Then follow the diagonal line from the highest resistance conductor to the deflector line at the extreme right, then pass along this same line towards the resistance scale until the diagonal line from the lower resistance conductor is reached. Opposite this point of intersection can then be read the resistance of the two conductors in multiple. This multiple resistance can then be used as a single conductor resistance and the resistance of another conductor in multiple with this can be determined by the same method.

As an example, suppose we had a No. 0 trolley feeding 5000 ft. in multiple with the No. 0000 feeder of the same length. Follow along the 0 line until the curved line from 5000 ft. is reached; the value on the resistance scale will be .5 of an ohm. Then follow along the 0000 feeder until 5000 ft. is reached, and the reading on the resistance scale will be found to be .26 of an ohm. Pass along the diagonal line from the higher of these two resistances, and continue along this line after it has changed its direction until it has intersected the lower diagonal line from the 0000 feeder resistance. From the point of intersection follow back the horizontal line to the resistance scale and the reading there will be the combined resistance of these two conductors, viz: .17 of an ohm.

Growth of the Electric Railway Industry in Europe

According to a recent monthly bulletin of the Compagnie Francaise pour l'Exploitation des Procédés Thomson-Houston, at Paris, the first electric railway in Europe was built by the Siemens-Halske Company, in 1881, between Lichterfeld, near Berlin, and the Central Military Establishment. In 1889, the first electric railway in France was built with Thury apparatus at Clermont-Ferrand, this tramway being still working. In the same year, 1889, at the Paris Exposition, the French Thomson-Houston Company first showed electric railway apparatus, of which exploitation had already commenced in America, and this exhibit was awarded the grand prize, while at the same time Prof. Elihu Thomson was made an officer of the National Order of the Legion of Honor. The first actual railway of the Thomson-Houston system was built in December, 1893, from Bordeaux-Bouscat to Vigean. To-day there are 11,000 kilometers operating by the Thomson-Houston system in France and 21,000 in the rest of Europe, or 32,000 in all. On these 32,000 km. of track about 7800 cars are run, of which 5800 are motor cars and 2000 trail cars. The current is furnished by 50,000 kilowatts of generator capacity.

After a number of trials of various floor paints and paints mixed especially for the purpose, the conclusion has been reached that there is nothing equal to pure white lead and linseed oil and suitable color for the floors of all cars. From paper at the Boston Convention, 1898.

Comparative Gross Receipts of American Street Railway Companies

In the following table are presented the comparative gross receipts of 222 American street railway companies for financial years ending (at various times) in 1897 and 1898, and the percentage increase or decrease in the two years. Classification is made on the basis of gross receipts in 1898, as the magnitude of operation is, of course, the interesting feature of a comparative presentation of this character. The details may be summarized as follows:

Roads having gross receipts of—	Number	Gross Receipts: 1897	1898	Percentage Inc.
$1,000,000 or more	26	$90,035,454	$93,740,164	4.1
500,000 to $1,000,000	20	13,685,777	14,407,780	5.3
100,000 to $500,000	58	12,634,697	13,389,776	6.0
50,000 to $100,000	62	4,237,941	4,414,039	4.2
25,000 to $50,000	56	2,019,385	2,130,762	5.5

The per cent increase in gross is seen to be uniform in the different classifications, but with wide variation in individual cases. In New York City the Metropolitan system shows an increase of 7.7 per cent, the Manhattan elevated system a decrease of 5.4 per cent, and the Third Avenue system a decrease of 9.6 per cent, while the receipts of the Union Railway Company, above the Harlem, increased 13 per cent. The Brooklyn Rapid Transit Company, both surface and elevated systems, made the very surprising increase of 17.5 per cent for the year ending Dec. 31, 1898, over the year ending June 30, 1897, and along with this came an increase of 23.8 per cent in the gross receipts of the Coney Island & Brooklyn Railroad Company, the only company competing with the Rapid Transit combination.

Seattle, Wash., has had apparently an exceptionally prosperous year, the gross receipts of the Seattle Traction Company having increased 54.9 per cent, while those of the West Street & North End Electric Railway Company, of Seattle, have increased 59.4 per cent.

Many of the suburban roads around Boston show large increases, among them the Norfolk Central Railway Company, 120.8 per cent; the Framingham Union, 52.6 per cent; the Newton & Boston, 48.7 per cent; the Commonwealth Avenue, 34.9 per cent, and the West Roxbury & Roslindale, 32.3 per cent. Several other interurban roads in Eastern Massachusetts, however, show decreases, among them being the Union Street Railway Company, of New Bedford, with its associated company, the Dartmouth & Westport Street Railway Company, the Haverhill & Amesbury, 9.9 per cent; the Taunton, 13.4 per cent; the Dighton, Somerset & Swansea, 12.2 per cent, and others.

Among other companies which show large percentage increases may be mentioned the system of New Castle, Pa., 217.8 per cent; Nashville, Tenn., 47.4 per cent; New Brunswick, N. J., 44 and 54 per cent respectively; Warren, Brookfield & Spencer, 43.2 per cent, and Chicago General Railway Company, 50 per cent.

ROADS HAVING GROSS RECEIPTS FOR 1898 OF $1,000,000 OR OVER

Name of Company	Gross Receipts, 1897	Gross Receipts, 1898	Per Cent Increase
Metropolitan St. Ry. Co., New York City	$11,160,167	$12,020,999	7.7
Union Traction Co., Phila.	11,014,991	11,226,998	1.9
Brooklyn Rapid Transit Co.	*9,214,592	†10,832,642	17.5
Boston Elevated Ry. Co.	8,719,032	9,257,254	6.1
Manhattan Ry. Co., N.Y. City.	9,477,052	8,965,851	d. 5.4
Chicago City Ry. Co.	4,816,516	4,832,806	0.3
United Rys. & Electric Co., Baltimore, Md.	.....	4,062,358	....
West Chicago St. R. R. Co.	3,899,918	4,031,904	3.4
Market St. Ry. Co., San Francisco, Cal.	3,406,606	3,483,445	2.5

*Year ending June 30, 1897. †Year ending December 31, 1898.

Name of Company	Gross Receipts, 1897	Gross Receipts, 1898	Per Cent Increase
North Jersey St. Ry. Co., Jersey City, N. J.	3,303,624	3,472,308	5.1
North Chicago St. R. R. Co.	2,911,552	3,015,323	3.5
Third Av. R R. Co., N.Y. City.	2,653,261	2,397,484	d. 9.6
Consolidated Traction Co., Pittsburgh	2,463,247	2,172,278	d. 11.8
Twin City Rapid Transit Co., Minneapolis, Minn.	2,009,121	2,170,716	8.0
Buffalo Ry. Co.	1,871,840	1,813,180	d. 3.1
United Traction & Electric Co., Providence, R. I.	1,685,775	1,732,424	2.7
Cleveland Electric Ry. Co.	1,632,024	1,718,515	5.3
Lynn & Boston R. R. Co.	1,431,936	1,490,311	4.1
Montreal (Quebec) St. Ry. Co.	1,342,368	1,471,940	9.7
United Trac. Co., Pittsburgh.	1,437,427	1,469,907	2.3
New Orleans (La.) Trac. Co.	1,239,256	1,311,365	5.8
Louisville (Ky.) Ry. Co.	1,238,042	1,297,394	4.8
Toronto (Ont.) Ry. Co.	1,077,612	1,210,618	12.3
Detroit (Mich.) Citizens' St. Ry. Co.	1,102,250	1,196,487	8.6
Coney Island & Brooklyn (N. Y.) R. R. Co.	927,245	1,148,015	23.8
Chicago Consolidated Traction Co.	.....	1,026,781	....
Totals	$90,035,454	$93,740,164	4.1
ROADS HAVING GROSS RECEIPTS FOR 1898 OF $500,000 TO $1,000,000			
Capital Traction Co., Washington, D. C.	908,839	993,177	9.3
South Side Elevated R. R. Co., Chicago (eleven mos. only).	637,346	978,330	....
North Hudson County Ry. Co., Jersey City, N. J.	923,100	966,280	4.7
Toledo (Ohio) Traction Co.	875,692	921,168	5.2
Metropolitan R. R. Co., Washington, D. C.	1,101,937	836,819	d. 24.1
Rochester (N. Y.) Ry. Co.	801,391	824,735	2.9
Los Angeles (Cal.) Ry. Co.	681,325	746,491	9.6
Denver (Col.) Consolidated Tramway Co.	726,106	735,588	1.3
Forty-Second St. & St. Nicholas Ave. Ry. Co., N. Y. City.	724,496	704,809	d. 2.7
Columbus (Ohio) St. Ry. Co.	611,318	689,033	12.7
Cincinnati, Newport & Covington Ry. Co.	638,477	681,672	6.8
Dry Dock, East Broadway & Battery R. R. Co.	698,502	675,467	d. 3.3
The Albany Ry.	596,766	648,746	8.7
Lake St. Elevated R. R. Co., Chicago	579,961	633,404	9.2
Union Ry. Co., N. Y. City.	542,855	613,499	13.0
Central Crosstown R. R. Co., New York City.	576,911	600,082	4.0
Springfield (Mass.) St. Ry. Co.	554,312	583,050	5.2
Worcester (Mass.) Trac. Co.	508,856	537,873	5.7
Troy (N. Y.) City Ry. Co.	506,298	530,810	4.8
Wilkesbarre (Pa.) & Wyoming Valley Traction Co.	491,289	506,747	3.1
Totals	$13,685,777	$14,407,780	5.3
ROADS HAVING GROSS RECEIPTS FOR 1898 OF $100,000 TO $500,000			
Nashville (Tenn.) St. Ry.	350,426	493,185	47.4
Richmond (Va.) Ry. & Electric Co.	475,851	477,541	0.4
Syracuse (N.Y.) Rapid Transit Ry. Co.	446,927	460,612	3.1
Lowell, Lawrence (Mass.) & Haverhill St. Ry. Co.	426,657	455,545	6.7
New York & Queens Co., Long Island City, N. Y.	472,472	437,757	d. 7.3
Pittsburgh (Pa.) & Birmingham Traction Co.	457,622	436,203	d. 4.7
United Traction Co., Reading, Pa.	419,927	430,956	2.9
Detroit (Mich.) Electric Ry.	394,213	401,179	1.8
New Orleans (La.) & Carrollton R. R. Co.	382,106	396,313	3.7
Lowell (Mass.) & Suburban St. Ry. Co.	381,804	389,949	2.1
Scranton (Pa.) Ry. Co.	366,325	383,727	4.8
Paterson (N. J.) Ry. Co.	.....	ETAOINNRDLUI	
Brockton (Mass.) St. Ry. Co.	332,256	337,604	1.6
Globe St. Ry. Co., Fall River, Mass.	322,094	323,604	0.4
Thirty-fourth St. Crosstown Ry. Co., New York City.	339,120	311,805	d. 8.8
Portland (Me.) R. R. Co.	276,858	302,126	9.1
Harrisburg (Pa.) Traction Co.	228,534	301,467	31.9
Camden (N. J.) & Suburban Ry. Co.	269,525	294,246	12.8
Des Moines (Ia.) City Ry. Co.	233,080	254,820	9.3
Trenton (N. J.) St. Ry. Co.	225,075	247,050	9.8
Ottawa (Ont.) Electric Ry. Co.	223,802	231,802	3.1
Atlantic Coast Electric R. R. Co., Asbury Park, N. J.	210,483	230,766	9.6
Holyoke (Mass.) St. Ry. Co.	216,684	229,098	5.7
Allentown (Pa.) & Lehigh Valley Traction Co.	214,845	227,669	6.0
Galveston (Tex.) City R.R. Co.	215,299	220,820	2.6
Chester (Pa.) Traction Co.	210,916	216,215	2.5
Union St. Ry. Co., New Bedford, Mass.	220,626	206,138	d. 6.6
Duluth (Minn.) St. Ry. Co.	202,031	201,840	d. 0.1
Halifax (N. S.) Electric Tramway Co.	196,178	197,829	0.8
Pennsylvania Traction Co., Lancaster, Pa.	* 198,770	† 194,167	d. 2.3
Utica (N. Y.) Belt Line St. R. R. Co.	166,793	193,258	15.7
Columbia Ry. Co., Washington, D. C.	162,497	171,397	5.5
Central Ry. & Electric Co., New Britain, Conn.	‡ 154,017	‡ 164,443	6.8
Binghamton (N. Y.) R. R. Co.	151,105	161,704	7.0
Manchester (N. H.) St. Ry.	146,326	158,885	8.6
Buffalo & Niagara Falls Electric Ry. Co.	136,756	155,497	13.7
Worcester (Mass.) & Suburban St. Ry. Co.	144,758	154,367	6.6
Richmond (Va.) Traction Co.	132,697	147,655	11.3
Seattle (Wash.) Traction Co.	91,453	142,738	54.9
Erie (Pa.) Electric Motor Co.	143,208	141,947	d. 0.9
Quincy (Mass.) & Boston St. Ry. Co.	118,395	135,728	14.6
Interstate Consolidated St. Ry. Co., N. Attleborough, Mass.	127,315	135,563	6.5
Fitchburg (Mass.) & Leominster St. Ry. Co.	133,770	134,315	0.4
Easton (Pa.) Transit Co.	123,812	131,758	6.4
Westchester Electric R. R. Co., New York City.	129,485	127,234	d. 1.7
Springfield (Ill.) Consolidated Ry. Co.	105,123	121,432	15.5
Chicago General Ry. Co.	79,821	119,739	50.0
Camden (N. J.), Gloucester & Woodbury Ry. Co.	123,424	117,404	d. 4.9
Yonkers (N. Y.) R. R. Co.	104,671	116,267	11.1
Southwest Missouri Electric Ry. Co., Webb City, Mo.	117,128	115,050	d. 1.8
London (Ont.) St. Ry. Co.	101,366	113,812	12.3
Lincoln (Neb.) Traction Co.	95,901	113,306	18.2
Johnstown (Pa.) Passenger Ry. Co.	106,350	113,031	6.3
Schuylkill Electric Ry. Co., Pottsville, Pa.	93,993	109,638	16.6
Roxborough, Chestnut Hill & Norristown Ry. Co., Phila.	85,231	109,596	28.6
Meriden (Conn.) Electric R. R. Co.	111,437	106,556	d. 4.4
Cleveland, Painesville & Eastern R. R. Co.	87,533	105,360	20.4
Lehigh Ave. Ry. Co., Phila.	102,803	105,164	2.3
Totals	$12,634,697	$13,389,776	6.0
ROADS HAVING GROSS RECEIPTS FOR 1898 OF $50,000 TO $100,000			
Norfolk Suburban St. Ry. Co., Hyde Park, Mass.	$98,159	$99,390	1.3
Springfield (Ohio) Ry. Co.	79,286	97,137	22.5

*Year ending December 31, 1897. †Year ending June 30, 1898. ‡Including electric light plant.

Name of Company	Gross Receipts, 1897	Gross Receipts, 1898	Per Cent Increase
Lehigh Traction Co., Hazleton, Pa.	109,618	97,025	d. 11.5
Dartmouth (Mass.) & Westport St. Ry. Co., New Bedford, Mass.	102,925	96,914	d. 6.2
Niagara Falls & Suspension Bridge Ry. Co.	89,320	96,399	7.9
Akron, Bedford & Cleveland R. R. Co.	101,321	96,054	d. 5.2
Newton (Mass.) St. Ry. Co.	94,072	95,820	1.9
Holmesburg, Tacony & Frankford Electric Ry. Co., Phila.	105,574	94,696	d. 10.4
Northampton (Mass.) St. Ry. Co.	95,086	92,326	d. 2.9
Jamestown (N. Y.) St. Ry. Co.	86,708	90,902	4.8
Schuylkill Traction Co., Girardville, Pa.	93,444	90,279	d. 3.4
Haverhill (Mass.) & Amesbury St. Ry. Co.	99,485	89,665	d. 9.9
Niagara Falls (N.Y.) & Lewiston R. R. Co.	87,322	85,613	d. 1.9
Poughkeepsie (N. Y.) City & Wappinger's Falls Electric Ry. Co.	85,3000	84,998	d. 0.4
Milford (Mass.), Holliston & Framingham St. Ry. Co.	61,408	83,472	35.9
New Castle (Pa.) Traction Co.	26,257	83,429	217.8
Hoosac Valley St. Ry. Co., North Adams, Mass.	81,328	79,242	d. 2.6
Macon (Ga.) Consolidated St. Ry. Co.	74,722	78,764	5.4
Newton (Mass.) & Boston St. Ry. Co.	52,638	78,309	48.7
Altoona (Pa.) & Logan Valley Electric Ry. Co.	83,051	78,176	d. 5.8
Rockland & Abington St. Ry. Co., North Abington, Mass.	74,787	77,889	4.1
Alton (Ill.) Ry. & Illuminating Co.	73,195	77,587	6.0
Norwich (Conn.) St. Ry. Co.	79,502	76,107	d. 4.2
Ithaca (N. Y.) St. Ry. Co.	70,935	75,141	5.9
Commonwealth Ave. St. Ry. Co., Newton, Mass.	54,552	73,630	34.9
Taunton (Mass.) St. Ry. Co.	81,632	72,083	d. 13.4
Gloucester (Mass.) St. Ry. Co.	66,398	70,571	6.3
Beaver Valley Traction Co., Beaver Falls, Pa.	68,555	69,937	2.0
Williamsport (Pa.) Passenger Ry. Co.	68,146	69,192	1.5
Delaware Co. & Philadelphia Electric Ry. Co., Phila.	63,258	68,477	8.5
Rockland (Maine), Thomaston & Camden St. Ry. Co.	66,782	68,223	2.1
City Passenger Ry. Co. of Altoona, Pa.	58,275	67,813	16.3
West Roxbury (Mass.) & Roslindale St Ry. Co.	50,940	67,438	32.3
Pittsfield (Mass.) Electric St. Ry. Co.	61,168	66,302	8.3
Bangor (Maine) St. Ry. Co.	69,493	65,291	d. 6.0
Glens Falls (N.Y.), Sandy Hill & Ft. Edward St. Ry. Co.	57,692	64,420	11.5
Schuylkill Valley Traction Co., Norristown, Pa.	62,963	63,867	1.4
Bangor (Maine), Orono & Oldtown Ry. Co.	65,659	63,676	d. 3.1
Geneva (N. Y.), Waterloo, Seneca Falls & Cayuga Lake Traction Co.	62,618	62,802	0.3
Auburn (N. Y.) City Ry. Co.	59,849	62,772	4.8
Elmira (N. Y.) & Horseheads Ry. Co.	68,810	62,169	d. 9.6
Wakefield (Mass.) & Stoneham St. Ry. Co.	58,225	62,063	6.5
Dighton (Mass.), Somerset & & Swansea St. Ry. Co.	69,096	61,569	d. 12.2
The Carbondale (Pa.) Traction Co.	60,083	61,186	1.8
Kingston (N.Y.) City R.R. Co.	55,412	60,745	9.6
Nashua (N. H.) St. Ry.	61,104	60,260	d. 1.4
Newburyport (Mass.) & Amesbury Horse Ry. Co.	60,897	59,892	d. 1.7
Fulton St. R. R. Co., New York City	61,840	59,743	d. 3.4
Gloucester (Mass.), Essex & Beverly S. Ry. Co.	58,642	59,036	0.7
Schenectady (N. Y.) Ry. Co.	‡ 51,961	‡ 57,632	10.9
South Middlesex St. Ry. Co., Natick, Mass.	52,074	57,119	9.7
York (Pa.) St. Ry. Co.	52,398	56,637	8.0
Portland (Maine) & Cape Elizabeth Ry. Co.	59,015	55,948	d. 5.2
Brightwood Ry. Co., Washington, D. C.	51,080	55,935	9.5
New London (Conn.) St. Ry. Co.	53,822	55,802	3.7
Woonsocket (R. I.) St. Ry. Co.	51,305	55,547	8.3
Natick (Mass.) & Cochituate St. Ry. Co.	45,739	55,490	21.3
City Electric Ry. Co., Port Huron, Mich.	52,565	55,252	5.1
Plainfield (N. J.) St. Ry. Co.	50,604	53,974	6.7
Concord (N. H.) St. Ry. Co.	49,779	52,440	5.3
West Side St. R. R. Co., Elmira, N. Y.	56,421	51,930	d. 8.0
Brunswick Traction Co., New Brunswick, N. J.	33,656	51,842	54.0
Totals	$4,237,941	$4,414,039	4.2

ROADS HAVING GROSS RECEIPTS FOR 1898 OF $25,000 TO $50,000

Salem (Ore.) Light & Trac. Co.	$45,028	$49,500	9.9
Burlington (Vt.) Traction Co.	53,327	49,369	d. 7.4
Rochester (N. Y.) & Irondequoit R. R. Co.	47,760	49,046	2.7
Hingham (Mass.) St. Ry. Co.	49,322	48,980	d. .7
Stamford (Conn.) St. R.R. Co.	40,426	48,561	20.1
Braintree (Mass.) & Weymouth St. Ry. Co.	46,687	48,558	4.0
Warren (Mass.) Brookfield & Spencer St. Ry. Co.	33,687	48,241	43.2
Newport (R. I.) St. Ry. Co.	37,375	48,031	28.5
Shamokin (Pa.) & Mt. Carmel Electric Ry. Co.	57,747	47,173	d. 18.3
Middletown (N. Y.)—Goshen Traction Co.	47,910	46,620	d. 2.7
Marshalltown (Iowa) Light, Power & Ry. Co.	41,607	45,581	9.6
Greensburg (Pa.), Jeannette & Pittsburgh St. Ry. Co.	41,075	45,485	10.7
Suburban Rapid Transit St. Ry. Co., Pittsburgh	42,192	45,445	7.7
Amsterdam (N. Y.) St. R. R. Co.	39,408	45,422	15.3
Wilmington (N.C.) St. Ry.Co.	42,769	45,253	5.8
West St. & N. E. Elec. Ry. Co., Seattle, Wash.	28,363	45,225	59.4
Braintree (Mass.) St. Ry. Co.	38,150	45,114	18.3
Leominster (Mass.) & Clinton St. Ry. Co.	40,588	43,626	7.5
Hamilton (Ont.), Grimsby & Beamsville Electric Ry. Co.	43,002	42,736	d. .6
Bergen Co. Traction Co., Undercliff, N. J.	39,288	41,583	5.9
Washington (D. C.) & Gt. Falls Electric Ry. Co.	49,734	40,903	d. 17.7
North Woburn (Mass.) St. R. R. Co.	36,294	40,838	12.5
Augusta (Maine), Hallowell & Gardiner R. R. Co.	40,840	40,620	d. .5
Bridgeton (N. J.) & Millville Traction Co.	35,055	39,180	11.8
Lebanon (Pa.) & Annville St. Ry. Co.	38,167	39,015	2.2
Marlborough (Mass.) St. Ry. Co.	34,766	38,855	11.8
Manistee (Mich.), Filer City & Eastlake Ry. Co.	36,159	38,635	6.8
Herkimer, Mohawk (N. Y.), Ilion & Frankfort Electric Ry. Co.	41,348	38,631	d. 6.5
Scranton (Pa.) & Carbondale Traction Co.	41,435	38,443	d. 7.2

Name of Company.	Gross Receipts, 1897.	Gross Receipts, 1898.	Per Cent Increase.
Buffalo, Bellevue & Lancaster Ry. Co	39,749	38,365	d. 3.5
Norfolk Central St. Ry. Co., Dedham, Mass	16,876	38,263	120.8
Atlantic Highlands, Red Bank (N.J.) & Long Branch Electric Ry. Co	41,160	38,238	d. 7.1
Plymouth (Mass.) & Kingston St. Ry. Co	37,888	36,834	d. 2.8
Olean (N. Y.) St. Ry. Co	26,180	34,977	33.6
Greenfield (Mass.) & Turner's Falls St. Ry. Co	33,252	34,585	4.0
New Brunswick City Ry. Co., New Brunswick, N. J	23,993	34,561	44.1
Cortland (N. Y.) & Homer Traction Co	36,885	34,406	d. 6.7
Citizens' St. Ry. Co., Fishkill, N. Y	34,616	33,934	d. 2.0
Reading (Pa.) & Southwestern St. Ry. Co	29,302	32,831	12.0
Anacosta & Potomac River Ry. Co., Washington, D. C.	46,834	32,743	d. 30.1
Van Brunt St. & Erie Basin R. R. Co., Brooklyn, N. Y.	31,390	32,101	2.3
Framingham (Mass.) Union St. Ry. Co	19,936	30,424	52.6
Syracuse (N. Y.) & East Side St. Ry. Co	34,810	30,291	d. 13.0
Oil City (Pa.) St. Ry. Co	28,315	30,237	6.8
Athol (Mass.) & Orange St. Ry. Co	32,550	29,459	d. 9.5
Phillipsburg (N. J.) Horse Car R. R. Co	29,614	28,979	d. 2.1
Southbridge (Mass.) & Sturbridge St. Ry. Co	25,149	28,531	13.5
Rockport (Mass.) St. Ry. Co.	28,539	28,433	d. .4
Cohoes (N. Y.) City Ry. Co.	23,322	28,321	21.4
Bradford (Pa.) Electric St. Ry. Co.	28,268	27,841	d. 1.5
Washington (Pa.) Electric St. Ry. Co	25,099	27,701	10.4
Charlotte (N. C.) Electric Ry., Light & Power Co	§ 27,338	§ 27,631	1.1
Troy (N. Y.) & New England R. R. Co	31,278	27,438	d. 12.3
Gt. Falls (Mont.) St. Ry. Co.	24,050	26,479	10.1
Utica (N. Y.) & Mohawk R. R. Co	27,359	26,422	d. 3.4
Dunkirk & Fredonia (Mass.) R. R. Co	26,123	26,068	.2
Totals	$2,019,385	$2,130,762	5.5

§Railway plant only. d Decrease.

Convenient Rheostat for Testing

For carrying large currents while testing in a power station or repair shop, a water rheostat made out of an old barrel is a common form of resistance employed. There are some disadvantages in connection with its use, however, especially the difficulty of keeping the ohmic resistance of the rheostat any way constant.

A different form of cheap rheostat is employed by the engineers of the Consolidated Traction Company of Pittsburgh, in the new power station at Twentieth Street and the Allegheny River. It consists of about 300 ft. of No. 12 bare copper wire, wound upon a wooden frame, and then immersed in an ordinary oil barrel filled with water. This wire will carry about 225 amps. (at 550 volts) if cold water is kept running continuously through the barrel. A ½-in. hose will usually supply enough water to keep the rheostat cool. At the Consolidated station there are ten of these rheostats, and they have been found very satisfactory.

Plows for Underground Conduit Electric Cars

Although a considerable item of expense was abolished when the overhead trolley went out of use, the trouble and outlay has probably been at least equalled, if not increased, by the care and expense incident to the use of the underground current.

The plow, although the result of a great deal of engineering talent outlay, is still far from being practically perfect. Even though suspended in a very elastic manner from the truck of a car, it is knocked and battered to pieces frequently. The present method of elastic suspension is from two 2½-in. round iron or steel bars, which in turn are carried by a light, yet stiff angle-steel frame attached to the end of a (double) truck by means of steel plates, which are bolted to both frame and truck. The plow is attached to a pivoted bar, which in turn is swiveled to shoes that slide easily over the round bars the entire width of a car. The shoes slide very easily, so easily in fact that it seems almost impossible that the plow can fail to respond to demands from the slot, yet it often does fail, and the plow which has been in use for several weeks bears many marks of extra hard usage.

The plows used with cable cars of the New York companies take the slot wear on the steel plates or bars which form the vertical supports of the grip and its mechanism. The life of these frame bars or plates averages about six weeks, when they are removed, being found worn nearly half in two, and are replaced by new bars. In the electric plows, the wear does not come directly upon the bars which support the plows. Instead, four soft malleable iron shoes are attached in pairs to opposite sides of the shoe support or frame. These "chafing plates" are held on by slight recesses in either side of the shoe, and by two countersunk units through the frame and each pair of plates which are located at the line of the slot. In practice, a set of these plates is found to last about three days. Then, the rivets must be chipped out by a round-nosed cold chisel, forged round and tapering, and ground on one side only, at an angle of about 60 degs.

At the lower ends the plows have loose spring contacts which are arranged on a wooden support, which in turn is dovetailed to the lower end of the iron portion of the plow. A piece of thin rainbow packing is cemented to each piece of wood, and the pair when fitted together over the plow frame is firmly fastened together by common wood screws.

The leads which run down through the plows are made of a number of wires, about No. 20 or 22, and braided into a flat tape about ⅝ in. wide. Frequently the wooden portion of a plow gets caught in the conduit and is torn off, the leads being broken just below their exit from the iron portion of the plow. The splicing of these leads is done by sandpapering the broken end until clean and bright. The wire ends of another piece of braided lead are then straightened for about 2 ins., and in alternate bunches of half a dozen, are bent back and forth to form a sort of Y into which the broken lead end is placed. The wires of the new piece are then bent down upon the old piece, bound with a narrow strip (¼ in. wide) of thin tinned copper and hammered flat. The joint is then soldered, alcohol and resin being used as a flux, after which the thin copper is stripped off and the splice filed a little and taped.

Testing, for continuity of leads and for grounds in the plows, is done by a couple of contacts rigged on long flexible wires in the usual manner and connected with a 500-volt current through five lamps in series. While it is usual to throw such contacts carelessly aside when not in use, it is the practice by at least one man in the Metropolitan shops to use his bank of test lamps for light. The test

points were thrust under the free ends of a strip of copper, which in turn was fastened by two screws through its middle portion, to a piece of slate. When it is necessary to test, the wires are pulled out from under the copper and applied to the work. There is no danger from fire from these testing points.

A Quick Piece of Electrical Equipment

The State Street line of the Chicago City Railway is now being operated by electric power, and the change was made from cable to electricity in three weeks. The ordinance allowing the temporary change was passed on June 19; permit to work on the streets was secured on the evening of the 23d, when work was immediately begun, and the first car was run on the evening of July 15, between 4 and 5 o'clock. The change embraced 7 miles of street on which poles had to be erected, the trolley and feed wires strung, additional power provided and a large number of extra cars to be electrically equipped. The 600 h.p. motor that was formerly employed at Fifty-second Street for driving the cable drums was moved to the Twentieth Street station, where it is operated as a generator during the hours of heavy traffic. Two feed wires were brought over from the Clark Street line and connected with the switchboard of the Twentieth Street station. The ordinance granting the privilege of operating for the present by electric power is for ninety days only, and does not allow the cars to be electrically operated north of Van Buren Street, but between Van Buren and Madison Streets horse cars are run every two and one-half minutes.

The grant was secured for the purpose of making repairs to the Twentieth Street power station, as some of the engines, and especially foundations, were so weakened by long service that a break-down was imminent. The No. 1 and No. 2 Wheelock engines of this station have been in continuous operation, driving the cable plant since 1882, and of late years have been greatly overloaded. The new equipment has not been fully decided upon, but will probably include new engines for those worn out, and new cylinders for the other four engines. The gripmen are operating the electric cars, having been broken in preparatory to the change. It should be noted in connection with the change that all the material had been secured and was on hand ready for immediate use. The change from cable to electric power is very acceptable to the patrons, as the time for making the entire trip is very much reduced.

A New Power Plant for Atlanta

The Atlanta Railway & Power Company has prepared plans for the construction of a modern power and lighting plant, to cost about $750,000. This plant will furnish all the power for the consolidated street railway lines and for general commercial purposes throughout the city, and a lighting service will also be given in competition with the existing company. Steam heat in winter and cold air in summer will be furnished to the large buildings in the business district. The plant is to be centrally located and will be built on a railroad, so that coal can be brought by cars direct to the storage bins. After the new station is completed the present plant in the outskirts of the city will be used for manufacturing street cars for the company and for other street railway companies in the South.

The Broad Ripple Traction Company, of Indianapolis, has been incorporated, with a capital of $100,000, as successor to the Indianapolis & Broad Ripple Rapid Transit Company.

German Track Specifications

A prominent German track engineer has sent us the following specifications for a tramway track, as used in Germany. As will be seen, they differ somewhat from what would be considered standard American practice.

A.—GENERAL REMARKS

The roadbed of an electric railway should be so substantial that it will carry the heaviest traffic. The cost of preparing rail joints and renewing tracks and rails in the city streets is so expensive that no reasonable precautions should be spared in making the weight of rail, quality of material or joint construction as good as possible. In this particular the maxim will be found true as much or more than in any other branch of tramway work, that it "pays to use the best." The track should be so laid as not to hinder the street traffic or interfere with the proper drainage of the street, and the head and flange of the rail should be so designed that uneven wear from street or vehicle traffic will be avoided. The style of pavement in which the track is laid has a considerable influence upon the most desirable height of the rail and the width of the base. Only in asphalt can considerable liberty be exercised in selecting the rail sections, as with this pavement there is comparatively little objection to projecting bolts, wide base, etc. The length of rail should be as great as possible. At present there is no difficulty in rolling rails 12 m. long, even in the heaviest sections. The section should be designed so as to bring the center of support as nearly as possible under the center of pressure. With the composite rail this condition is obtained in an almost ideal way. The single web rail can never be constructed so as to absolutely accomplish this result, as the vehicular traffic will keep on the flange, although the car wheels may be directly over the web.

The heaviest angle plates should be used, and all shock at the joints should be reduced by laying the ends of the rails close together, and, in general, by using the mitered joint. In asphalt paving the rails can be butted, as the rails are held rigidly by the pavement; but in block paving a space should be left for expansion and contraction, though this space should be less than that on exposed track. The tie rods also need not be so numerous in asphalt construction, and, as a usual thing, only about half as many should be used as when the rails are laid in block pavements.

B.—DETAILS OF RAIL SECTION.

1. Rail Head.—The width of the rail must correspond to that of the wheel tread, and should therefore be at least 50 mm. wide. The shape of its surface must correspond to that of the wheels. Where the mitered joint is used the angle plates must be bolted up tight to get satisfactory results.

2. The Groove.—With single web rails the lip of the rail is integral with the rest of the rail, while composite rails are composed of two girders. The depth of the groove with single web rails is limited by rolling mill considerations, but rail makers can now provide, without any trouble, a groove 40 mm. in depth; with composite rails the groove can be made any depth. It is to the interest of the public to have the groove as narrow as possible, and 30 mm. may be considered standard width.

For heavy traffic (ninety cars per hour) the wear of a 50 mm. wide steel rail head, made of the best material, is supposed to be 1.5 mm. per annum, so that for a ten years' life of rails the depth of the throat should equal 15 mm. plus the depth of the wheel flange, or 13 mm. to 15 mm.; total, 28 mm. to 30 mm.

3. The Shape of the Groove.—This should be angular and considerably wider than the wheel flange, to prevent the crowding of dirt and snow into the groove. The wheel flange should be able to press the dirt upward over the lip. The width of the tram (or flat surface of the lip), the part on which street vehicles will run, should amount to at most one-third of the width of the head of the rail, and generally 15 mm. is sufficient if the rail is elevated slightly above the grade of the street. Here unfortunately track engineers are not given much choice, for the authorities frequently demand a much wider tram; for instance, at Berlin, 25 mm.

4. Thickness of the Web.—While with the composite rail 8 mm. is usually a sufficient width of rail web, with a single web rail the web should have the thickness of 10 mm. With an eccentric web rail the thickness of the web should be 16 mm.

5. Base of Rails.—This should not be less than 100 mm. for horse-car rails and 130 mm. for electric rails. The base should have a thickness at the web of at least 20 mm. This thickness may taper down at the ends to 10 mm.

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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.

All matters intended for publication in the current issues must be received at our office not later than the twenty-second of each month.

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We are pleased to note the incorporation in Great Britain of the Tramways and Light Railways Association, an organization similar in scope and purpose to the American Street Railway Association, and with a function quite as valuable, no doubt, as that which the great American Association has for so many years fulfilled. The new association is fathered by excellent men widely known in the industry, both at home and abroad, the six first members of the council being George Richardson, George F. Fry, Emile Garcke, J. Barber Glenn, W. M. Murphy and Stephen Sellon. The honorary secretary is A. M. Willcox, editor of the "Railway World." We sincerely wish our friends across the water the highest measure of success in their organization.

Graphical methods of solving engineering problems are always convenient and usually a time saver to the engineer or worker in the electrical field. For this reason we call attention to the application of "graphics" to the proportioning of feeders, as contained in an article with inset sheet, published elsewhere in this number, and think that the ingenious methods adopted, based, as they are, upon correct geometrical principles, will commend their use to our readers.

A careful study instituted to determine the cause of flat wheels on the North Jersey Street Railway recently has brought to light the interesting fact that the rear wheels, particularly of double truck cars, are more subject to flattening than the forward wheels. The argument adduced to explain this is that when the brake shoes are applied, the tendency of the truck is to rock forward, bringing greater weight on the forward wheels and less on the rear wheels. As the brake rigging is arranged to produce an equal tension on both wheels, the rear wheel develops a tendency to slide before the forward wheel, and this is thought to produce the flattening. An effort is being made to reduce this by so changing the brake leverage that a difference in pressure is exerted by the two sets of brake shoes, corresponding to the difference in weight carried by each pair of wheels. The outcome of this test will be watched with interest.

The striking difference between European and American track construction is shown in a set of track specifications by a prominent German engineer, which is published elsewhere in this issue. It seems somewhat amusing to American readers to be told that the rolling mills have now no difficulty in producing rails 39 ft. long, and that in asphalt paving the rails can be butted, but that in block paving a space should be left for expansion and contraction. It is also contrary to the best American practice to lay rails in asphalt without a stone setting, while the frequent reference to composite rails, and rails with eccentric web and mitred joints, seems strange to American readers. Undoubtedly several of the differences in practice, such as the eccentric web rail and the composite rail, are due to differences in conditions. While the former rail undoubtedly possesses certain advantages from a structural standpoint, the cost of milling the rail ends will undoubtedly preclude its general use in this country, with present prices of labor, but this expense may not be as great in Europe. The composite rail has been tried to a limited extent only in this country, and perhaps under such unfavorable conditions that its true value has not been determined by American managers, but the sentiment in this country at present is practically unanimous in favor of a single web rail. Certain other conditions must undoubtedly be attributed to differences in the weight of cars, the European cars being, as a rule, much lighter and smaller. The tendency will grow, we think, however, in European countries towards the employment of longer and heavier cars, although the labor charge being lower, there is not the same incentive to the use of long cars in Europe as in America. In other respects we look for a modification of the European practice in track building, tending towards the American grooved rail construction; and while municipal councils abroad seem unalterably opposed to any section of head similar to

the American standard girder rail, we should think that the Metropolitan or Crimmins' rail would admirably suit the conditions existing in European cities.

There is grave danger that the strong hold upon the export trade in a hundred different industries which American manufacturers have obtained during the past five years will be loosened, if not destroyed, this year and next, by lack of foresight or sheer carelessness, either or both. The home demand for manufactured product has suddenly become so almost overwhelming, and profits immediately in sight seem to be so great, that the foreign demand is being in many cases neglected, and foreign agencies, which have been doing such magnificent work, and which are worthy of all support, are being "starved out" through refusal of home manufacturers to fill orders except at practically prohibitive prices. The wisest of our manufacturers are not, it is true, falling into this mistake, but mindful of the possibly temporary character of the home trade, are continuing to help out the foreign agencies in their endeavor to secure the wide and varied world market, which ought to be far more permanent in character than that of any one country, however rich and prosperous. But too many of the smaller manufacturers are "spasmodic" in their effort to enter the foreign field, and will find it extremely hard to take up the lines again and renew old friendships when the necessity for foreign outlets again comes upon them.

The foreign customer in almost all branches of trade is a very different being from the American. The British people, home and colonial, are attracted by age and persistence in business dealings, and despise weak and ill-sustained effort. They are not constantly seeking lower prices, but will often deal for a score of years with long established houses with which they have a *habit* of dealing. With them confidence once lost is never regained. Continental Europe buys in America, not because it wishes to do so—only because it has to. Any excuse which a customer can find for failure to place orders in America will be availed of. The South American trade has always belonged chiefly to Great Britain, though partly to Germany and France. Latterly, pro-American feeling has been largely developed in many of the South American countries, and it needs only a little cultivation to build up an important and constantly increasing market for American goods. Elsewhere in the purchasing countries of the world American goods have come to be highly regarded for their intrinsic value and a new trade is partly worked up. This ought not now to be lost through carelessness or neglect, even when home profits are more tempting.

There is every reason in the world why America should become the great manufacturing nation of the world. With limitless natural resources in coal and ores; with unequaled internal and external transportation facilities, natural and created; with unsurpassed organizing ability for the creation of vast industries and the handling of labor; and with labor itself skilful, intelligent, well fed and well treated for a hundred years past, our manufacturers may safely expand their facilities to meet the present home demand, and a future foreign demand enormously greater than which exists to-day.

In a lengthy argument in favor of the municipal control of street railways, which appeared in one of the New York dailys recently, great stress was laid upon the economic value of the fact that municipalities can borrow money at very low interest, and that consequently they could afford to operate street railways at much lower rates than could a private corporation. This is an old and favorite argument which seems, from a superficial view, to be sound, but a little further consideration will show that it is not such a good argument in favor of municipal control as would first appear. The people who lend money to municipalities do not accept low rates in interest from sentimental grounds, but because the security is better than that which a private corporation can give. The municipality is practically an unlimited corporation, made up by the different taxpayers, and the security given or pledged to make good the loan is their property. Now if, with private ownership, a railway should be uneconomically administered, or if, even with excellent management and the best human foresight, the line should prove unprofitable and the company fail, the loss does not come upon the residents of the city. On the other hand, however, if under municipal operation a similar trouble should be encountered, the citizens have to make up the deficiency. That is, the real property of all kinds belonging to the taxpayers is pledged as security for the wisdom and ability of municipal officers as railway managers. The taxpayers pay the bill if anything goes wrong. Moreover, any possible saving in interest account will be far more than counterbalanced by the large increase in cost of labor sure to come with municipal ownership, since one thing which the advocates of municipal ownership always promise to do is to increase the wages of labor or reduce the hours of work, which amounts to the same thing. In fact, one of the laughable features of municipal ownership arguments as usually advanced is that "you can eat your cake, and have it, too," i. e., you can reduce fares, increase wages of labor and make more money for the city's treasury—all at the same time.

We believe that Mr. Duffy and Mr. Ham were, on the whole, justified in yielding to the unanimous wish of the committees representing the Associations of Railroad Commissioners and of Railroad Accountants that "taxes" should be included in "deductions from income," instead of made a part of "operating expenses," though the latter classification was decided upon by the committee on standardization of accounts of the Street Railway Accountants' Association of America. It is best that railroad accounting practice should first be made uniform, and then should be corrected "from the inside," as it were, wherever corrections are right and necessary. We believe that taxes belong in operating expenses, in spite of the almost universal accounting practice to the contrary, and we have no doubt that in the course of time the reasons in favor of this will appeal to the different associations with sufficient force to cause a change to be made. The original argument in favor of the present ruling, which is a reversal of early practice, is that taxes are not within the control of the manager, and that his administration, therefore, should not be held responsible for a non-flexible item of this kind. The real truth of the matter is, however, that taxes are affected as much as any other item in operating expenses by the wisdom or unwisdom of the manager in his dealings

with the public. If he is popular, fair minded and meets the public half way in any propositions for the public good, his company is not nearly so likely to be "struck" by cruel and unusual tax burdens. If, on the contrary, he is too generous, too yielding, too ready to establish dangerous precedents, a load may be fastened upon the company which it can never shake off. Taking either point of view, it can be held as an absolute certainty that management has an influence on taxation as important as that on "wages of conductors and motormen," or any other pure "operating expense," where all that a manager can do is to increase or diminish an average volume of expenditure, which cannot be abolished in its entirety. If, therefore, the test of managerial ability is to be expressed in the percentage of operating expenses to gross receipts, taxes should be logically included, as the Street Railway Accountants' Association decided. The most important thing, however, is uniformity, and, as before stated, we believe that the Street Railway Accountants' Association should accept for the present the practice of the Interstate Commerce Association and other railroad accounting practice.

Should Strikes be Permitted

"If I should allow my men to strike, I should not be worthy of the position which I hold."

These pregnant words uttered by President Vreeland of the Metropolitan Street Railway Company contain a truth well worthy of interpretation, and a secret of successful management.

The employees of a modern electric railway—particularly those in the transportation department—are not unreasoning or unreasonable beings, eager to give ear to the counsel of demagogues or the ravings of the disaffected. On the contrary, they are usually intelligent, frequently ambitious, and always appreciative of the genuine efforts of their employers to improve their condition. It would probably be impossible to-day to induce the employees of the Metropolitan Street Railway Company of New York, for example, to leave its service in a body, because they see in President Vreeland and his department heads chiefs who are sincere and honest in their friendship for the men whom they employ, who are fair and just at all times in dealing with them, and who are ready to aid their employees in the lower ranks of the service to rise to the higher in every practicable way, recognizing merit and ambition wherever it occurs. As Mr. Vreeland frequently says to his men: "There is just as much reason for any one of you to hope that he may become president of this company as there was for me to expect a position of high responsibility twenty years ago, when I was a flagman on the Long Island Railroad." The secret of the hold which a manager can thus obtain upon his men is found in his treatment of them as reasonable fellow citizens, recognizing that each is doing a work as dignified in its way as is that of the department chief or the company's president.

When, therefore, a strike of any magnitude occurs upon a street railway system, it is not safe to assume that the fault is wholly with the men, however unreasonable their demands may seem at first sight to be. There is rarely heavy smoke without some fire, and it is more than probable that men who claim to have grievances are not wholly without the elements of them, particularly as no body of men can afford to ask public sympathy on too flimsy pretexts. If, now, the manager arbitrarily refuses to discuss such grievances frankly and freely, or even if he lets the disaffection grow to serious proportions without quieting it by prompt investigation and correction of abuses, he runs a grave risk of being found unworthy of the responsibilities placed upon him as a "master of industry." His most important business is to make sure that his men have no excuse for striking—nothing which they can urge as a sufficient reason.

It does not follow by any means, however, that strikes can always be avoided. It is often the case that the incoming of a new manager or superintendent, whose intentions, however good, are wholly unknown, is made the occasion of a strike, or of strike talk, which is really an effort to "find the master." Under such circumstances the mischief may have gone too far for correction and the gage of battle must be accepted. Again, a body of employees may be taken into a larger body through railway consolidations, as in Brooklyn, and before it can become assimilated and get used to the new management, disaffection may creep in and be fomented by unworthy labor leaders to the point of rupture. How much blame can attach to a management under these circumstances is not self evident, but depends upon the underlying facts in the case. Other exceptional causes may also lead to strikes without the possibility of putting blame upon the managers. Broadly speaking, however, it is true that the ablest street railway managers of to-day are men who are not troubled by strikes nor the fear of them; they do not hold themselves aloof from their employees, but mingle with them constantly, though without loss of dignity, commanding respect for the position rather than for the man. And they are *honest* in their friendship for the workers in every branch of the service, not simply superficially desirous of being regarded as friendly.

But when a strike is actually declared, it must be fought to a finish, assuming, of course, that the company has deliberately decided beforehand that it can go so far and no further, even if a strike be the consequence. The results of yielding to force what is denied to reason are so utterly disastrous to discipline and success in management, and involve such dangers of renewed attempts to obtain further concessions that almost any loss of money or property is preferable to allowing strikers to succeed in their strike. Arbitration even is usually unwise or impossible in contests of this kind, partly because the results of arbitration, particularly where the matter of wages is to be considered, may mean bankruptcy to a company, and partly because if the decision of arbitrators is unsatisfactory to strikers they rarely, or never, consider themselves bound by it, but often decide to continue the strike until some satisfactory conclusion is reached.

The best guarantee that the public can have that a street railway company will treat its employees with fairness, and that, in the case of strikes actually declared, the burden of proof as to its justification rests upon the strikers and not upon the company, is that "labor troubles" are so costly in their continuance and so disastrous in their effects, that a management will never permit them to be brought about if it is possible to satisfy the demands of the men.

High Speed Electric Railway Between Dusseldorf and Krefeld

The electric railway between Düsseldorf and Krefeld, Germany, which was put in operation a few months ago, is of special interest, as it is the first installation in Europe of a high-speed electric railway. For this reason new methods and apparatus of a kind untried in European countries, had to be installed. An interesting paper on this road was read at a recent meeting of the Verband Deutscher Electrotechniker, in Hamburg, by Gustav Braun, from which the facts given below have been largely taken.

The necessity for a direct connection between the two cities, Düsseldorf and Krefeld, was discussed as early as 1830, and it may be said that the plan has been agitated ever since. Düsseldorf, which is situated on the right bank of the Rhine, and is famous for its enormous industries and as an important railway center and river harbor, has long felt the lack of opportunity to extend more than in one direction on account of the broad river; while Krefeld, situated 6 km. to the left of the Rhine, and the center of the German silk and velvet industry, has felt the necessity of being connected with the neighboring city on account of railroad facilities.

In 1891 the State Minister of Railroads announced that the Government was not willing to grant the subsidy necessary for the building of the bridge across the Rhine required for the projected line, but if the city of Düsseldorf, or a stock company, would build the bridge at its own expense, it could obtain permission for the collection of a reasonable bridge toll. Finally all difficulties were overcome, and the Rheinische Bahngesellchaft was formed in March, 1896, for the purpose of constructing the required bridge at Düsseldorf and an electric railroad from that city to Krefeld.

The bridge itself is a handsome structure. The main portion consists of two large spans of 183 meters (600 ft.) each, framed by immense sandstone portals. At either side are a number of smaller spans. For the railroad two tracks have been laid, and two vehicles can pass outside of them at one time with ease. At each side of this roadway are two conveniently wide passenger walks.

As the electric road parallels a steam railway for the greater part of its length it was necessary to adopt a speed of 40 km. (25 miles) per hour on open stretches, and here the highway was avoided as much as possible. For this reason also the road does not pass through the intervening towns, but only touches them on the outskirts.

The route is shown in the map on page 527. The total length of the road from the Haroldstrasse in Düsseldorf to the Rheinstrasse in Krefeld, is 22 km. (13.6 miles). The length of the open stretch between the stopping places, Oberkassel and the Krefeld depot, is 16.7 km. (10.4 miles). The steepest grade is that of the bridge approaches, and is

MOTOR CAR AND TWO TRAIL CARS ON S CURVE IN KREFELD

2½ per cent. Between the starting point in the city of Düsseldorf and the stopping place, Oberkassel, which may be considered the end of the Düsseldorf local traffic, double tracks have been laid, while there is but a single track along the open stretch up to Krefeld, excepting at the stopping places, where double tracks serve as turnouts.

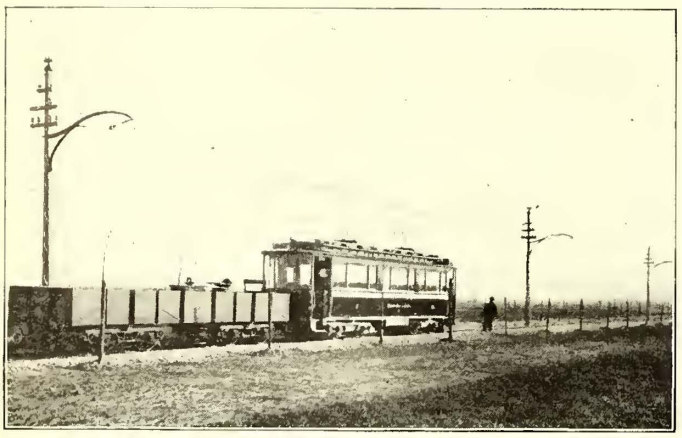
In Krefeld only a small portion is provided with two tracks. The entire road bed, however, has been laid out with sufficient width so that two tracks, on a road bed 9.2 m. wide, can be laid at any time without any difficulty.

As it is the intention to eventually run State railway cars over the open stretch between Oberkassel and Krefeld for private use as well as the needs of the company, the gage and distance between tracks had to be chosen to conform to the needs of these larger cars, which are considerably greater than that required by street cars. On the stretches intended for the latter the distance between tracks is only 2.75 m. (9 ft.) from center to center.

For the portion between the bridge and Krefeld tie con-

struction with Vignol T-rail sections, 11 A of the Prussian railways, were chosen. The rails have a weight of 27.5 kg. per meter (54 lbs. per yard), which is sufficient for the support of the large railway cars, as the lines are not to be used by the locomotives. The rails are laid in 12 m. (39 ft. 4 ins.) lengths, and in this distance fifteen tie rods are used.

The switches are of the tongue type, with a radius of



TRAIN ON HIGH SPEED SECTION BETWEEN OBER-KASSEL AND HEERDT-LÖRRICK

curvature of 150 m. (492 ft.), which permits the use of the railway cars. For the flange rails in the city streets, Phoenix, type 25 A, with a weight of 42 kg. per meter (84 lbs. per yard) were selected.

The construction of the road was started in the beginning of July, 1897. The ground and stone work for the completion of the roadbed was begun first and pushed so quickly that before winter set in the roadbed on the entire open portion, consisting of several cuts, road and railway crossings at Osterath, were finished, and the greater part of the rails laid. In the fall of the same year the building of the central station was started, and roofed before winter, so that during the winter months the machine and boiler foundations could be built. As soon as the warmer weather in year 1898 commenced, the outside work was resumed, and the several depots, which are very handsome, the car barns and workshops, as well as six dwelling houses for officers and workmen, were erected. In April the tracks were laid, in May the poles were placed in position and soon after the trolley line was strung.

Bids for supplying the electrical equipment for the line were requested by the Rheinische Bahngesellschaft in 1896 of a limited number of well-known electrical firms, the results of which gave the company plenty of material for comparison. Though the proposition of the firm Siemens & Halske was found to be the most acceptable, another competition with definite instructions was opened, and again the Siemens & Halske proposition proved the best. On account of the excellent general and special apparatus which this firm proposed to furnish, as well as the splendid operation of all electric lines executed by it, it received the contract for the electrical equipment of the road, that is the construction of the line and car equipment, while the well-known firm, Elektricitäts-Aktien-Gesellschaft, formerly W. Lahmeyer & Co., received the contract for the furnishing of the electrical machinery in the generating station, which had to conform, however, to the plans of the Siemens & Halske Company.

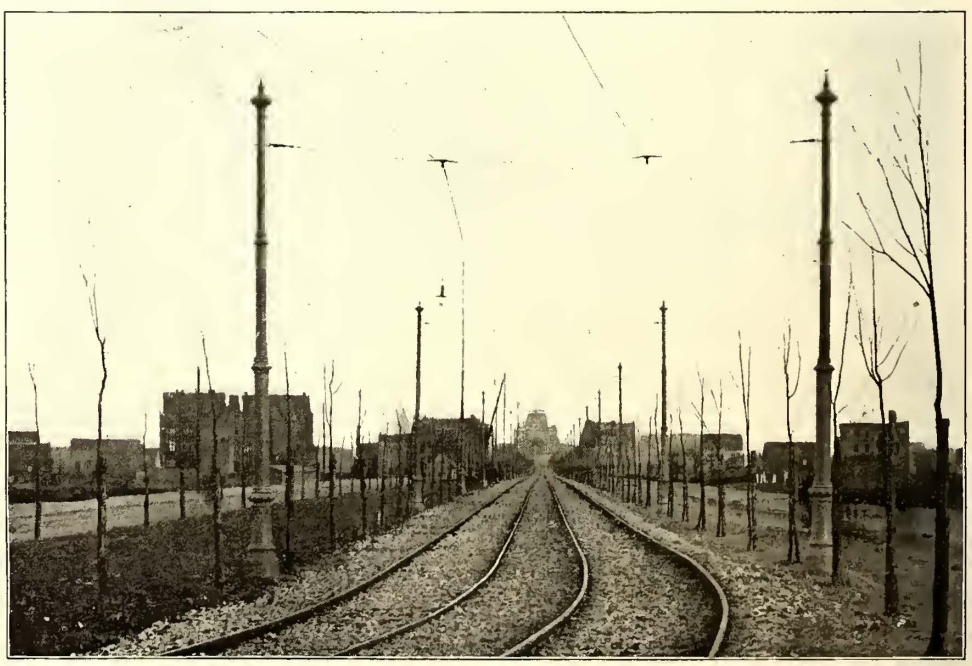
In view of an expected large demand for power by factories, the power house was located at Oberkassel, near one end of the line. In order, however, profitably to feed the other end at Krefeld, an accumulator plant was installed at Fischeln, and housed in the beautiful depot at that place.

The power house is a large, single-story building, containing the boiler, engine and generator rooms, as well as a repair workshop for cars. In the engine room are two horizontal tandem compound condensing steam engines of 270 normal effective h.p. each, and 330 h.p. effective maximum, at a speed of 90 r.p.m. The engines were built by the Hohenzollern Machine Company of Düsseldorf. Directly coupled to them are two shunt-wound continuous current generators, of 330 amps. capacity at 600 volts. Only one of these units is in use at any one time, the other being held in reserve. Besides the above, for the charging of the batteries, at Fischeln two sets of rotary converters have been installed, one for service and one for reserve, which furnish an additional 45 volts.

For the lighting of the station there is another continuous current rotary converter which runs at a speed of 900 rev. 4 amps. at 600 volts, and delivers current at 110 volts pressure. All the electrical machines were furnished by the Elektricitäts-Aktien-Gesellshaft, formerly W. Lahmeyer & Co., of Frankfort-on-Main. All machines in the engine and dynamo room can be reached by a 12,500 kg. (27,500 lb.) crane. Three arc lights illuminate the room.

In the boiler room are two water-tube boilers of 220 sq. m. (2370 sq. ft.) heating surface each, and a pressure of 10 atm. They were also built by the Hohenzollern company.

A voltage of 600 volts was chosen as being best suited in this instance, so as to reduce the cost of the line to a minimum. A higher pressure was not advisable, as this would exclude any possibility of connecting the road with the electric roads of Düsseldorf and Krefeld in the future.



CURVE CONSTRUCTION IN LUEG-ALLEE IN OBER-KASSEL

The overhead line, carried by iron poles, consists of two hard-drawn copper wires 9 mm. in diameter (No. 00),

which are strung 15 cm. (6 ins.) apart, along the single track portions, but are strung on both sides of the roads along the two-track portions and at the turnouts, and doubly insulated from the ground.

In order to prevent interruption of service in case of a break in the trolley wire, a special power wire, 100 sq. mm. in section (No. 0000) is stretched along the entire route, and is connected to the trolley wire at definite distances so that in case the latter should break the current can be interrupted for a length only corresponding to the distance between two successive poles.

The distance between any two points of support is about 30 m. (96 ft.) on the straight open sections and 35 m. (103 ft.) within the city limits. At curves and turnouts the distance is considerably less. The advantage of supporting the trolley wire when the bow-sliding trolley is used over that required by the wheel trolley is especially evidenced by the sharp curves in Krefeld, particularly in the S curves shown in one of the illustrations. The number of points of support of the trolley at this curve is remarkably small.

All wires are arranged so that they can be tightened if they stretch, and every 300 m. (984 ft.) the poles are made specially strong, so that a break in the trolley wire does not cripple the entire line.

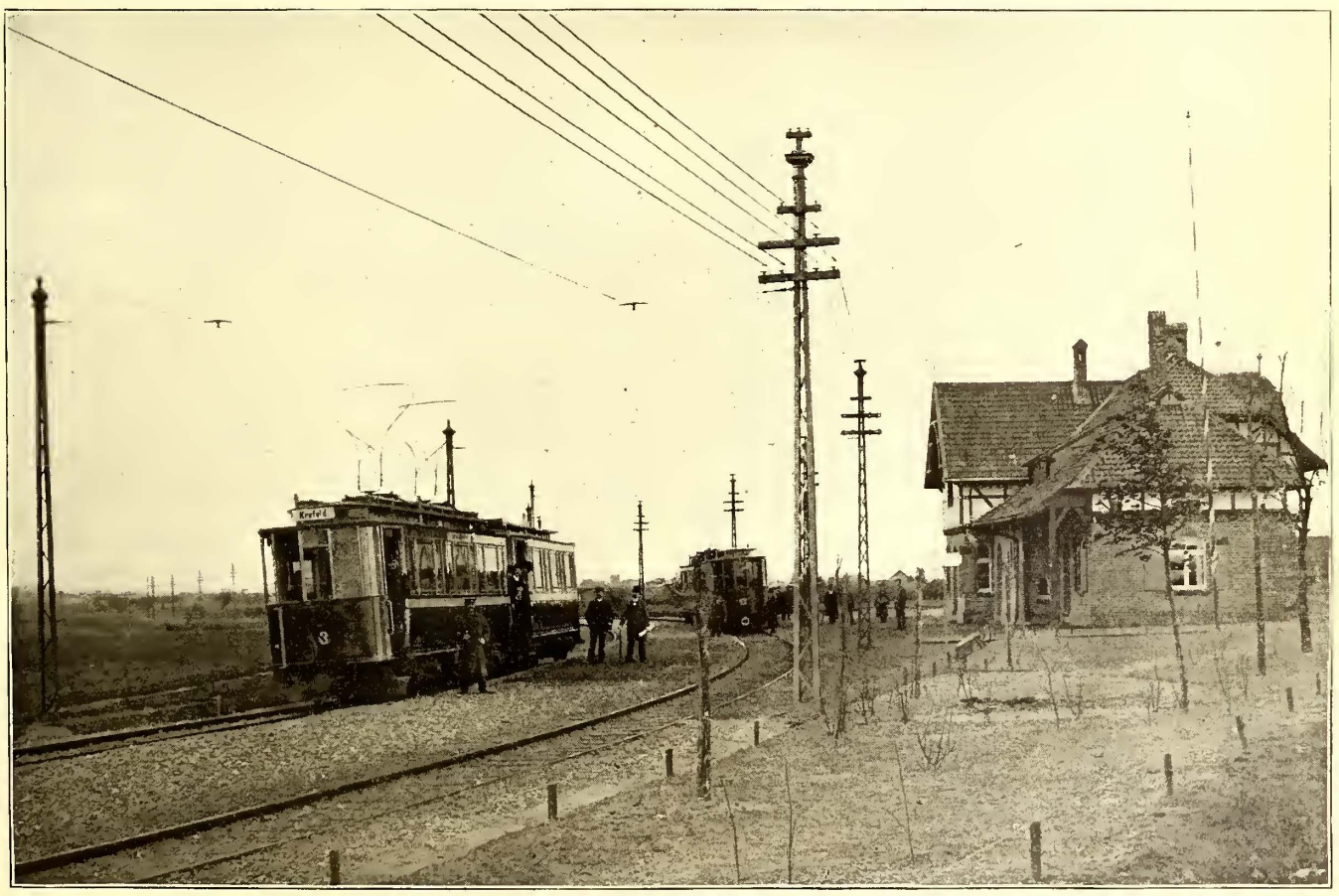
Along the open stretch, from Oberkassel to Dissem, bracket poles are used; at the turnouts and on double track span construction is employed. At the land pillars of the new Rhine bridge the trolley poles also support the arc lamps.

Three feeders lead from the power and accumulator stations to the feeding points at the stopping places The entire system is therefore divided into six independent sections, which can be separately controlled, and are again subdivided into 1 km. (0.62-mile) lengths. Each one of these is separated from the adjoining one by a line insulator with switch and is protected by a lightning arrester.

The feeders are supported by glass insulators on wooden crossarms, fastened to the upper part of the poles. In order to be able to report the cars along the open stretch the several stations are connected by telephone.

The car equipments, which were also furnished by the Siemens & Halske A. G., and conform to the requirements of this road, possess some departures from usual methods. The motors are mounted direct on the axles without springs. Double trucks are used, and each truck carries on its inner axle a 35-40 h.p. motor. A pair of wheels with armature and magnet frame weighs about 2.9 tons. The field consists of four poles, of which two are consequent. The diameter of the wheels is 800 mm. (31.5 ins.), the wheel base is 1600 mm. (5ft. 2 ins.), and the distance between

CAR FOR LOCAL TRAFFIC



STATION AT FORSTHAUS-ALEER AND TRAIN OF CARS

axles 5.9 m. (19 ft. 4 ins.). The over-all length between buffers is 12.4 m. (43 ft.).

The passenger cars have a seating capacity of thirty-four, and standing room for sixteen, and are divided into II. class (12 seats) and III. class (22 seats), while the trailers in the III. class have cross seats, and those in the II. class have parlor car arrangement. The platforms are provided with glass storm doors; the illumination consists of eighteen 16 c.p. incandescent lamps. There are two lamps in the headlight, of which only one burns, while the other one is held in reserve in case something should happen to the first. The cars are heated with briquettes, by means of a stove under the car frame, to which pipes are attached, running along under the seats. The interior and exterior finish of the cars is extremely elegant compared with other German roads, and care has been taken to make them as comfortable as possible.

The cars can be braked in three different ways, i.e., usually by an air or hand brake, and in case of necessity by an electrical short-circuit brake. The air brake is of the Standard Air Brake Company's type. Its compression pump is coupled direct to a small electric motor, which is wound for 600 volts and uses 3-4 amps. in order to compress the air to 3-6 atmospheres. The two-cylinder, single-acting compressor of 76 mm. (3 in.) piston diameter, and a stroke of 51 mm. (2 ins.) delivers 140 to 200 liters (5 to 7 cu. ft.) of free air per minute, at an average speed of 600 r.p.m. The weight of a four-axle motor car is 18,750 kg. (41,250 lbs.).

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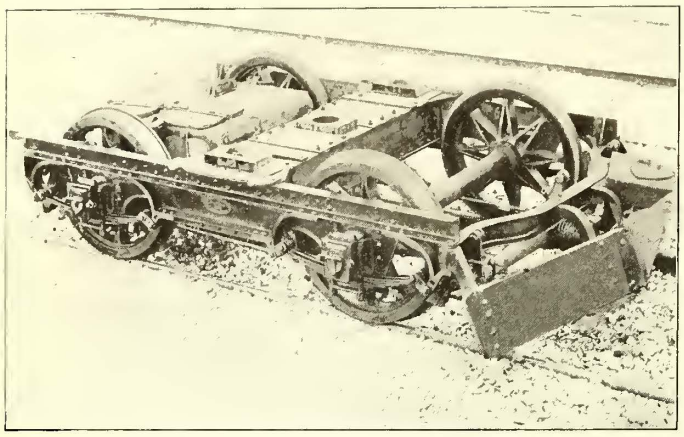
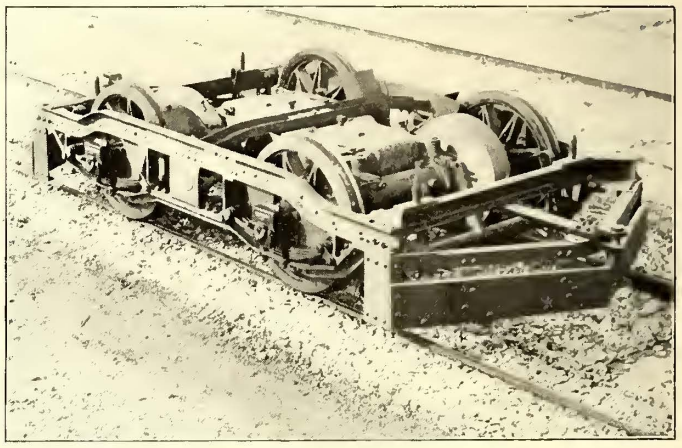
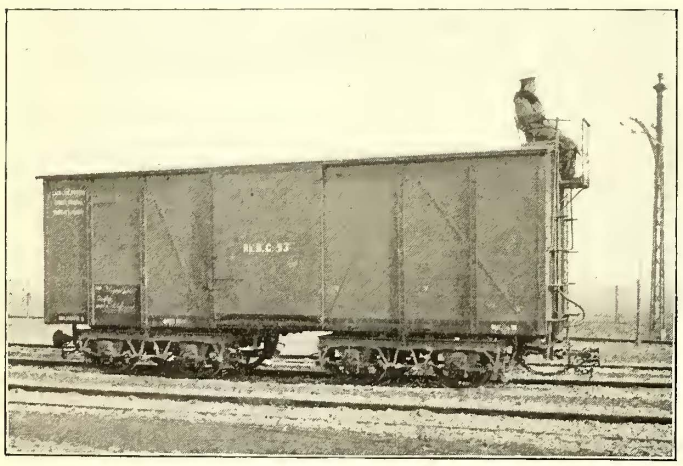


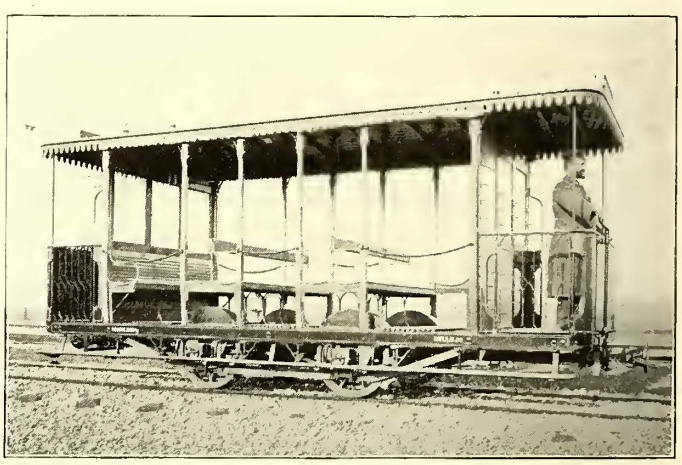
DOUBLE TRUCK FOR 8-WHEEL CARS



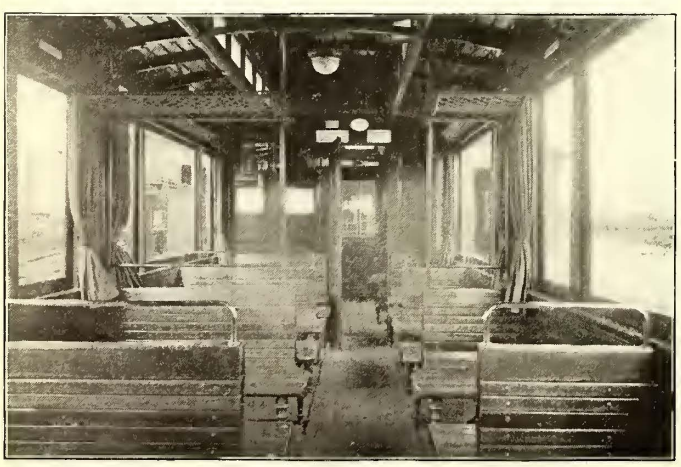
TRUCK FOR 4-WHEEL CARS



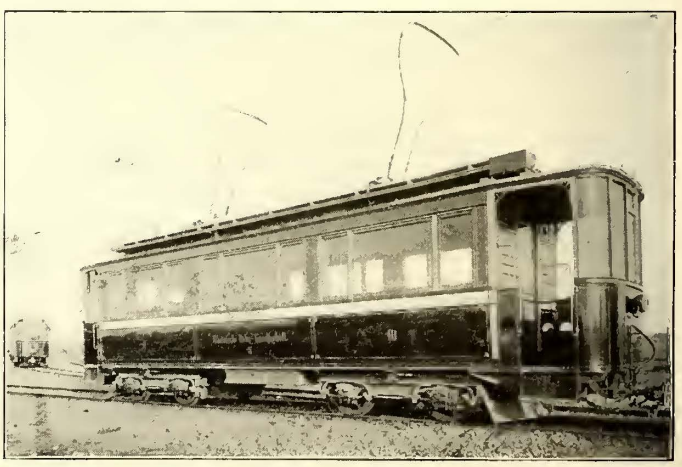
DOUBLE TRUCK CLOSED FREIGHT CAR



SINGLE TRUCK TRAIL CAR



INTERIOR OF OPEN TRAIL CAR



DOUBLE TRUCK MOTOR CAR

motor cars are supplied with two trolley poles of the well-known Siemens & Halske sliding contact type. This has proved satisfactory with the high speed of 60 km. per hour.

The passenger trailers, open and closed freight cars are also supplied with air and hand brakes. The four-axle passenger trailers weigh, empty, 12,100 kg. (26,620 lbs.). For the local service in Düsseldorf and Krefeld two-axle open and closed small cars are used. These closed two-axle passenger cars have a seating capacity of sixteen, and standing room for fourteen, and are elegantly furnished. The open trailers have a seating capacity of twenty-four, and standing room for twelve. Each axle of the motor car is driven by a 20 h.p. electric motor. The current is collected by only one sliding trolley. The local cars are equipped with a hand brake, but here also the electrical brake can be used. The freight cars also have four axles, a wheel base of 1.4 m. (4 ft. 7 ins.), distance between axles 5.2 m. (17 ft.), weigh, empty, 7750 kg. (17,050 lbs.), and can carry a load of 6300 kg. (13,860 lbs.). Trial trips were made at the close of 1898, and speeds of 60 km. (37.2 miles) per hour were obtained, showing that the electrical equipment was suited for even this speed, far in excess of the prescribed speed of 40 km. per hour.

At an early date the building of a 1.2 km. extension of the Düsseldorf portion of the road will be begun, .8 km. of which will be of the underground conduit system of Budapest.

Electric Transportation Systems at the Paris Exposition

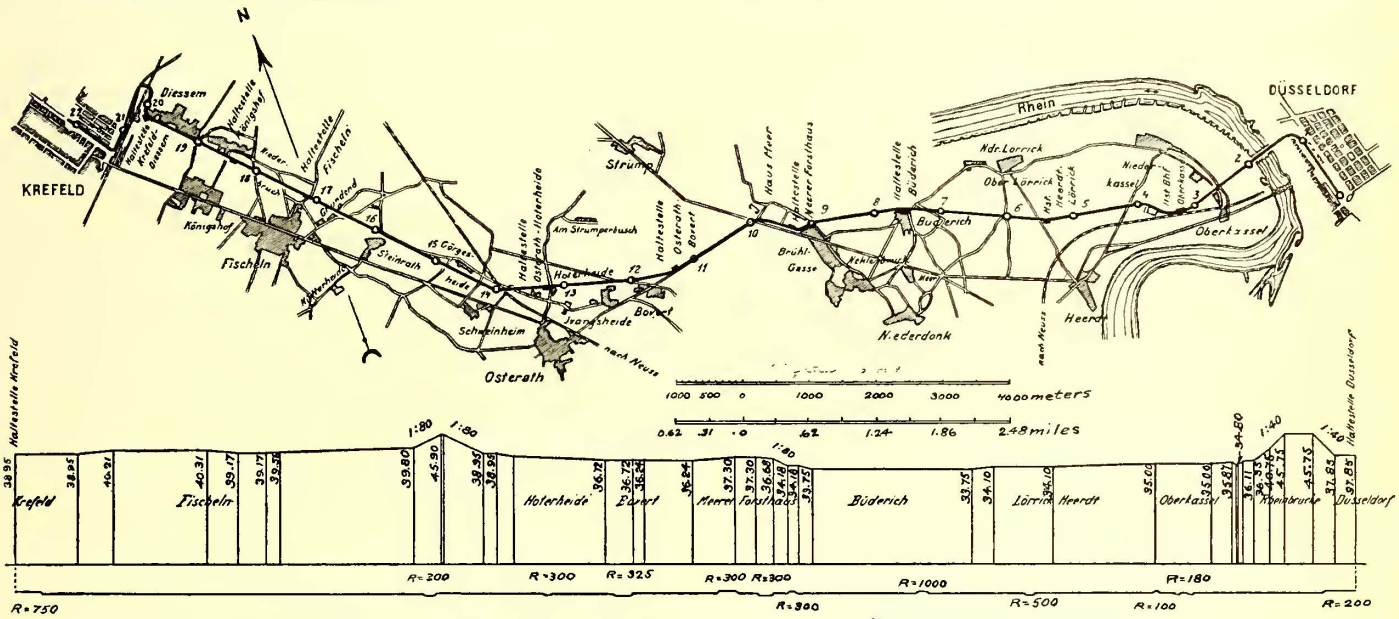
Arrangements are being made for the extensive introduction of transportation systems at the forthcoming exposition in Paris in order to accommodate the large number of strangers which, it is expected, will attend. Without counting the Metropolitan road, the Orleans Railroad Company and the Compagnie des Chemins de Fer de l'Ouest will extend their tracks to the entrance of the exposition. Both of these lines will be operated by powerful electric locomotives, so that while the city of Paris will not be able to show any extensive application of electricity to tramway service, visitors will be able to see electric transportation on a large scale, with the employment of heavy electric locomotives.

The plans adopted by the Orleans Railroad Company for the use of 45-ton electric locomotives, with a capacity of 700 h.p., have already been described in the STREET RAILWAY JOURNAL. These locomotives, mounted on four axles, each carrying one 25-h.p. motor, are able to draw a train of 250 tons at a speed of 50 km. per hour. The power station will have a capacity of 2000 kw., and will distribute current on the three-phase system at 5500 volts, with two substations, at which this current will be transformed to 550 volts for traction and 450 volts for lighting the trains.

The Compagnie de l'Ouest has already commenced the construction of a power station, from which it will generate current for, (1) electric traction on its Invalides-Exposition-Versailles line; (2) for the compression of air for its compressed air locomotives; (3) for pumping purposes in its Invalides station; (4) for the electric lighting of its Invalides station; (5) for the electric lighting of its Champs de Mars station; (6) for the operation of elevators.

This power station will contain a number of groups of 1200-h.p. engines, operating 800-kw. three-phase alternators, running at 5500 volts, at which the power will be distributed. There will be three substations at 2.4 km., 6.7 km., and 3.4 km. distance.

The company will also install a number of electric locomotives capable of drawing trains of 120 tons at a speed of 50 km. per hour on a maximum grade of 1 per cent.



MAP AND PROFILE OF HIGH SPEED RAILWAY BETWEEN DÜSSELDORF AND KREFELD

The road was opened to the public on Dec. 15, 1898, and the service was under the control of the Siemens & Halske A. G., by contract for three months, and it was found that all requirements were met.

For passenger service a through train leaves each terminal station every half hour; for local service between Düsseldorf and Oberkassel the small two-axle cars are used, which have a headway of from 6 to 8 minutes, while the small cars for the local service of Krefeld have a headway of 10 minutes.

The freight and farm service is regular, and the trains have but a small headway. The results of service are as follows:

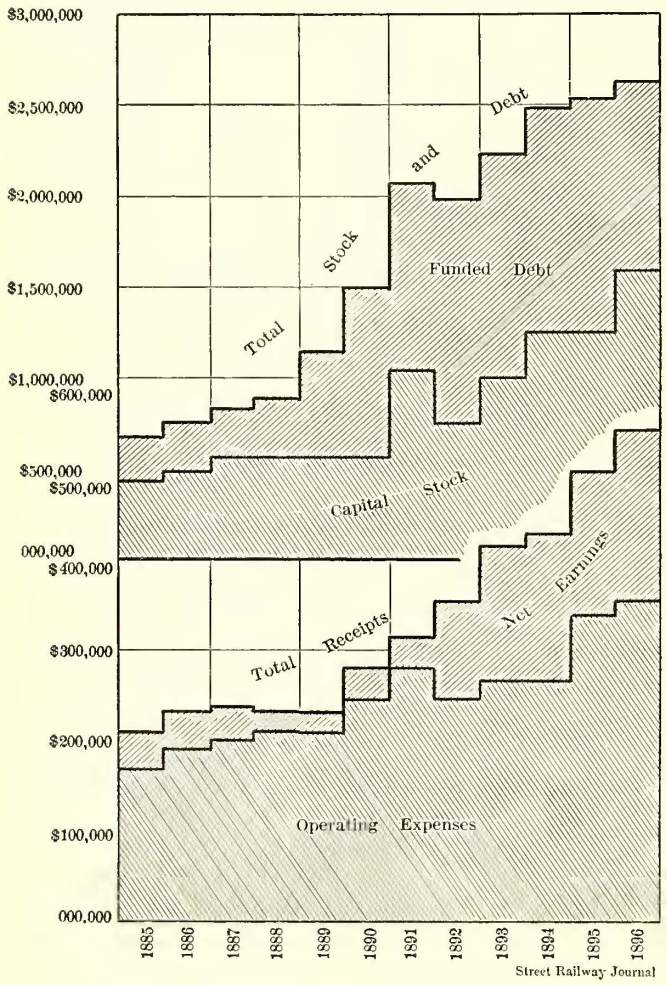
	January	February	March	April
Kilometers traveled by				
4 axle motor cars	43577.8	38242.9	43864.2	44354.0
" trailers	7298.0	9223.6	10253 0	13141.1
" freight cars	.....	4144.3	4843.3	5202.7
2 axle motor cars	15992.1	14994.1	12869.1	12777.7
" trailers	.....	.....	36.8	453.4
Number of long distance passengers carried	50,763	44,673	45,726	53,576
Number of local passengers carried	43,036	25,643	27,886	30,974

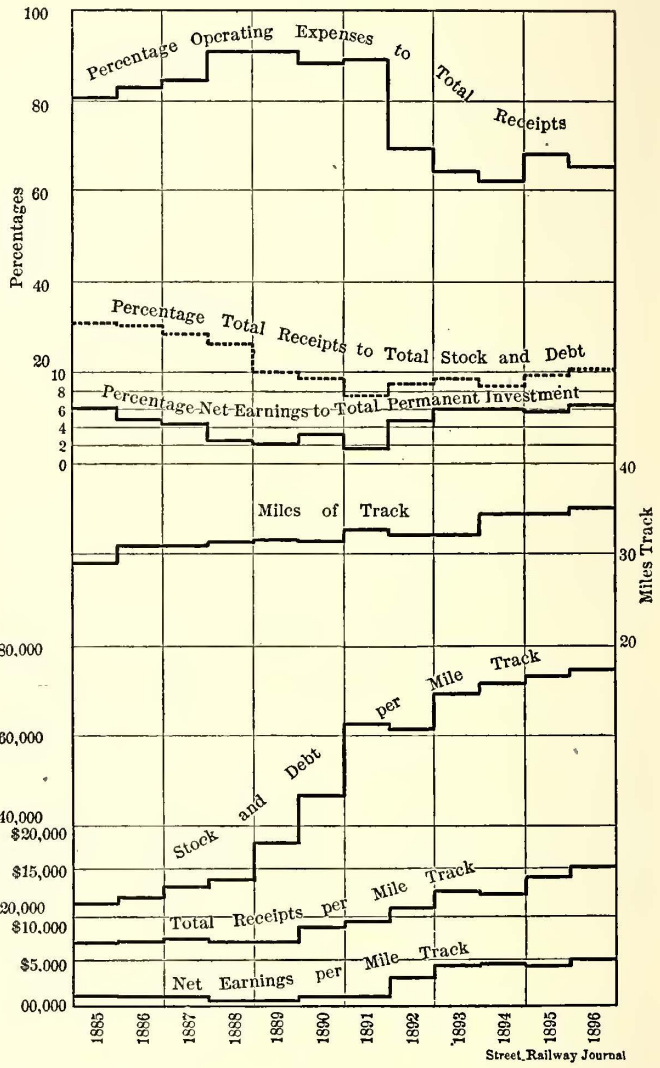
Financial and Operating Reports in Diagrammatic Form for Use of General Managers

During the past two or three years the Street Railway Journal has several times called attention to the value to the street railway manager of diagrams, or "curves," in interpreting the financial results and details of operation of his system. In no other way can five and ten year reports be so well examined and compared. The usual system of comparing "this year" with "last year" by figures is oftentimes unsatisfactory, in that one or both of the two years may be exceptional in certain respects, and it is often, if not always, desirable to have before one on the same sheet the results of several years' operation.

In Figs. 1 and 2* may be seen one form in which the general results from the operation of a street railway for many years can be compared. A diagram in this same form can be made for months, as well as years, so that nineteen diagrams would reflect comparative monthly, quarterly, semi-annual and annual reports covering any desired period—ten, fifteen, or twenty years.

Mr. H. C. Mackay, auditor of the Milwaukee Electric Railway & Light Company, about a year ago presented to General Manager John I. Beggs a pocketbook, in which appeared in diagrammatic form, but on a system somewhat different from that just illustrated, practically all the details of operation, information concerning which would be desired. Illustrations of two or three of the typical pages of this book are given herewith. Each year is traced through the different months by a line of a given color of ink. On completing the year another line commences with January, and is traced through the following year in another color. Five colors, red, black, purple, green and blue are provided for in the general scheme, and the result is, perhaps, more distinct than appears in the accompanying illustrations, where black lines only are used. Every detail of gross receipts and operating expenses, in both railway and lamp departments, is represented by these diagrams in Mr. Beggs' pocketbook, and from the index in front the desired page can be quickly found.





FIGS. 1 AND 2.—MILWAUKEE NOTE BOOK

The general manager of the Maple Leaf line, a large steam railroad of the West, employs a clerk whose sole business it is to translate into diagrams of this form all the figures submitted by the auditing department. In this way Mr. Stickney can rapidly go over the reports of each month, seeing at a glance whether or not pay rolls are being increased or diminished, and to what extent, and where leakages occur, and can get a much better comparative bird's eye view of the entire system in its operating and financial phases than could possibly be obtained in any other way except by the expenditure of far greater time.

*From Street Railway Journal, July, 1897, pp. 410-11.

Electric Railways at Florence, Italy

One of the first of the modern electric railways in Europe was built in Florence, in 1891, and connected that city with Fiesole, a mountain suburb of the city. During the last year, however, the principal tramway company of the city, la Société des Florentins, has completed the equipment of its lines, comprising about 60 km. of track,

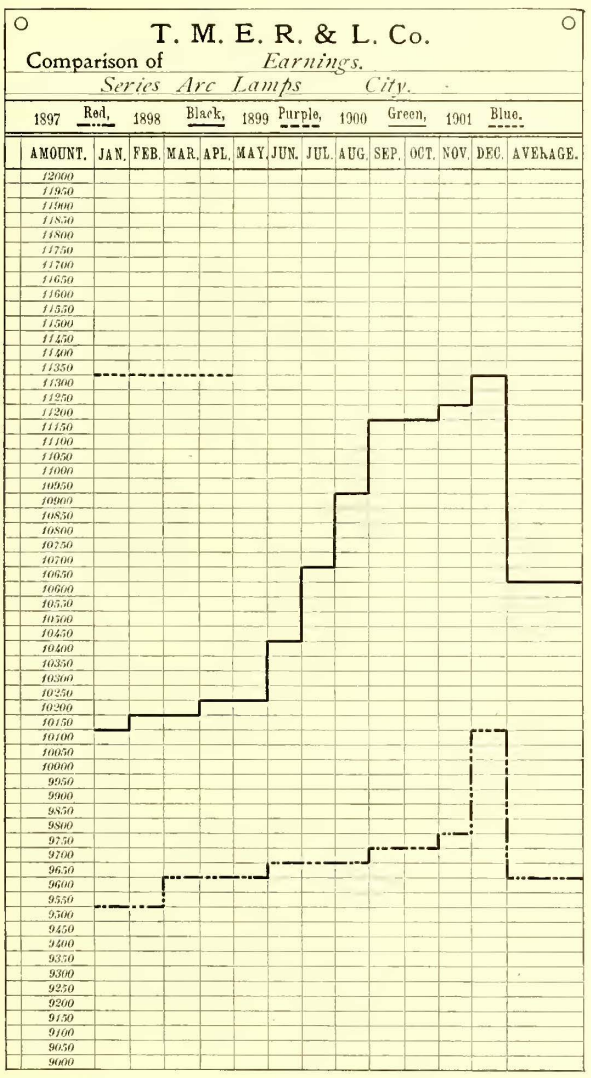
and the famous city of Savanarola, Dante and Galileo now possesses an electric railway complete in modern equipment. The installation was made by the French Thomson-Houston Company, and was put in operation Dec. 5, 1898.

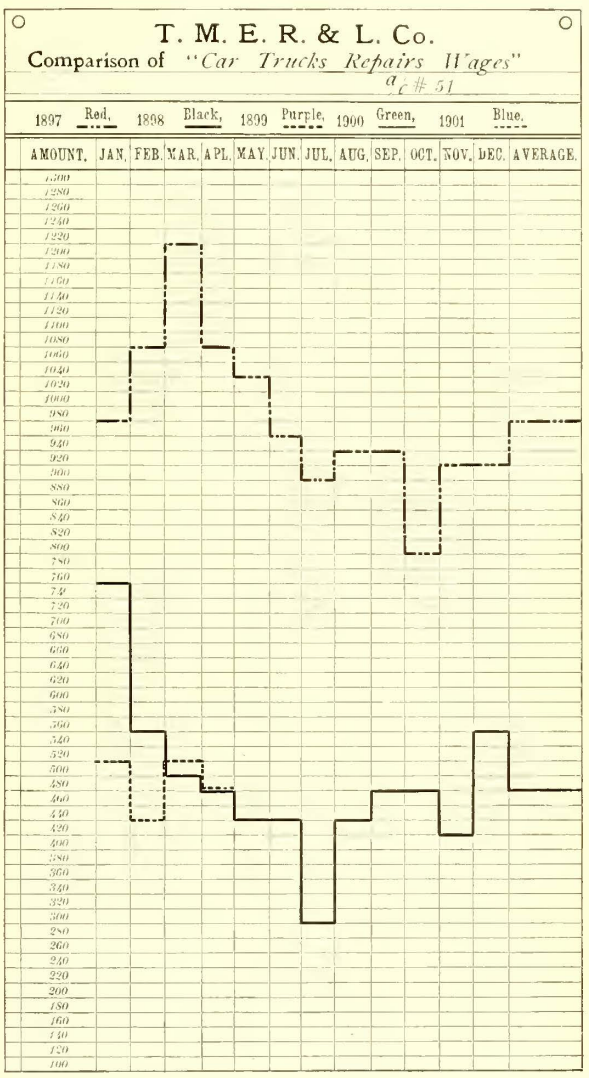
The track construction within the city is made up of the standard Broca rails, weighing 34 kg. per m., and mounted on metal ties weighing 18.75 kg. each, and spaced seven to every ten meters. In the suburbs the Vignole rail is used, weighing 24 kg. per m., laid on oak ties. These rails have a length of 9 meters and each rests on ten ties. The rails are bonded with the Chicago rail bond, 9 mm. in diameter, and are cross connected every 50 meters. The return feeders are made up of old rails weighing 30 kg. per m., connected electrically and buried a distance of 700 mm. in the ground. The outgoing feeders are also carried underground in the center of the city, and are of 250 mm². and 500 mm². section. The suburban feeders are entirely overhead and are composed of bare copper wires of 250 mm². and 125 mm². section.

The overhead system is standard, with a trolley wire 8.25 mm. diameter and is divided into sections of about 50 meters in length, each equipped with a lightning arrester.

The power station is a handsome building, the front of which is finished in the characteristic Italian style with alternating horizontal stripes of dark and light material, and is located about the center of the system. The boiler room contains four Weinlig boilers, each with a heating surface of 155 m². and capable of furnishing 2500 to 3000 kg. of dry steam per hour under a pressure of 9 atmospheres. Green economizers are used, and the chimney is 55 meters in height. The engine room contains three Escher Wyss & Company's tandem, compound condensing engines, two of 700 i.h.p. each and the third of 350 h.p., all running at 120 r.p.m. The air pumps are operated directly from the engine shaft, but the condenser pumps are driven by a 25-h.p. electric motor. A traveling crane of 15 tons capacity completes the mechanical equipment of the engine room.

The generators are of the Thomson-Houston M. P. type. Two are of 425 kw. capacity, and one of 225 kw. capacity. The switchboard is made up of eight panels, of which three are for the generators, two for the feeders, one a totalizer panel, one for the distribution of electric power and one a lighting panel for station and car house use.



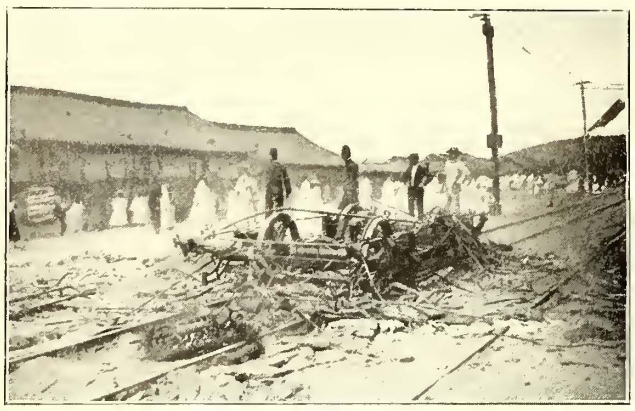


FIGS. 3 AND 4.—PAGES FROM MILWAUKEE HAND BOOK

There are seventy-five cars, of which sixty are closed cars, each equipped with two G. E. 800 motors; ten are open cars with the same equipment and five are closed cars equipped with two G. E. 57 motors. The latter cars are intended to act as locomotives in driving ordinary freight cars within the city, where steam locomotives are not permitted. The cars carry thirty-eight passengers each, and are equipped with electric brakes and are mounted on Brill trucks. The company also possesses a number of trail cars which are used on days of special traffic, but are not employed under ordinary operating conditions. These cars are also equipped with electric brakes.

Electric Railroading in Corea

Some of the difficulties of operating electric railroads in oriental countries are almost as great as those experienced in this country, and occasionally a mob will take offense at the management of the railroad and destroy nearly as much property in the same length of time as a more civilized mob provided with improved instruments of destruction can accomplish in the same length of time in this part of the globe.



RUINS OF CAR IN COREA

An incident of this kind occurred on May 26 at Seoul, Corea, where an electric railway has been in operation for a few months. It was the first road of its kind in the country, and at the start the natives took kindly to it, the opening celebration continuing practically for a week. Unfortunately for the railway company, however, soon after the opening of the line a drought occurred, which threatened the failure of the rice crop. As the most likely cause, the natives imagined that rain was cut off by the electric wires, and to them the most obvious way to obtain the needed showers was to remove the objectionable cause. This they proceeded to do by tearing down the trolley wires and burning the cars. The result of a few hours of this pastime is shown in the accompanying engraving, where the only thing left of the cars was the J. G. Brill trucks on which they were mounted, and which do not seem to have been injured by the conflagration above them. It is interesting to note that order was very quickly restored after this example of the mob's violence, as the method adopted by the government was a simple one, and consisted in cutting off the heads of some of the rioters.

CLEANING AWAY THE DEBRIS

The simple minds of the natives soon comprehended that droughts and trolley cars are less serious calamities than the loss of one's head, and are likely to leave the cars alone in the future.

According to the press dispatches of the riot the disturbance was largely quelled by two officers of the company, H. R. Bostwick, formerly of San Francisco, manager of the Seoul Electric Railway Company, and H. Raymond Krumm of Columbus, Ohio, chief of the Imperial Engineering Department, who, alone and unarmed, by their coolness and nerve dispersed a howling mob of from 3000 to 4000 Orientials and saved their own lives, the power house and electric plant.

New Road in Massachusetts

Westminster and Gardner, Mass., are two towns respectively 7 and 12 miles west of Fitchburg, Mass., on the line of the Fitchburg Railroad. The village of Westminster is about a mile and a half distant from the railroad station of that name, and between it and Fitchburg no adequate accommodation for local traffic can be obtained through the steam road. The Gardner, Westminster & Fitchburg Street Railway is an electric line, of which all but three miles have been completed, connecting the three places named. Frederick S. Coolidge, of Fitchburg, is president, and the general management of the road is to be in the hands of M. A. Coolidge, who has the contract for construction, and will do all buying for the work.

A power house and car barn are now being erected at Westminster. H. G. Howard, of Ashburnham, has the contract for the former, which is of brick, 82 ft. x 85 ft. The car barn is being built by M. C. Ryan, of Gardner, and is of wood, with brick underpinning. It will be heated by steam from the power station.

The boilers are three in number, of the horizontal tubular type, 72 ins. in diameter by 21 ft. 6 ins. long, built by D. M. Dillon, of Fitchburg. They are to rest on ordinary brick settings with rough stone foundations and are to have firebrick linings throughout. The engines are two Slater cross compounds, 14 ins. x 28 ins. x 36 ins., of 300 h.p. each. They will be erected on brick foundations over a concrete bed 2 ft. deep, the outside dimensions of the foundations being 25 ft. 4 ins. x 20 ft. 11 ins. The stack is of brick, 10 ft. 8 ins. square outside, with a circular core 5 ft. in diameter and 85 ft. high. The piping contract, including the heaters, pumps, etc., has been placed with the Walworth Construction & Supply Company, of Boston. Warren pumps and condensers, Cochrane separators, Wheeler heaters, Crane valves, Metropolitan injectors and Johns' asbestos fire felt covering will be used throughout. The generators are two 225 kw. General Electric 550-volt machines. The car equipments, also furnished by the General Electric Company, include motors for eight double truck cars. Hodges & Harrington, of Boston, are the engineers for the power plant.

The individuals controlling the road form also a majority interest in the Gardner Street Railway, a road covering some 5 miles of streets in the town of Gardner. This road is at present supplied with power by the Gardner Electric Light Company, but will be operated from the Westminster plant when the latter is completed.

I realize that it is a hard matter for the Government to make a flat rate to cover all roads and the local condition pertaining to each road; but as they have attempted to do this, I claim that they should have made the rate flattering enough to the electric railroads to make them at least interested in the subject, and that three cents per mile for pouch service and sixteen cents per mile for 16-ft. cars, which are fast becoming obsolete and replaced by cars from one-third to twice as large, is not enough. From paper at the Boston Convention, 1898.

The Recent Street Railway Strikes

The Brooklyn strike of July was due to dissatisfaction among the men of the Nassau Electric Railway system, which has recently been taken into the great combination which now controls nearly all the surface and elevated railways of Brooklyn. The Nassau men are said to be made up largely of former strikers who were "locked out" in the last great Brooklyn strike, and who remained out of work until the Nassau system was built by the Johnsons, by whom they were largely re-engaged. Rightly or wrongly, these Nassau men seem to have felt that their past record was being brought against them by the management of the Brooklyn Rapid Transit system, and that sooner or later practically all would be discharged upon one pretext or another. It was also claimed by them that the provisions of the ten-hour law were being evaded and that the men, particularly in the Nassau system, were obliged to run their cars at high speeds under serious nervous strain for more than the legal limit of a day. All other grievances than these two were merely perfunctory or non-existent.

There appears to be little doubt that strike feeling was secretly fostered by Wall Street speculators for the fall, and at a critical moment Albert L. Johnson, formerly president of the Nassau system, came out in open championship of the cause of his old employees, and as a contributor to their funds. Almost immediately after this the strike was declared.

There was never from the first the slightest hope of success. The disaffection was not general, but highly localized, and in spite of the most urgent effort on the part of the strikers, but few of the employees of the Rapid Transit system, outside of the Nassau lines, could be induced to "go out." The strike was short lived, and ended in a lock-out of most of the Nassau men and a few of the remainder. There was some violence, including one serious case where dynamite was used to blow up a portion of the elevated structure, but the prompt and stern determination of the police to preserve order at all costs was largely effective in preventing serious riots or bloodshed.

The strike on the Metropolitan Street Railway system was a roaring farce. The absurd Parsons, Grand Master Workman of the Knights of Labor, pretended at first to represent a powerful organization among the Metropolitan employees, although nearly 90 per cent of the latter had signed a statement which they sent to President Vreeland to the effect that they were entirely satisfied with their treatment, and had appointed no representatives to present grievances. Later on, certain over-enthusiastic followers of Parsons, who were chiefly ex-employees of the Metropolitan Company, demanded that he declare a strike, and although he used his best efforts to prevent this, fearing, no doubt, that the weakness of his alleged organization would thereby become known, he was carried away and practically forced to declare the strike. As a result hardly one hundred men out of the 3500 Metropolitan employees responded to his call. The cars ran almost as usual throughout the city, and the great body of employees remained loyal to the management which has done so much to improve their condition during the past six or eight years. Statement after statement was issued by Parsons to the effect that the tie-up was complete, and the remainder of the men would go out immediately, but the employees themselves laughed him to scorn and went about their business. There was practically no violence on any line except the Second Avenue, where, in fact, the disaffection was chiefly localized, this having been one of the last properties to be brought into the Metropolitan system.

The Cleveland strike in its revived form belongs to a wholly different and far more dangerous class than the New York strike. As Mayor Farley of Cleveland says, "Our people seem to have gone crazy." The strikers have actually come out with a public statement justifying violence as necessary—a very rare thing in strike annals, where the labor leaders generally disclaim all attempts at violence, and frequently allege that it is practiced by the friends of the railway company in order that the men may lose sympathy in their struggle. Never before have high explosives been so freely used as in the Cleveland strike to date. Cars have been blown up, bombs have been thrown into car houses, shots have been fired at cars, passengers and non-union motormen, and the latter have been maltreated at every opportunity. To quell the insurrection, for it is little less than that, the local troops have all been ordered out, and the State troops called for, and Mayor Farley states that no effort will be spared to stop the reign of terror which now exists in Cleveland. It is much to be feared that a large part of the trouble has been due to lack of firmness of the city government in dealing with the strikers at the beginning of the difficulty, but the authorities now seem fully aroused to the occasion, and the result cannot be in question.

New Railway in Ohio

The new line being built at Galion, Ohio, by the Ohio Central Traction Company is nearly completed, and the company will commence operations soon. The company owns 12 miles of track, laid with 60-lb. T rails, and about eight cars. Four of these cars will be 36-ft. double-truck combination cars, and four ten-bench open cars. The cars will be mounted on the Brill maximum traction and No. 21 trucks, and the cars will be built by the American Car Company. The power station will contain two 250-h.p. Slater engines, two 150-kw. General Electric generators, and two 250 water tube boilers built by the Turner Engineering Company, of Bucyrus, Ohio. Located on the route of the road will be a park, known as Secaium Park. It comprises 58 acres, and is being fitted up with a summer theater, which will seat from 800 to 1000 persons, also with a large pavilion, seats, tables, etc. The president of the company is I. A. Kelsey, of West Haven, Conn., and the general manager, W. E. Haycox.

Chartered Car Rates in Rochester

The Rochester Railway Company, of Rochester, N. Y., publishes the following as the rates for chartered cars during the coming season:

CITY LINES

One motor car to any point	$4.00
One motor car and return	6.00
One motor car and trailer to any point	5.00
One motor car and trailer and return	9.00

CHARLOTTE AND WINDSOR BEACH

One motor car one way	$6.00
One motor car one way and return	10.00
One motor car one way with trailer	9.00
One motor car one way with trailer and return	14.00

CHARTERED CARS (BY THE HOUR)

First hour	$4.00
Each hour after	2.00

PRIVATE CAR

First hour	$5.00
Each hour after	2.00

One motor car and trailer will carry 100 passengers comfortably

LEGAL NOTES AND COMMENTS*

Edited by J. Aspinwall Hodge, Jr., of the New York Bar

The Constitutionality of the Ford Amendment to the New York Tax Law

In the June number of the Journal we commented upon the taxation of franchises, and especially upon the tax proposed by what was known as the Ford Franchise bill, which has since become an act of the New York Legislature, after having been amended in two important particulars.

The constitutionality of that act, owing chiefly, if not wholly, to the amendments which were made to it at the instance of the Governor in the extra session of the Legislature, is being seriously questioned and upon two grounds.

First, it is contended that the act is unconstitutional in that it provides for the appointment by the Governor of officers who shall make local assessments for the purpose of taxation; while the constitution provides, in section 2, of article 10, that all State, town and village officers whose election or appointment is not otherwise provided for by the constitution, shall be elected by the electors of such city, town or village or appointed by such authorities thereof as the Legislature shall designate for that purpose.

The supporters of this contention cite the case of the People vs. Raymond, 37 N. Y., 428. Chapter 410 of the Laws of 1867, provided for the appointment, by the Governor, of an officer to be known as the Commissioner of Taxes and Assessment of the City and County of New York, and the constitutionality of the act was attacked in that case.

In answer to the argument made by the counsel of the opponents of the act that additional powers and duties were conferred upon the office created by the act, and that the office was a new one, and so was not within the prohibition of the constitution, the court observed:

"If offices can thus be made new, the section of the constitution above quoted may readily be made a nullity. I am far from conceding that it would be competent for the Legislature to take from the city all control over the assessment of the property of the city for purposes of taxation, and vest this power in the central authority, by conferring powers upon the officers or boards, upon which they conferred it over other subjects, and imposing duties upon them entirely foreign to those of making the assessment."

But it is to be noted that the powers and duties of the commissioner under that act were limited to the territory of the city and county of New York.

We are not able to subscribe to the proposition that this case establishes the proposition for which those who cite it contend, especially in view of other decisions of the Court of Appeals, beginning with the case of the People vs. Draper, 15 N. Y., 532, the doctrine of which was reaffirmed in the People vs. Shepard, 36 N. Y., 285.

The Draper case involved the constitutionality of the act creating the Metropolitan Police District. There the Court of Appeals held that an act was constitutional which created the office of Police Commissioners (who were admittedly local officers when appointed for a single city) to act in a territory to be known as the Metropolitan District, including the city of New York and some contiguous territory. And this, notwithstanding that it was admitted that had they been appointed for a single city, the prohibition of the constitution would apply and notwithstanding that it was contended with reason that the act created a new political division of the State.

It will be noticed that the Ford bill appoints officers who would be local were they appointed for any particular city, but gives to them powers and duties over the entire State. The act, therefore, is not as open to constitutional objections as the act passed upon in the Draper case, for no new political division of the State is created by the Legislature fiat, and the State officers who are appointed have duties in every city alike.

It is quite true that the Draper case was very severely criticised in the Court of Appeals in the case of the People vs. Albertson, 55 N. Y., pp. 50, 64, but the criticism there made by Judge Allen, writing for the Court, is rather directed to the creation of the Metropolitan District than to the proposition which is involved in the appointment of a general State officer to perform duties throughout the State, and distinguishes between an office created for a particular locality and one which covers a larger legitimate political division.

The principle of the Draper case that the officer who performs duties beyond, as well as within, the limits of a particular locality is not a local officer of that locality, whatever his duties may be in it, has never been overruled by the Court of Appeals.

The second, and it seems to us more serious objection, to the constitutionality of the act, is that the tax levied is unequal.

By the amendment to the bill, it is provided that if it shall appear that the person or corporation owning a franchise has paid during the preceding year to the city, town or village any sum of money on account of the franchise, all such amounts, except such as is paid for paving or repaving the streets, shall be deducted from the tax levied and the remainder shall be the tax that is payable by the holder of the franchise.

We have in a preceding article referred to the inequality which distinguishes between a payment on account of paving and payments made for other purposes. But the objection on the ground of inequality is broader and goes deeper.

It would readily be admitted that a system of taxation is unconstitutional, because unequal if it provides that a real estate owner who could show that he paid a larger sum for his property, which he had purchased from the State, than his next door neighbor, should have a deduction made from the tax levied upon him. Yet this is what the amended Ford act does.

An individual or a corporation (for the act applies to both) who owns a franchise is to be granted a deduction if he is, by some previous agreement, paying a part or the whole of the purchase price in instalments. As between a corporation which has paid a lump sum for a franchise and one which has bargained for an annual payment, however computed, the discrimination is seemingly unjust and the tax unequal.

The only answer to this serious objection is that the State might have remitted the annual payment; in other words, forgiven its debtor, and then levied a tax on all alike. Thus in two acts, neither of which would have been unconstitutional, the Legislature would have accomplished the same result as has been attempted in the Ford act. The supporters of the constitutionality of the act are entitled to any comfort they may derive from that consideration.

H.

CHARTERS, ORDINANCES, FRANCHISES, ETC.

CONNECTICUT.—Franchise—Location—Terminus—Description.

A street railroad charter described the location and terminus of the road as "over and through Main street in the town of S. to

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

a convenient point in said town, where connections can be made with the 'S. & P.' Electric Railroad," and authorized it to connect with any other street railroad. Held, that the terminus was sufficiently described, and the right to build the road was not affected by the fact that the "S. & P." road was abandoned, and connection could not be made with it.—(Central Ry. & Elec. Co. vs. N. Y., N. H. & H. R. R. Co., 43 Atl. Rep., 490.)

NEW YORK.—Nuisance—Implied Powers—Injunction—Appeal.

1. Where the trial court does not fully state the facts found, but decides that defendant's conduct amounts to a nuisance, the Court of Appeals, after an affirmance by the Appellate Division, must assume the existence of the nuisance.

2. Where a statute authorizes a company to construct and operate a railroad, the implied authority to operate a turntable in connection therewith does not justify its operation, so as to constitute a private nuisance.

3. Where a continuing trespass is shown, which must necessarily result in substantial damages to plaintiff's property, which are in no way offset by benefits, a permanent injunction may be issued, although the amount of the damages is not fixed.—(Garvey vs. Long Island R. R. Co., 54 N. E. Rep., 58.)

LIABILITY FOR NEGLIGENCE.

ALABAMA.—Injuries to Passenger Alighting—Argument of Counsel—Instructions—Negligence—Discharge of Passenger—Sudden Starting—Contributory Negligence.

1. In an action for death of a passenger, caused by a sudden jerk of a street car while he was attempting to alight therefrom, the evidence tended to show that, through negligence of the conductor, the car was carried beyond the passenger's destination. The conductor testified that the passenger was drunk, used profane language, and made faces at some women on the car. There was evidence to contradict these statements. Held, that a statement of plaintiff's counsel, in argument, that, not satisfied with taking the passenger's life, the conductor attempted to rob him of his good name, was not improper.

2. In an action for death of a passenger, claimed to have been caused by a sudden jerk of a street car while he was alighting, a passenger testified for the company that, to the best of his recollection, the car stopped at the crossing. All of the company's testimony was not introduced to show that the car so stopped. Held, that a charge that some of the testimony offered by the company tended to show that the car stopped at the crossing was not erroneous.

3. In an action for death of a passenger, claimed to have been caused by a sudden jerk of the car while he was alighting therefrom, a witness testified that the car slowed up almost to a standstill, it being hard to tell whether it was going or standing still. The court charged that some witness testified that the car so nearly stopped that its motion was almost imperceptible, but subsequently withdrew the statement, saying merely that some of the testimony tended to show that the car slowed up. Held, not error.

4. Where a street car, having failed to stop at a crossing in compliance with a passenger's request, slows up beyond such crossing to such an extent as to imply an invitation to him to alight, it is the duty of the operatives not to cause the car to jerk suddenly so as to endanger his safety.

5. Where a street car slows up to allow a passenger to alight, and he is injured by a sudden jerk thereof, his attempting to alight before the car actually stops cannot be held contributory negligence, as matter of law, but it is for the jury to determine, though the passenger carried a small bundle under one arm (which, however, was not shown to have incumbered him), whether he was negligent or not.

6. In an action for injuries to a passenger, some witnesses testified that, when the street car had slowed up nearly to a standstill, the passenger attempted to alight, and by a sudden jerk of the car was thrown down. Other witnesses testified that the passenger was thrown from the platform after the car had started, and while it was going six or eight miles an hour. It was admitted that the passenger was negligently riding on the steps or platform in violation of the rules. Held, that a charge that such negligence alone would not defeat a recovery, unless it proximately contributed to the injury, was proper.

7. In an action for injuries to a passenger, claimed to have been caused by a sudden jerk of the car, throwing him off, a charge that, if the injury resulted from the passenger's riding on the platform, he could not recover, was properly refused, as it did not hypothesize such riding as the proximate cause.

8. Ordinarily it is not, as a matter of law, contributory negligence for a passenger, when the street car is slowing up to allow him to alight, to go upon the platform or steps before the car has actually stopped.—(Birmingham Ry. & Elec. Co. vs. James, 25 So. Rep., 847.)

CONNECTICUT.—Crossing Track—Negligence—Evidence—Default—Appeal—Review.

1. In a negligence case, in which the question of legal liability is purely that of prudent conduct under circumstances peculiar to the case, and no violation of law by the trial court is apparent from the record, its conclusion as to negligence or legal liability, including the measure of duty and the extent of its performance, is final.

2. Deceased passed a street car standing at its termius ready to start in the direction in which he was traveling with a wagon. After traveling alongside of the track for some time he turned to cross the track, and was struck by the car and killed. He did not stop before turning across the track, and it did not appear whether he looked back or listened before attempting to cross. He was slightly deaf. When he started to cross the car was at least 70 ft. from him, and he had time, at the speed at which he was driving, to have crossed the track ahead of the car had it been going at its ordinary and proper rate of speed. Held, in an action to recover for deceased's death, that he was not guilty of contributory negligence as a matter of law.

3. On the hearing in damages after a default in an action against a street railway company to recover for death of a person run over by its cars, it appeared that deceased was driving alongside of the track, and turned to drive across the track, when he was struck by a car from behind and killed. The car was coasting down a heavy grade at a speed greater than its ordinary, proper rate, and after seeing deceased on the track not less than 70 ft. ahead of him, the motorman was unable to stop the car until after it had gone 200 ft. further, though it could be stopped within 70 ft. when going at its usual rate of speed. In trying to stop the car the motorman failed to sand the track, which was slippery in places. Held, that a finding that the street railway company had not shown its freedom from negligence was warranted, as after the default the burden of proof was on it.—(Lawler vs. Hartford St. Ry. Co., 43 Atl. Rep., 545.)

ILLINOIS.—Injury to Persons Near Track—Questions for Jury—Instructions—Motion in Arrest of Judgment.

1. Plaintiff was on a crossing near a sidewalk, beside a policeman, waiting to cross a street crowded with vehicles, when defendant's cars came around a curve at a speed of about six miles an hour, and the gripman, not seeing or not heeding the policeman's signal to stop, ran against a vehicle, throwing it against plaintiff, causing her injury. Held, that whether plaintiff was exercising ordinary care for her own safety, and whether defendant was negligent, were questions for the jury.

2. The refusal of an instruction limiting the damages alleged to have been sustained by plaintiff to a just compensation for the injury is not erroneous, where the court had instructed that no exemplary damages were allowable.

3. A motion in arrest of judgment, because of a defect in the record, in that the declaration was not filed ten days before the second term of the court at which the suit was begun, is properly overruled, where the declaration was filed before the date on which defendant was served with summons.—(Chicago City Ry. Co. vs. Roach, 54 N. E. Rep., 212.)

ILLINOIS.—Personal Injuries—Evidence—Instructions.

1. Where, in an action for personal injuries caused by plaintiff's wagon being struck by defendant's car, there was evidence that after the wagon was struck it was carried 70 to 80 ft. before the car could be stopped, and there was conflicting evidence as to the rate of speed at which the car was moving, the question whether the car was moving at a negligent rate of speed was properly left to the jury.

2. Where there is no evidence that defendant was negligent in any manner other than that charged in the declaration, and the jury were charged that the evidence must show that defendant was negligent as charged in the declaration, a charge to find for plaintiff if they found defendant negligent is not error, although it does not limit the negligence to that alleged in the declaration.—(West Chicago St. Ry. Co. vs. Musa, 54 N. E. Rep., 168.)

INDIANA.—Receivers of United States Courts—Action for Death of Husband—Damages—Instructions—Instantaneous Death—Survival of Cause of Action.

1. Under 25 Stat., 436, providing that every receiver of any property, appointed by any United States court, may be sued in respect to any act or transaction of his in carrying on the business connected with such property, without previous leave of the court in which he was appointed, but such suit shall be subject to the general equity jurisdiction of the court in which he was appointed so far as necessary to the ends of justice, an action can be maintained in the State courts against a receiver operating a railroad for negligence, without first obtaining leave from the United States Court appointing him.

2. Five thousand dollars is not an excessive verdict in favor of a widow for the wrongful death of her husband where he was in good health; fifty years of age; was at at the time of his death earning $1,150 per annum as United States postal clerk, which position he had held for seventeen years; left a wife and two children dependent upon him, nineteen and fourteen years old, and his expectancy of life was about twenty-one years.

3. In an action for wrongful death, it is not necessary to show that deceased would have been able to continue to earn what he was receiving at the time of his death, or what part of his earnings he expended for the benefit of his family, or what part of his time he spent with his family, or what part he took in raising and educating his sons, in order to entitle his widow to more than nominal damages.

4. In an action by a wife for the wrongful death of her husband, an instruction that she is entitled to recover for the pecuniary loss sustained by her is not erroneous, as being vague, in defining the damages to which she was entitled, in the absence of a request for more explicit instructions.

5. In an action under the statute, which provides that whenever the death of a person shall be caused by the wrongful act of another, and it is such as would, if death had not ensued, entitled the party injured to maintain an action and recover damages therefor, then the person who would have been liable if death had not ensued shall be liable to an action by the personal representative of deceased for the exclusive benefit of the widow and the next of kin, an instruction that plaintiff cannot recover if her intestate's death was instantaneous is erroneous, as the statute does not contemplate the survival of a cause of action which would otherwise abate with death, but creates a cause of action.—(Malott vs. Shimer, 54 N. E. Rep., 101.)

INDIANA.—Actions for Death of Child—Who May Sue.

Under Horner's Rev. St., 1897, Sec. 266, providing that a father (or, in case of his death, the mother) may sue for damages for injury or death of a child, a woman who is neither the mother of a child nor has legally adopted it cannot maintain an action for damages for its death, although she has raised it from infancy, and maintained and supported it as her child.—(Citizens' St. Ry. Co. vs. Cooper, 53 N. E. Rep., 1092.)

KANSAS.—Degree of Care—Injury to Passenger—Acts of Intermeddler—Negligence of Employee—Objections to Evidence.

1. A street railway company is bound to the highest possible caution and prudence in letting off its passengers at its stopping places, and its employees must not merely wait a reasonable time to enable the passengers to alight, without looking to see whether such has been done, but they must see and know that the passengers are safely off before starting the car in motion again.

2. When a street railway car is negligently started in motion before a passenger endeavoring to leave it has safely alighted from it, and while it is so in motion the passenger is seized with an attack of dizziness, which prevents him from holding on, and, in consequence, he falls off and is injured, the company is liable.

3. A street railway company is not responsible for injuries resulting from the act of an intermeddler in the running of its cars, which its employees could not foresee and guard against; but when such act of intermeddling consists in giving the signal to start the car in motion, and the conductor in charge, without seeing and knowing that a passenger has safely alighted before the car started, does not stop it as soon as can be, but allows it to continue in motion in obedience to the unauthorized signal, he will be held to have ratified and adopted the act of the intermeddler, and the company will be liable for the consequent injury as caused by an act of its employee's negligence.

4. If, by custom among street railway employees, known and assented to by the company, those who are on duty are in the habit of calling for and receiving assistance from those who are not at the time on duty, and an employee off duty, thus called upon, undertakes to render the assistance asked, he will be regarded as in the employ of the company for such service; and, if he negligently abandons the work before completing it, whereby injuries to a passenger occur, the company will be liable.

5. If, however, such custom does not exist, or, existing, is not known and assented to by the company, but an employee on duty deputes the one off duty to assist him, and he undertakes to do so, but negligently fails to fully perform it, whereby injury to a passenger occurs, the company is likewise liable, because of the negligent abandonment of duty by the employee directly chargeable with its performance.

6. When additional bodily injuries and damages resulting therefrom were not alleged in the plaintiff's petition, but evidence of them was received upon the trial without objection by the defendant, and upon which evidence the defendant cross-examined the witnesses giving it, an objection to it cannot be made for the first time by a request to instruct the jury to disregard it in making up their verdict.—(Leavenworth Elec. Ry. Co. vs. Cusick, 57 Pac. Rep., 519.)

MICHIGAN.—Crossing Street Car Tracks—Duty to Look—Contributory Negligence.

A woman, twenty-six years old, who has crossed street car tracks at the place where she is injured for about a year, and is familiar with the running of cars thereon, will be guilty of contributory negligence when she stands about six feet from the track to permit a car to pass her, and then passes behind the car and in front of a car on the other track, going in the opposite direction, by which she is injured, and there is a space of 5 ft. between the tracks, and no physical obstacle to prevent her seeing the approaching car if she looks after the first car passes.—(McCarthy vs. Detroit Citizens' St. Ry. Co., 79 N. W. Rep., 631.)

MINNESOTA.—Injury to Passenger—Evidence—New Trial.

1. On the evidence, held, that the St. Paul City Railway Company and the Minneapolis Street Railway Company were jointly operating the Interurban Line, partly owned by each, and connecting the two cities, and each one is liable for the acts and omissions of the other in operating the same.

2. Held, the uncorroborated evidence of the plaintiff on the vital and essential point in the case is so inherently unreasonable and improbable that the trial court abused its discretion in failing to grant a new trial.—(Messenger vs. St. Paul City Ry. Co., 79 N. W. Rep., 583.)

MISSOURI.—Harmless Error—Speed of Car—Ringing Bell—Negligence of Parents—Instructions.

1. Failure of a street car company to equip its car with a fender, which would have prevented the injury complained of, is not, in the absence of an ordinance or statute requiring it, negligence.

2. Where, on cross-examination, a witness for defendant says that he testified in a certain way before the coroner, and his testimony on the trial is substantially the same, it is harmless error to allow counsel for defendant to read his testimony before the coroner (Rev. St. 1889, Sec. 2303), providing that the Supreme or Appellate Court shall not revise a judgment unless it believes that the alleged error materially affected the merits.

3. In an action to recover for injuries alleged to have been caused by the negligence of defendant's motorman and conductor, it is competent for the motorman (who has been shown to be experienced), after testifying to what was done, to testify that there was nothing else that he could have done, under the circumstances, to prevent the injury, as such testimony does not preclude the jury from finding from the other testimony that he could have done something which he failed to do.

4. In an action to recover for personal injuries, plaintiff alleged that defendant was negligent in running its cars at a greater rate of speed than was permitted by an ordinance. The evidence disproved this allegation. Held, that the court properly took the question of negligence on account of the speed of the car from the jury, as plaintiff was not entitled to rely on common-law negligence as to its speed.

5. A complaint alleged that defendant was guilty of negligence in failing to ring the bell on its gripcar as it approached the crossing where the injury occurred. Plaintiffs witnesses testified that they did not hear the bell, but admitted they were not paying attention, while defendant's witnesses testified that the bell was rung twice, which was the usual signal at a crossing. Held, that an instruction, at defendant's request (plaintiff making none), that, if the jury found from the evidence that the gripman rang the bell as the train approached the crossing, it must find for defendant on that issue, is not erroneous.

6. It is not error to refuse to give an instruction, though it states the law correctly, where there is no evidence in the case on which to predicate it.

7. An instruction that defendant is liable, even though the parents of the child killed were negligent in permitting it to be on the street unattended, if the person operating defendant's car which killed it was negligent, and his negligence was the immediate cause of the injury, and by the exercise of ordinary care and precaution the injury might have been avoided, is properly refused because it excludes the principle that defendant would be liable if, after the discovery of the danger in which the child was, the exercise of ordinary care would have averted the injury, and it failed to exercise such care, or if it failed to discover the danger through its own recklessness, when by the exercise of ordinary care it could have discovered the danger and averted it, and because it makes defendant liable, if negligent, though the negligence of plaintiff contributed to the injury.—(Hogan et al. vs. Citizens' Ry. Co., 51 S. W. Rep., 473.)

MISSOURI.—Injuries to Passengers—Negligence—Riding on Footboard—Contributory Negligence—Instructions—Trial—Witnesses—Contradiction.

1. In an action against a street railway company for the death of a passenger, caused by collision between the car on which he was riding and a broken-down wagon on the track, there was evidence that the gripman was engaged in conversation with a passenger, and was not looking at the track ahead of him. Passengers on the train testified that they saw the wagon on the traek when within 50 to 125 ft. from it, and the driver of the wagon and another testified that the driver had gone up the traek about 60 ft. to warn the approaching ear, but that the gripman paid no attention to him; the evidenee being conflicting whether the car could have been stopped within 40 ft. or in not less than 75 ft. Held, that the question of the gripman's negligence was for the jury.

2. A passenger on a cable car notified the gripman of his intention to get off at a erossing, and preparatory to doing so stepped on a footboard running alongside the car on which persons getting off the car were obliged to step. The motorman failed to stop at the crossing, and stated he would let the passenger off at the next erossing, and thereupon the passenger remained standing on the footboard, though there were empty seats in the car, and, before reaching the next street he was killed by the car eolliding with a wagon on the track. Held, that the passenger was not guilty of eontributory negligenee in remaining on the footboard while the ear was going to the next crossing, the position not having been voluntarily assumed by him.

3. Nor was he guilty of contributory negligenee in that he saw the obstruction which caused the injury on the track ahead of the car in time to have stepped back into his seat, and failed to do so, as he had a right to assume that he would be carried safely, and that the gripman would see the obstruetion in time to prevent a collision.

4. A passenger confronted with sudden danger while on a car is not guilty of contributory negligence merely beeause he fails to exercise what might have seemed to others the best judgment in trying to avoid the danger.

5. In an action against a street railway company for the death of a passenger from injuries received while riding on a running board used to step on in getting on and off the car, an instruction that if the passenger voluntarily left his seat in the car to ride on the running board, and that he would not have been injured had he not been standing thereon, and if the position on the running board was an unsafe one for passengers, no recovery can be had, is properly refused, since it prohibits a recovery notwithstanding the carrier's failure to exercise the greatest care to carry him safely, though he had voluntarily assumed an unsafe position.

6. In an action for the death of a passenger from injuries received while riding on a car, an instruction that if the passenger voluntarily left his seat, and took up the position in which he was injured, and that he would not have been injured had he remained in his seat, no recovery can be had unless the person in charge of the car saw him in his position of danger in time to have prevented the injury, is properly refused, as it assumes that the position which the passenger took was dangerous as a matter of law, and that no recovery could be had, though the injury was caused by the negligent management of the train.

7. A witness cannot be contradicted by proof that on a prior occasion he expressed an opinion at variance with the facts testified to by him.

8. In an action for the death of a street car passenger from injuries caused by the car in which he was riding colliding with an obstruction on the track while the passenger was riding on the footboard of the car preparatory to getting off, the charge being negligence, in that the collision could have been avoided with ordinary care, an instruction that the carrier is liable if the injury was the result of even slight negligence in the management of the train, is not erroneous as enlarging the issues.

9. A street railway company is bound to exercise towards its passengers the utmost care and diligence of a very cautious person, and an instruction that it will be liable if its servants are guilty of even slight negligence is proper.

10. In a negligence case the court need not, in its charge, define the word "negligence."

11. In an action for the death of a street car passenger, caused by the car in which he was riding colliding with a wagon, an instruction using the term, "a broken-down wagon and obstruction which was at said time upon and in close proximity to the tracks," is not erroneous as assuming that there was a broken-down wagon on the track, where the evidence shows that part of the wagon extended over one of the rails for a distance of one foot.

12. Nor is such an instruction erroneous where the carrier has requested an instruction, assuming that there was an obstruction on the track, thereby conceding the fact.

13. In an action for the death of a passenger caused by the car in which he was riding colliding with an obstruction on the track, an instruction that the carrier is liable if its servants in charge of the ear saw the obstruction in time to stop the car and avoid the danger, or could, by the exereise of the care required of them, have seen it in time to stop the car, followed by an instruction as to the degree of care required of a carrier, is not erroneous as requiring the carrier's servant to stop the car when he saw the obstruction, though too late to avoid the injury.—(Sweeney vs. Kansas City Cable Ry. Co., 51 S. W. Rep., 682.)

NEW YORK.—Appeal—Review—Questions Considered.

1. In an action by a husband for the loss of his wife's serviees through injuries received by her, the husband cannot for the first time on appeal raise the question that the joint negligence of the wife and defendant cannot defeat his rights.

Crossing Accidents—Contributory Negligence.

2. The question whether a person run over by a street car at a crossing was guilty of eontributory negligence is for the jury, where it appears that, before stepping into the road, she looked in both directions for approaching ears, and then walked fast towards the other side of the street, and stepped on the track on which she was struck, without again looking.—(Hickman vs. Nassau Elec. R. R. Co., 58 N. Y. Suppl., 858.)

NEW YORK.—Injury to Passengers—Defects in Roadbed—Notiee.

1. A passenger was injured in alighting from a street ear by the giving way of the roadbed, which was elevated, the street having been cut down to a lower level. The proof did not show by whose ageney the street was lowered, but similar aeeidents had happened to passengers alighting from defendant's cars in that vicinity. Held, that, even if defendant was not responsible for the lowering of the street, it was bound, knowing the defective condition of its roadbed, to inform passengers about to alight thereon that they could not safely do so.

Same—Exereise of Due Care.

2. While a street railway company may not be obliged to furnish a passenger a safe place to alight from its cars, where they are stopped not at a regular stopping place at his instance, yet, if it has provided any portion of its roadbed as a plaee for passengers to alight, it must exercise reasonable care to keep that particular place safe for the purpose.—(Flack vs. Nassau Elec. R. Co., 58 N. Y. Suppl., 839.)

NEW YORK.—Master and Servant—Personal Injury—Negligence of Co-Employee.

1. Two bobtail horse cars, each in charge of a driver, met on the same track. At the request of one of the drivers, a boy about twelve years of age got on the rear platform of his car, which was a safe place, to drive the horse back to a switch, while the driver took charge of the brake at the other end. It was necessary for the driver to get some one to assist him, as there were no other employees of the company in the vicinity. Other boys boarded the car, and the driver pretended he was coming through it to catch them, whereupon they scrambled off, and pushing the boy who was driving off the the platform, he fell under the car and was injured. Held, that, assuming that the boy was an emergency employee, and that his injury was due to the negligence of the driver, he and the driver were co-employees, and the railway company was not liable.

Trespasser on Street Car—Personal Injury—Company's Liability.

2. A boy boarded a bobtail car, at the request of the driver, to drive the horse attached to the hind platform back to a switch, while the driver attended to the brake at the other end. Other boys boarded the car, and, on the driver pretending he was coming through to catch them, they scrambled off, and, pushing the boy driving off the platform, he fell under the car and was injured. Held, that, assuming that he was a trespasser, the company was not liable, since the driver could not have foreseen that the injury would result from his act, and hence it was not the proximate cause thereof.

Passenger for Hire.

3. A boy about twelve years old, at the request of the driver in charge of a bobtail street car, which met on a single track, got on the rear platform, to which the horse was hitched, and drove back to a switch, while the driver attended to the brake. Held, that he was not a passenger for hire, and that the railway company was not liable for an injury caused by the negligence of the driver.—(Marks vs. Rochester Ry. Co., 58 N. Y. Suppl., 210.)

NEW YORK.—Injuries to Passengers—Negligence—Evidence.

In an action for injuries received in alighting from a street car, plaintiff testified that the car suddenly started as she was attempting to take hold of a brass rail on the car to aid her in getting off, thereby throwing her to the ground. The conductor and two disinterested witnesses testified that, while the car was still in motion, plaintiff, though told by the conductor to wait until it stopped, got off, and was thrown to the ground. Held, that a finding that plaintiff's injuries were caused by starting the car too

soon, was against the weight of the evidence.—(Ormond vs. Metropolitan St. Ry. Co., 58 N. Y. Suppl., 335.)

NEW YORK.—Injury to Passenger.

A verdict for plaintiff in an action against a street car company for injuries alleged to have been received by the car starting while she was alighting at a street crossing is not conclusive, but will be set aside, as against the weight of the evidence, where the uncorroborated evidence of plaintiff that the car started while she was alighting was contradicted by the conductor, gripman and two disinterested witnesses, who testified that the accident happened north of the crossing, and that plaintiff alighted from the car before it came to a stop.—(Connor vs. Metropolitan St. Ry. Co., 58 N. Y. Suppl., 340.)

NEW YORK.—Injuries to Passengers—Evidence.

Plaintiff testified that a street car was started after it had stopped, and after he had a foot on a step, and he was thrown into an excavation and injured. A person on the opposite side of the street partially corroborated and partially contradicted plaintiff's testimony. Six other persons who were near the place of the accident, two of whom were disinterested passengers, testified that the car did not stop at all, and that plaintiff fell into the excavation before he touched the car. Held, that a judgment for plaintiff was not sustained.—(Hansen vs. Third Ave. R. Co., 58 N. Y. Suppl., 282.)

NEW YORK.—Railroads—Turnouts—Right to Construct.

1. A city deeded a strip of land in a street to a railroad company and its lessees, successors and assigns, with the right to use it for the purposes of tracks and turnouts in the same manner as on land ceded by it to the city. A successor of such company leased such strip to another, whose charter authorized it to maintain a railroad with necessary appendages. Held, that the lessee company could construct a necessary turnout from its tracks on such strip to a freight yard situated near it.

Same.—Right to Connect—Intersection.

2. Under laws 1890, chap. 565, sec. 4, subd. 5 (laws 1875, chap. 606, sec. 26, subd. 3), authorizing any corporation formed thereunder to join or unite its railroad with any other railroad before constructed at any point on its route, the two roads need not actually intersect in order that a connection be authorized.

Street Railroads—Elevated Railroad—Right to Connect.

3. Laws 1839, chap 218, re-enacted in laws 1890, chap. 565, sec. 78, makes it lawful for any railroad corporation to contract with any other railroad corporation for the use of their respective roads, or any part thereof. Laws 1875, chap. 606, sec. 26, subd. 3 (laws 1890, chap. 565, sec. 4, subd. 5), which contemplated the construction of elevated street railroads, provides that any corporation formed thereunder may join or unite its railroad with any other railroad before constructed at any point on its route, and upon the grounds of such other road; and sec. 26, subd. 5, prohibits any elevated railway company formed under the act from using or occupying any streets except those designated for its route. Laws 1890, chap. 565, sec. 129, prohibits any such company from constructing a street surface railroad. Held, that an elevated railroad company could connect with a surface railroad company, and that they could agree for the use of each other's tracks, the connection being entirely on the latter company's land.

Railroads—Viaduct—Right to Connect.

4. Where a city deeds a railroad company a strip of land in a street for the purpose of railroad tracks and turnouts, to be used and traveled over by cars and locomotives and otherwise, in the same manner as the tracks on land ceded by the company to the city, the company may construct a viaduct on such land to connect with an elevated railroad.

Same.—Connecting with Freight Yards.

5. Such company may also, by another viaduct, connect such viaduct with its freight yards, situated near such land.

New York City—Connection of Railroads—Consent of Assembly.

6. The granting of permits by the Highway Commissioner of New York City to an elevated and a surface railroad to connect their tracks by a viaduct so as to enable each to operate its cars on the tracks of the other, does not create a new franchise, so as to require the consent thereto of the Municipal Assembly, under sections 72-74 of the charter.

Same.—Authority of Highway Commissioners.

7. Under New York charter, secs. 524 and 525, giving the Commissioner of Highways cognizance and control of the laying or relaying of railroad tracks in the streets, and providing that there shall be no disturbance of the street except with his permission, he has authority to permit an elevated railroad to connect with a surface road under an agreement for the use by each of the other's tracks.—(Gallagher vs. Keating et al., 58 N. Y. Suppl., 366; affirmed on appeal, 57 N. Y. Suppl., 632, 1123.)

Further Progress Towards Standardizing Street Railway Reports

The following is a copy of the report made by C. N. Duffy, chairman of the Committee on a Standard System of Street Railway Accounting of the Street Railway Accountants' Association of America, to President Calderwood covering the action taken at a meeting of the representatives of several railway accounting associations, held in New York City, July 11:

St. Louis, July 21, 1899.

John F. Calderwood, Esq., president of the Street Railway Accountants' Association of America, Minneapolis, Minn.:

Dear Sir.—In response to the invitation of Wm. O. Seymour, of the Board of Railroad Commissioners of the State of Connecticut, to attend a meeting at the Manhattan Hotel, New York City, on July 11, 1899, to confer with the committee representing the National Association of State Railroad Commissioners, and a committee representing the Association of American Railway Accounting Officers, for general discussion upon the subject of a classification of construction and operating expenses of street railways, I beg leave to report that Wm. F. Ham and myself attended this meeting, representing the Street Railway Accountants' Association of America.

The following gentlemen were present at the meeting: Wm. O. Seymour, member of Board of Railroad Commissioners of the State of Connecticut, and chairman of committee on classification of construction and operating expenses for street railways: Ashley W. Cole, chairman Board of Railroad Commissioners of State of New York, and a member of Mr. Seymour's committee; H. M. Kochersperger, Comptroller, New York, New Haven & Hartford Railroad Company, and a member of committee representing American Railway Accounting Officers Association; J. D. Greene, Auditor of Disbursements, Pennsylvania Railroad Company, and a member of committee representing American Railway Accounting Officers Association; Wm. F. Ham and C. N. Duffy, representing Street Railway Accountants' Association of America, and H. T. Billings, clerk, Board of Railroad Commissioners, State of Connecticut.

After a morning and afternoon session, in which was discussed the report of our committee made to the Street Railway Accountants' Association of America, at its second annual convention in Boston, the following modifications and changes were uanimously agreed to by all the gentlemen present:

1st. The sub-heading "Car Service" under "Transportation," which includes operating expense accounts numbers 16 to 24, was changed to "Operation of Cars."

2d. Account No. 8, "Maintenance of Miscellaneous Equipment." In the second paragraph the phrase: "Repairs and renewals of all harness should be charged to this account," should be followed by: "The cost of replacing horses lost by death or worn out in service, and the depreciation in the value of horses should be charged to this account."

3d. Account No. 30, "Stable Expenses," which now reads: "Charge to this account the cost of feed, keep and shoeing of horses, replacing horses lost by death or worn out in service, depreciation in value of horses, and all other stable expenses," should be changed to read: "Charge to this account the cost of feed, keep and shoeing of horses, and all other stable expenses." A fourth paragraph should be inserted, to read: "The cost of replacing horses lost by death or worn out in service, and the depreciation in the value of horses, should be charged to account No. 8." This will necessitate a change in the printed report as it appears on page 35.

4th. The number of operating expense accounts is to be thirty-eight, Nos. 1 to 38 inclusive, account No. 39, "Taxes," is to be eliminated from operating expense accounts and classified as a "Deduction from Income."

This will necessitate a number of changes in phraseology, punctuation, etc.

5th. In the monthly and annual reports, under "Deductions from Income," the first item is to be "Taxes."

After the modifications and changes referred to above were unanimously agreed to by all of the gentlemen present, Mr. Seymour announced that at the annual meeting of the National Association of Railroad Commissioners, to be held in Denver, Aug. 11, 1899, his committee would report to the convention, recommending the adoption and use of the standard system of street railway accounting adopted by the Street Railway Accountants' Association of America, with the modifications and changes as agreed upon, which he would have embodied in his report, and that he was confident that his association would unanimously

adopt the report as presented. Mr. Seymour stated that he would have at least 200 copies of the system printed, containing the modifications and changes as agreed upon, together with blank reports printed to conform thereto, and that he would have the street railways of the State of Connecticut make their annual reports for the fiscal year beginning in 1900, on these new forms.

Mr. Kochersperger and Mr. Greene, representing the American Railway Accounting Officers' Association, stated that they would report to their association at its next annual convention, to be held in May, 1900, the result of this conference, and they would recommend the adoption and use of the street railway accounting system, with modifications and changes as agreed upon.

Mr. Ham and myself, on behalf of the committee representing the Street Railway Accountants' Association of America, agreed to all the modifications and changes that were made, and stated to the gentlemen representing the other two associations that we would present a report at the next annual convention of our association, to be held in Chicago in October, 1899, embodying what was agreed upon, and assured the gentlemen that we were confident that our association would sustain us in what we had done.

Through the co-operation of the various associations represented at the New York conference Mr. Ham and myself are satisfied that the standard system will be used by all of the street railway companies of the United States, and that a uniformity of methods and results, which has been so much desired, and for which we have so earnestly labored, will now be attained.

In explanation of the modifications and changes that were agreed to I beg leave to submit the following:

1st. As to changing the title of the sub-heading "Car Service" from "Car Service" to "Operation of Cars," Mr. Kochersperger and Mr. Greene stated that the title "Car Service" would conflict with a technical term used in the operation of steam railroads, and with an account that steam railroads carried on their books, which represents a car mileage account, as I understand it. In addition, it was suggested by the gentlemen that the title of the sub-heading "Operation of Cars" was preferable to "Car Service," and was in uniformity with the title of the first sub-heading under "Transportation," "Operation of Power Plants." Mr. Ham and myself readily agreed to this suggestion, and we both considered not only the objection to the other title well founded, but the name of the new title an improvement over the old.

2d. As to transferring from account No. 30, "Stable Expenses," to account No. 8, "Maintenance of Miscellaneous Equipment," the cost of replacing horses lost by death or worn out in service, and the depreciation in the value of horses, Mr. Kochersperger and Mr. Greene criticised the action of our committee in classifying this item as a "General Expense" account, for the reason that they thought that the cost of maintaining horses was a maintenance charge, and should be classified under the same account that carried the cost of maintaining the wagons and horses. They pointed out that the wagons, harness and horses were one, in the sense that the wagons and harness were useless without the horses, and that, in their opinion, account No. 8 should carry the cost of maintaining wagons, harness and horses, in order to have the classification consistent. In this, Mr. Ham and myself thought that unquestionably they were correct.

3d. As to eliminating account No. 39, "Taxes," from "Operating Expense" account, and classifying same as a "Deduction from Income," in view of the fact that under the Inter-State Commerce Classification of Accounts, the universal standard followed by steam railroads, and the position taken by all of the boards of railroad commissioners throughout the United States that exercise any supervision over the books and accounts of street railways, to consider "Taxes" as a "Deduction from Income," and not as an "Operating Expense Account," and, for the sake of bringing about a uniformity of methods and secure the co-operation of the National Association of State Railroad Commissioners and the Association of American Railway Accounting Officers, all of the gentlemen representing these two associations being firmly fixed in their opinion that "Taxes" should not be a part of the operating expenses of railroads, Mr. Ham and myself agreed to change our classification of operating expense accounts to conform with theirs.

A copy of this report will be sent to each of the gentlemen who attended the meeting at the Manhattan Hotel, New York City, July 11, 1899; to the two members of the committee of the Street Railway Accountants' Association, besides yourself, who were not present at the meeting; to the secretary of our association, and also to the two honorary members of our association, H. H. Windsor, of the "Street Railway Review," Chicago, and E. E. Higgins, of the Street Railway Journal, New York, as both of these gentlemen are deeply interested in the subject, and will no doubt give our association the benefit of the columns of their papers to further the work of our committee.

I trust that what was accomplished at the meeting and the action taken by Mr. Ham and myself will be endorsed and approved by the other members of our committee, as well as ratified and confirmed by our association at the next annual convention.

Very respectfully,

C. N. Duffy,

Chairman of Committee on Standard System.

Proposed Solution of Municipal Franchise Problems

The following extract from Allen Ripley Foote's new work upon "Municipal Public Service Industries" is worthy the attention of street railway managers as a proposed equitable solution of the way in which to carry on public service industries with private capital in the interests of the municipality:

Franchises should be granted to municipalities by a general State law, uniform in its provisions for every town and municipality. This law should constitute every incorporated town and city a legal corporation for the purpose of rendering industrial public services, and clothe them with power to own and operate in the name of and for the benefit of the municipality and of its inhabitants, one or all public service industries, when ever such a policy is determined upon by a majority vote of all registered municipal voters.

This law should require:

1. That every public service industry owned by a municipality shall be owned and operated as a monopoly in order to secure for the people all benefits derivable from natural monopolies.

2. That municipalities deciding to transfer a public service industry from private to public ownership shall take possession of all existing property, by whomever owned, then being used for the purpose of rendering such service, under proceedings for the exercise of the right of eminent domain, or by arbitration, if so mutually agreed upon with the owners of said property.

3. Municipal authorities to dedicate public possessions to and to take private property for the special use required for the effective rendering of the service, and to adjust the distribution of special burdens or benefits created thereby, by an assessment of damages or benefits on the private property affected, as for other public improvements.

4. The taxation of all private and public users of the service on the basis of the cost of service used plus such profit, if any, as the Municipal Council may determine; and that no service shall be furnished to a public or private user free of charge, or at a price less than the full and entire costs of ownership and operation.

5. Every municipality to include in all statements of cost made to determine the price to be charged to public and private users for service rendered:

(a) Interest on the entire investment at the rate paid by the municipality on its bonded debt.

(b) The cost of insurance against loss by accidents of all kinds.

(c) The value of municipal taxes relinquished by reason of municipal ownership.

(d) The amount of State taxes paid.

(e) The cost of insurance against the impairment of investments by reasons of depreciation from use and improvements in mechanical arts.

(f) The cost of all material consumed.

(g) The cost of all salaries and wages paid for administration and operation.

(h) The cost of all sundry expenses not otherwise classified and included.

6. An addition to cost, for the purpose of determining selling price, of a sufficient annual provision for a sinking fund to fully pay at their maturity all bonds issued on account of the industry.

7. All municipalities to keep books for each public service industry owned and operated by them, in the form prescribed by the State, and to subject the same to an audit whenever required by the duly authorized officer of the State.

8. The creation of a competent *Board of Municipal Regulation*, which shall have immediate supervision of and be responsible to the Municipal Council for details of administration and operation. Said board shall determine all qustions of engineering, mechanical and operating details, and shall report to the Municipal Council at stated periods all information necessary for its guidance in deciding questions of public policy pertaining to the service.

9. All employees shall be protected in their right to employment by civil service regulations, which shall provide that no employee shall be discharged without cause, set forth in a written statement signed by the officer ordering the discharge, and after a proper opportunity to be heard in his own defence.

10. The Municipal Council shall determine the rates to be charged public and private users for services rendered to them, for periods of five years, and shall provide that all services rendered to any municipal department, or to the municipality in any way, shall be estimated and paid for at a fixed price, out of appropriations for such department, or for the general expense of the municipality.

11. The Municipal Council, on the recommendation of the Board of Municipal Regulation, may lease to a private person, partnership or corporation the municipal franchise and property then used for the purpose of a public service industry owned by the municipality on terms that will secure to the municipality all the benefits of municipal regulation provided for in the act, and the additional advantages of employing private capital, for which interest on the entire investment shall be paid at the same rate per cent as the municipality is at that time paying on its bonded debt, and all responsibility and risks of management to be assumed by the lessee, in consideration of the determination of rates for periods of five years, to be charged by said lessee for services to be rendered to public and private users, on the basis of cost as herein provided, plus a profit calculated at twice the rate per cent of interest then paid by the municipality on its bonded debt, such lease to terminate at the expiration of any period of five years, at the option of the municipality.

12. To reimburse the State for the loss of taxes relinquished by municipal ownership and for the expense of supervision and auditing municipal public service accounts, and for the publication in an annual volume by the State, which is hereby required, in form to facilitate reliable comparisons, of the reports of all municipal public service industries, each municipality shall pay to the State an annual tax of 1 per cent on its gross receipts from the sale of service to public and private users.

These requirements are designed to develop the highest attainable degree of efficiency for municipal governments, the agent to which the people must intrust the administration of their public service industries when they adopt the policy of municipal ownership and operation.

It is only through expert and honest management, the just individual distribution of the burdens of providing the required investment, and of the costs, responsibility and risks of ownership and operation, and by the just distribution of benefits collectively earned, that the people can hope to realize from municipal ownership and operation the full measure of the advantages they seek.

NEWS OF THE MONTH

The Manhattan Railway Company, of New York, has purchased about 120 lots just north of its present terminus at 177th Street and the East Side. It is not known whether this foreshadows the extension of the elevated system to Fordham or the establishment of new storage and repair yards and shops.

Recent newspaper reports to the effect that the General Electric Company was to engage in the automobile business and move a large portion of its Schenectady plant to Lynn are authoritatively denied, and the report that large steel works are to be established at Lynn for the manufacture of castings is pronounced premature.

The organization of the National Tube Company, a consolidation of the wrought iron, steel tube and pipe industry of the United States, was completed on July 12. The required capital was furnished by J. P. Morgan & Company and their friends. Twenty-one companies operating in New York, Pennsylvania, West Virginia and Ohio are included in the combination, and their combined output at present is about 1,100,000 tons of all classes of tubular goods per annum. The capital stock is $80,000,000, of which half is to be 7 per cent preferred stock, and half in common stock. The officers are: President, Edmund C. Converse; chairman of the board, Joshua Rhodes; first vice-president (in charge of manufacturing), F. J. Hearne; second vice-president (in charge of mercantile affairs), Horace Crosby; third vice-president (financial), Francis L. Potts; general manager (manufacturing department), A. S. Matheson; treasurer, Arthur F. Luke; assistant treasurer (at Pittsburgh), William H. Latshaw; general counsel, Sullivan & Cromwell.

The second annual meeting of the Pacific Coast Electric Transmission Association was held at San Francisco, Cal., on June 20 and 21, 1899. Prominent electrical transmission engineers were present from all parts of the Pacific Coast, and a valuable discussion of this subject took place. Papers were read as follows: "Tests and Calculations for a Forty-Mile Aluminum Wire Transmission Line," by F. A. C. Perrine, of Stanford University; "Electric Lighting vs. Gas," by John Martin, president of the Yuba County Power Company; "Regulation of Alternating Current Generators," by C. L. Corey, of the University of California; "Electrically Driven Centrifugal Pumps," by L. A. Hicks, of the Bakersfield Gas & Electric Company, and "Prices for Current Supply," by C. W. Hutton. Officers for the ensuing year were elected as follows: President, Prince A. Poniatowski, of the Standard Electric Company, of California, with headquarters at Stockton, Cal.; vice-president, A. G. Lamson, of Salt Lake City, Utah; secretary, George P. Low, of the Journal of Electricity; treasurer, William Angus.

The New York & Long Island Terminal Railway Company, which has asked for franchises to construct a tunnel railway to be operated by electricity, under the East River, has elected the following officers: President, W. H. Baldwin, Jr.; vice-president, C. M. Pratt; treasurer, A. C. Bedford, secretary, George D. Pratt. All of these gentlemen are connected with the Long Island Railroad.

The new contract between the Twin City Rapid Transit Company, of Minneapolis, and the United States Government for carrying the mails gives the company $1,666.35 per year, which is at the rate of three cents a car mile for the 53,545 miles traveled by the mail carrying cars between Minneapolis and St. Paul, in the course of a year. The company is also to receive $975.02 for carrying mail in Minneapolis. The new agreement is for four years.

At a recent meeting of the Massachusetts Electric Companies the following officers were chosen: President, Amos F. Breed; vice-president, Charles E. Cotting; secretary, Everett W. Burdett; treasurer, J. H. Goodspeed. Executive committee will consist of Gordon Abbott, Charles Francis Adams, 2d; E. N. Foss, Percy Parker and Philip L. Saltonstall. P. F. Sullivan will be general manager.

President Gould, of the Manhattan Railway Company, has authorized the statement that his company has secured a location for its power house at Seventy-fourth and Seventy-fifth Streets and the East River. The plot has a frontage of 204 ft. on the river and 570 ft. on the side streets. It is also announced that the contract for 9000 tons of rail to be used as the third rail conductor, and weighing 100 lbs. per yard, had been given to the Lackawanna Steel Company, the material to be delivered in September. Bids have also been asked for and received from the leading engine and boiler manufacturing companies in the country for the necessary power station equipment. No decision has been reached as to the electrical equipment. W. E. Baker, the electrical engineer of the company, is at work upon the various problems connected with the change of motive power on the system.

What is probably the largest order for steel rails ever given at one time has been placed with the Carnegie Steel Company by the Russian government. The order is for 180,000 tons of steel rails, to be delivered within twenty-six months, and it is said the price is the highest quoted this year, and was not less than $25 per ton at the mill.

As announced first in these columns some time ago, Jesse Spalding has been elected president of the Chicago Union Traction Company. The new general manager will be John M. Roach, for many years vice-president and general manager of the North and West Chicago systems. Louis Owsley, formerly secretary and treasurer of the West Chicago Street Railroad Company, has been elected treasurer of the consolidated properties, and J. Charles Moore, formerly secretary and treasurer of the North Chicago system, has been elected secretary. F. E. Smith, until now with the Lynn & Boston Railroad system, has, as previously announced, become general auditor of the consolidated properties.

The Electric Vehicle Company has placed an order for 4200 electric automobiles with the Columbia & Electric Vehicle Company. The contract amounts to over $8,000,000.

A regular service from the New York end of the Brooklyn Bridge to Coney Island has been instituted on the Fifth Avenue branch of the Brooklyn Union Elevated Railroad Company. From the bridge to Twenty-fifth Street the trains are run by the Sprague multiple unit third-rail system. Each train consists of a motor car and two trailers. The trail cars are equipped with motors and an overhead trolley pole. On reaching Twenty-fifth Street the trains are broken up, and the trail cars proceed to Coney Island as independent motors, taking their current from an overhead wire.

The property of the King's County Elevated Railway Company, of Brooklyn, was sold on July 7, as originally advertised, although on July 6 it was announced the sale would be postponed for twenty days, owing to a restraining order secured by the New York Bank Note Company. At the last moment, however, an agreement with the Bank Note Company was effected, and the sale proceeded. The property was purchased by the reorganization committee. Immediately after the transaction a new company was incorporated at Albany under the name of the King's County Elevated Railroad Company, to take over the road. The capital stock of the new company is $8,800,0000, of which $2,800,000 is 5 per cent preferred and $6,000,000 common stock. The incorporators are E. Mora Davison, Wilton C. Percy, Charles H. Werner, George S. Bonner, Walter F. Wood, Adolph Frank and William J. Cahill, of New York city, and John L. Wells and Benedict Hamburger, of Brooklyn. It is stated that two-thirds of the stock of the King's County Elevated Railway Company will be exchanged for securities of the Brooklyn Rapid Transit Company at once. As soon as this is done, the electrical equipment of the road with the third-rail system will be completed as rapidly as possible.

Owing apparently to worn or defective feeder cables on the section of the Union Loop, of Chicago, the positive side of the circuit became grounded a few days ago, and traffic was stopped for more than an hour, while brilliant displays of electric fireworks were made on the structure. It took some time to locate the defective cable. Meanwhile, the South Side trains were switched back at their old terminus at Congress Street, and the Lake Street and Metropolitan roads were gradually put into service about half an hour apart. No serious damage was done.

The Rochester Railway Company has built a new mail car, modeled after somewhat different lines from the mail cars formerly in operation on that road. The old style cars had the doors at the ends, but in the new type the doors have been placed in the center of each aisle, this being done to prevent the motorman or conductor from gaining admission to the sorting department.

In a recent interview Charles T. Yerkes, of Chicago, stated that his plan is not to desert Chicago, but to give his active attention to the development of suburban and elevated transportation business, the former through the Chicago Consolidated Street Railway Company, and the latter through the interests which he still holds in the Lake Street and Northwestern Elevated Railways.

The Corporation Counsel of Illinois announces that he has discovered that the statutes of Illinois contain a franchise tax law as sweeping in many particulars as the provisions of the new Ford law of New York State.

At the weekly meeting of the Manhattan Railway Company, held on July 11, it was decided to place a contract with the E. P. Allis Company, of Milwaukee, for eight 8000-h.p. engines capable in the aggregate of developing 100,000 h.p. It is stated that the price paid is above $1,000,000. The contract will be drawn and executed as soon as possible.

The Montreal Street Railway Company was recently fined $2 and costs for permitting two of its cars to become overcrowded in violation of a city ordinance.

The Coney Island & Brooklyn Railroad Company has renewed the existing contract and agreement between itself and its employees for another year, or until July 1, 1900. The employees express themselves as satisfied with the treatment they have received and the best of feeling evidently exists.

The Ashtabula Rapid Transit Company has reduced the working hours per day of all its men from sixteen to eleven hours. The employees will receive the same pay as before.

It is probable that within a short time a stable trolley car will be put in operation in Detroit, for the purpose of moving valuable race horses from the railroad stations to the training stables at the race track in the suburbs of the city. The inside of the car will be padded, and each end will be divided into three stalls, making accommodations for six horses. The doors will be at the side, and it is probable the upper parts of the sides of the car will be formed of slats, so as to give good light and ventilation.

The new office building of the Philadelphia & Westchester Traction Company, at Llanarch, is now completed and ready for occupancy. The building is 32 ft. x 45 ft., built of brick with slate roof, and is very artistic in appearance. It contains, in addition to the superintendent's office, a spacious waiting room for patrons of the road, and a room for the use of the motormen and conductors, the latter being provided with lockers, in which the men can keep their uniforms, etc., if they so desire. This room also contains a table with magazines and periodicals. The basement of the building will be used as a storage room for electrical supplies.

The general offices of the Chattanooga Electric Railway Company have been moved from the Market Street car shed to the new transfer station between Fourth and Fifth Streets, on Market Street. The company is engaged in making extensive improvements in its system, and is adding a number of handsome cars.

The Fort Wayne Street Railway Company maintains a swimming pool at Robinson's Park, which is controlled by the company. Hans Reitdard, while swimming with other boys, dove against a stump concealed in the pool, and was so severely stunned as to cause him to drown. His mother brought suit for $10,000 against the company, alleging carelessness in not removing the obstruction, and that by reason of such negligence her son's death occured. The case was tried at Auburn, and the jury, after being out two days, awarded her $500 damages.

The Marion County Tax Board has fixed the assessment of the reorganized Indianapolis Street Railway Company at $3,000,000. General Manager McGowen claimed that in view of the heavy drain on the company by the cost of improvement, together with the direct tax of $30,000 a year to the city, the assessment was too large. He says he will go before the State Board of Tax Review and ask for a reduction. The county board fixed the company's assessment last year at $2,200,000, and the State board raised it to $3,000,000.

The Boston Elevated Railway Company has placed a contract with the Westinghouse Electric & Manufacturing Company for a 4000-h.p. generator, to be installed at Lincoln's wharf.

The Massachusetts Electric Companies have leased the eight-story building at 14 Kilby Street, Boston, and will occupy the premises at once as a general office.

The cars of the New York & Queens County Railway Company, of Long Island City, carry large colored placards showing the right and wrong way to alight from the car. At one side of the card is pictured a young lady in the act of stepping easily to the ground with her face toward the motorman; at the other is a stout dame in the act of turning a somersault on the pavement, with her packages flying in all directions. The lettering accompanying the pictures reads simply: "How to Get Off and How Not to Get Off a Trolley Car." It is thought these signs have prevented numerous accidents.

A car belonging to the Brooklyn Rapid Transit Company was nearly destroyed by fire on July 15. A short circuit caused the flames.

A short circuit burned out one of the transformers in the big electrical power houses in Buffalo Avenue on July 15. The flame communicated to a small tank on the subway floor that supplies oil to the machinery. It took the firemen an hour to extinguish the blaze. The transformer that was burned supplied power to the Buffalo & Niagara Falls Railway, the Gorge Road and the Niagara Falls & Suspension Bridge Road. Cars on these lines were stalled for two hours. The loss, it is stated, will be large.

The State Railroad Commissioners of New York have authorized the Long Island Railroad to discontinue eleven stations in Brooklyn, where the traffic has been nearly all taken away by electric and elevated cars running in the streets. A new station will be established to take the place of three others that are to be discontinued.

The Columbus (Ohio) Street Railway Company has decided on a profit sharing distribution to employees in the same proportion that stockholders receive. The only stipulation is that employees must have been in continuous service for six months. The company has just declared a quarterly dividend of 1 per cent.

The wages of the laborers employed by the Columbus Street Railway Company in relaying its tracks have been increased twenty-five cents per day.

The Cincinnati Street Railway Company will divide among its motormen and conductors about $10,000 as a 5 per cent dividend, thus enabling the employees to share in the profits of the past year.

In order to prevent accidents due to persons putting their heads out of car windows and coming in contact with poles and other obstructions near the track, the Twin City Rapid Transit Company is putting netting in all the windows of its closed cars, along the side nearest the centre of the street.

To encourage pleasure riding the Janesville Street Railway Company, after seven o'clock every evening during the warm weather, will carry passengers around the entire system for five cents, provided they do not leave the car. The same ride usually costs ten cents.

The Columbus Street Railway Company has published a very artistic guide to the city of Columbus. This contains a number of splendid engravings, and tells how to reach all points of interest.

Hambleton & Co., of Baltimore, and New York capitalists are about to complete plans for a purchase and consolidation of the street railways of Chattanooga and the two incline roads to the summit of Lookout Mountain. It is estimated that the deal will involve about $800,000.

The "Leader," of Marion, gives the following list of proposed electric railways to be built in Indiana this season: Indianapolis Street Railway Company will build a line from that city to Greenfield; an electric line from Hartford City to Indianapolis, passing through Noblesville. This road is to be built the coming summer. It will be 46 miles long, and estimated to cost between $300,000 and $400,000; an electric line from Evansville to Rockport, Tell City and Cannelton; an electric line between New Castle and Indianapolis; an electric line between Richmond and Eaton, Ohio; an electric line between Richmond and Muncie; an electric line between Columbus and Terre Haute; an electric line between Ft. Wayne and Indianapolis; an electric line between Aurora and Rising Sun; extension of the Monon from Greencastle to the Indiana coal fields; an electric line to connect Garret, Auburn, Waterloo, Ashley, Hudson, Pleasant Lake, Angola and Ft. Wayne.

The Mayor of Minneapolis has vetoed the ordinance passed recently by the City Council authorizing the Twin City Rapid Transit Company to run through fast cars between Minneapolis and St. Paul. It was the intention to build side tracks along the line and place in service a number of special cars that would make the trip without stops and reduce the running time twenty-four minutes. The fare was to have been fifteen cents on these fast cars instead of ten cents, the regular fare. The Mayor in his veto message said: "There is little doubt that such a fast service as is here proposed would be a convenience, and were the interests of all the citizens properly guarded, there could be no objection to it. In its present form, however, the ordinance is open to the objection that it contemplates a backward step in the relation of public service corporations and municipalities. This is especially apparent when the municipality volunteers an advance in fares in the absence of a showing of loss, or even a failure of reasonable profit on present rates.

Merger of Electrical Manufacturing Companies

Although not officially announced, there seems to be little doubt that the Sprague Electric Company and the Stanley Electric Manufacturing Company will shortly be brought together in a close union of interests amounting to a consolidation. It is practically certain that a director in the Sprague Company is as an individual the purchaser of the Stanley Company, and Henry Hine, of the Stanley Company, has assumed the management of both companies. The control of the Stanley Company will put the Sprague Company in an exceedingly strong position for a general electrical business, inasmuch as it will now be able to manufacture alternating current apparatus for transmission of power under the Stanley patents, direct current generators and motors of the largest types, designed by Mr. Sprague and Mr. Lundell, and apparatus required for the Sprague multiple unit system of train equipment.

The complete list of officers of the Sprague Electric Company is as follows: President, A. B. Chandler, president of the Postal Telegraph Company; first vice-president, John E. Searles; second vice-president and technical director, Frank J. Sprague; general manager, Henry Hine.

The Chicago Convention of 1899

John M. Roach, general manager of the Union Traction Company, of Chicago, who will doubtless be made chairman of the local committee of arrangements in place of the late M. K. Bowen last week authorized a representative of the Street Railway Journal to state emphatically that the local street railway companies were working in great harmony. That the plans for entertaining the members of the American Street Railway Association had been outlined, and that the work from now on would be pushed with great vigor. He stated that the street railway companies of the country and the representatives of manufacturing and supply houses could rest assured that they would receive as cordial a welcome, and find as ample and satisfactory accommodations for entertainment and exhibits as had ever been accorded them at any previous convention.

The secretary of the association also states that all the space in the exhibition hall has already been applied for and assigned, but that additional space will, if necessary, be provided or the original allotments be cut down to provide for later applicants.

The Detroit Situation

The Michigan Supreme Court, on July 5, decided that the McLeod law, authorizing the appointment of the Detroit Street Railway Commission was unconstitutional, that there is no such office as the Detroit Street Railway Commission, and that Governor Pingree and the other commissioners have no title thereto.

The court based its opinion almost wholly on the proposition that the law is in contravention of a section of the State Constitution which provides 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, except in the expenditure of grants to the State of lands or other property."

In spite of this decision Governor Pingree and Mr. Johnson endeavored to force through the Detroit Common Council the "Security Franchise," the principal features of which were described in the last issue of the Street Railway Journal. The bill was passed by a small majority, but was promptly vetoed by the Mayor. This action was followed by a determined effort on the part of Mr. Pingree and Mr. Johnson to pass the bill again through the Council over the veto. Charges of bribery were freely made, and the people were greatly aroused. Near the end of the struggle the Detroit companies announced an "object lesson" in 3-cent-fare opera-

tion by putting all the lines in the city on this basis. The bill was finally defeated, and a communication was sent by Mr. Johnson to the Street Railway Commission reading as follows:

"We are satisfied that it is not feasible to consummate, under existing conditions, the plan of transferring the street railway property to your company. We must face squarely the proposition which the opponents of the plan put forward, that our franchises are running out, and that when they do expire we shall have an expensive plant on our hands which the opponents of the plan say they can compel us to sell at a ruinous sacrifice unless we are willing to accept a new franchise on their terms. We must so manage the railways in the meantime as, if possible, to prevent the loss so threatened. Low fares and short franchises are incompatible if railways are to be run for profit as a private enterprise."

This communication is held to indicate an intention on the part of the Detroit companies to return to a straight five-cent fare, abolish tickets and transfers, and endeavor to make the most money possible out of the property during the remainder of the franchise term.

"The Other Side"

Allen Ripley Foote is editor of a new weekly paper entitled "The Other Side," which is published at 126 Market Street, Chicago, and in which will appear arguments and statistics upon questions of municipal ownership of public service industries, in general supporting private ownership. The publication will be found extremely useful and valuable to all who wish to get a clear idea of municipal ownership problems which are coming up for consideration in many cities, and Mr. Foote's well-known ability and long study of public questions of this character are a sufficient guarantee that the reading columns of "The Other Side" will be carefully and well edited.

Street Railway Complications in Atlanta, Ga.

The recent consolidation of the Atlanta Consolidated Street Railway Company and the Atlanta Railway Company under the title of the Atlanta Railway & Power Company has resulted in a complicated fight over franchises between that company and the Collins Park & Belt Railroad Company, which was not included in the consolidation. This, the only opposition railway in Atlanta, at present a suburban road 10 miles long, has been purchased by a syndicate, at whose head is H. M. Atkinson, president of the Georgia Electric Light Company, which corporation has the exclusive contract for street lighting, and until recently has furnished the power for operating the Atlanta Railway Company's lines. The Collins Park & Belt Railroad Company has elected the following officers: J. Simmons, president; H. M. Atkinson, vice-president, and F. M. Zimmerman, superintendent. Mr. Zimmerman has been, during the past year, superintendent of the Atlanta Railway Company, until the formation of the Atlanta Railway & Power Company.

The Collins Park Line has made application to the City Council for franchises over a large number of the most important streets, and consulting engineers who have recently been in Atlanta have laid out a system of 27 miles of track, which will enter into nearly all of the territory now served by the Atlanta Railway & Power Company, and, in fact, crosses that company's lines in about thirty places. Suburban lines have also been surveyed, which parallel the Railway & Power Company in many places.

In the meantime, a fierce newspaper controversy is being waged between H. M. Atkinson, of the Collins Park Company, and Joel Hurt, ex-president and chief stockholder of the Atlanta Railway & Power Company. Mr. Atkinson claims that there is a good opportunity for profitable investment in the new proposed lines, which he expects to operate in connection with his present power plant.

Mr. Hurt, on behalf of the Railway & Power Company, has made the announcement that the latter will begin shortly the construction of a power house to cost $750,000, so as to enter actively into competition for municipal and building lighting, and states that they will be prepared to furnish electricity to the city for streets, manufactories and buildings, and in addition will furnish steam, heat and cold air. They also state that the buildings now occupied by their present power house will be converted into a car manufactory, and active competition will be made for the Southern street car and truck trade.

The latest development in the struggle is the application through the courts for an injunction against the Atlanta Railway & Power Company to restrain them from connecting with or operating the lines formerly controlled by the Atlanta Railway Company, to dissolve the consolidation with that company and to prevent them from abandoning certain portions of lines that formerly competed in the same territory. A temporary injunction has been granted. The courts are also requested to place the properties under a receiver and prevent the transfer of stock.

Storage Batteries in Washington

The new Washington Traction & Electric Company has just placed contracts for ten storage battery cars to be run on the Anacostia & Potomac River Division. These cars are to be practically duplicates of the cars now running in Chicago. Old trolley cars of the system will be changed over to provide for the batteries, and Westinghouse motors and the chloride batteries of the Electric Storage Battery Company will be used. There are several practical reasons for putting storage batteries upon this line. The Pennsylvania Railroad is going to elevate its tracks in that section, and the territory is such that it is not at present safe to go to the expense of putting in an underground electric system. Moreover, it is desired to make a practical experiment of storage battery cars under Washington conditions, with the hope of using them on other lines as feeders. The batteries will be charged from terminals carried in a vault in the streets. Two of these cars may possibly be used on the P Street loop.

Patent Office Report

The report of the United States Patent Office Commissioner for the year ending June 30, 1899, advance copy of which has just been received, shows this department of the government to be in better condition than ever before in its history. A summary of the different tables contained in the report is as follows:

There were received in the last fiscal year 35,352 applications for mechanical patents, 2292 applications for designs, 91 applications for reissues, 1610 caveats, 1861 applications for trade-marks, 612 applications for labels and 112 applications for prints; a total of 41,930 applications. There were 23,550 patents granted, including reissues and designs; 1406 trade-marks, 372 labels and 76 prints were registered. The number of patents that expired was 16,670. The number of allowed applications which were by operation of law forfeited for non-payment of the final fees was 4021. The total receipts of the office were $1,209,554.88; the total expenditures were $1,148,663.48, and the surplus of receipts over expenditures, being the amount turned into the treasury, was $60,891.40.

Steam Railroad Statistics

The Interstate Commerce Commission at Washington reports the following statistics concerning the steam railroads of the United States, for the year ending June 30, 1898: On June 30, 1898, the total single-track mileage was 186,397 miles, this being an increase of 1968 miles for the year. The total mileage, including single tracks, second, third and fourth track, yard track, sidings, etc., was 247,533 miles, an increase of 4088 miles. The total number of railroad corporations was 2047. On the above date there were 36,234 locomotives, of which 9956 were passenger, 20,627 were freight and the rest switching, etc.; 1,326,174 cars, of which 33,595 were passenger, 1,248,826 were freight and the rest special cars for officials, etc. This does not include cars owned by private individuals or companies. There were 874,558 employees, an increase of 51,082.

The amount of capital outstanding on June 30, 1898, not including current liabilities in the term, was $10,818,554,031. This amount equals $60,343 per mile of line. The amount of capital which existed in the form of stocks was $5,388,268,321, of which $4,269,271,714 was common stock, and $1,118,996,607 was preferred stock. The amount which existed in the form of funded debt was $5,430,285,710, comprising mortgage bonds, $4,640,762,632; miscellaneous obligations, $486,977,279; income bonds, $262,194,688, and equipment trust obligations, $40,351,111. The aggregate number of passengers carried during the year was 501,066,681, an increase of 11,621,483.

The gross earnings of 184,648 miles of steam roads for the year were $1,247,325,621, an increase of $125,235,848; operating expenses were $817,973,276, an increase of $65,448,512; earnings from operation were $429,352,345, an increase of $59,787,336; deductions from earnings were $427,235,703. The total dividends declared were $96,240,864.

Organization of a New Manufacturing Company in Great Britain

A prospectus of the British Westinghouse Electric & Manufacturing Company, Limited, was issued in London under date of July 10. The capital is to be £1,500,000, of which £1,000,000 are in 6 per cent £5 prefcrence shares, and £500,000 in £10 ordinary shares. Preference shares have priority in distribution of assets and are entitled to a non-cumulative preferential dividend at the rate of 6 per cent per annum on the amounts paid up, together with one-quarter of the surplus profits of each year available for dividend after. paymcnt of 6 per cent on the ordinary shares, the remaining three-quarters to go as additional dividend on the latter.

The Westinghouse Electric & Manufacturing Company, of Pittsburgh, receives the entire issue of ordinary shares in consideration of certain contracts and agreements referred to below; £500,000 of the preference shares are offered to the public, of which £150,000 have been subscribed by the vendors and their friends and allotted in full.

The directors are J. Annan Bryce, late director of the National Construction & Armaments Company, Ltd.; C. W. Benson, Joseph Lawrence, chairman of the Linotype Company, Ltd., and chairman of the Machinery Trust, Ltd.; Hon. R. Clere Parsons, M. I. C. E., A. I. E. E., late partner in the firm of Kitson & Co., Leeds; George Westinghouse, president of the Westinghouse Electric & Manufacturing Company, and Lemuel Bannister. As technical adviser, the company will have the invaluable services of Lord Kelvin, F. R. S. The secretary is Arthur E. Scanes, and the company's temporary offices are at Cornhill Chambers, 63 Cornhill, E. C.

The prospectus states that the company has been formed for the purpose of establishing works for the production of every description of electrical machinery and appliances on a larger scale than any now existing in Great Britain, and thus meeting a demand that has hitherto been largely supplied from foreign sources. With this object an agreement has been made with the Westinghouse Electric & Manufacturing Company, whereby valuable rights for the United Kingdom, its colonies, possessions, protectorates and dependencies (except those in North America) are secured to the British company.

The American Company agrees to transfer to the British company its patents for the territory above mentioned, and further, for a period of ten years, to communicate all improvements it may make, and supply all plans, specifications and information necessary to conduct its manufacturing operations to the best advantage. The British company, by availing itself of the accumulated experience and technical assistance of the American company, will thus avoid heavy experimental expenditure in establishing its business.

The orders for plant and appliances for the British company's territory for the year ended June, 1898, are certified by the vendors to the board at £130,613, and for the year ended June, 1899, at £266,528. Recent orders and inquiries indicate a progressive increase. The American company returns the output of its Pittsburgh factory for the year ending March 31, 1899, at £1,428,474, and its net profit thereon at above £255,000, these figures being subject to final audit. In view of the constant increase of orders and the profitable nature of the business, the Pittsburgh works are in course of being approximately doubled.

The agreement contains provisions for mutual support and protection between the companies, for the immediate turning over to the British company of the existing business relating to the abovementioned territory, including the orders on hand, which will at once form a source of revenue, and for the supplying by the Pittsburgh factory at wholesale prices, less agreed discounts, of all apparatus, appliances and accessories which the British company may require until the factory in England is in working order. The British Company will thus start as a going concern. The American company guarantees that the profits resulting from the business for the first two years shall amount to a sum not less than sufficient to pay the dividend upon the amounts called up on the preference shares during that period, so that pending the completion of the factory, which is estimated to take eighteen months at the outside, the 6 per cent to the preference shareholders is assured.

A site, covering about forty acres for the proposed works, has been agreed for at Trafford Park, Manchester, where water and railway communications are excellent. The situation is about the center of the manufacturing districts, where skilled labor is plentiful and where the demand for electric apparatus will be great.

Mr. Westinghouse and Mr. Bannister, who have been for many years associated with the business, have joined the Board of the British company.

The present issue of capital will suffice for the construction and equipment of the works as now proposed, but if the contemplated success is achieved, the land acquired will accommodate larger premises, and further capital will have to be from time to time provided.

The consideration payable has been fixed by the American company, and consists of the 50,000 ordinary shares issued credited as fully paid. It will pay all costs, excepting only government and stamp duties, in connection with the formation and registration of the British company down to the allotment of the preference shares now offered. The entire proceeds of such preference shares will therefore be available for the business.

Opening of a New Niagara Bridge

On Friday, July 21, the new suspension bridge of the International Traction Company, connecting the United States and Canada, over the Niagara River was formally opened with appropriate ceremonies. The new bridge forms a link in the international belt line which it is proposed to establish around the Niagara Gorge and Whirlpool. The most important factor in the belt is the Niagra Gorge Railroad, which starts at Prospect Park, Niagara Falls, and runs through the gorge at the water level, furnishing the only means of access to the immediate vicinity of the Whirlpool and rapids. At Lewiston a switch leads to the new bridge, which crosses to Queenston, Ont. The cable span of the new bridge, now the only suspension bridge across the Niagara, is 1040 ft.

At the Canadian end the Niagara Falls Park & River Railway, controlled by the International Traction Company, ascends a heavy grade to Queenston Heights and runs thence along the bluff on the Canadian side of the upper steel arch bridge, across which cars have been run for the last year. This brings the car back to within less than 1000 ft. of the starting point, and the Niagara Reservation Commission has been asked to grant permission, under a recent act of the Legislature, for the laying of tracks along the riverway, connecting the upper bridge and the Gorge Road tracks in Falls Street. It is understood that this permission will be granted early in August, allowing the completion of the international belt line. A traffic agreement has been made between the Niagara Gorge Railroad and the Niagara Falls Park & River Railway for the sale of round trip tickets good for the complete circuit. This will benefit both roads, but the Gorge Road has less to gain than its Canadian rival, which is now able to add to the inducements to travel on it the possibility of returning via the Gorge.

Organization of the Tramway and Light Railways Association in Great Britain

There has just been organized and registered under the Companies' Acts the "Tramway and Light Railways Association," for the promotion of tramway interests in Great Britain, along lines similar to those of the American Street Railway Association. The articles provide that the governing body of the association shall be a president, a vice-president, a council of not more than eighteen members, the first members to be appointed by the signatories to the articles of the association. In accordance with this provision the following gentlemen have been nominated as the first members of the council: George Richardson, Esq., chairman of the North Metropolitan Tramways Company, Belfast Street Tramways Company, Blackpool and Fleetwood Tramroad Company, etc.; George F. Fry, Esq., member of the Tramways Committee of the Dover Corporation, chairman of the London Street Tramways Company, director of the Belfast Street Tramways Company, etc.; Emile Garcke, Esq., managing director of the British Electric Traction Company, chairman of the Potteries Electric Traction Company, chairman of the Swansea Improvements & Tramway Company, etc.; J. Barber Glenn, Esq., director of the London Street Tramways Company, managing director of Provincial Tramways Company, secretary of the Belfast Street Tramways Company, Isle of Thanet Light Railway Electric Company, etc.; W. M. Murphy, Esq., chairman of the Dublin United Tramways Company, director of the Belfast Street Tramways Company, London Southern Tramways Company, etc.; Stephen Sellon, Esq., Parliamentary engineer of the British Electric Traction Company, director of the Potteries Electric Traction Company, etc.

A. M. Wilcox, editor of the "Railway World," has been appointed honorary secretary, and William Morris, Jr., of the firm of Ashurst, Morris, Crisp & Co., has consented to act as honorary solicitor. The membership will consist of companies of the tramways departments of municipal corporations, and of individuals. Each individual member will have one vote, and every corporation or company will have five votes.

Solid Wrought Forged Axle Box Frames vs. Riveted Patchwork Truck Frames

BY JOHN A. BRILL

In the June and July issues of the STREET RAILWAY JOURNAL are two articles on the fundamental principles of an electric truck, signed by Edgar Peckham. These articles are essentially an attempt to reply to an article by me published in the May issue of the STREET RAILWAY JOURNAL. Mr. Peckham very adroitly begs the question, and at the same time entirely avoids the points which I made in the discussion of the "Parallel in the Development of the Locomotive and the Electric Truck." In that article I did not mention any "make" of truck, but my effort was entirely directed towards showing the fallacy of a patchwork truck frame, which he, very naturally, thinks it is necessary to defend. His statements relating to plate frames in locomotives, as compared to bar frames, are wholly misleading. The bar frame is essentially American locomotive engine practice, and was found necessary because of the formerly inferior roadbed construction. The plate frame is a European type of construction, and the plates are cut out of a single piece of metal; this is the ease also of the pivoted or bogie trucks used on European railways. There could be no question about some value of Mr. Peckham's truck if, instead of a patchwork made up of a multitude of rods, bars, castings and rivets, he would follow the English and Continental locomotive practice, as recited above, and cut the side frames of his truck from a single plate of metal.

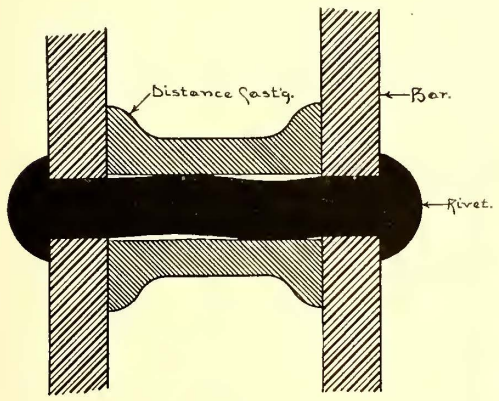


FIG. 1.

FIG. 2.

It is rather surprising to be told that locomotive frames have no weight to carry, and that engines weighing from 120,000 lbs. to 140,000 lbs. "put no strains upon their frame beyond those produced by the propelling mechanism." In English and American locomotive frames, whether of the plate or bar pattern, rivets are conspicuous by their absence. Riveted joints are nowhere able to stand such straining and pounding as trolley car trucks or locomotives give their frames. Then, too, the reference to bridges and rivcted structures is not to the point. Riveted bridges, he seems to think, are strong and in every respect analogous to a locomotive or an electric truck. This indicates a radical failure to comprehend the mechanical principles involved. A bridge, it is true, has heavy loads to sustain for a few minutes; it is subjected to a certain amount of vibration in a vertical direction only; but there is no comparison between its work and the hammering which a truck or locomotive frame receives during all the time of service. Whereas a bridge is subjected to a violent strain vertically for a few moments during the passage of a train, and then remains at rest for a very much longer interval of time, a truck frame is subjected to stresses in every possible direction, and the pounding which it receives is almost unparalleled in mechanics. Riveted bridges are not considered as fine structures as the type known as the "pin" connected, and the repairs upon them and upon such structures as elevated roads are sufficient demonstrations of this. The weakness of riveted structures made up of a multitude of parts, eombining cast iron, cast steel, bar iron and rivets, is shown in every direction, particularly in trucks over bridge work, because in the trucks the spacing blocks are cored out, whereas the holes in the bars are either punched or drilled. When the parts arc riveted the rivets buckle to a large extent, if the hole in the spacing block is large, as shown in Fig. 1 herewith, and under heavy strains allows the rivet to stretch or bend. In this particular riveted truck work differs esscntially from that of riveted bridgcs, especially plate girder bridges, because the plate girders havc no spacing blocks, and the plates are placed together, drilled and riveted, under which process the rivets, fitting snugly in all holes, have no chance to buckle.

The difference between bridge work and truck work is illustrated in the accompanying sketches. A rivet driven in two bars separated by a distance piece does not fill the hole, and presents in section the appearance shown in Fig. 1. In bridge or boiler work plates with drilled holes come solidly together, and the rivet is capable of filling the hole, as shown in Fig. 2. The distinction is a radical one. Manufacturers of trucks with this type of side frames have always been obliged to concentrate their attention upon holding up the load, as they have been obliged to use the truss under most unfavorable conditions as to support and submit it to strains for which it is in no wise suited. The inevitable result is the sagging of the car ends. With solid forged frames or a plate bar frame of sufficient size of section the ends of the cars would more likely have stayed in place.

Mr. Peckham entitles the article which he is writing in defence of the composite frame truck "The Functions of the Electric Truck." In his two instalments he makes no mention of these functions. In his writing he as completely ignores them as he does in his construction. The pith and point of his article seems to be that "I can build a fine truss that will hold up the ends of a car." The reply to this is that there is no difficulty whatever in holding up the ends of a car, or there ought not to be, although Mr. Peckham seems to have encountered no end of trouble in this line. The truss of which he speaks and of which he appears to be so proud is one that he has but recently introduced, and is not a part of the frame of his truck, but is a direct copy of a truss the J. G. Brill Company has used for years, and was employed by it on its open horse cars; it is also the same class of truss which the company put on the first motor truck which was ever built.

Mr. Peckham distinctly says that the solid frame trucks are being replaced by those of his own manufacture. I wish to say in reply to this surprising statement that I have yet to learn of a place where such a thing is happening. So far as I know, it has not happened in the past except in one case five years ago, and there the Peckham trucks were not a success, while the discarded ones were purchased by other lines, and are in good condition and operation to-day.

It should be understood that when I undertook to discuss the developments of the electric truck or its frame I was not attempting to consider the matter of building a separate and independent truss for sustaining the ends of long cars. In holding up the ends of cars Mr. Peckham has been as peculiarly unfortunate as he was in the choice of a design for his truck frame. The truck side which he is now making is the same old style that he built in 1892, and is of a type which the Brill Company at that time discarded because of its inherent weakness. Because of this weakness and inability to hold up the ends of a car, he has been obliged to devise what he terms the "new truss," and several thousands of his trucks are now in operation without this truss upon which he lays so much stress. The composite truck side which the J. G. Brill Company built in 1892, and the side which Mr. Peckham builds at present contain all the inherent weak points of the composite locomotive frame of 1832. The J. G. Brill Company thought then, as Mr. Peckham thinks now, that the horizontal stresses were comparatively insignificant. These horizontal stresses are so great that the truss and riveted truck sides shake to pieces and allow the end of the truck to drop, taking the end of the car with it. With the best riveting machines possible, and the most careful attention to every detail of workmanship, the riveted structure is unable to stand the strains of street railroad work. Even after seven years of experience and constant failure, this fact does not seem to have impressed itself upon Mr. Peckham. The "trusses" are simply names to conjure with. They are mere selling points, and are of no value except as such, and as means to cover up weaknesses which are a part of the bad original designs.

The quotation which Mr. Peckham makes from an article by Henry E. P. Cottrell is merely an effort to draw attention away from the main question. I am very glad that Mr. Peckham has called my attention to this article, as I propose to answer it, and set the public straight in regard to this matter. A long car body and a truss for holding its ends up are questions entirely outside of the truck. One truss can be just as easily applied to a car as another. It is the truck side which is defective, and no matter how well the ends of a car may be trussed, the truck side, by reason of the multitude of parts, soon gives out under the stresses and hammering, its ends drop, it ceases to hold the axles in line, and it then becomes an expensive failure. My article was written for the purpose of bringing clearly before the minds of street railway men the fundamental principles of good truck construction. It seems unfortunate to attempt a discussion of principles which are not important, and to undertake to defend one maker's trucks by the application of an outside clement which has nothing to do

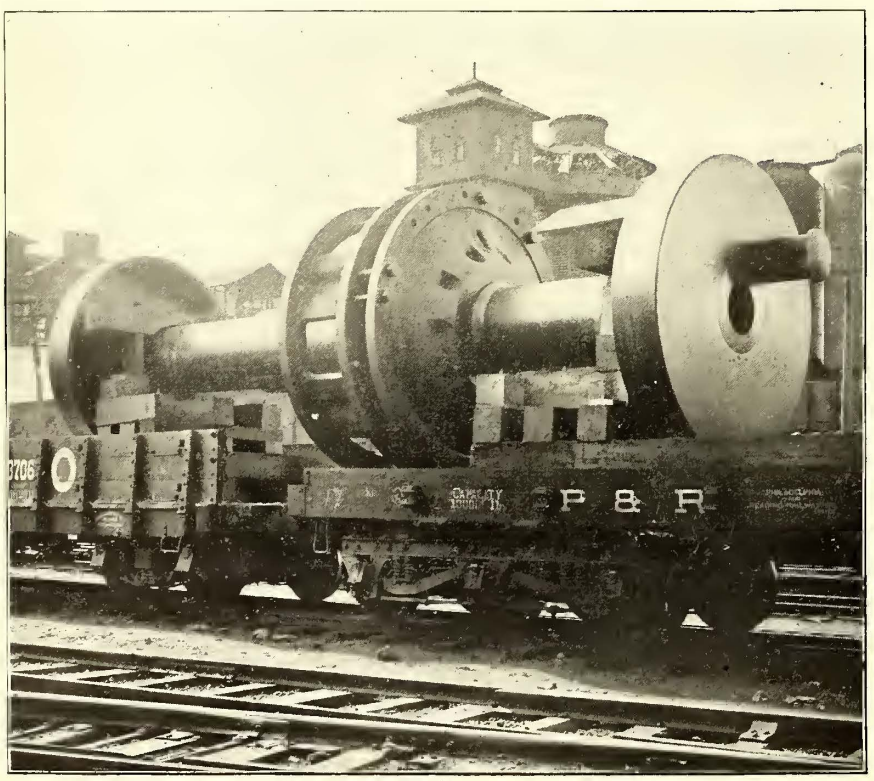
with truck building, because the long truss does not effect the riding qualities of the truck. It does not decrease the pitching nor steady the body in any way, nor strengthen a weak truck side, yet these ideas are persistently advanced in Mr. Peckham's article.

Sale of an Ohio Road

The entire assets and property of the Newark & Granville Electric Street Railway Company, of Newark, Ohio, will be sold at receiver's sale on Aug. 26, 1899. This system consists of about 8 miles of road in the city of Newark, which has a population of over 22,000 and about 7 miles of road, extending from Newark to Granville, a college town of about 3000 population, with one of the finest parks in the country along the road near the city of Newark. It is equipped with first-class machinery and cars.

Large Engine Shaft for Boston

On June 9 there was made from the works of the Bethlehem Steel Company, at South Bethlehem, Pa., what is thought to be the second largest shipment ever made in this country, the largest having been the Krupp gun, which was transported by the Pennsylvania Railroad Company, between Sparrow's Point, Md., and the World's Fair, Chicago. The illustration shows the shipment referred to. It is a shaft with crank discs and generator fly-wheel hub assembled on it, all finished complete. This shaft was made for an engine built by the Corliss Steam Engine Company, of Providence, R. I., for the Boston Elevated Railway. The total



LARGE ENGINE SHAFT FOR BOSTON

weight of the shipment was 170,400 lbs., and in order to transport it from South Bethlehem to the site at Boston, Mass., the Philadelphia & Reading Railway Company furnished two cars of 100,000 and 80,000 lbs. capacity respectively and blocked the shaft so that 60 per cent of the weight was supported on the stronger car and 40 per cent on the other. The shipment was made over the New Jersey Central, the Delaware & Hudson Canal Company and Boston & Albany Railroad Company.

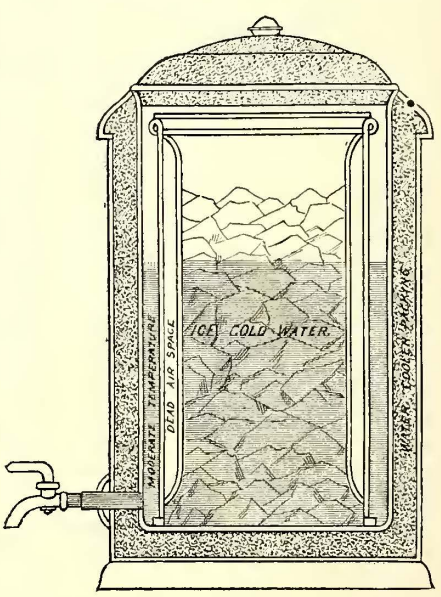
The shaft is the first of three for the Boston Elevated Railway. It is of fluid compressed nickel steel, hydraulically forged hollow on a mandrel, oil tempered and annealed. It is 37 ins. diameter in the center, with a 17-in. hole through its axis, and is 27 ft. 10 ins. long. The metal of which it was made showed tests of 50,000 lbs. elastic limit and 18 per cent elongation in test pieces 1 in. diameter and 10 ins. long. Shipments, approximating this size, will frequently have to be made by railroads in the future.

The Bethlehem Steel Company has in hand orders from the Edward P. Allis Company, Milwaukee, Wis., for the Metropolitan Street Railway Company, of New York city, eleven shafts of exactly the same size, also from the Westinghouse Machine Company, Pittsburgh, Pa., orders for sixteen similar shafts for the Third Avenue Railway Company, of New York city, and two for the Brooklyn Edison Illuminating Company, also from the Westinghouse Electric & Manufacturing Company, Pittsburgh, orders for fifteen shafts a little smaller in size for the water power plant at Messina Springs, N. Y. The power plants for which these shafts are intended are designed to be equipped with engines of 8000 h.p. capacity. In all probability even larger units than this will be called for in the future, as the tendency toward centralization of power is in that direction. It is stated that the engines for the power plant, made necessary by the change from steam to electricity by the Manhattan Elevated Railway, New York city, will have a maximum capacity of 12,000 h.p. The shafts for these engines will, of course, be considerably larger than that shown in the illustration.

Receptacle for Water Cooler

A scientific ice-water receptacle for holding drinking water in waiting rooms, on street cars, in offices, etc., is being placed on the market by A. Major, of New York city. For this device is claimed a saving of 50 per cent in ice, and in addition a more agreeable temperature for the water than is obtained by simply putting a piece of ice in water in an ordinary cooler. The water is kept at a uniform temperature, resembling very closely that of cool spring water.

The new device is very simple, consisting of an independent receptacle, open at the bottom, as shown, and having double walls, with a dead air space between them. It also has a double cover. This receptacle is designed to be placed in any cooler, and should be about 1½ ins. smaller all the way around than the cooler in which it is to go. The ice is placed in the inside vessel, which, having no bottom, permits the water to circulate in and around it, keeping, it is claimed, the water from getting extremely and unnecessarily cold, and preventing the ice from melting as rapidly as it ordinarily would. Mr. Major, whose address is 461 Pearl Street, has succeeded in introducing his invention quite successfully throughout the United States. The receptacle is made in any size to fit any cooler.



NEW WATER COOLER

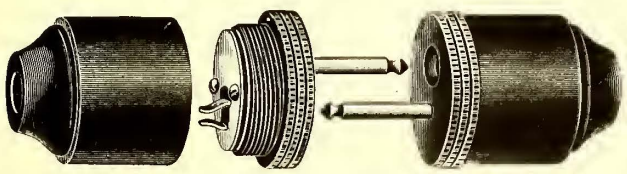
Tickets for Tramways

A good idea of the extent of the tramway business is obtained by a glance over the catalogue of T. J. Whiting & Sons, of London, manufacturers of tramway tickets. This company has been engaged for a long time in the business of printing tramway tickets for all parts of the world, and its catalogue contains reproductions of these tickets. They include tickets from cities throughout Europe, Asia and Africa and in all languages, including Chinese and various dialects of Hindoo. The catalogue gives an excellent idea of the firm's world-wide connections and reputation.

Electric Trailer Connector

At this period of the year there are varying calls for train capacity, through picnics, trolley parties, baseball games, etc. This means frequent additions of trailers to motor cars. Safety of connecting current devices doubtless is more sought for by electric railway managers than articles giving ease of operation. A combination in one device of these two elements makes it of greatest usefulness. The Wood's trailer connector, as illustrated herewith, is claimed to possess these qualities. It has the particular advantage that at no time (after connection to lighting circuit) is there any exposure of live metal, the connecting pins being absolutely "dead" until beyond the reach of the conductor's fingers. This safety factor also is worth noting as applying to inquisitive or careless passengers.

The Wood's trailer connector, as well as a complete line of elec-



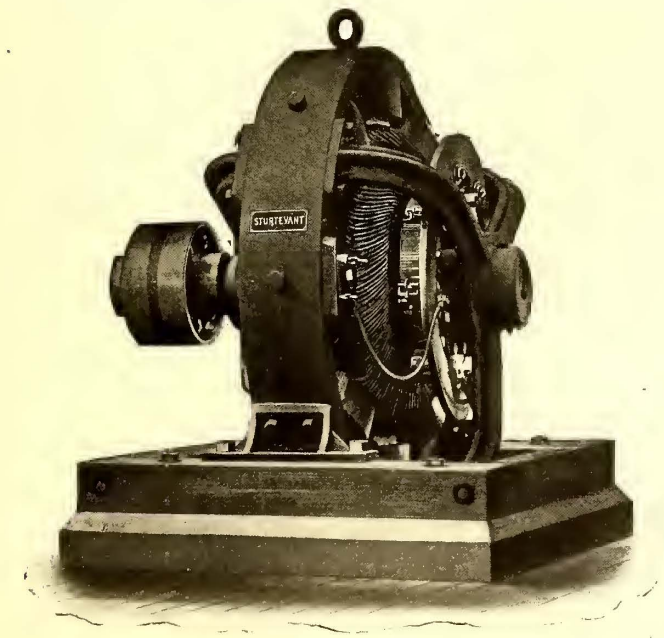
CONNECTOR FOR TRAIL CAR

tric railway supplies, is carried by the Central Electric Company, Chicago, as selling agents for the Central Union Brass Company, St. Louis, Mo.

New Type of Dynamos and Motors

The B. F. Sturtevant Company, of Boston, has made a specialty of the construction of eight-pole generators and stationary motors, running in size from 3 kw. to 110 kw. The motors of this type were designed originally for driving fans for subway work, and their use in the Boston subway has been described in the STREET RAILWAY JOURNAL. They have been found, however, so economical and desirable that the Sturtevant Company has increased the number of sizes in which these motors are built, and recommends them not only for ventilating, but for general power purposes about car houses and power stations.

The field ring, which also constitutes the frame of these machines, is of wrought iron in the small, of cast steel in the medium, and of cast iron in the large sizes. The field cores are of wrought iron, and the pole shoes of cast iron, of such peculiar shape and size as to render these machines capable of meeting extreme variations of load without sparking or the necessity of adjustment.



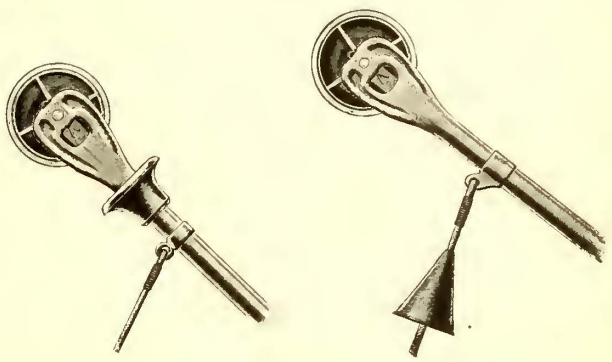
NEW MULTIPOLAR DYNAMO

The field coils are machine wound, thoroughly insulated, and of such open construction as to secure the maximum radiation and ventilation. The armature core is built up of laminated slotted discs, which are solidly clamped between two brass rings having corresponding slots. The coils are machine wound, of uniform size and shape, and thoroughly insulated, the armature being of the drum type.

The commutator is of large diameter, the segments being of fine rolled or drop-forged copper. For high voltages or small outputs at low speeds two sets of reaction brushes, of fibre-graphite, are usually employed, and from the character of the design require no adjustment. Tripod bearing yokes are provided, as shown above, except in the largest machines, which are equipped with special bases and pedestal bearings. The shaft runs in gun-metal sleeves, and is lubricated by means of ring oilers.

Water Guards for Trolly Poles and Ropes

The accompanying illustrations show a water guard invented by Thomas Hawken, superintendent of the Rockland, Thomaston & Camden Street Railway, of Rockland, Maine. The guards are made of rubber, and that on the trolley pole is intended to keep the rain from running down the pole and also the rope. That on



GUARD ON POLE GUARD ON ROPE

the rope protects the rope only and rear platform, and when the car is in motion the water drops clear of the car. The method of application is clearly shown in the engravings.

It is not necessary to use both of these devices, but, as some managers or conductors would prefer to have the device on the rope and others on the pole, Mr. Hawken makes both types. The guard has been given a severe test for several months on the Rockland, Thomaston & Camden Railway, and has given perfect satisfaction.

Large Sales of Boiler Cleaning Device

The Union Boiler Tube Cleaner Company, of 240 Penn Avenue, Pittsburgh, Pa., was organized in 1895 for the purpose of introducing an entirely new industry, that of removing scale from the interiors of the tubes of water tube boilers, and it is one of the largest concerns of the kind in the world, having machinery especially designed for this specific business. Its devices are patented abroad, as well as in the United States, which enables this company to safely contract for thoroughly cleaning boilers under a time limit, with bond for heavy penalty for non-fulfillment, or to sell or lease tools for cleaning all makes of water tube boilers having straight, horizontally inclined or vertical tubes and those having curved tubes, such as the Climax, Stirling, also the Hazelton, having closed end tubes, the latter three types having been heretofore considered impossible to clean.

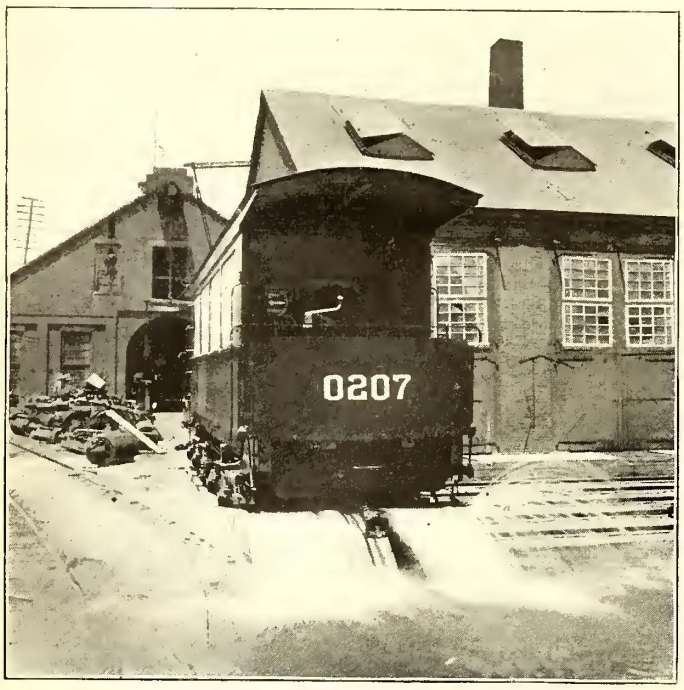
This concern commenced business as a firm May 1, 1895, a time of great depression in the industrial world, notwithstanding which the evident merits of its devices caused their immediate adoption in a number of the power plants in the United States and England. The continued demand for these cleaners has compelled the manufacturers to greatly enlarge their works, despite which the factory is overcrowded with orders.

Large Orders for Registers

The business of the New Haven Car Register Company is constantly increasing, and the company reports a large number of new orders. Of its recent large orders one is for several hundred machines for the Third Avenue Railroad Company, New York city. The company has also received large orders lately from St. Joseph, Mo., and additional orders for its registers for the Market Street system, of San Francisco, from Oakland and Los Angeles, Cal., in both of which cities its registers are in use.

Large Sprinkling Car

Wendell & MacDuffie, of New York City, have sold during the past summer three sprinkling cars, which are said to be of larger capacity than any ever before built in this country. Two of these



END VIEW OF SPRINKLING CAR

were sold to the North Jersey Street Railway Company, and one to the Philadelphia & Westchester Street Railway Company. The tank cars were manufactured by the Taunton Locomotive Manufacturing Company, of Taunton, Mass.

In the accompanying illustrations one of the cars furnished to the North Jersey Street Railway Company is shown. The tank proper is 24 ft. long and about 64 ins. in diameter. The car is mounted on Peckham 14-B double trucks, and is equipped with Van Dorn couplers, North Jersey Street Railway Company's standard bumpers, and Sterling brakes, in accordance with specifications. The tank is completely housed in, there being four dummy windows fitted with curtains. The sprinkler has a total capacity of 4000 gals. of water.

A Handsome Catalogue

The Gold Car Heating Company, of New York, has recently published a very tasteful catalogue of its various types of car heaters for steam and electric railways. Mr. Gold has made a life study of the heating of cars, and the list of railroads whose cars he has equipped with heating apparatus is a most extended one, and includes roads in all parts of the world. Altogether about 20,000 cars and locomotives have been equipped with the Gold system.

As is well known, the Gold Car Heating Company manufactures both steam and electric heaters. In the latter, which is the type, of course, in which electric railway managers are most interested, special attention has been given to securing a good circulation of air around the heated wires and distributing the heat in a uniform manner through the car. The degree of heat can be regulated by a three-point switch. The company also makes electric heaters for car house and miscellaneous uses.

The catalogue is very fully illustrated and is handsomely printed.

A Successful Car Fender

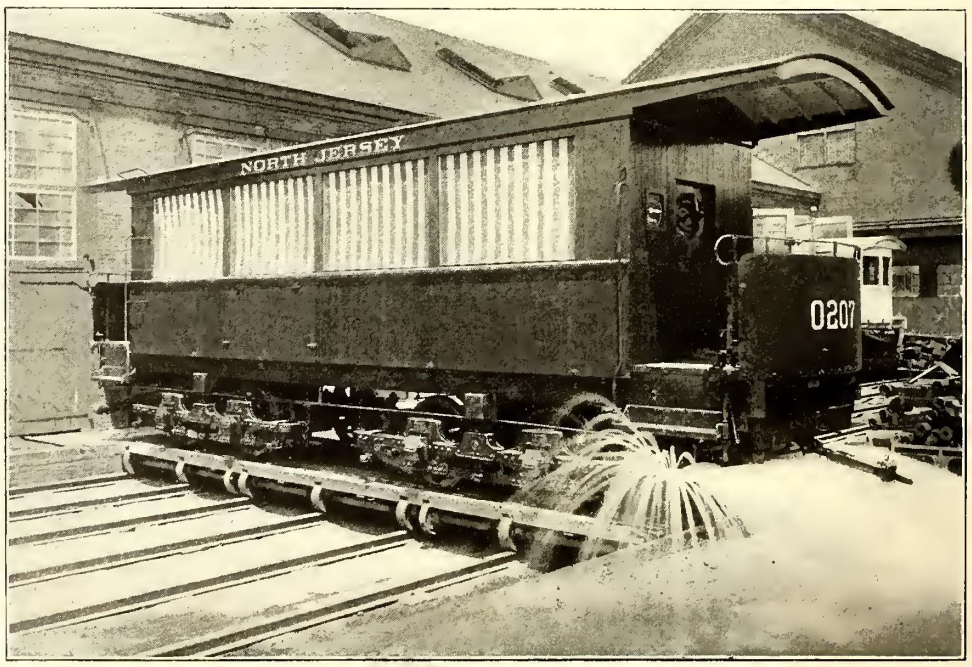
The Hipwood-Barrett fender, a test of which was described in the July issue of the STREET RAILWAY JOURNAL, is exciting a well-deserved interest among street railway officials. When the fender is dropped to the ground by a slight action of the motorman's knee, its construction is such that it conforms perfectly to any unevenness in the roadbed, by means of the five distinct sections. As these have a resilient action, there is no danger of stubbing, and a tension holds them close to the roadbed. The tests have shown it to be infallible in picking up a body, no matter in what position it may be standing or lying on the track. These features also prevent impairment of efficiency by oscillation of the car.

Attached to the sections are lips just forward of the bed, which, allowing a body to readily pass over them when being picked up, successfully prevent its falling back on to the track again, and continued tests have proved the adjustment of the tension to be such that snow, ice or mud cannot possibly interfere with the action. The fender is folded up and disposed of under the car when a trailer is to be used or a disabled car pushed along, or when housing, which, taking but three seconds to accomplish, will recommend its use to all railroad men.

New Road in Wisconsin

On July 4 the cars on the Waupaca & Chain o'Lakes (Wis.) Electric Railway were started for the first time. The building of this road has been in contemplation for the past two years, but only recently were the franchises secured and financial arrangements made. The contract for the entire construction and equipment, including track and overhead work, cars and equipments, was awarded to the Electrical Installation Company on May 18 last. Work on the grade was started May 26, and cars put in operation, as above stated, July 4, thus making thirty-two working days for the entire building of 5 miles of road complete. No better record than this can be shown in the United States, especially in this year of never-ending delays in delivery of apparatus and materials.

One of the features of this remarkably fast piece of work was



SIDE VIEW OF SPRINKLING CAR

the laying, lining and surfacing of 23,000 ft. of track in sixty working hours. Had it not been for delay in receipt of special work for track the line could have been open for traffic June 25. The road is built on standard lines throughout, using cedar ties, 50-lb. T rail, crown bonds and 00 trolley wire with both span and bracket construction. The city end of the line is ballasted with stone, the suburban portion with gravel for its entire length. This road reaches one of the most delightful spots in the State of Wisconsin, and opens up a new territory such as cannot fail to make the road a paying investment. W. B. Baker and Irving P. Lord are the owners of the line.

Compressed Air Cars in Chicago

The Compressed Air Motor Company, of Illinois, with headquarters at Chicago, reports that it placed in operation on May 30, 1899, one of its compressed air motor cars, replacing one of the horse cars in the night service of the North Clark Street Cable Railway. It is stated that this car has performed a continuous service, carrying passengers each night without failure or delay, and, it is said, entirely with satisfaction to the street railway officials. Since May 30 an additional compressed air car has also been put on, and air cars are now doing the "owl" service between the City Hall and the city limits.

On the first and second trips at night one or two trail cars are attached to the motor car, and in a single round trip of 7 miles 417 passengers have been carried.

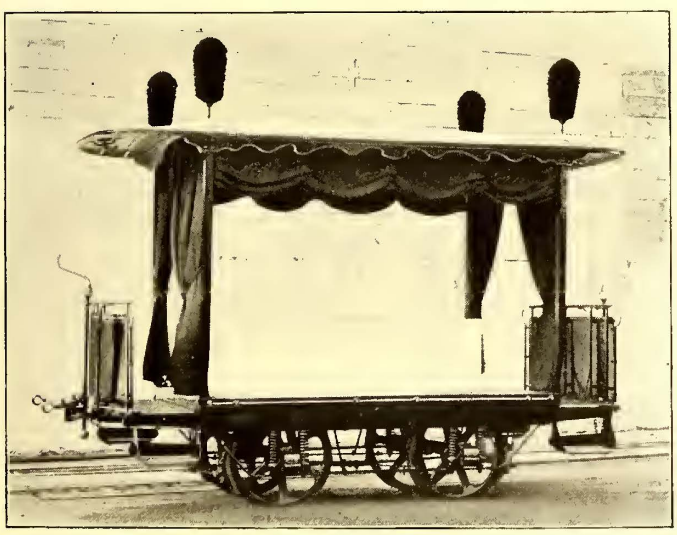
Patent Litigation

The Thomson-Houston Electric Company has been granted preliminary injunctions restraining the Worcester & Clinton Street Railway Company from infringing claims 20, 21, 22, 27, 28, 29 and 31 of Letters Patent No. 393,323, covering a system of electrical controllers, and claims 3, 4, 11, 19, 20, 23, 25, 26 and 27 of Patent No. 424,695 granted to Van Depole, and covering a suspended switch.

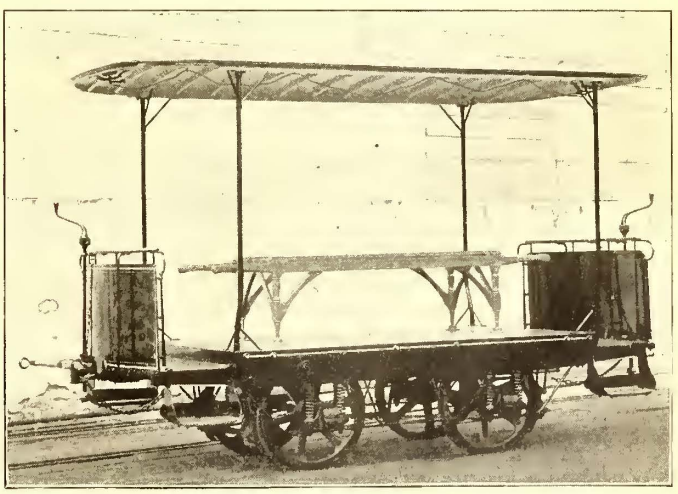
The Thomson-Houston Electric Company has also been successful in its suit against the Central Union Brass Company for infringement of the Van Depole Patent No. 424,695; and also against the Mill Creek Valley Street Railway Company for infringing Patent No. 393,323.

Open Funeral Cars

The Mexicans of all classes have a very sensible idea about the utilization of their street railways for transportation of funerals. In America a few steam railroads provide funeral facilities, but the idea of using the ordinary street car, whether propelled by animal power or electricity, does not seem to have been carried out to any great extent in America. The two cars illustrated were built recently for the Cia Tranvias de Merida Yucatan by the J. G. Brill Company. The road is narrow gage and is operated by animal power. The cars are but 9 ft. long by 6 ft. in width over all. One of them is of the plainest possible sort, merely a platform carrying a bier with a light roof supported by four rods at the corners. The other one is somewhat more elaborate, draped curtains at the corners and an enclosed bier in the center are provided, while the roof is decorated with plumes. A small crucifix is placed in the center of each roof. The inside of this car is finished in white and gold. The cheaper car has the ordinary carlin finish. The casket can, of course, be placed in the car from either side. For the mourners the ordinary horse cars are provided, and, as the cemeteries are made termini for the roads, the system is one which is in every respect sensible.



FIRST CLASS HEARSE

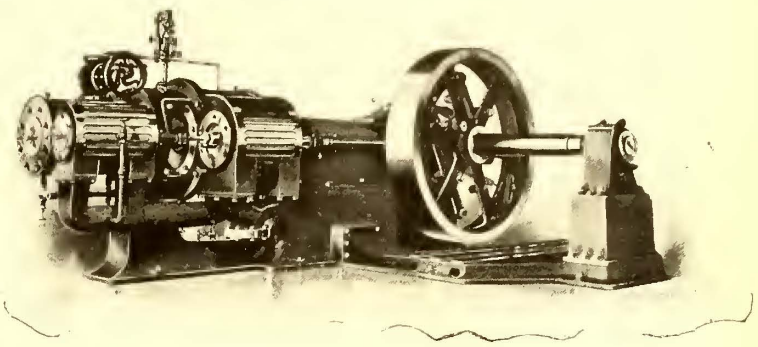


SECOND CLASS HEARSE

A Well Known System of Compound Engines

Although it is but a comparatively short time since the practicability of a short-stroke, quick-acting, wheel-governing compound engine has been admitted by the leading engineering talent, the demand for such engines is now very extensive and is constantly increasing, and under proper operating conditions the economy of the compound engine is unquestioned.

Recognizing these conditions, the Harrisburg Foundry & Machine Works, of Harrisburg, Pa., has developed a complete system of engines of this nature, one size of which is shown herewith. In this design the low pressure cylinder is placed next to the engine frame, since this method insures a more substantial attachment than otherwise, and the high pressure cylinder, with the generously proportioned connection between them, has a bracket support which rests upon the end of the sub-base, which extends the full length of the engine. The bottom of this bracket support is planed with a tongue, which is fitted accurately in a corresponding groove in the top surface of the sub-base, bolts being provided in longitudinal holes, thus allowing expansion and contraction, but preventing any lifting tendency. Ample opportunity is provided for repairing or adjusting the piston and rings without having to detach the high pressure cylinder, piping, connections, etc., this being a most important consideration.



REAR VIEW OF ENGINE—GENERATOR REMOVED

The receiver, between high and low pressure cylinder, is a neat flanged casting with bolt attachment. The larger sizes are built with separate valve connections, whereby the high pressure valve is automatic in action, and the low pressure valve is driven by a fixed eccentric, so arranged, however, that the cut-off may be set by hand at any desired point. In this way, it is claimed the most economical results possible can be obtained under almost any changing conditions. A further advantage is obtained in this regard by the arrangement of the heads of the piston valves, which are adjustable, and so may have both "lead" and "lap" changed also to suit any and all conditions. The engines are provided with the Ideal automatic oiling system, and in closely graduated sizes, from 25 h.p. to 1200 h.p. The accompanying illustration shows the engine arranged for direct connection to generator. Belted styles are, of course, also built. There are already nearly one hundred of the Harrisburg engines of this style in operation.

New Method of Welding Rails in Germany

Herr Dr. Goldschmidt, chief chemist of the experimental laboratory of Essen, has invented a new method for welding street car rails, which is described as follows:

The Goldschmidt method for the production of high temperatures, as applied to the welding of street railway rails, has been tried on portions of the Essen Street Railway, after the possibility of the welding of rails of the Phœnix, or grooved section, of 180 mm. (7 ins.) height had been thoroughly demonstrated in the laboratory. The practical application of the principles are identical with the experimental. The rail ends, which must be perfectly square and thoroughly clean, are firmly forced together by a special clamping device. The general construction of this apparatus, of which several types were made and tried, consists of several cast steel pieces, which securely hold the rail ends in both a vertical and horizontal position, making it easily transferable from one joint to another. The total space it occupies when in position at the joint is about 80 mm. x 50 mm. x 30 mm. (3 ins. x 2 ins. x 1.2 ins.) When sufficient pressure has been secured the joint to be welded is covered by a sheet-iron casing, corresponding to the contour of the rail surface, and the whole covered with sand. The welding process proper is now ready to take place.

The welding compound, which is composed of pulverized oxide of iron and aluminum, is prepared in and poured from a crucible by means of long tongs.

A small portion of the compound is ignited in the crucible by means of a fuseé (zundkirsche), and the remainder is gradually brought around it so that the ignited portion is completely covered. Finally, a coating of fluid corundum appears, which radiates intense heat and a brilliant light. A residual metal settles in the bottom of the crucible. Inasmuch as the top layer of this corundum solidifies rapidly, it is necessary to remove it by means of an iron rod just before pouring. At first the fluid metal will run into the mould and cover the joint with a thin, hard coating. The corundum solidifies at a temperature considerably higher than that of the iron to be welded. When the metal that collected on the bottom of the crucible begins to flow, this coating referred to above prevents it from coming in contact with the rails and thereby injuring them. The sheet-iron form is also protected in this way, and permits its use over and over again. On cooling, the whole mass can be easily removed, on account of its brittleness, by being struck with hammers. During the application of this intense heat at the joint the metal expands, but, owing to the presence of the clamp, still greater pressure is caused, and the result is a perfectly sound weld, as has been demonstrated by breaking tests. A bending test, made by loading a joint with a weight of 45,000 kg. (99,000 lbs.), with supports 70 c.m. (27.6 ins.) apart, showed a permanent set of 2 c.m. (0.79 ins.) only, but a rupture occurred considerably later, by the application of a live load.

The entire work of welding a joint on the track can be accomplished by the aid of three men in a few moments. By using this device all cumbersome machinery is eliminated, the only necessary requisites being the metallic compound, which can be shipped in barrels; clamps, crucibles and a few other small utensils, thereby reducing the cost of transportation to a minimum. The cost of this operation is such that it can easily compete with the old method of fish-plates and copper bonding as a means of effecting a rail joint.

The New Street Railway Management in Washington

Col. George Truesdall, ex-Commissioner of the District of Columbia, and for many years closely identified with the business and public interests of Washington, has been elected president of the Washington Traction Company and of the street railway companies which it controls. The other officers of the properties are Charles A. Lieb, of New York, vice-president; H. D. Merrick, treasurer; James B. Lackey, secretary, and V. B. Deyber, assistant treasurer. The new directors are George Truesdell, O. T. Crosby, Charles A. Lieb, S. C. Stevens, George W. Young, Nathaniel Wilson, James B. Lackey, V. B. Deyber and H. D. Merrick.

Col. Truesdell is a native of Fayetteville, N. Y., but has lived in Washington for many years. He has been prominently connected with the city's real estate development, particularly in the suburbs, and is said to have been the original projector of Eckington and builder of the Eckington & Soldiers' Home Railway Company, which was one of the first electric railways in the country, and the first to use center-pole construction. Largely through the building of this road and the excellent results thereby given to the district, the property greatly increased in value, and houses were built so rapidly as to make this one of the most populous of Washington's suburbs. Col. Truesdell served as District Commissioner for three years under the Cleveland administration.

Street Railway Conditions in St. Petersburg

The street railways of St. Petersburg are single track lines, operated by horses, with double deck cars, of which three are usually run together. By the terms of the franchises the roadbed and rails become the property of the city on the expiration of the charter, the other property to be purchased by appraisement. The city has had possession of and has been running the best line, about ten miles long, for a year, and a suit is now pending to get possession of the remainder of the system. The city intends to equip the Nevsky Street Car Line with some electric system, but details have not yet been decided upon, and a number of interests are endeavoring to secure contracts. Belgian capitalists have been particularly active in their attempts to obtain contracts and franchises.

Personal

MR. H. A. JONES has been appointed secretary of the Oswego Traction Company, of Oswego, N. Y.

MR. JOHN A. WILSON has been appointed chief engineer of the Trenton Passenger Railway Company.

MR. FRANK J. SPRAGUE sailed for Europe on Wednesday via steamship St. Paul, to be gone for about six weeks.

MR. P. H. KING has been appointed manager of the Montgomery & Chester Electric Railway Company, of Montgomery, Pa.

MR. J. L. YOUNG, JR., is the new auditor of the Richmond Traction Company of Richmond, Va., taking the place of Mr. J. A. Cook.

MR. GEORGE W. MOFFAT has resigned his position as superintendent of the Doylestown & Willow Grove Trolley Road, of Doylestown, Pa.

MR. A. K. BAYLOR, general manager of the British Thomson-Houston Company, has arrived in America, where he will remain until about Sept. 10.

MR. WM. J. BURNS, general manager of the West End Traction Company, of Pittsburgh, died on June 16, 1899, in Paris, France, where he had been staying for his health.

MR. A. G. CARLSON, chief draughtsman of the Chicago City Railway Company, sailed for Europe on July 12 for a short recreation trip. He will visit Sweden before he returns.

MR. ROBERT P. LINDERMAN has been elected president, Mr. E. M. McIlvain vice-president, and Mr. R. W. Davenport general superintendent of the Bethlehem Iron Company.

MR. G. F. GREENWOOD, formerly general manager of the Consolidated Traction Company, Pittsburgh, will, it is stated, go to Cuba this fall to reconstruct the street railways in Havana.

MR. W. B. BROCKWAY, secretary of the Toledo, Bowling Green & Fremont Electric Railway, has been placed temporarily in charge of the system, owing to the death of President Jacoby.

MR. SAMUEL G. BOYLE has been elected secretary and treasurer of the Louisville Railway Company, of Louisville, Ky., to succeed Mr. James Pettus, who retires on account of ill-health.

MR. DANIEL T. HUNT has succeeded Mr. Charles T. Yerkes as president of the North and West Chicago street railway companies, which are leased to the Chicago Union Traction Company.

MR. EDWIN JACOBY, president and treasurer of the Toledo, Bowling Green & Fremont Electric Railway Company, and a prominent business man of Toledo, died last week after a short illness.

MR. J. HOWARD WILSON, president and general manager of the Mobile Light & Railway Company, of Mobile, Ala., has resigned his position to look after private business interests in New York.

MR. J. E. WOODBRIDGE, editor of the American Electrician, was married to Miss Ethel Hotchkiss, of New York, on July 25, at Grace Church. He and his bride left soon after the ceremony for Chicago.

MR. THEODORE STEBBINS, vice-president and manager of the Schenectady Railway Company, of Schenectady, N. Y., has been succeeded in that position by Mr. R. H. Fraser, of Des Moines, Iowa.

MR. W. R. CASSELS, who has been for many years connected with the electric lighting interests of Buenos Aires, Argentina, was in the United States, during July. He will return to Buenos Aires, via London.

MR. J. M ATKINSON, well known in street railway circles in connection with the Atkinson protected rail bonds, was married on June 21 to Miss Elizabeth Amolia, at the First Presbyterian Church, of Lynchburg, Va.

MR. C. C. JOHNSON, secretary and superintendent of the Raleigh (N. C.) Electric Company, has been appointed manager of the Ithaca (N. Y.) Street Railway Company, and will assume his new duties about July 15.

MR. A. K ASHWORTH has retired from the office of manager of the Youngstown Park & Falls Street Railway Company, of Youngstown, Ohio, and has been succeeded by Mr. Robert T. Ivory, formerly track superintendent.

MR. JOHN GRAHAM, the retiring general manager of the Wilkesbarre & Wyoming Valley Traction Company, of Wilkesbarre, Pa., was tendered a banquet on June 23, by his friend and business associate, William J. Harvey.

MR. N. GRABURN, assistant superintendent and electrical engineer of the Montreal Street Railway, has been appointed to the position of electrical superintendent of the Glasgow (Scotland) Tramways, and will leave Canada within a few weeks.

MR. P. A. B. WIDENER, the well-known street railway financier, of Philadelphia, is president of the National Export Exposition, which intends to hold a very extensive national exhibit of manufactures, in Philadelphia, from Sept. 14 to Nov. 30, 1899.

MR. H. J. MALOCHEE, of New Orleans, under whose supervision the Orleans Railroad of New Orleans was rebuilt, has been appointed constructing engineer of the Huntsville Electric Railway, of Huntsville, Ala., and material will be ordered and work begun at an early date.

MR. A. C. RODENBOUGH, who has accepted the superintendency of the Easton, Palmer & Bethlehem Electric Railway, of Easton, Pa., in connection with his present duties as superintendent of the Easton Transit Company, has appointed Nathan Capon division superintendent.

MR. J. H. PASSMORE, of Reading, Pa., will, on July 1, assume the duties of manager of the Schuylkill Valley Traction Company, of Norristown, Pa. Mr. A. G. Davids, formerly manager of this system, has resigned, and will go to Gloucester, N. J., to take charge of a railway at that place.

MR. WILLIAM KELLY, JR., has been appointed general passenger agent for the Niagara Gorge Railway Company. Mr. Kelly has been for some years the general Eastern passenger agent of the Chicago, Milwaukee & St. Paul Railroad, and is secretary of the Buffalo Passenger Association.

MR. GEORGE E. SCRANTON, superintendent of transportation of the Columbus Street Railway Company, of Columbus, Ohio, will leave on Sept. 20 for Havana, Cuba, where he will assume the direction of the construction of a street railway system to be built by a syndicate of Eastern capitalists.

MR. JOHN E. SEWELL, general manager of the Waterbury (Conn.) Traction Company, has been appointed general manager of the Connecticut Light & Power Company, with headquarters at Waterbury. This is the company recently formed by the consolidation of several Connecticut electric railway and lighting systems.

MR. CHARLES G. BURTON has accepted a position with the Chicago office of the Westinghouse Electric & Manufacturing Company. Mr. Burton has had an active electrical career, having originally been with the Brush interests, and later with the Central Electric Company, of Chicago, and the Sprague Electric Company, at Chicago.

MR. EUGENE CLARK, formerly superintendent of the Plank Road line of the North Jersey Street Railway Company, of Newark, N. J., has been succeeded in that position by Mr. James McDonough, who has had charge of the South Orange line. Mr. P. McDermott, of Jersey City, takes Mr. McDonough's place on the South Orange line.

MR. H. N. HURT has been appointed superintendent of the Atlanta Railway Company, of Atlanta, Ga. Mr. Will Glenn has been appointed assistant superintendent and purchasing agent, and Mr. N. W. L. Brown has been appointed superintendent of construction. These gentlemen hold similar positions with the Atlanta Consolidated Street Railway Company.

MR. M. F. H. GOUVERNEUR, who was formerly manager of the Wilmington (N. C.) Street Railway Company, and later on of the Yonkers Street Railway Company until its consolidation with the Union Railway Company, of New York city, has just accepted a position as general manager of the Mobile Light & Railway Company, of which Mr. J. H. Wilson is president.

MR. HORACE B. ROGERS has been chosen manager of the Brockton & East Bridgewater Street Railway Company and the Brockton, Bridgewater & Taunton Street Railway Company in place of James W. Shaw, resigned. Mr. Henry Reynolds has been elected secretary and treasurer. These changes are made in consequence of the consolidation of the two companies.

MR. W. E. COOKE, formerly connected with the Peckham Motor Truck & Wheel Company, and the Walker Company, is now in Perth, Western Australia, constructing a tramway for the Deep Leads Company, which owns several mining properties in Australia. Mr. Cooke reports the country a fine one, with conditions which do not differ very greatly from those found in America.

MR. and MRS. PHILIP DAWSON of London, who have been traveling in America for some two months, sailed for London via steamship "Trave," on July 25, having made a host of new friends as well as renewed many old ones. On July 24 Mr. and Mrs. Dawson gave a farewell luncheon at Delmonico's to their friends in New York and vicinity, of whom about twenty were in attendance.

MR. ALLEN R. FOOTE, the well-known authority on street railway legal and financial matters, has recently undertaken the publication of a new weekly paper, known as the "Other Side." It will be the object of this periodical to give the current views and expressions of writers and thinkers on both sides of such questions as treat on the relations of the public to quasi-public institutions.

MR. JOHN LUNDIE, whose office has been for some time in the Empire Building, has removed to 925 Exchange Court Building, 52 Broadway. Mr. Lundie's report to the Boston Elevated Railway Company, covering the cost of train service at different speeds, schedules, etc., has been presented to the company, and Mr. Lundie is now engaged on other important special work in a similar line.

COL. C. F. MORSE has retired from the position of president and treasurer of the Metropolitan Street Railway Company, of Kansas City, Mo. At the annual election of this company the following officers were elected: President, W. H. Holmes; vice-president, L. E. James; general manager, Conway F. Holmes; treasurer, W. E. Kirkpatrick, of Chicago, and general superintendent, W. A. Saterlee.

MR. GEORGE C. DRESSEL, president of the Dressel Railway Lamp Works, of New York, died July 3. He was born in Germany in 1828, and learned the trade of coppersmith. He came to this country when he was still a young man and entered the employment of the New York & Harlem Railroad, where he remained for eighteen years. In 1881 he began the manufacture of railroad signal lamps.

MR. C. R. HEAP, of London, the British representative of the C. & C. Company, of New York; the Wagner Company, of St. Louis; the Partridge Carbon Company, of Sandusky, and other American concerns, has been in America on a business trip for some time, and sailed by the New York on July 12. He reports that the business in Great Britain for American apparatus is very large and is constantly increasing. He has placed orders for apparatus to a considerable amount in America.

MR. S. L. NELSON, general manager of the Springfield Railway Company, of Springfield, Ohio, took occasion, upon the celebration of the fortieth anniversary of his birthday, which occurred June 23, 1899, to present each of the employees of the company with which he is connected with different sums of money, ranging from $1 to $10, as a token of his appreciation of their faithful services. The gifts amounted in all to over $600. The men in turn, to show their regard, presented Mr. Nelson with an elegant leather-covered chair and a number of small silver articles.

MR. S. W. CHILDS has charge of the construction of the Perth Tramways at Perth, Western Australia, immediately under Mr.

W. E. Cooke. Mr. Childs was engaged for some time in the United States in railroad construction work, having been connected with the building of the street railway systems at Brooklyn, Columbus, Ohio; Baltimore and Charleston, S. C. At the latter place he had full charge of the construction of the entire system, including the building of about 30 miles of track, erection of power house, car barns, etc. In 1893 he accepted a position with J. G. White & Company, and is now in Perth as their representative.

MR. LOUIS J. MAGEE, managing director of the Union Elektricitäts Gesellschaft, of Berlin, who went to Germany from America some years ago, has just been given special and very unusual honors in being elected one of six directors of the Association of German Electricians (Verbund Deutscher Elektrotechniker). Over this directory Herr von Siemens presides and Gisbert Kapp is general secretary. The association, which is seven years old, has 2395 members. Mr. Magee was instrumental in forming the Union Elektricitäts Gesellschaft in 1892, to take up the Thomson-Houston business for a large part of Europe and European and Asiatic Russia, and has become widely known in Germany and other countries as an engineer and business man.

MR. EDWARD B. WYMAN and MR. ALLEN H. P. STONEHAM, of London, were in the United States last month for a short visit. Both of these gentlemen are prominently connected with the Deep Leads Electric Transmission Company, of Victoria, Australia, and with the Perth Tramways at Perth, Australia. Mr. Stoneham is managing director of several, and director in a number of large mining companies in Victoria, Western Australia, British Columbia and other parts of the world. He is the chief owner of, and individually financed the Perth Tramways. He is also interested in a number of power transmission properties in different parts of the globe. Mr. Wyman is the managing director of the Deep Leads Transmission Company, and the Victorian Deep Lands, Ltd., and a director of the Kalgoorlie Power syndicate. He is an American, and was engaged for several years in the electric heating business in the United States. In addition to his connection with the Deep Leads enterprise he is interested in several other mining projects.

MR. J. B. CAHOON, general manager of the Elmira Municipal Improvement Company, which operates the electric railway, lighting, gas and waterworks of that city, has resigned his position in order to accept that of general manager of the Syracuse Underground Electric Wiring Company, which controls the franchise for underground wiring in Syracuse, and has also a franchise for operating an electric plant. The new company is composed of Messrs. William L. Elkins, Stephen Peabody, Henry Seligman, Hollister & Babcock, Robert C. Pruyn and local capitatlists, and will have a capital of $500,000, nearly all of which will be spent immediately in putting up a new electric lighting plant. Mr. Cahoon is a graduate of the Annapolis Naval Academy, class of 1879. In 1889 he became connected with the Thomson-Houston Company, and organized the expert department of the General Electric Company after the consolidation in 1894. He later became chief engineer of the local companies committee, and at different times had charge of thirty-seven electric lighting and two street railway properties owned by the General Electric Company. He went to Elmira in 1895, where his record has been exceptionally good.

AMONG THE MANUFACTURERS

THE UNION TRACTION COMPANY, of Philadelphia, is making some tests with the Christensen air brake on its York Road line.

C. W. MOFFETT has taken the management of the Boston office of the Heine Safety Boiler Company, of St. Louis, in place of Russell Walker, recently resigned.

W. H. WISSING has been appointed general agent for Nagle, Holcomb & Company, of Chicago, and will have his headquarters at 642 Century Building, St. Louis, Mo.

R. W. BLACKWELL & COMPANY, of London, have been successful in the suit brought against Greenwood & Batley, Ltd., of Leeds, for £608 15s. 2d., claimed to be due for material furnished.

THE PARRISH SIGNAL COMPANY, of Jackson, Mich., has just finished the installation of a block signal system on the Rochester Railroad, at Rochester, N. Y., which is giving perfect satisfaction.

THE ELECTRIC STORAGE BATTERY COMPANY, of Philadelphia, has published another of its regular bulletins, this one being No. 51. It describes in detail the installation of chloride accumulators in the Dun Building, at New York.

THE MILWAUKEE RAIL JOINT & WELDING COMPANY, of Milwaukee, Wis., has closed a contract for 2000 joints for the Columbus Street Railway Company. The work of installing these joints is to begin during the month of August.

THE PECKHAM TRUCK COMPANY, of Kingston, N. Y., and New York City, was awarded a contract last month for 200 trucks by the Boston Elevated Railway Company. This is in addition to the order given the same company a few months ago.

FRED. H. FITCH, having become financially interested in the Electrical Installation Company, of Chicago, was at a special meeting of the stockholders held June 17, elected a director, and at a subsequent special meeting of the directors elected vice-president of that company.

THE STILWELL-BIERCE & SMITH-VAILE COMPANY, Dayton, Ohio, has been awarded the contract for the turbine wheels for the Virginia Electrical Railway & Development Company. The order calls for four pairs of Victor wheels, the contract price being about $20,000.

THE JOSEPH DIXON CRUCIBLE COMPANY, of Jersey City, has prepared a pamphlet describing in full the new process of brazing by immersion, a process that is particularly adapted to the bicycle trade, but is also applicable wherever the uniting of two metals by brazing is desired.

THE BURT MANUFACTURING COMPANY, of Akron, Ohio, has recently received orders for four Warden oil filters and refiners, from the Alaska Treadwell Gold Mining Company, of San Francisco, for use in Alaska. Two of these were purchased after the first two had been thoroughly tried.

MAYER & ENGLUND, of Philadelphia, the well-known supply dealers, have found their New York business grow so rapidly as to compel them to establish an office in this city. This enterprising firm has therefore opened an office at 85 Liberty Street. It will be in charge of Edward L. Philips.

GEORGE HIPWOOD, of the Hipwood-Barrett Car & Vehicle Fender Company, of New York, has sold the European patents on his car fender to Hermann Romünder. The company will manufacture fenders for the European trade, and will be represented at Cologne, Germany, by Ferdinand Romünder.

THE PROVIDENCE ENGINEERING WORKS, of Providence, R. I., states that the cylinder dimensions of the Greene engines installed by them at the power station of the United Traction Company, of Pittsburgh, are 20 ins. and 38 ins. x 48 ins., and not 28 ins. and 38 ins. x 48 ins., as stated in the last issue.

THE LACLEDE CAR COMPANY, of St. Louis, reports that this has been one of the best and most satisfactory seasons it has ever had. Although its big plant has been running to its fullest capacity the work has nearly all been for its regular customers, who it has endeavored to take good care of by filling the orders with its usual promptness.

THE MILWAUKEE RAIL JOINT & WELDING COMPANY, Milwaukee, Wis., has secured the contract for cast welding 2000 joints for the Columbus Street Railway Company, Columbus, Ohio. The steel jacketed joint which this company is manufacturing has long since proved itself a success, and is meeting with the approval of street railway men everywhere.

THE SHERWIN-WILLIAMS COMPANY, manufacturers of paints and colors, and having offices at Cleveland, Chicago, New York, Montreal and Boston, are sending to the trade a very unique paper-weight, consisting of a very ugly looking animal resting upon an imitation bronze base. This little gift will be appreciated by all fortunate enough to be presented with one.

THE KEYSTONE LUBRICATING COMPANY, of Philadelphia, is receiving proof almost continually of the satisfaction given by the Keystone motor greases, in the shape of testimonial letters from prominent firms, stating they have used and tested these lubricants, and will hereafter use no other brand. One letter states 10 lbs. of Keystone grease lasted a car for two months, during which it ran 8205 miles.

THE CONTINENTAL CONSTRUCTION COMPANY, of Boston, Mass., has just declared a semi-annual dividend of 5 per cent. This company is now building and equipping the Buffalo,

Hamburg & Aurora Street Railway, a Buffalo (N. Y.) suburban line of 22 miles in length. The company gives its whole attention to the building and equipping of electric railways, and has some other good orders in hand.

GATES & RANDOLPH, of Chicago, the new firm of engineers and contractors, have brought out a pamphlet describing a few of the specialties which they handle. These are, improved generators and motors, manufactured by the Triumph Electrical Company, of Cincinnati; the Warren inductor, Empire electric instruments, Scheffer transformers, wattmeters, ammeters, voltmeters, etc., circuit breakers and arc lamps.

A. L. IDE & SONS, of Springfield, Ill., are sending out a catalogue which fully sustains the concern's reputation for careful and painstaking work. The brochure describes the "Ideal" automatic cut-off steam engines, and great care has been taken to make it of real value to engine purchasers. The latter half of the book describes the different parts in detail, cross sections being shown of the cylinders and pistons, cross-heads, etc.

THE WARD-LEONARD ELECTRIC COMPANY, of Bronxville, N. Y., has just issued its catalogue No. 996, devoted exclusively to a description, with price list and cuts, of the Carpenter enamel rheostats. The catalogue contains information regarding 125 different standard forms of field rheostats, all of which are carried in stock by this company. It is noticed the prices quoted are very much lower than those given last year.

THE JOHN A. ROEBLING'S SONS COMPANY, of New York, brought out last month a very pretty Fourth of July souvenir, being a printed and photographic reproduction of the Declaration of Independence, the latter, with signatures appended, and with a beautifully printed cover, showing in antique style an old bell-ringer passing through Philadelphia streets proclaiming the declaration. The whole thing is a charming souvenir well worthy of preservation.

A. L. IDE & SONS, of Springfield, Ill., has filed suit in the United States Circuit Court by Addie F. Ide, Roy W. Ide and Francis P. Ide, executors under the last will and testament of Albert L. Ide, against the Trorlicht, Duncker & Renard Carpet Company, Joseph F. Chuse and Richard Heap. J. F. Chuse is a resident of Mattoon, Ill. The complainants claim to have a patent on improvments in lubricating devices for engines. They pray for an injunction against infringement.

THE HARRISON SAFETY BOILER WORKS, of Philadelphia, Pa., is sending out a neat brochure, which it has been pleased to call "A Peculiar Sort of a Treatise on Feed Water Heaters and Steam Separators." The book, however, sets forth in an extremely forcible manner the claims made for these Cochrane specialties, and it should be in the hands of all steam users who are looking for up-to-date methods of increasing the efficiency of the plants under their charge.

THE CENTRAL ELECTRIC COMPANY, of Chicago, Ill., called attention in its advertisement last month to "The Gem" overhead material, which was also described in the reading columns of the same issue. Through a typographical error in the advertisement the beaded skirt, one of the distinctive features of "The Gem" material, was made to read beaded shirt, and this correction is made in order to stem the flood of orders for beaded shirts which the company is receiving as a result of this error.

THE BETHLEHEM STEEL COMPANY, on the 26th of June formally took over the property, etc., of the Bethlehem Iron Company, of South Bethlehem, Pa., which latter company has leased its works, etc., to the former company. The officers of the Bethlehem Steel Company are: Robert P. Linderman, president; Edward M. McIlvain, vice-president; Abraham S. Schropp, secretary; C. O. Brunner, treasurer; R. W. Davenport, general superintendent; Owen F. Leibert, chief engineer; Charles P. Coleman, purchasing agent.

THE MORRIS ELECTRIC COMPANY is the name of a new corporation just formed as the successor to Elmer P. Morris, of New York. Mr. Morris is treasurer of the new organization, and the business will be carried on largely on the same lines as formerly, with the exception that the company will also engage quite extensively in the manufacture of specialties for the electrical trade. Mr. Morris reports an excellent showing in orders for the last month, particularly in rail bonds. Many contracts have come from foreign countries.

THE SIEGRIST LUBRICATOR COMPANY, of St. Louis, Mo., reports that the Arnold Electric Power Station Company, of Chicago, Ill., after a most thorough investigation of the different kinds of oiling systems, has awarded it the contract to equip the large new power and electric light plant now being erected for the "Imperial Electric Light, Heat & Power Company," of St. Louis, Mo., with the Siegrist "automatic oiling system." This power station is to be one of the most elaborate and perfectly equipped plants in the country.

THE ELECTRICAL INSTALLATION COMPANY, of Chicago, has just completed 5 miles of track and overhead work at Waupaca, Wis., it having had the contract for the complete equipment and construction for the Waupaca & Chain o'Lakes Electric Railroad, which is mentioned elsewhere in this issue. It also has on hand four separate contracts for extensive track and overhead construction for the Metropolitan Street Railway Company, of Kansas City, Mo., as well as additional work for the Vicksburg Railroad, Power & Manufacturing Company.

THE McGUIRE MANUFACTURING COMPANY, of Chicago, is sending out a collection of loosely bound sheets, each one bearing a large half-tone engraving and a short description of some one of the company's specialties. These include the McGuire adjustable traction truck, the No. 39 double truck, the No. 35 motor truck, the solid steel Columbian truck, the No. 28 double frame "L" truck, and the combination snow plow and sweeper. Upon one page appears a list of over seventy-two street railway companies using the McGuire plow and sweeper.

THE SIMONDS MANUFACTURING COMPANY, of Pittsburgh, Pa., announces that it has transferred its Pacific Coast agency from the C. B. Kaufman Railway Supply Company to the Electric Railway & Manufacturers' Supply Company, of 548 Mission Street, San Francisco, Cal. The Kaufman Company has no longer any connection with the Simonds Company, and all communications intended for the latter concern should be addressed either direct to Pittsburgh or to the new agents. A stock of gears and pinions will be carried in San Francisco, as heretofore.

THE BULLOCK ELECTRIC MANUFACTURING COMPANY, Cincinnati, presents in its new catalogue reproductions and descriptions of its apparatus for direct current electric light and power, and particular attention is called to the special applications of its slow speed direct-connected motors, which are shown therein, and in which the company takes pardonable pride. The company's new factory is equipped with the most modern and improved machinery throughout, all electrically driven, and every department is under the most thorough inspection of experts in each particular line.

THE IRONSIDES COMPANY, of Columbus, Ohio, reports activity on all lines of its specialties, both in domestic and foreign trade. Among the products of this company is a special lubricant for gear teeth, that forms a deposit on the working surfaces of teeth, protecting the parts from wear, and incidentally avoiding noise of operation. It is in use by many street car companies on their motor gearing, whose endorsement indicates satisfaction experienced in decreased noise and retarded wear. The Ironsides Company is publishing a series of very readable pamphlets describing its specialties. These include, in addition to the lubricant, boiler scale solvents, gear shields, rope fillers and shields, etc.

THE GENERAL ELECTRIC COMPANY, of Schenectady, has published its usual number of bulletins during the past few weeks, among them being No. 4186, devoted to single-phase alternating current generators, 125 cycles; No. 4187, to artificial light for mills; No. 4188, to electric railway locomotives, etc. The company has also issued from its press a very entertaining little pamphlet entitled "A Trip to the Schenectady Works of the General Electric Company." This last was published for the benefit of the delegates to the recent convention of the National Electric Light Association, and is a brief resumé of the most noteworthy features encountered in a trip from New York to and through the great Schenectady works.

THE CLING-SURFACE MANUFACTURING COMPANY reports rapidly increasing sales, not only in this country, but many orders are being received from Australia, European and South American countries, with a fast growing business in Mexico, all seeming to prove that the truth of the company's motto, "The days of tight belts are over," is being accepted by belt users. A recent letter from the engineer of Brown, Durrell & Co., of Boston, to the company says: "Having tried cling-surface on my 12-in. dynamo belt, I have been able to carry full load with 22-in. sag on belt, with no perceptible slip. It surpasses my expectations, and I can cheerfully recommend it to do all that is claimed for it if directions are followed."

THE NEW YORK SAFETY STEAM POWER COMPANY, of New York, is having excellent success in the manufacture and sale of the Worthington steam boilers, described and illustrated in a recent issue of the STREET RAILWAY JOURNAL. Among the recent orders which this company has received for these boilers are three boilers for the St. Dennis Hotel, New York; two boilers for the Heermance Refrigerator & Cold Storage Company, New York, and boilers for the Hygeia Ice Company, Polytechnic Institute, of Brooklyn; Seminole apartment building, New York, and Grand Union Hotel, New York. The latter has been using two of these boilers for the last six or seven years, and has recently placed an order for a third boiler.

G. A. DENTZEL, builder of steam and electric motive power carousels and organs, of 3635-41 Germantown Avenue, Philadelphia, has recently shipped carousels to the following places: One to Idlewild Park, Pittsburgh; one to Kenwood Park, Pittsburgh; one to Youngstown, Ohio, and one to Parkersburgh, W. Va., in addition to many that were shipped during the winter for the early spring business. He also recently shipped one to Para, Brazil, which has given such satisfaction, and has proved so profitable, that Mr. Dentzel has recently received a letter from the people to whom he sold the carousel, stating that the order would be followed by others in the near future. Mr. Dentzel has also recently placed a carousel in Washington Park, Philadelphia, and Castle Rock Park, near Philadelphia.

THE HARRISBURG FOUNDRY & MACHINE WORKS, Harrisburg, Pa., is to be congratulated upon its new publication entitled "A System of Engines." Although primarily a trade catalogue, the work has been so extended and enlarged as to comprise a very valuable treatise upon the theory and practical operation of the modern steam engine. The book has been published in two editions, one in paper cover for general distribution, and the other handsomely bound in heavy cloth covers, and printed on extra fine paper, and known as the "library edition." This latter will be very extensively circulated, with the compliments of the company, to the mechanical and electrical professions. This company reports its factory is running night and day to keep up with orders on hand, although its present capacity is three times greater than it was in 1897.

JOHN S. NOWOTNY, of 313 East Second Street, Cincinnati, Ohio, announces to the public and his many friends in the electrical business and kindred lines that he severed his connection with the Nowotny Electric Company March 31, 1898. Mr. Nowotny founded the Nowotny Electric Company, and managed the business from its infancy until March 31, 1898. The assignment of the Nowotny Electric Company, which occurred June 30, 1898, in no way affects him. After severing his connection with the above named company he immediately started the manufacture of Nowotny's semi-vacuum long-burning inclosed arc lamps and electrical specialties. The latter business is owned solely by him and operated under his personal supervision and name, and is in no way connected with the Nowotny Electric Company.

THE DUPLEX CAR COMPANY, of New York City, is building cars for the Buffalo, Hamburg & Aurora Street Railway Company, the Ithaca Street Railway Company, the Norfolk Southern Street Railway Company, the Norton & Taunton Street Railway Company, the Bristol County Street Railway Company, Greenville (Miss.) Street Railway Company, Winneconnet (Mass.) Street Railway Company, Allentown & Kutztown Traction Company, Monmouth Traction Company (Pa.), etc, and Duplex cars are going as far away as Honolulu. The Duplex Car Company reports that its representatives abroad have recently visited Armenia, and are making extensive preparations to introduce these cars on the continent. Contrary to some expectations it has been found that it is possible to keep this type of convertible car as warm in winter as the ordinary closed car.

THE BULLOCK ELECTRIC MANUFACTURING COMPANY, of Cincinnati, Ohio, reports June sales as follows: Deere & Company, Moline, Ill.—One 75-kw. moderate speed belt driven generator; Consumers' Park Brewing Company, Brooklyn, N. Y.—two 50-kw. engine type generators, one 7.5-h.p. type "H" motor, one 10-h.p. type "H" motor, two 20-h.p. type "H" motor; Pacific Coast Borax Company, Bayonne, N. J.—one 100-h.p. type "H" motor (375 r.p.m.), one 25-h.p. type "H" motor, one 15-h.p. type "H" motor, one 25-h.p. type "N" motor (back geared); Ruppert Brewing Company, New York—one 100-kw. engine type generator, one 50-kw. engine type generator; Southern Electrical Supply Co., St. Louis, Mo.—one 50-kw. engine type generator, one 25-h.p. type "H" motor, one 12.5-kw. type "H" generator, and many others.

New Publications

Some Glimpses of Elmira. Paper. Illustrated. Published by the Maple Avenue Railroad Company and the West Side Railroad Company, Elmira, N. Y.

This handsomely illustrated pamphlet is a complete street railway guide to Elmira and the surrounding country, and particulars of interesting features in the neighborhood are given. The book contains a large number of advertising pages.

"How Should the Franchise Question Be Settled?" a paper submitted to the League of Illinois Municipalities in 1899, is the title of Part I. of Mr. Foote's able work; "Powers of Municipalities," a paper submitted to the Commercial Club, of Indianapolis in 1898, is the title of Part II.; and "Cost of Service to Users and Tax Payers," a paper submitted to the National Conference of Mayors and Councilmen, at Columbus, Ohio, in 1897, is the title of Part III.

This book is cordially recommended to street railway managers and other students of municipal problems, as an indispensible part of their working equipment.

Practical Electricity. Cloth. 286 pages. Illustrated. Price, $2.00. Published by the Cleveland Armature Works, Cleveland, Ohio.

This book is written throughout by practical men for the purpose of reaching that class of mechanics who are daily called upon to operate electrical machinery without knowing very much of the general construction. The principal feature, which is believed to be original, is the review of each chapter. After the reader has finished a chapter sufficient questions to thoroughly review the subject and to bring out all the important points, are asked at the end of the chapter. These questions the reader must study out and answer for himself, according to his judgment. He can then verify the same by turning to the back of the book, where all answers to questions are given.

Municipal Public Service Industries. By Allen Ripley Foote. The Other Side Publishing Company, 126 Market Street, Chicago, Ill. Cloth. 337 pages. Octavo. Price, $1.00.

Mr. Foote has undoubtedly given more time to the study of municipal problems, particularly those affecting public service industries, than has any other American economist, and his writings are always valuable and interesting. The present volume is composed of three discussions of questions involved in the ownership, operation and proper regulation of municipal public service industries, written for different occasions, and now published with a full index to facilitate an examination of the elements of the subject and a study of it in its entirety. The problems are examined from the standpoints of taxpayers, users of the services, employees and investors, and a scheme is presented by which it is hoped that municipalities and private capital can come together on a fair, equitable and permanent basis to avoid the many difficulties and disagreements which now occur.

Trade Catalogues

Catalogue for 1899 and 1900. Published by the Gold Car Heating Company, New York. Cloth. 80 pages. Illustrated.

Catalogue. Published by Gates & Randolph, Chicago. 20 pages. Illustrated.

Feed Water Heaters and Steam Separators. Published by the Harrison Safety Boiler Works, of Philadelphia. 48 pages. Illustrated.

Catalogue. Published by the Bullock Electric Manufacturing Company, of Cincinnati, Ohio. 62 pages. Illustrated.

Catalogue. Published by A. L. Ide & Sons, Springfield, Ill. 16 pages. Illustrated.

The Application of Storage Batteries to Isolated Plants. Published by the Electrical Storage Battery Company, Philadelphia. 6 pages. Illustrated.

Various Catalogues. Published by the General Electric Company, of Schenectady, N. Y. Illustrated.

A System of Engines. Published by the Harrisburg Foundry & Machine Works, Harrisburg, Pa. 111 pages. Illustrated.

Rheostats. Published by Ward, Leonard Electric Company, of Bronxville, N. Y. 15 pages. Illustrated.

Brazing by Immersion. Published by Joseph Dixon Crucible Company, Jersey City. 48 pages. Illustrated.

Various Catalogues. Published by The Ironsides Company, of Columbus, Ohio. Illustrated.