THE STREET RAILWAY JOURNAL

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The Electric Road at Ashland, Wis.

The energy of a gas company was never more strikingly illustrated than in the case of the Ashland Company, which is a gas, electric lighting and electric railroad company at one and the same time. The three interests are directed successfully in conjunction, and the road, though but small, is an excellent example of what can be done by American energy.

The power house illustrated is of brick and houses both the lighting and street railway plants. The boilers supplying the steam are each eighteen feet long by five feet six inches in diameter, and are of the return tubular type. The two engines, which are run non-condensing, are compound tandem Ideal engines, working under an initial pressure of 120 lbs., each developing 90 H. P. at one-quarter cut-off. The generators are two in number, and are directly belted to the engines. One generator only is used at a time. These machines are of the D 62 General Electric type, with the series coil wound next the core, and are shown in the background of the cut. The lighting plant is shown in the foreground, and consists of General Electric alternators and arc machines.

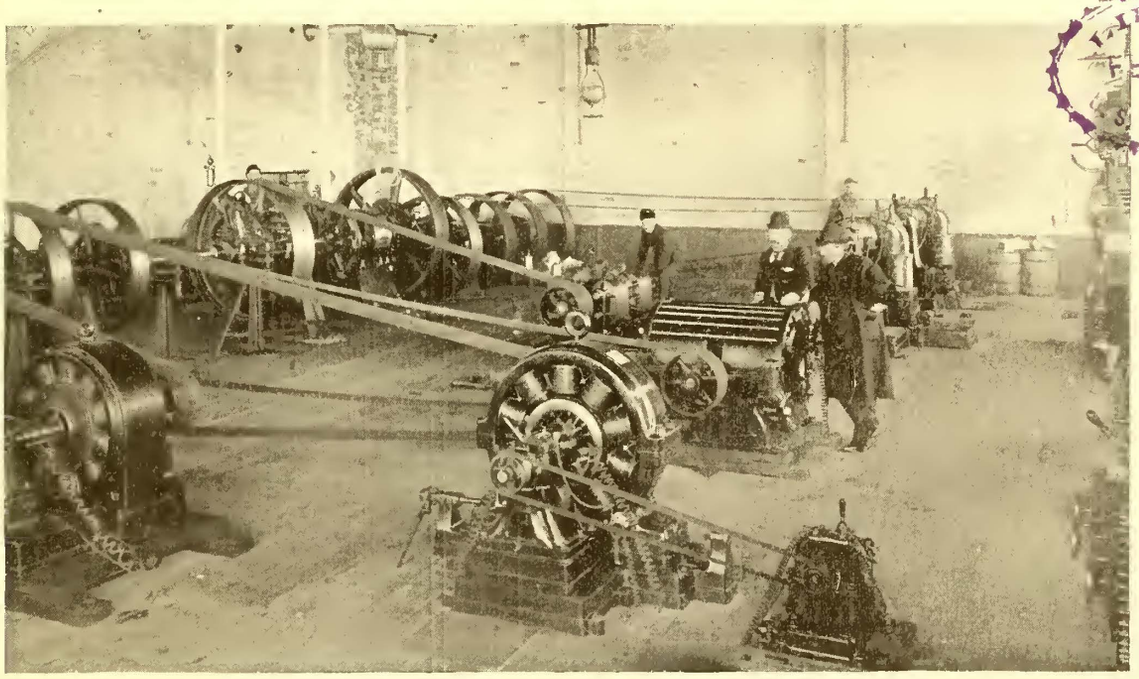
The rolling stock consists of six sixteen foot car bodies mounted on McGuire 19 A trucks, with six foot wheel base, four feet eight and a half inches gauge; car wheels thirty inches in diameter, with three-quarters of an inch flange and two and a half inches tread. Five are operated regularly, the sixth being reserved for special occasions. All cars are cleaned and oiled at night, and made ready for the next day's service. Each car is equipped with two W. P. 30 motors, controlled by the type 51 rheostat, no departure being made in the use of the rheostat. No armature has been burned out since the road was started. The cars are heated by Garland stoves.

The road is about 35,000 ft. in length, laid down in T rail throughout. 8,000 ft. is laid wiith sixty pound Shanghai type of rail from the Illinois Steel Company, the remainder being laid with forty-eight pound T rail from the same source. The 8,000 ft. of line referred to is double track, laid in the business portion of the town, the pavement being of wooden blocks.

The rails are bonded with No. 4 galvanized iron wire and channel pins, two bonds to each joint, but no supplementary wire is used. Every two rail joints are cross connected, except on the double track, where the rails are tied together with flat tie bars. The rail circuit is in excellent condition.

The overhead trolley wire is suspended from octagon cedar poles in the business center and from ordinary round cedar poles elsewhere, the cross suspension method being employed. The overhead line devices are all of the General Electric well known type. The curves on the single track are constructed of modified devices to allow of the use of two trolley wires over a portion of the single track. A double trolley wire is used from the end of the double track to the end of the first turnout, a distance of about one mile. This double trolley wire acts in the capacity of a feeder, doing away with the use of two overhead switches, and still supplying a sufficient area of copper for the 8½ per cent. grade, and the other small grades at a distance from the station. The lightning arresters are grounded in an artesian well.

The entire installation was effected by the Northwest General Electric Company.



INTERIOR OF ELECTRIC POWER STATION—ASHLAND, WIS.

Terminal and Coaling Station of the Second and Third Avenue, New York, Elevated Railways.

The Manhattan Elevated Railway Company has recently completed a terminal station (Fig. 1) extending from Second to Third Avenues on 129th Street, with side tracks and appliances for delivering coal and water aboard the tenders of the 200 locomotives belonging to the eastern division of the elevated system, which embraces the Second and Third Avenues and the suburban lines which terminate at this point. The principal interesting features of the station are the fuel handling devices for unloading, weighing, storing and placing of the coal upon the locomotive tenders, together with the operating steam plant, all of which have been designed by Lincoln Moss, principal assistant engineer of the Manhattan Elevated Railway Company, and erected under his supervision. The amount of coal annually consumed on the entire elevated system is about 200,000 tons, of which the locomotives of the eastern division require about 2,000 tons per week, so that the handling of the vast weight becomes a matter of considerable moment.

The 129th Street station extends for a considerable distance along the water front of the Harlem River, and to this point the coal is delivered in barges (Fig. 2). The unloading devices are mounted on a steel structure, and consist of a traveling crane with a hoisting engine and an automatic steam shovel, together with hoppers, transfer cars and tracks. The steam shovel, cars and tracks were furnished by the C. W. Hunt Company, of New York, dealers in coal hoisting machinery. The top of the crane is 83 ft. above the dock, the reach of the arm in front is 40 ft., and the total hoist is about 70 ft. The crane, which contains a large hopper, and the operating mechanism, is mounted on wheels, and has a movement of 100 ft. along the top of the structure. A Lidgerwood hoisting engine, having duplicate 10 × 10 in. cylinders, is mounted on the outside of the derrick to assist in balancing the weight of the arm and load, but in addition the hoist is anchored to the structure. The main steam pipe, which extends the whole length of the run, is provided at intervals with short stand pipes having ball and socket joints and clamps by which they may be readily connected with the supply pipe leading to the hoisting engine. The engineer's cab is located at the front right hand corner, in a position from which he can watch the shovel and the signals of the attendants on the barges, and which is provided with levers for operating the throttle valve, piston and brake. The automatic shovel is of the standard size, and of about one ton capacity (Fig. 3.) It is operated by means of a chain which embraces a sprocket pulley on the shovel and terminates in a bob at the arm weighing about 800 lbs., which on being released takes up enough slack in the chain to close the shovel when the hoisting engine is started. In the process of hauling in the slack of the chain the bob returns, and the jaws of the shovel are drawn together enclosing a ton of coal. The shovel is then lifted, and as-

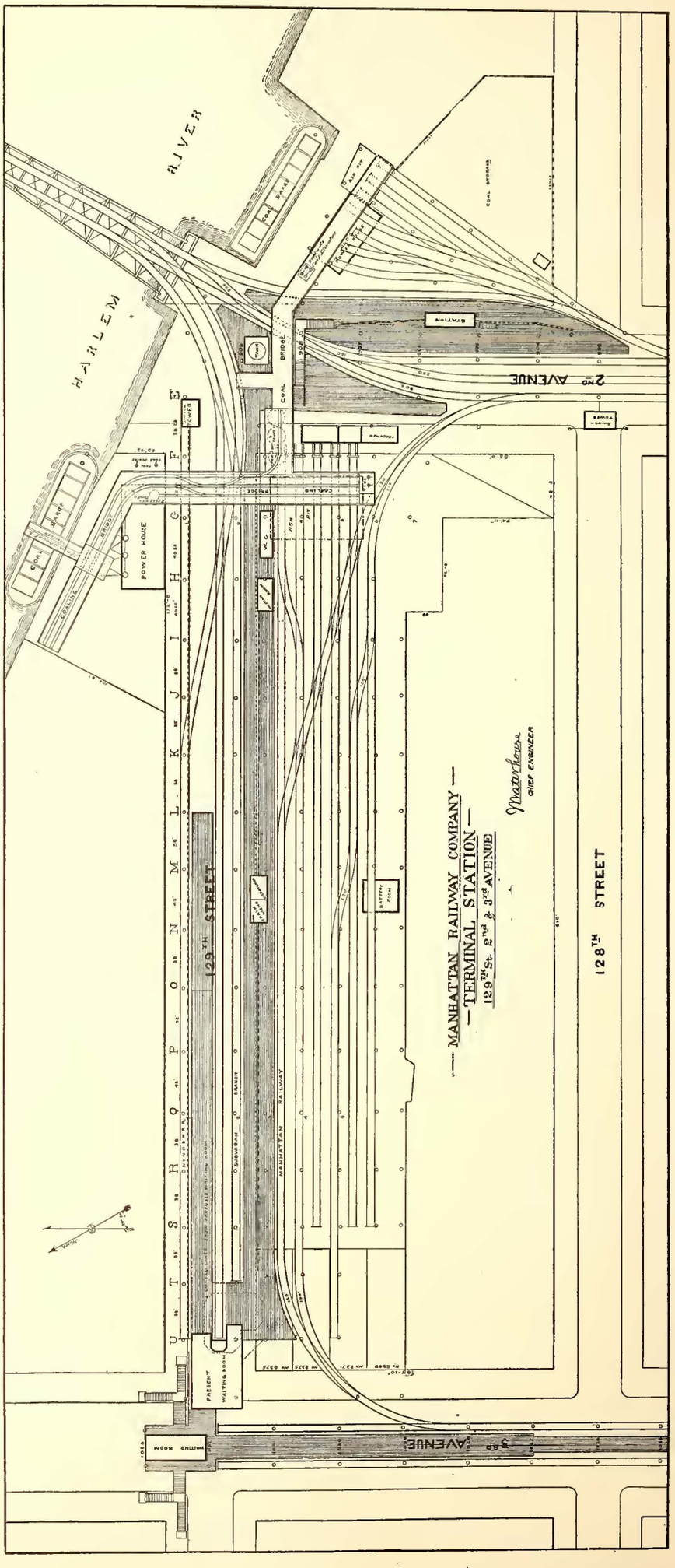


FIG. 1.—GROUND PLAN OF 129TH STREET TERMINAL STATION OF SECOND AND THIRD AVENUE ELEVATED RAILWAYS, NEW YORK.

cends the incline until it is brought over the hopper, when a trip unlocks the jaws, and the load falls into the hopper from which it is drawn into the transfer cars, and the shovel immediately returns for another load. The device, when starting on a fresh cargo, is capable of unloading

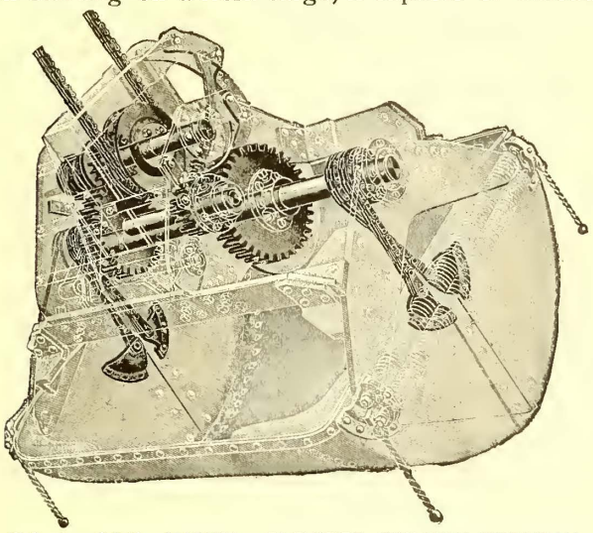


FIG. 3.—COAL SHOVEL—ELEVATED RAILWAY TERMINAL STATION, NEW YORK.

about sixty tons of coal an hour, and its average work at this station is about 300 tons per day of ten hours.

Besides the steam shovel above described there are six auxiliary hoists for use when, for any cause, the shovel is idle. The principal one of these is located at the left side of the structure shown in Fig. 2, and is operated by a hoisting engine located in the power plant directly underneath. With this hoist two ordinary dumping coal buckets are employed which are operated by wire ropes, one ascending as the other descends, and the load is dumped into rolling chutes, from which the coal is drawn into the same transfer cars as are employed with the main hoist. A second hoist of the same description is provided at the south end of the structure, by which coal is lifted from the storage bunkers for the use of the Third Avenue engines, and a third, which is of the ordinary jib type, is located on the dock to the east, and is employed for hoisting coal into the storage bunkers under the Second Avenue structure.

The power plant from which all the hoists are operated, which also supplies power for pumping purposes and steam for heating all the terminal station offices, and for protecting from frost the numerous water pipes and drip pans, is located in an iron, three gable, one story structure directly on the wharf at the angle of the elevated structure, and which rests on a pile foundation. This is one of the most compact steam plants of equal capacity that we have ever visited. The boilers are three in number, of the Scotch marine type, and are rated at 200 H. P. each capacity, under a steam pressure of 130 lbs. per square inch (Figs. 4 and 5). The boilers are 10 × 10 ft., and rest on independent pedestals, so that all the parts of the surface are readily accessible, and are covered with asbestos plaster and planished iron, while all the steam and water pipes on the structure are double covered by sectional asbestos covering manufactured by the H. W. Johns Manufacturing Company. The outer shell of the boilers is three-fourths of an inch thick, with double covered butted joints and sextuple rivets. They are each provided with two corrugated fire flues thirty-six inches in diameter, with three-eighths of an inch shell, the corrugations having been spun in after the sheets were

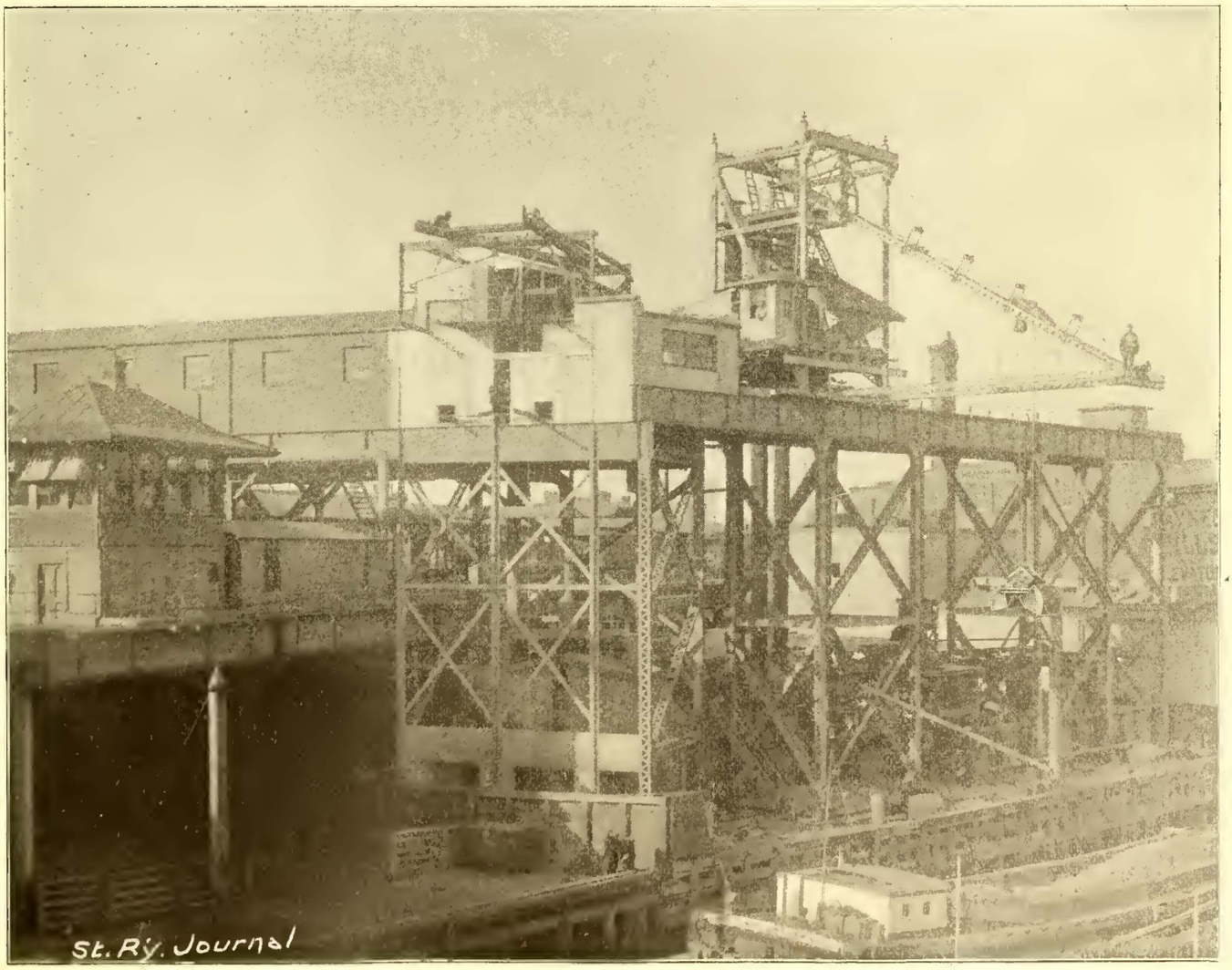


FIG. 2.—COALING STATION OF SECOND AND THIRD AVENUE ELEVATED RAILWAYS, NEW YORK.

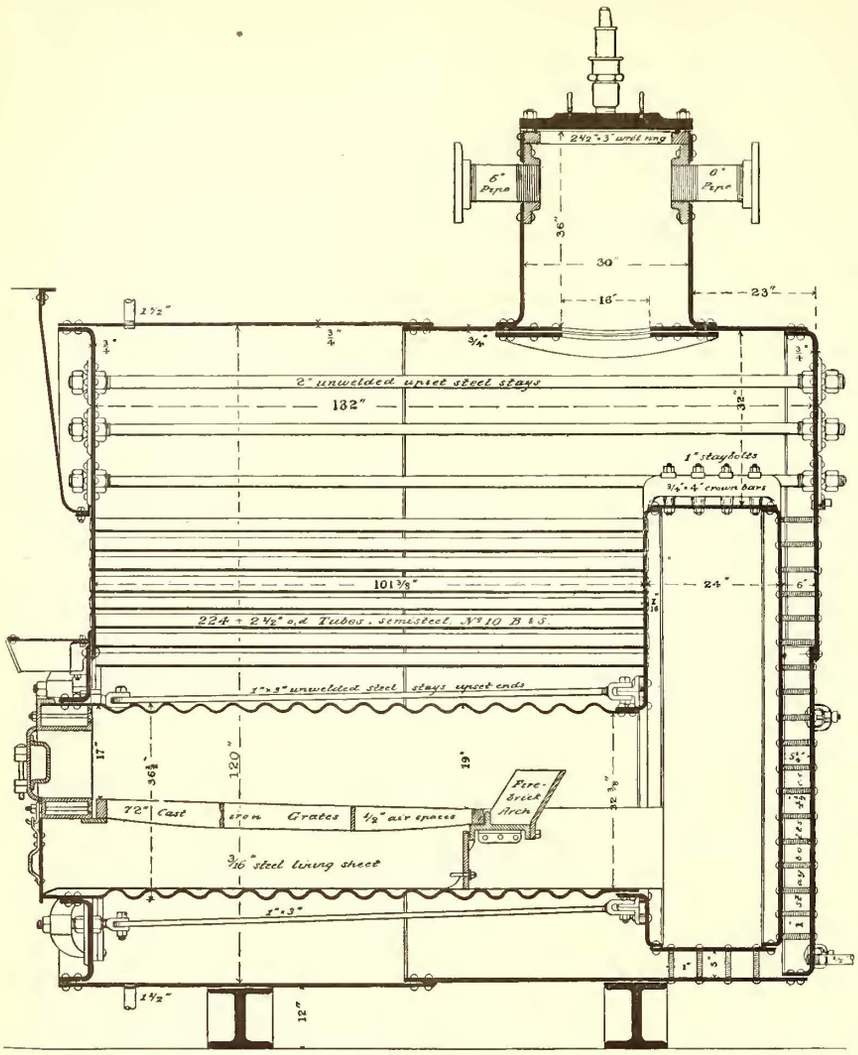


FIG. 4.—SECTION OF BOILER EMPLOYED AT TERMINAL STATION—SECOND AND THIRD AVENUE ELEVATED RAILWAYS, NEW YORK.

welded. The flues are slightly tapering to facilitate removal when necessary, and the grate bars are placed midway of the flue. There is provided an ash chamber underneath from which the ashes and cinders are readily removed. There are 224 two and a half inch return tubes in each boiler, which lead into individual flues leading to the three smokestacks, which are shown in the rear of the hoist in Fig. 2. The fuel, which consists of broken coal, is brought in by means of a portable bunker having a slanting side, from which it is readily shoveled into the furnaces, leaving the floor clean at all times. Each boiler is provided with a duplex and independent system of water and steam pipes and safety appliances. There are two Blake feed pumps of the vertical marine type, and six injectors. The feedwater is drawn from a hot well and led through a reheating apparatus. Each boiler can be used independent of each other, and one is always kept in reserve. There is also a Wainwright surface condenser which can be used when necessary. These boilers have proved themselves to be excellent steamers, and produce a very dry steam, so that it is not visible when escaping from the safety valve.

The engine equipment of the station (Fig. 6) is located near the boilers, and embraces, besides the boiler, pumps and condenser, two automatic Knowles duplex, compound, condensing pumps, having a capacity of 3,000 gals. a minute each. These pumps are provided to supplement the pressure in the city mains, from which the supply of water is drawn, and is then forced against an air cushion into steel storage tanks located on the structure, under a pressure of from forty to 150 lbs., and from which water is drawn directly into the locomotive tanks. An air compressor is also provided for increasing the tank pressure when necessary. The pumps may also be used for fire purposes should occasion require. In addition to the station equipment there are four hoisting engines located at different points, as noted above, and two steam capstans for moving the shovel crane back and forth along its run.

Fig. 7 illustrates the coaling and watering station for the Third Avenue locomotives. The coal is first drawn by an attendant from the elevated bunkers into balanced tilting hoppers which hold about one-fourth of a ton each, and by which the weight is tallied, and from which it is readily dumped by the firemen into the tender. Each locomotive takes on 560 lbs. for a round trip of nearly seventeen miles. So perfect are the coaling arrangements, that after the steam shovel stops at night only one man is required at the station to coal all the locomotives of the Third Avenue line that require fuel before 5:30 the next morning. As the

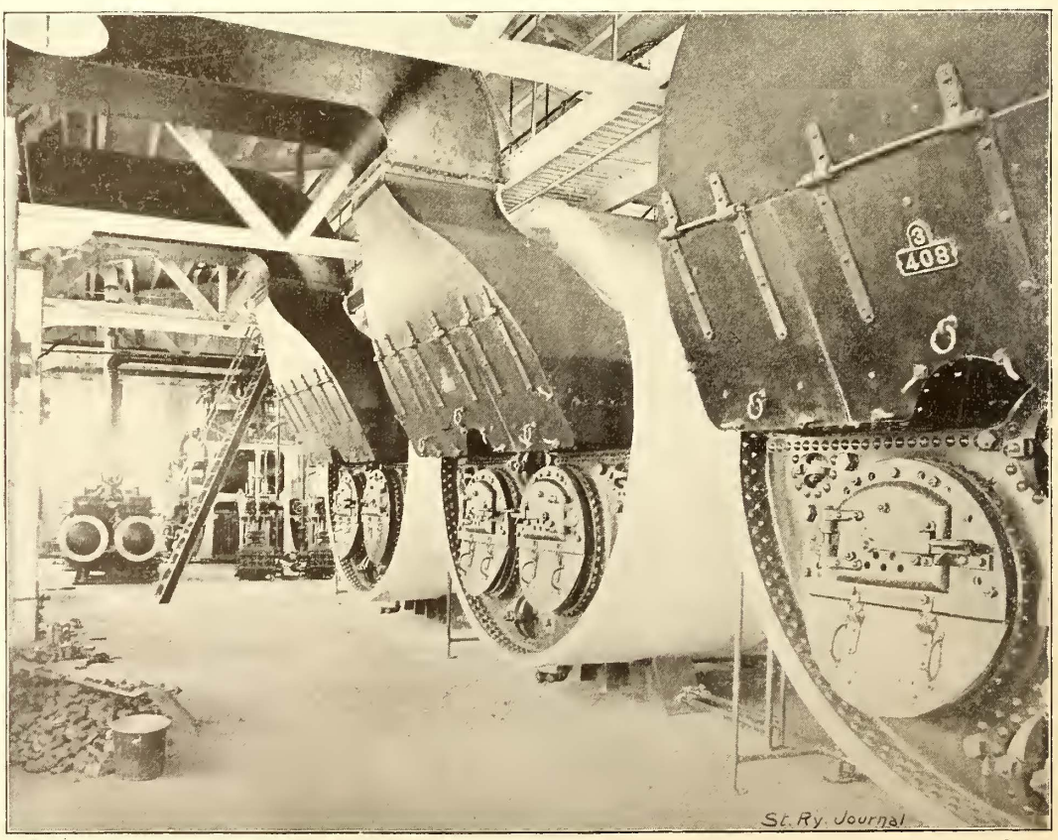


FIG 5.—SCOTCH MARINE BOILERS EMPLOYED AT TERMINAL STATION OF SECOND AND THIRD AVENUE ELEVATED RAILWAYS, NEW YORK.

locomotives come in for fuel and water the fires are raked and the ashes dumped into flues leading into fireproof chambers beneath, when they are carted away.

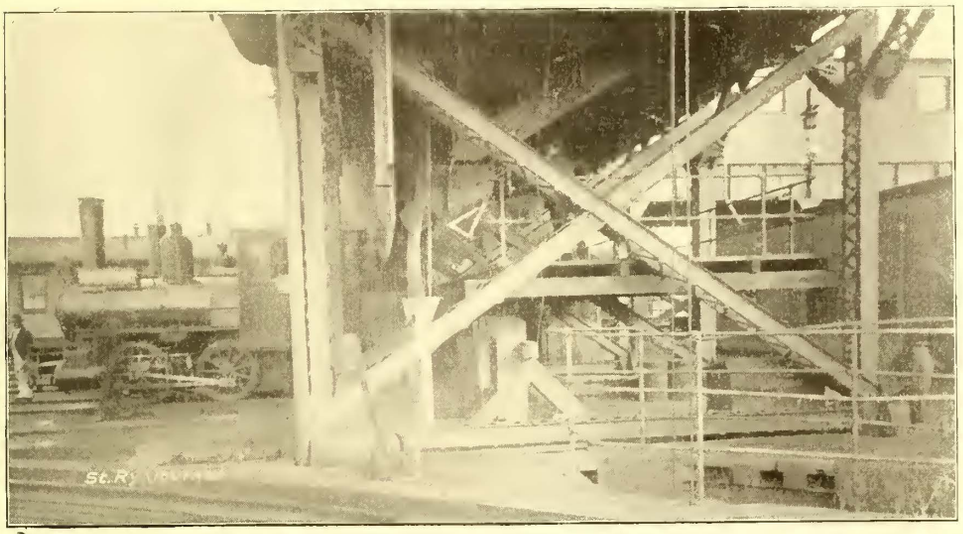


FIG. 7.—COALING CHUTES FOR THIRD AVENUE LOCOMOTIVES—NEW YORK. ELEVATED RAILWAY.

storage bunkers, having a capacity of from six to seven thousand tons, or a thirty-day supply, which can be drawn upon when, for any reason, the daily supply is interrupted. The coal for the storage bunkers on the Second Avenue side is transferred from the barges by means of a jib hoist and dumping buckets and an overhead single rail, circular track, upon which runs a two-wheeled trolley hoist, to which the loaded buckets are hooked and pushed by hand to any point where the coal is to be dumped. White ash coal only is employed on the locomotives of the elevated lines, the grade being known as broken coal. The Philadelphia & Reading Coal & Iron Company has the contract for the entire supply for the elevated system. This is brought by rail from the Lehigh mines to Port Reading, near Communipaw, where it is transferred to barges, which are towed directly to the landing on the Harlem River, as noted above. The coal

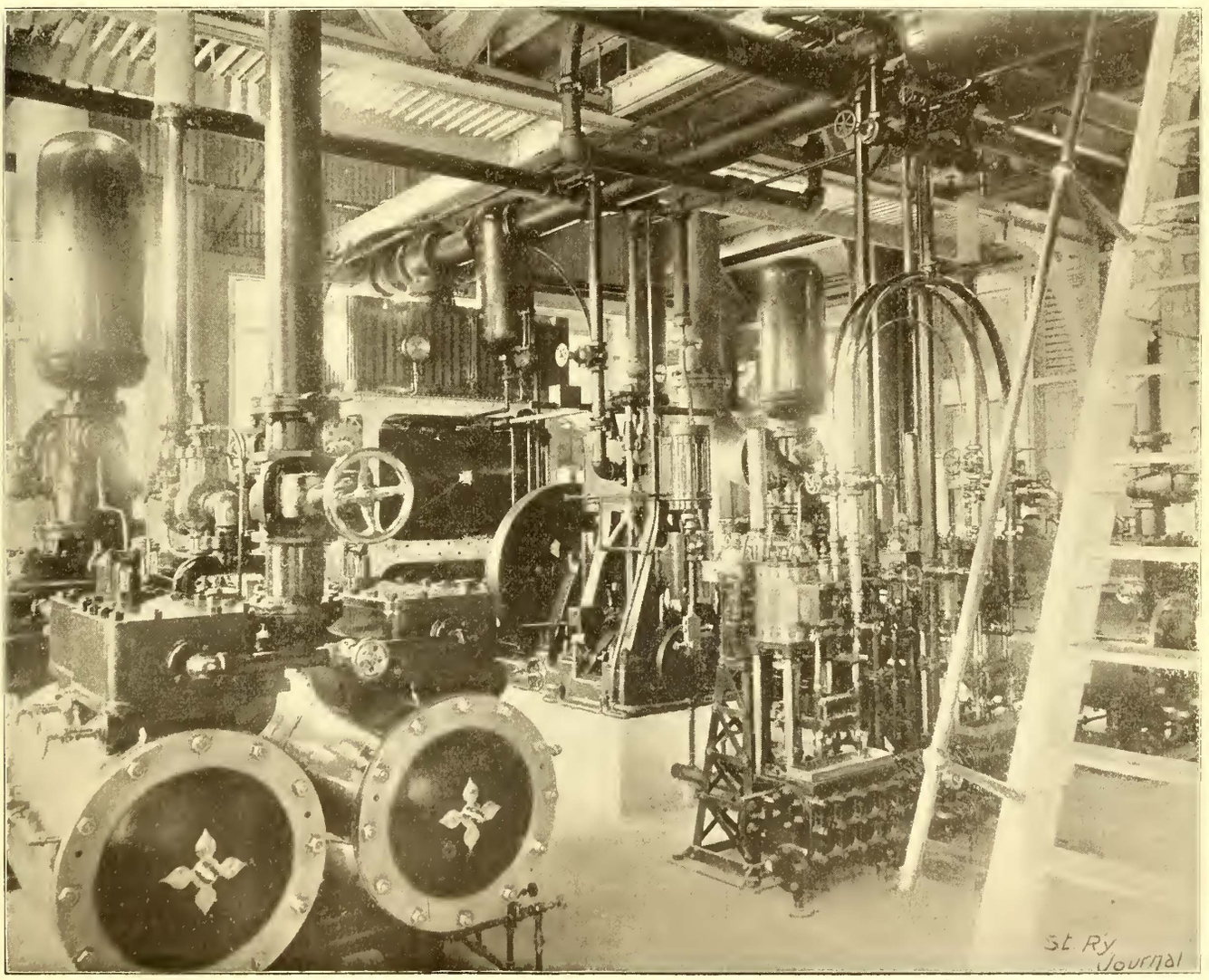


FIG. 6.—ENGINE AND PUMP ROOMS—TERMINAL STATION OF SECOND AND THIRD AVENUE ELEVATED RAILWAYS, NEW YORK.

The entire structure is provided with facilities for coaling ten locomotives at a time. The locomotives of the Second Avenue and suburban lines are coaled from the south end of the station (Fig. 8), the arrangements being similar to those provided for the Third Avenue engines.

Located beneath the elevated structure are extensive

costs, delivered, $3.55 per ton, and the average weight consumed per train mile is 38.83 lbs., costing 7 cts., an unusually economical result.

This coaling station, together with others for the West Side lines, as well as the many other facilities for the economic operation of the entire railway system,

under the control of the Manhattan Elevated Railway Company, which embraces 102 miles of track, is a credit to the good judgment and ability of the general manager, Col. F. K. Hain.

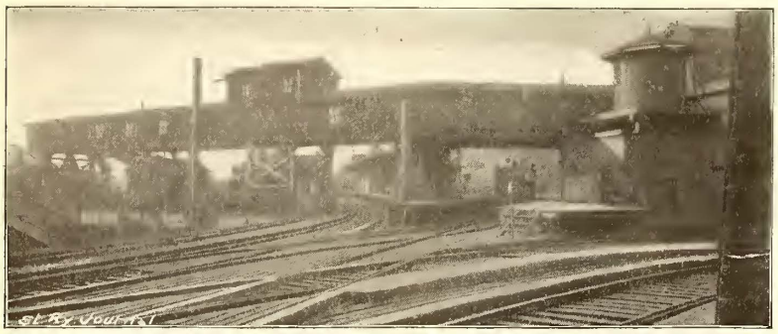


FIG. 8.—COALING STATION FOR SECOND AVENUE LOCOMOTIVES—NEW YORK ELEVATED RAILWAYS.

This system carries daily an enormous traffic, with few delays, and has the enviable record of never having killed a passenger.

The Government Tramways of New South Wales.

By Geo. Macoun, Government Accountant for Tramways, New South Wales.

The keen interest exhibited by street railway men in the various systems of tramway traction, be the motive power electricity, cable or steam, has induced the writer to attempt to place before American readers of the Street Railway Journal, some description of the steam tramways operated for the state by the Railway Commissioners of New South Wales. At the present time there are eighty-nine miles of street railways, all single track, open for traffic in the whole of the colony, while there are eleven and an eighth miles under construction, four and three-quarters miles cable and one and an eighth miles steam in Sydney, and five and a quarter miles steam in Newcastle.

The existing roads are as follows: Sidney city and suburban lines sixty-eight miles; North Sidney lines six and a half miles; Ashfield to Enfield two miles; Newcastle and Plattsburg seven and a half miles, and Kogarah to Sans Souci five miles.

With the exception of the North Sidney lines, which consist of four and a quarter miles cable road and two and an eighth miles electric, these roads are operated by steam motors. This paper has reference only to the Sidney city and suburban steam lines.

Sidney City and Suburban Steam Lines.—The inception of tramways in the city of Sidney dates back as far as September, 1879, the International Exhibition year. At that time, in consequence of the main railway terminus being at Redfern, one and a half miles distant from the center of the city, it was found necessary to lay down what was intended as a temporary tram line between Redfern and Hunter Street to provide complete means of transit to the Exhibition grounds for the large number of visitors. For the operation of this road four motors and six cars were imported from America, and so successful was the net result for the first year's operations that the Government was almost inundated by deputations from the various suburbs, urging the extension of the tramway in their directions.

The Redfern line having returned a profit of 33 per cent. in 1879, it appeared to be good business to extend the steam system in all directions as an improved means of communication between the city and suburbs, a substitute for the ordinary omnibus in vogue being badly wanted. Consequently for a time there was a boom in tramway construction. In the roseate view taken of the profits, however, the probable cost of the heavy repairs and renewals afterwards to be encountered was quite overlooked.

At first the extensions promised well. Over 8 per cent. clear profit was realized after payment of working expenses, and the 4 per cent. interest at which the tramway capital had been raised. After a little time, however, when renewals, heavy repairs, etc., began to get in their work the aspect of affairs underwent an alarming change, and year by year the returns became more and more unsatisfactory, until 1884, when they may be said to have reached zero. The dead loss was then 3.24 per cent. on the capital invested. A more or less unsatisfactory state of things continued until 1888 when, in accordance with the Railways Act of that year, the management of the tramways, in conjunction with the railways, was removed from political control and placed in the hands of an independent board of three commissioners. A change for the better soon ensued, and the net returns have gone on steadily increasing, until the surplus for the last financial year has reached the handsome result of 5.94 per cent. on the capital invested. Not only has this vast improvement been effected, but the value of the property has been considerably augmented, inasmuch as 60 per cent. of the cars, several motors, and eleven and one-fifth miles of track, have been renewed out of working expenses, while the public have been given many direct benefits in the shape of reduced fares, increased service, thoroughly watered streets, and greatly improved waiting room accommodation at the principal stopping places.

As the system of control is somewhat different from American methods, a few words as to the management will not be out of place, before referring to the various

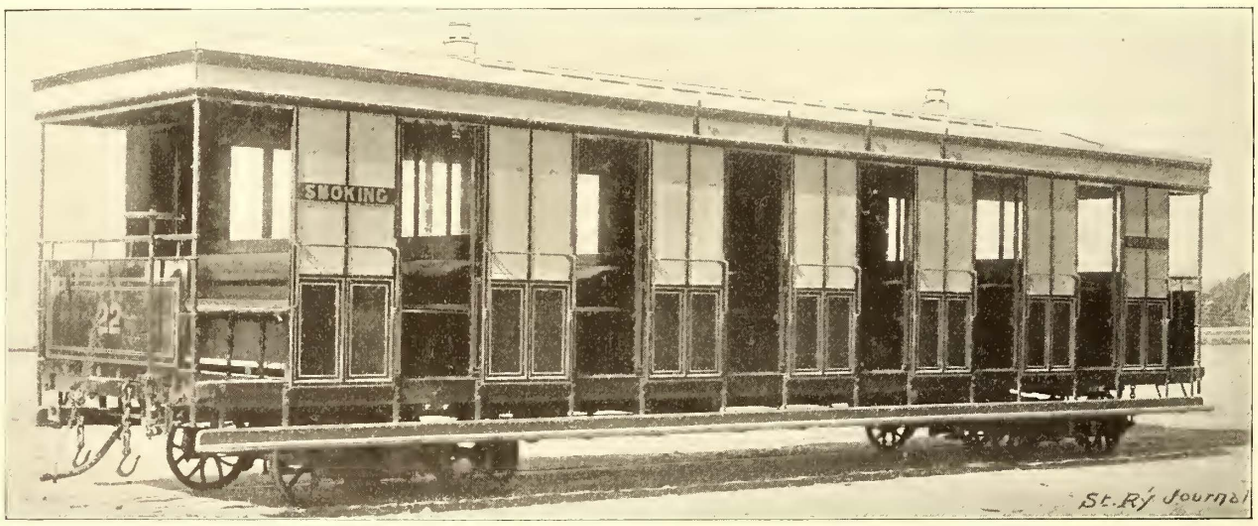


FIG. 1.—STANDARD CAR FOR SEVENTY PASSENGERS—GOVERNMENT STEAM TRAMWAYS, NEW SOUTH WALES.

matters of detail. The supreme rulers are the Railway Commissioners, E. M. G. Eddy, chief, W. M. Fehon and C. Oliver, who are placed practically in unlimited control, and who exert a very close and searching command of the whole service. The department is divided into three branches; the traffic, locomotive and permanent way. The executive officers in charge, respectively, being designated the tramway manager, the locomotive superintendent, and the tramway engineer. Each reports directly to the commissioners and is responsible only for matters appertaining to his own branch. Monthly committee meetings of the heads of branches presided over by a railway commissioner are held, when the expenditure, staff changes, and other matters affecting the welfare of the service are reviewed, discussed and disposed of. No special expenditure may be incurred without the commissioners' sanction having first been given. Heads of branches may fine, disrate or dismiss an employe, but action in this direction must be reported to the commissioners for confirmation. Any employe dissatisfied with the decision of his officer has the right of appeal to the commissioners.

Track.—As already stated, the Sydney city and suburban lines embrace sixty-eight miles of track, fifty six miles of which is double track and twelve miles single. The gauge is four feet eight and a half inches. The steepest gradient is one in seventeen, or, say, 6 per cent., while fully one-third of the track is constructed on grades ranging from 3 per cent. to 5 per cent., the latter predominating. The aggregate of level track is but three miles. The curves are numerous, ranging from eighty-five to 196 ft. radius. A distance of a little over ten miles of track is wood blocked, the remainder of the street surface construction being macadam. Most of the road was originally laid with forty-two pound iron rails on sleepers bedded in concrete, but recent practice in relaying on macadam roads is to use sixty pound and seventy-one and a half steel T rails on sleepers 8 ft. × 9 ins. × 4½ ins., spaced two feet four and a half inches apart, with ordinary blue metal ballast in place of concrete, the old rails removed being used as guard rails.

The main trunk line starts from Bridge Street yard, the terminus for all the lines, and is continued along Phillip Street and Elizabeth Street to the railway station, a distance of one and three quarters miles. At Liverpool Street, one mile from the city terminus, the eastern suburbs section branches off, and this again has five diverging lines, while at a point near the Redfern railway station the southern sections, consisting of two principal lines, branch off, and these latter have also five feeders.

Rolling Stock. — The stock consists of 105 motors, all with four wheels coupled. About 80 per cent. have 11 × 16 in. cylinders, and the remainder have 10 × 16 in. cylinders; ninety-two were built by the Baldwin Locomotive Works, of Philadelphia, three by English manufacturers and ten by local makers, the latter being in no way inferior to the imported engines. The car equipment consists of 202 vehicles, almost entirely of the description known here as the "standard" car; that is, seating seventy passengers, with cross seats and sliding doors, eight wheels mounted on double bogies, having a total weight of five tons, and measuring thirty-five feet in length. Thirty seats are reserved for smokers, fifteen at each end, the compartments being separated by glass partitions. The average life of a tram car, so far, is a little under ten years. This refers to the double decked type of car, the use of which has been abandoned, but the single deck, "standard" cars, constructed of thoroughly seasoned timber, supplied by the Commissioners to the builders, promise much better results. No advertisements are allowed in the cars, as a trial in this direction some time ago gave unsatisfactory results. No covering is provided for the seats, the interior being wood finish throughout. All the stock is fitted with the Eames vacuum brake. The car wheels are cast steel, and were supplied by Hadfield, of Sheffield. They are twenty-four inches in diameter, and give an average life of 26,000 miles, which, considering the heavy brake work encountered, is good service. The motor wheels have Vicker's tires, which give an average life of 43,661 miles and 1,712 miles per one-sixteenth inch of wear to first turning. The average number of motors in daily use is sixty-seven, and the corresponding number of cars 160. On special occasions, such as public holidays, the whole of the stock, with the exception of about 3 per cent. of the motors and 2½ per cent. of the cars, is available for traffic.

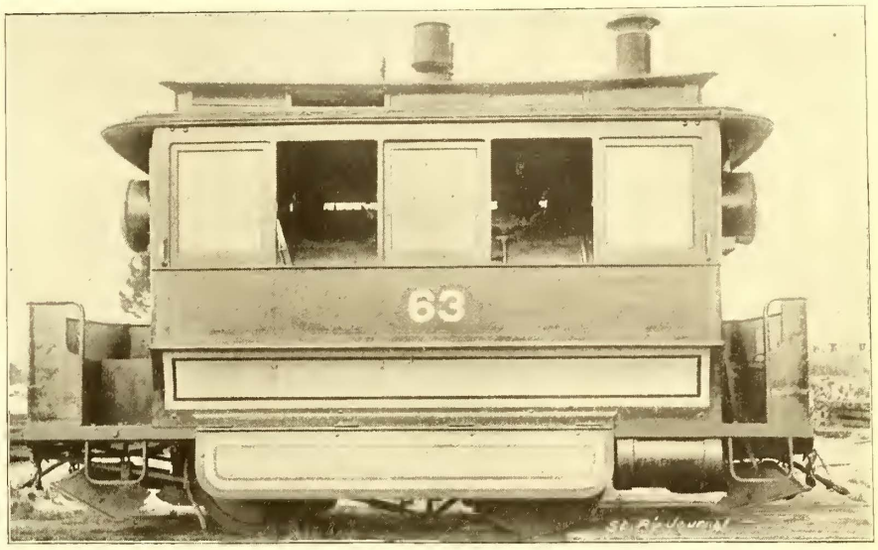
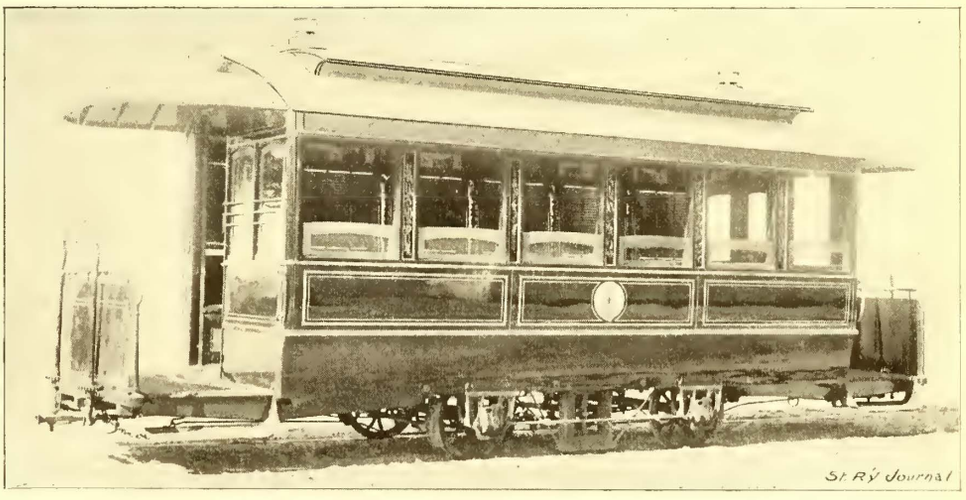


FIG. 2.—STEAM MOTOR—GOVERNMENT TRAMWAYS, NEW SOUTH WALES.



FIG, 3.—CABLE TRAIL CAR—GOVERNMENT TRAMWAYS, NEW SOUTH WALES.

Tram Service, etc.—The cars are run in trains of one, two, three and four cars to the motor. The requirements of the various suburbs are met by a carefully prepared time table. The average speed, including stoppages, is about nine and a half miles per hour. The total engine mileage per motor per annum is 18,650, or per motor continuously in steam, 29,883 miles. The fuel used is gas coke, delivered on the tramway premises at a total cost of 12*s.* 3*d.* ($2.94) per ton of 2,240 lbs. The average consumption of fuel per train mile is twenty-five pounds.

The principal lubricant is castor oil, obtained at a cost of just under 2*s.* (48 cents) per gallon.

With the exception of three small sections worked by a motor and car each, all of the cars are run right through between the branch termini to the city terminus at Bridge Street. This naturally produces a somewhat congested traffic along the main trunk line in Elizabeth Street and at the terminus. This will be readily understood when it is mentioned that the total number of ordinary cars running in and out of the Bridge Street yard daily is 1,164, while on holidays this number is largely increased. On the other hand the advantage this system gives to the public by enabling passengers to complete their journeys to and from the city without transfer is considered a fair offset against the inconvenience in working it occasionally creates. As indicating the heavy nature of the traffic along the main trunk line between the city terminus and Liverpool Street, it may be stated that a careful calculation shows the total weight, rolling stock and passengers, moved over this track to average 35,000 tons daily. The effect of this on the permanent way may be gauged from the fact that at a point in this section on a gradient on a severe curve, seventy-one and a half pound steel T rails have been completely worn out after but three years' service. The costly nature of the steam motor service may also be realized when it is mentioned that each motor absorbs within a period of four and a half years, for maintenance alone, a sum equal to its original capital cost.

How important a factor in the development of the suburbs of a city is an efficient tramway system may be well understood, but additional evidence of an interesting nature in support of this is furnished in the case of the Sydney tramways. The total number of suburbs served by the city and suburban lines is twenty-three, and according to figures recently published by the government statistician the total capital value of the ratable property in all the suburbs of Sydney had increased within the nine years ending 1891, by the enormous sum of £31,425,093, or 159.12 per cent.

The unit of comparison is the "train mile." A train mile represents an average of one motor and two and a third cars, affording seating accommodation for 164 passengers moved one mile, and weighing, empty, about twenty-six tons, or 58,240 lbs. This explanation is necessary as absurd deductions are apt to be drawn when cost per "car mile" or per "train mile," are instituted unless the exact value of the car mile or train mile under consideration is clearly understood.

Employes.—Running men are paid at the following rates per day: Drivers 11*s.* to 14*s.* ($2.64 to $3.36); firemen 7*s.* 6*d.* to 9*s.* ($1.80 to $2.16), and cleaners 4*s.* 6*d.* to 7*s.* 6*d.* ($1.08 to $1.68). The day's work represents nine and a sixth hours, the motors being worked in two shifts; overtime is allowed for any time worked in addition to the ordinary shift. Sufficient staff is employed to permit of each man having one day off per week. Workshop hands work at the rate of eight hours per day and are paid: Fitters 10*s.* to 13*s.* ($2.40 to $3.12); turners 10*s.* to 11*s.* 6*d.* ($2.40 to $2.80); blacksmiths 10*s* to 12*s.* ($2.40 to $2.88); boilermakers 9*s.* 4*d.* to 11*s.* ($2.24 to $2.64); car builders 10*s.* to 11*s.* ($2.40 to $2.64); carpenters 9*s.* to 10*s.* ($2.16 to $2.40); painters 8*s.* to 12*s.* ($1.92 to $2.88), and laborers 6*s.* 6*d.* to 7*s.* ($1.56 to $1.68). Apprentices, not bound, 10*d.* ($.20) per day for the first year up to 5*s.* ($1.20) per day in the last year of apprenticeship. Traffic employes receive per day: Foremen 12*s.* ($2.88); conductors 8*s.* to 9*s.* ($1.92 to $2 16); assistant conductors 5*s.* to 7*s.* 6*d.* ($1.20 to $1.80); switchmen 8*s.* ($1.92), and car cleaners, etc., 6*s* 6*d.* to 7*s.* ($1.56 to $1.68). Permanent way men are paid: Gangers 9*s.* ($2.16), and laborers 7*s.* 6*d.* ($1.80) per day of eight hours.

Drivers, firemen and conductors are granted six good conduct holidays per annum in addition to days in lieu of the proclaimed government holidays, allowed to all employes, upon which they may have been at work, so that all round the men enjoy from eleven to seventeen holidays each per annum on full pay. Conductors are allowed two suits of uniform a year and one waterproof overcoat every two years. Any employe incapacitated from work by accident is, after examination by the departmental medical officer, allowed half pay until recovered, and if the injury sustained was the result of circumstances entirely beyond his control, or due to defect in machinery or plant, full pay is granted. The wages staffs are paid once a fortnight, while salaried officers and foremen receive payment once a month. A signed receipt for each payment is taken in terms of the Government Audit Act.

Under the provisions of the Railways Act all officers and servants appointed after October 22, 1888, must insure their lives and hold their offices on the express condition that a deduction will be made from their salaries or wages for the payment of the premium on the policy to keep their lives insured, should they fail to pay the necessary premium to the insurance company. The insurance may be effected with any one of nine life insurance companies, carrying on business in New South Wales approved by the commissioners. The policies are lodged with the railway commissioners and are unassignable either at law or in equity. The insurance is by way of endowment and is payable when the assured attains the age of sixty years, or sooner in the event of death. The amount of the insurance is determined by the following scale: Wages staff, receiving 7*s.* 6*d.* ($1.80) per day or less, insurance £50 ($240); from 7*s.* 6*d.* to 12*s.* ($1.80 to $2.88) per day, £100 ($480); above 12*s.* ($2.88) per day, £150 ($720). Salaried staff, in receipt of less than £100 ($480) per annum, £50 ($240); from £100 to £200 ($480 to $960) per annum, £100; and so on to a maximum insurance of £500 ($2,400), for officers receiving over £550 ($2,640) per annum.

Workshops.—The principal workshops and running sheds are at Randwick, a distance of four miles from the city, and with yard cover about nine acres. Here all the repairing work demanded by motors, cars and the permanent way is executed. Occasionally new cars are built, and all points and crossings used by the department are made. The main shops consist of five large galvanized, corrugated iron buildings as follows:

No. 1 building, 300 × 40 ft., subdivided into machine and fitting shops. A liberal equipment of the best machine tools and other facilities for the efficient and expeditious performance of the work is provided.

No. 2 building, 300 × 50 ft., with three roads and engine pits throughout, is used as a running shed for stabling twenty-five engines by night and for effecting jobbing repairs to engines by day.

No. 3 building, 300 × 40 ft., is used as a carriage and wagon repairing shop. Here the work of repairing and renewing the cars and trucks and the woodwork of the motors, etc., is performed.

No. 4 building, 300 × 50 ft., embraces the smith and boiler shops. The smiths' shop is 150 × 50 ft., and contains fourteen smiths' fires, seven on each side; adjoining is the boiler shop of equal dimensions with four smiths' fires, punching and shearing machines, plate rolls, etc.

No. 5 building, 300 × 30 ft., is used as a paint shop. There are two pits of forty-six feet each, the total accommodation being equal to fourteen cars.

In addition to these buildings there are the pattern makers' shop, an iron building 28 × 16 ft., a tinsmith's shop of similar construction, 70 × 15 ft., and the brass foundry, a small brick building wherein all brass, copper and lead castings required in the workshops are made.

The number of engines constantly undergoing general overhaul, and other repairs of lighter nature at Randwick workshops varies from twelve to twenty, and similarly the number of cars is nine. The total day staff engaged in these shops is 255.

Not only is the repairing work demanded by all the branches of the C. & S. lines performed at Randwick, but so also are all the important repairs of stock and plant for all the street tramways throughout the colony.

A night staff is also engaged in the Randwick running sheds cleaning and effecting running repairs to the engines in active service. The sheds are illuminated by electric light, the engine pits being fitted with portable electric lamps. The motors have their fires banked at night, a sufficient number being blown down nightly to to ensure every boiler being washed out with hot water once in seven days.

The expenditure is dealt with under a simple, yet

comprehensive, system of shop orders, which will show with accuracy the cost of repairs to each head of service without calling for the use of an expensive clerical force. Standing shop orders exist for all the regular work, and special shop orders are issued for all work not included in the standing shop orders. The record of cost is kept in a journal, the heading showing the number with particulars of the work dealt with, one page being used for the labor incurred in each shop and the other for materials and total. This book is indexed so that any order can be readily referred to. In many establishments it is considered sufficient to add an all round percentage on the direct cost of a job to cover shop charges, but as this undoubtedly produces erroneous results the practice here is to add to the direct wages the percentage cost thereon of the shop charges of each shop, the rate being determined by the proportion of the actual shop charges to direct wages as incurred during the previous twelve months. These percentages run: Fitters 13 per cent., turners, 38 per cent, boilermakers 25 per cent., blacksmiths 32 per cent., plumbers and tinsmiths 13 per cent., painters 15 per cent., car repairers 18 per cent., patternmakers 16 per cent. and foundry 28 per cent.

Rate of Fare.—On the first section for all trams starting from the city terminus, the rate of fare is two pence and thereafter one penny sections prevail, the average rate throughout the whole of the lines being .77*d.* (1.54 cents) per mile; fares are paid by one penny tickets and by cash, but in order to confine the revenue to the former channel as much as possible, the rate is lower than when cash was tendered. Bell registers of the Hornum patent, of New York City, are supplied to the conductors in pairs, one for recording tickets received, and the other for cash fares. Immediately on collecting a fare the conductor sounds the bell of the register required, one stroke for each penny received, and then destroys the value of the tickets by tearing them in halves in front of the passengers. The half tickets in collection bags, with cash and bell registers, are handed in daily at the termination of each shift to the receiving clerk at Bridge Street terminus. The revenue value of the tickets is ascertained by weighing them on very delicate scales, and the results are checked with the registers, while the cash is counted and also compared in similar manner. The half tickets are afterwards destroyed in a furnace specially constructed for this purpose. Numerous agencies exist for the sale of tickets in the city and suburbs, so that they can be purchased with the same facility as postage stamps.

Members of Parliament, police constables in uniform, transit officers and employes going to and fro from duty, are carried free.

Capital and Revenue.—At the close of the financial year on June 30 last, the total capital cost of the city and suburban tramways was £947,775, while the gross revenue for the year amounted to £271,041, the net return after paying working expenses being 5.94 per cent. on the capital invested. The total number of passenger fares collected during the year was 63,588,885.

The total cost of operating expenses was 30.67*d.* (61.34 cents) per train mile, *i. e.*, twenty six tons of rolling stock with accommodation for 164 passengers moved one mile.

Subjoined is a schedule of details of the working expenses for the last financial year with the cost per train mile, but for a proper comparison of this unit with the average American car mile, cost a little less than one eighth of the figures shown must be taken:

SYDNEY CITY AND SUBURBAN TRAMWAYS.

Schedules under working expenses for the year ending June 30, 1893.

HEAD OF SERVICE.	Total Cost.	Cost per Train Mile.
PERMANENT WAY BRANCH.		
Tramway engineer, clerks and office expenses	£1,014	£ 1.45
Maintenance and renewals of permanent way; wages £23,138, materials £14,096	37,234	5.315
Repairs of bridges, culverts, etc	45	.006
Repairs of waiting sheds and buildings	272	.039
Sundries	65	.009
Total permanent way branch	£38,630	£5.514
LOCOMOTIVE BRANCH.		
SUPERINTENDENCE, ETC.		
Locomotive superintendent, clerks and office sundries	£1,925	£ .275
RUNNING EXPENSES.		
MOTORS.		
Locomotive foremen, inspectors and timekeepers	£ 1,729	£ .247
Locomotive drivers and firemen	45,079	6.435
Locomotive cleaners, coalmen and laborers	9,164	1.308
Locomotive sundries	2,352	.336
Coke, wood, etc	10,737	1.532
Water	1,644	.234
Oil, tallow, waste	2,716	.388
Stores for cleaners	551	.079
Total	£73,972	£10.559
CARS.		
Greasing and oiling, wages £256, Stores £213	£ 469	£ .067
Total running expenses	£74,441	£10.626
MAINTENANCE EXPENSES.		
MOTORS.		
Repairs and renewals; wages £21,448, materials £5,043	£26,491	£ 3.781
CARS.		
Repairs and Renewals; wages £6,685, Materials £12,244	*£18,929	£ 2.702
WAGONS.		
Repairs and renewals; wages £72, materials £44	£ 116	£ .017
Total	£45,536	£ 6.500
Total locomotive branch	£121,902	£17.401
TRAFFIC BRANCH.		
Traffic manager and supervision staff	£ 1,958	£ .280
Clerks	1,209	.172
Staffmen, pointsmen and flagmen	6,085	.869
Conductors	23,915	3.414
Car cleaners, shunters and lamp trimmers	4,856	.693
Stores	2,414	.345
Advertising, printing and stationery	1,422	.203
Traveling and incidental expenses	328	.047
Sundries	3,747	.535
Total traffic branch	£45,934	£6,558
COMPENSATION.		
For personal injury	£ 1,670	£ .238
For damage to vehicles, etc	229	.033
	£ 1,899	£ .271
GENERAL EXPENSES,		
Proportion of salaries of commissioners, secretary, chief accountant and their office staff	£ 2,185	£ .312
Audit office	1,563	.223
Commission on sales of tickets	2,097	.299
Sundries	614	.088
	£ 6,459	£ .922
Grand total	£214,824	£30.666

*NOTE.—Includes cost of twenty renewal cars purchased from contractors.

The Offer of the Metropolitan Traction Company.

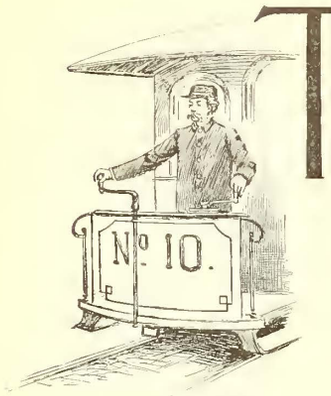
It has not yet been determined whether the Board of Railroad Commissioners, of the State of New York, are to act as judges in the $50,000 prize contest offered by the Metropolitan Traction Company, for a "working system of motive power for street railway cars demonstrated to be superior or equal to the overhead trolley," referred to in our last issue. As there mentioned, the Railroad Commissioners have doubted their power under the general railroad law to accept the proposition to act as judges. An application was therefore made to the Legislature for authority to act in this capacity. This request was referred to the Assembly Railroad Committee, which is expected to make a favorable report at an early date. In making this request, the commissioners spoke in the most commendatory terms of the proposal of the Metropolitan Traction Company, and expressed an earnest desire to extend the co-operation which was asked.

Cable Decision.

A decision has been made by the United States Court of Appeals for the Ninth Circuit, in favor of the Pacific Cable Railway Company, sustaining the Root track brake patent. This decision is final as far as this circuit is concerned.

THE TRANSFORMATION OF BALTIMORE.

PART I.



THREE years ago Baltimore, Md., had about as poor street railway accommodations as could be found in any large city in this country, but there has been a transformation that has hustled off the old cars, horses and tracks, and the city will now stand comparison with the most progressive in the matter of rapid transit. The features of advantage that present themselves most prominently are, first, the convenient distribution of the various lines throughout the thickly populated sections and their convergence at or near a common center in the business focus of the city; second, the high speed of transit made possible by the almost complete substitution of mechanical traction for animal power; third, the liberal system of transfers that is maintained by several of the most important lines. These are the factors that make the really excellent rapid transit accommodations of the city of Baltimore. The work of changing all the roads has been done quickly, but for the most part it has been done thoroughly, and with a view to durability and permanence rather than economy in first cost. Especially is this noticeable in roadbed construction and in rolling stock. The peculiar topography of Baltimore, with its somewhat violent undulations of surface, has familiarized Baltimore railway men with about all of the problems that arise from grades and curves, and the system of surface drainage, for which the city is notorious, has given considerable trouble and expense to the railways, particularly the cable roads, which have found it necessary, in many instances, to carry the drainage to cross streets beneath the cable conduits by means of inverted siphons. Work on the railways was prosecuted during the unusually severe weather of last winter under conditions that were as trying to the public as to the railways, but all the obstacles thus far encountered have been satisfactorily disposed of, saving only the exactions of a captious municipal government, bent on harassing the railway companies by unreasonable tax assessments and car fender ordinances.

There are many features of the rapid transit system of Baltimore that would be of much interest to railway men, such as the heavily built suburban roads, the section of elevated structure in the heart of the city, the two heavy iron viaducts that span Stony Run, the heavy grading on the York Road, the complications of cable crossings, and numerous striking engineering features. The limits of this article, however, preclude extended treatment of details, and only a superficial view of the work that has been done during the past two years will be attempted. First of all, a few general facts about Baltimore railways may be of interest. By numerous consolidations the number of companies has been reduced to five from about four times that number, which were in independent operation a few years ago. This consolidation of interests has had no tendency towards creating a monopoly of business prejudicial to public welfare; on the contrary, the principal lines are well paralleled by competing roads, which furnish a stimulus that always improves service and facilities. The five operating companies and the track mileage of each, are as follows:

Companies.	Miles.
Baltimore Traction Company	75
City & Suburban Railway Company	61
Baltimore City Passenger Railway Company	46
Lake Roland Elevated Railway Company	22
Central Passenger Railway Company	13
Total	217

On thirty-eight miles of this track the cable is used; on 143 miles electricity is the motive power, and the remaining thirty-six miles are still operated with horses, but the change to electricity on the horse roads has been planned for early execution, and much of the work is already under way. The progress of the transformation from horses to mechanical traction is best indicated by the following chronology of changes, showing the date on which each line commenced operating with its new power and equipment:

August 16, 1890.—North Avenue Electric Railway, from Division Street west to 10th. (Now part of the Lake Roland Elevated Railway.) Electric.

May 23, 1891.—Druid Hill Avenue line of the Baltimore Traction Company. Cable.

May 28, 1892.—Baltimore & Curtis Bay Railway. (Now part of Traction Company system.) Electric.

July 25, 1892.—Pikesville division of the Baltimore Traction Company. Electric.

August 30, 1892.—Gilmor Street line of the Baltimore Traction Company. Cable.

September 17, 1892.—Central Passenger Railway. Electric.

April 23, 1893.—Lake Roland Elevated Railway, North Avenue to Roland Park. Electric.

April 26, 1893.—York Road line of the City & Suburban Railway. Electric.

May 6, 1893.—Lake Roland Elevated Railway, to City Hall and to Walbrook. Electric.

May 15, 1893.—Cary Street line of Baltimore Traction Company. Electric.

May 22, 1893.—North Avenue line of City & Suburban Railway. Electric.

May 23, 1893.—Blue line of Baltimore City Passenger Railway. Cable.

July 23, 1893.—Red line of Baltimore City Passenger Railway. Electric.

July 23, 1893.—South Baltimore division of Cary Street line of Traction Company. Electric.

July 30, 1893.—Wilkins Avenue line of City & Suburban Railway. Electric.

August 9, 1893.—Highlandtown line of City & Suburban Railway. Electric.

August 20, 1893.—White line of Baltimore City Passenger Railway. Cable.

September 3, 1893.—Maryland Avenue line of City & Suburban Railway. Electric.

September 20, 1893.—Linden Avenue line of Baltimore Traction Company. Electric.

October 4, 1893.—John Street line of City & Suburban Railway. Electric.

The aggregate cost of the rapid transit improvements that have been made in Baltimore, during the past three years, exceeds $10,000,000, and the work yet to be completed in track laying, equipment and power plants will involve the expenditure of several millions more.

It is too early to present any statistical evidences of the benefits resulting from these extensive improvements. Traffic figures, if accessible, would not make an accurate showing, inasmuch as traffic has been seriously interfered with by construction work during the past two years, and few of the lines have yet been in operation long enough with their new power and equipment to reach their normal conditions of traffic. Furthermore, for reasons of policy, the railway companies carefully guard their traffic figures and refer to the park tax payments as indicative of their business. In this city, the street railways pay into the city treasury 9 per cent. of their gross receipts, as a tax for the maintenance of the public parks. While this tax affords a means of ascertaining the gross business of each company, it is obviously impossible to calculate therefrom the number of passengers carried by each company, as half fares, transfers and other disturbing factors destroy the accuracy of such figures. Such

an estimate, however, is added to the following statement of park tax payments during the past two years, for what it is worth:

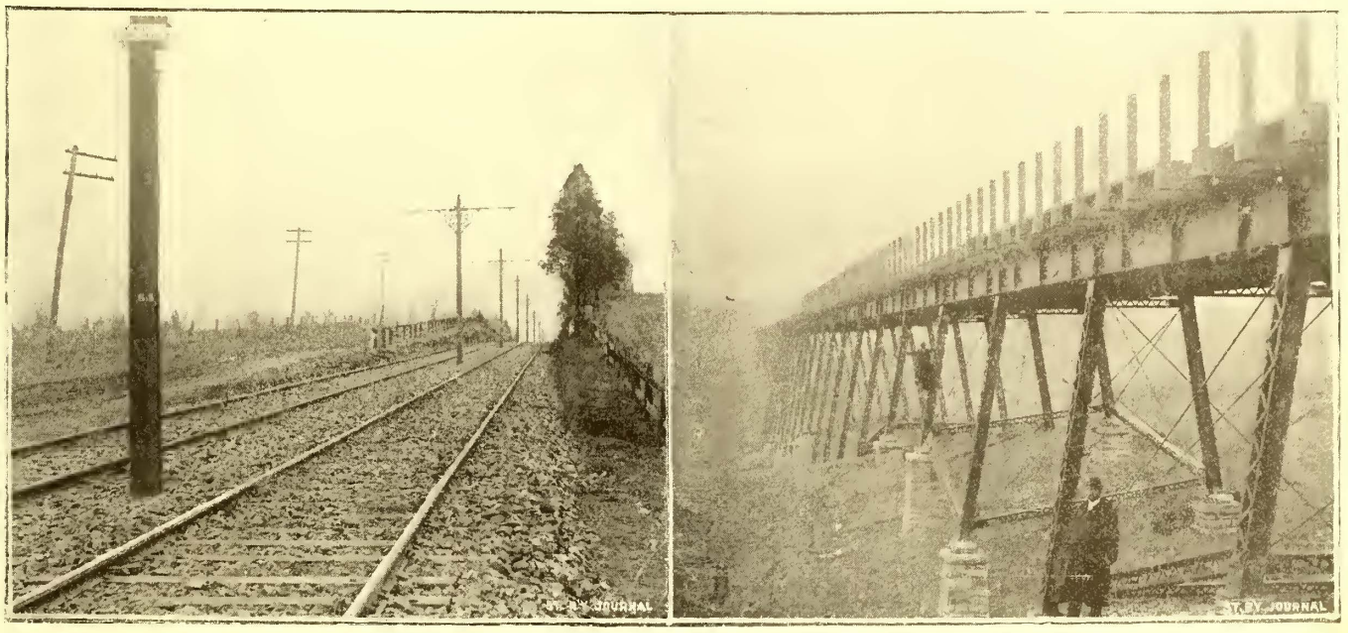
Companies.	Park tax payments. 1892.	1893.
Baltimore City Passenger Railway Company....	$70,421	$66,854
Baltimore Traction Company.....	61,672	89,025
North Baltimore Passenger Railway Company...	22,525	
City & Suburban Railway Company.....	25,266	30,111
Highlandtown & Point Breeze Railway Company	1,279	
Central Passenger Railway Company.....	10,221	18,763
Lake Roland Elevated Railway Company.....	1,944	8,171
Total.....	$193,328	$212,924
Indicating aggregate gross receipts of.....	$2,148,088	$2,365,822
Equivalent to passengers carried @ five cents...	42,961,760	47,316,450

CITY & SUBURBAN RAILWAY COMPANY.

The City & Suburban Railway Company, which has undertaken the introduction of electric traction upon a very comprehensive scale, was organized in June, 1892, by the consolidation of the York Road Railway Company, the Union Passenger Railway Company, the Baltimore & Hampden Railway Company, the Highlandtown & Point Breeze Railway Company, and the Baltimore, Catonsville & Ellicott's Mills Railway Company. Considerable new mileage has been added to these lines in the shape of extensions and feeders, and the entire system of sixty-one miles is now operated by electricity, with the exception of Catonsville line, which has not yet been changed. The suburban lines of this system constitute one of its interesting features, as they tap territory likely to furnish important traffic as the growth of the city extends its limits. The York Road line reaches to the county seat at Towson, eight miles from the City Hall; the Catonsville line runs to Catonsville, seven miles from the City Hall; the Hampden & Woodbury line extends to these important manufacturing suburbs, a distance of three and a half miles, while the Point Breeze line goes to Point Breeze, about five and a half miles southeast of the city.

The most interesting work undertaken by this company was the reconstruction of the York Road line, which follows the old York turnpike, an ancient toll road extending to York, Pa. This pike, which had its city terminus at North Avenue, was owned by the Baltimore & York Turnpike Company, a corporation whose interests were identical with those of the City & Suburban Railway Company. The double tracks of the horse line extended a mile and a half north of North Avenue, and a single track continued thence to Towson. The turnpike followed the rolling contour of the country with no attempt at grading, and the grades ranged from 6 to 8 per cent Upon undertaking the change of motive power on this line, it was decided to reduce the grades throughout the entire distance from North Avenue to Towson, a distance of six miles. Work was commenced in September, 1892, by J. G. White & Company, who had the contract for grading and track laying on this division, and by April, 1893, electric cars were running through to Towson.

In reducing the grades of this line from a maximum of 8 per cent. to a maximum of 3½ per cent. (with the exception of one 5 per cent. in Towson), some heavy cutting and filling was necessary, and the turnpike was practically closed to travel during the work. The excavation amounted to 10,000 cu. yds. per mile, and above the city limits only the roadbed was carried to the new grade, the remaining portion of the turnpike being left at its original lines. The illustration, showing the work in progress, will give an idea of the extent of the changes in grade. For a considerable time during last winter the road was impassable, even for the horse cars that were operated on the old tracks, so the temporary expedient of steam traction, as illustrated in the accompanying view, was resorted to. A hoisting engine, mounted on a hand car and geared to its axles with sprocket wheels and chains, did service for a time as a locomotive and maintained occasional service on the road.



FIGS. 1 AND 2.—VIEWS ON THE LINE OF THE CITY & SUBURBAN RAILWAY—BALTIMORE.

The first two miles north of North Avenue, to the city limits at Arlington Avenue, was graded to the full width of the street and was paved between the tracks and two feet outside, in accordance with the requirements of the city ordinances. This portion of the line is laid with seven inch Johnson girder rails, for one mile on two inch chairs, and for the balance of the way spiked to the ties. At Arlington Avenue, the line is swung to the east side of the road, and the construction is changed to Pennsylvania Steel Company's fifty-eight pound T rails, on 6 × 7 ins. × 8 ft. sawed Georgia pine ties, two feet centers. The double tracks are continued and the road is rock ballasted, a quarry having been purchased and a crushing plant erected for the contractor by the company. Wooden center poles are used, and the line was lighted by arc lamps placed at the tops of the poles, but it was found necessary to remove these because of their repeated destruction by boys. This construction continues to Towson, where the road terminates in a single track loop of about half a mile through the principal streets of the town. This loop is laid with Pennsylvania Steel Company's seven inch girder rails spiked to the ties.

This line runs through a charming country, admirably adapted for suburban settlement, and as Towson, the terminus of the line, is the seat of Baltimore County, the road is assured considerable through travel. The charge from the city to Towson is fifteen cents, three five cent

fares being collected at intervals. As the city end of the line passes the City Hall and through the principal business section, it will be seen that the road occupies a very valuable territory. The status of the ungraded portion of the turnpike is uncertain at present. The company has attempted to deed to the city and county its respective portions of the highway, but the gift has been rejected because of its ungraded condition. The suburban portion of the railway is a beautiful piece of work, and with the turnpike fully graded, this will be a charming rural highway.

On North Avenue, formerly the northern limit of the city, the City & Suburban Company has constructed an east and west line extending from Belair Road on the east to Madison Avenue on the west. This line is chiefly of value as a crosstown connection for the north and south lines of the company, three of which are crossed by it. By free transfers with the other lines of the same company, this North Avenue line is an important feeder. This line has its own tracks as far west as Guilford Avenue, where the Lake Roland elevated road comes in. Two squares further west, at St. Paul Street, both lines use the tracks of the Blue line of the Baltimore City Passenger Railway Company for one square. Thence for two squares west there is a piece of mutual track used by the City & Suburban, Lake Roland, and Traction companies. West of Jones' Falls, the troublesome creek which meanders through the city as a great open sewer, the North Avenue tracks are owned jointly by the City & Suburban and Lake Roland companies.

FIG. 3.—CHANGING GRADE, YORK ROAD—CITY & SUBURBAN RAILWAY.

The Maryland Avenue line of the City & Suburban system is one of its most important divisions, extending from Woodbury in the northern part of the city to the business center, and then striking east to the outskirts, a total distance of six and a half miles. The York Road line has the same general arrangement, striking west to the edge of the city, both lines using the same east and west tracks on Pratt Street in the business section. The Maryland Avenue line has one of the most striking engineering features of the system—a heavy iron viaduct, 1,100 ft. long, crossing Stony Run in the northern part of the city, by which the crossing of this ravine at a lower grade, with several bad grades and curves and about 1,100 ft. of additional track, are avoided. Starting at the intersection of Huntington Avenue and 11th Street, at the south end of this viaduct, the approach is graded for a distance of 425 ft.; then there are twenty-four 30 ft. spans of girders on steel bents and pedestals, then a single 250 ft. span, four 30 ft. girder spans on bents, and 425 ft. of grading, bringing the tracks to the intersection of Cedar and Remington Avenues, where they cross the Lake Roland tracks. The viaduct carries two tracks and the deck is 25 ft. wide over all. The 250 ft. span crosses the tracks of the Baltimore & Lehigh Railroad and the small stream which flows through the ravine, the greatest depth being 95 ft. below the top of the viaduct. The structure is heavily constructed throughout, being calculated for a live load of 30,000 lbs. on a four wheel truck of six and a half foot wheel base. This portion of the line, formerly the Baltimore & Hampden Railway, was operated by electricity nearly ten years ago. Two Daft motors were used, and the third rail which was used was supplemented at troublesome points by crude overhead conductors which can still be seen standing at several points along the line.

The John Street line, which extends from West North Avenue to the center of the city, has been rebuilt and newly equipped throughout, and the Wilkins Avenue line is an entirely new line of about one mile of double track, that has been built in the southeastern section of the city.

There is a great variety in the construction of the various lines of the City & Suburban Railway, although the character of the work cannot be said to have been sacrificed thereby. The rails used are chiefly six inch and seven inch girders on chairs. Most of the rails were supplied by the Johnson Company, and some from the Pennsylvania Steel Company and Wm. Wharton, Jr., & Company. Most of the specials were made by the Johnson Company. For about 4,000 ft. on Pratt Street the steam track of the Baltimore & Ohio Railroad is straddled, and a ten inch Johnson girder with electrically welded chairs, is used on this section. The subject of track construction has been given careful study, and curves and grades have been very carefully worked out with a view of obtaining the best possible results in operating.

The power arrangements of this system are incomplete. A temporary station at Waverly, on the York Road, supplies power for a portion of the line, and current is rented from other companies for the operation of some of the cars. The temporary plant at Waverly contains four 250 H. P. McIntosh & Seymour tandem compound engines, belted to four 200 K. W. General Electric (Thomson-Houston) generators, steam being furnished by six return tubular boilers. Plans are being prepared, however, for an extensive power plant which will be located on the water front and will have sufficient capacity to operate all the lines of the company.

The rolling stock of the company is new throughout. There are now in service 100 cars, sixteen and eighteen feet in length, for closed cars, and twenty-nine feet for open cars. They are of several types, and were furnished by the Lewis & Fowler Manufacturing Company, the J. G. Brill Company, the John Stephenson Company and the Laclede Car Company. The trucks are of various patterns, Brill, Bemis, Peckham and Baltimore Car Wheel Company. General Electric (Thomson-Houston) motors are used throughout, two twenty horse power to each car. The City & Suburban system shows good organization and management, and its service is excellent, which is the more noteworthy because of the temporary disadvantages to which it is subjected. The engineering and construction work of the company, which have been under the direction of the chief engineer, Frank H. Sloan, furnish many instructive examples for railway men, and it is regretted that more detailed consideration of these features must be omitted from this article.

LAKE ROLAND ELEVATED RAILWAY.

The Lake Roland Elevated Railway is the most recent organization in the rapid transit system of Baltimore. It was formed in June, 1892, by the consolidation of the North Avenue Railway Company and the Baltimore, Hampden and Lake Roland companies. The

North Avenue Railway was the first line operated regularly by electricity hereabouts, having commenced operations on West North Avenue in the upper part of the city on April 16, 1890. The inauguration of an extensive suburban real estate enterprise at Roland Park, about five miles north of the city center, necessitated a means of rapid transit to and from the city. The promoters of the Roland Park enterprise acquired control of the North Avenue Railway and the Baltimore, Hampden and Lake Roland companies, and made use of existing franchises to reach the center of the city by means of an elevated structure on North Street, a side street that is already obstructed by the tracks of the Northern Central Railroad. The present Lake Roland road, which was opened throughout for business on May 6, 1893, starts at the City Hall and runs north on North Street to North Avenue. The approach to the elevated structure, which begins within a few rods of the City Hall, is by an incline of 250 ft., rising on a 9 per cent. grade. Ninety feet of this approach is masonry, 16 ft. in width, and the iron work widens to 36 ft. The entire length of the elevated structure and approaches is 3,910 ft. It consists of lattice girder spans of from 40 ft. to 65 ft. in length, supported upon transverse plate girders 60 ins. deep, which rest upon steel columns standing on the curb line of the street. At Centre Street the line crosses the tracks of the Northern Central upon a bridge span of 156 ft., and again at Madison Street by a span of 196 ft. At the north end of the structure the street level is reached by an incline similar to that at the south approach, 240 ft. in length. On the elevated structure there are two tracks of 70 lb. T rails. Stations were planned for several points on the elevated road, but they have been built only at Centre and Madison Streets, the chief advantage of the structure being the speedy access to the center of the city, which it makes possible. The elevated line was built by the Pennsylvania Steel Company.

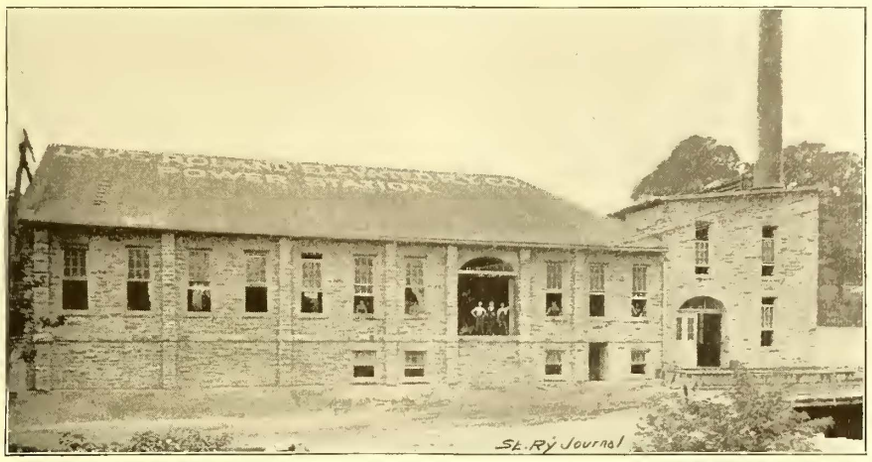


FIG. 4.—EXTERIOR OF POWER STATION—LAKE ROLAND ELEVATED RAILWAY.

The line follows North Avenue west to Oak Street, where it divides, one branch following North Avenue to Walbrook at the western edge of the city, a distance of nearly four miles, and the other running to Roland Park. Some distance above North Avenue the Roland Park line crosses Stony Run upon a steel viaduct 660 ft. in length, built by the Variety Iron Works Company, of Cleveland, O. There are two 130 ft. bridge spans in this structure, the remainder being in lattice girder spans of fifty-six feet. Fifty-eight pound T rails are used on this viaduct, and on both of the structures tubular center poles are used for carrying the trolley wires, the feed wires being placed underneath the deck.

The power house for both divisions of the road is located in the ravine traversed by Stony Run, near the point where the viaduct crosses, and near the tracks of the Northern Central and Baltimore & Lehigh Railroads. The building is a handsome stone structure with iron roof, measuring 56 × 130 ft. The building stands at the junction of Stony Run and Jones Falls, at a point where the foundations of the walls necessitated troublesome and expensive work. The power plant consists of two 750 H. P., tandem compound engines, built by the Corliss Steam Engine Company, of Providence, R. I., driving a single main shaft, from which four 400 H. P. Thomson-Houston generators are driven. There is also a 120 H. P. Ball engine and a Westinghouse alternating dynamo for the electric lighting service of Roland Park. The boiler room, which is separated from the engine room by a two foot wall, is 58 × 100 ft., and contains six vertical Corliss boilers eighty inches in diameter.

FIG. 6.—STONY RUN VIADUCT—LAKE ROLAND ELEVATED RAILWAY.

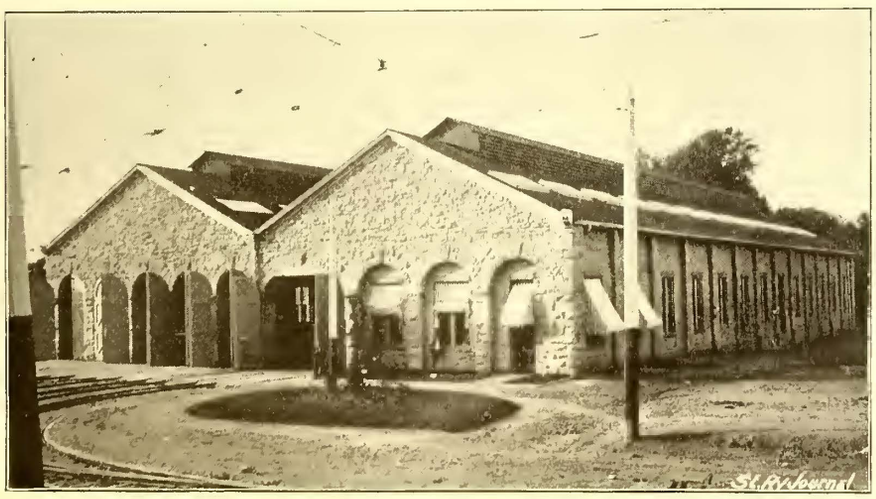


FIG. 5.—CAR HOUSE—LAKE ROLAND ELEVATED RAILWAY.

At Roland Park the car house and general offices of the company are located in a handsome stone building 112 × 203 ft. The building stands parallel with the line, and is reached by a short side street, as Roland Avenue in

this vicinity is designed to be a choice residence location, and it is, therefore, essential that the street shall not be obstructed by cars. The car house contains 1,640 ft. of track, with the necessary pits, machine shop, motor repair shop, paint shop, etc. While the terminus of the line is properly at this point, the road continues further for a distance of about two and a half miles to Lakeside, a beautiful park on the shores of Lake Roland, which was fitted up by the railway company as a pleasure ground. The length of the lines of this company is as follows:

FIG. 7.—STONY RUN VIADUCT—LAKE ROLAND ELEVATED RAILWAY

	Feet.
City Hall to North Avenue and Oak Street	9,534
Oak Street and North Avenue to Walbrook	19,100
Oak Street and North Avenue to Roland Park	18,900
Roland Park to Lakeside	11,100
Total	58,634

All of this is double track, with the exception of a portion of the Walbrook division. All the track put down by the present company was laid with duplex rails. The heavy cars of the company have made bad work with the roadbed, and on some portions of the line ties have been put under the chairs, while other sections where the line crosses private property have been relaid with T rails.

The rolling stock consists of twenty-five of the thirty foot double truck Pullman cars, which were used for a time on the Duquesne Traction Company's road in Pittsburgh, but subsequently replaced by smaller cars. These cars have been found too heavy for the Lake Roland road and will be replaced with eighteen foot cars of a very handsome pattern built by the J. W. Fowler Car Company, Elizabethport, N. J. The company also has eighteen twenty-eight foot open cars, built by the Lewis & Fowler Manufacturing Company. Edison and Thomson - Houston motors are used on the present cars. A second order for twenty-five cars was placed last month with the J. W. Fowler Car Company.

The line of this road is full of bad grades and curves, the operations of the line having been handicapped by mistakes in engineering and construction. From the City Hall terminus to Roland Park there is a rise of nearly 400 ft., and the line appears to have been located with little regard to grades and curves. The economy in first costs attempted by the promoters of this road appears to have been a pretty expensive kind of saving, but in spite of the disadvantages under which it has operated, the road has been very successful from the start and has succeeded in building up a large traffic in an entirely new field.

BALTIMORE CITY PASSENGER RAILWAY.

The Baltimore City Passenger Railway Company operates six different lines of railway, on three of which the cable has been introduced during the past two years, and the remaining lines are now being changed from horse to electric traction. The lines of this company tap the largest traffic producing sections of the city, and converge to the business center. Baltimore Street, the chief east and west thoroughfare of the city, is occupied by the

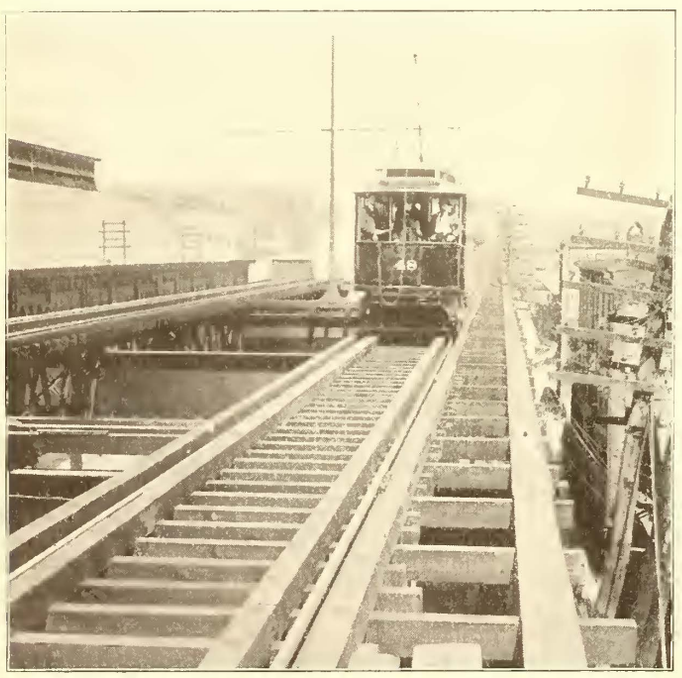


FIG. 8.—VIEW OF TRACK—LAKE ROLAND ELEVATED RAILWAY.

FIG. 9.—CITY HALL TERMINUS—LAKE ROLAND ELEVATED RAILWAY.

cable lines of this company, and all of its lines touch or traverse this street within the space of a few blocks east and west of Charles Street. At the present time the three cable lines of this company are of the most interest, as they are complete and in regular operation, while horses are still in use on the other lines. The White line extends from Patterson Park to the east, through Baltimore Street to the center of the city, and then strikes away to Druid Hill Park on the northwest. The Red line extends from the western edge of the city east through Baltimore Street to the business center, and then strikes away to the northeast. The Blue line runs north and south from Baltimore Street to the northern limits, serving as a spur or feeder for the other two lines. Roughly speaking, the cable system of this company resembles the letter K with a third leg bisecting the obtuse angle. Free transfers between the lines of this company are given at intersecting points, thus giving a very comprehensive service.

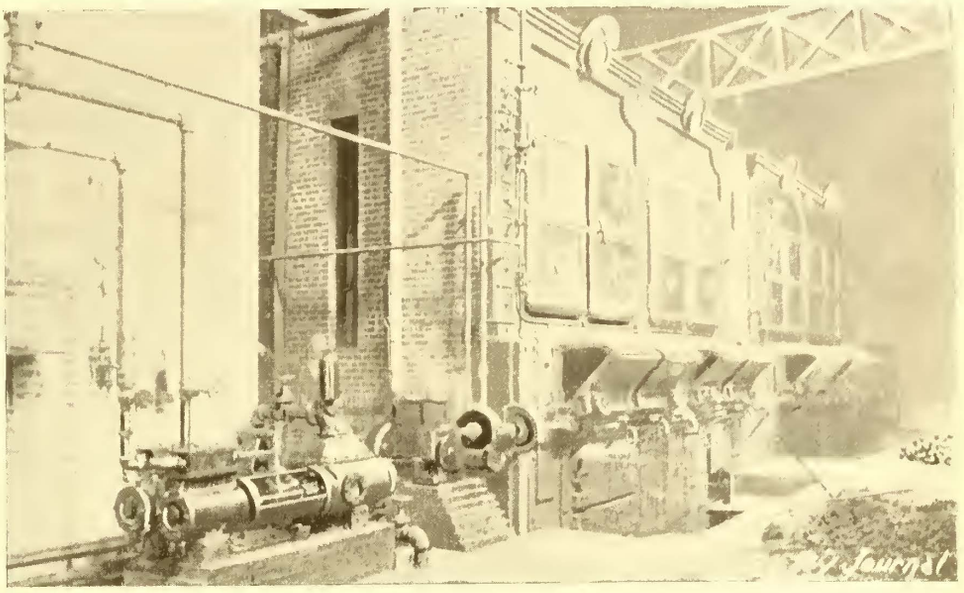


FIG. 11.—INTERIOR OF EUTAW STREET BOILER HOUSE—CITY PASSENGER RAILWAY.

There are three power houses for the cable system of this company, one on Eutaw Street, 500 ft. south of Baltimore Street, one on East Baltimore Street, and one on North Charles Street. Three cables are driven from the Eutaw Street station, one operating the western division of the Red line on West Baltimore Street, one operating the northwestern end of the White line on Madison Avenue to Druid Hill Park, and a short rope on Baltimore Street east from Eutaw Street, through the crowded portion of the city, which is used by both the Red and White lines. The station is a handsome structure of red brick trimmed with Seneca sandstone, with a frontage of 110 ft. and a depth of 160 ft., and an L, 70 × 47 ft. The driving gear is from the Walker Manufacturing Company, and a rope drive is used to transmit the power from the main shaft to the drum shafts. The cable drums for the West Baltimore and Madison Avenue ropes are fourteen feet in diameter, these ropes running at a speed of eleven miles an hour. The Baltimore Street rope is driven from ten foot drums at a speed of six miles. The power is furnished by two Reynolds-Corliss compound, non-condensing engines, with cylinders 24 and 38 × 60 ins. Steam is supplied by Campbell & Zell water tube boilers which are fitted with Roney stokers. Upton tension carriages, similar to those used on the Washington & Georgetown road in Washington, D. C., are used here and in the other stations of this company. A winding drum for reeling old cables has just been set up in this station, and similar reels have been put in the other houses. It consists of a wooden spool driven by a small Lidgerwood hoisting engine, connected by gearing. The drum is placed in the tension run and is designed to take the old rope as it comes from the street.

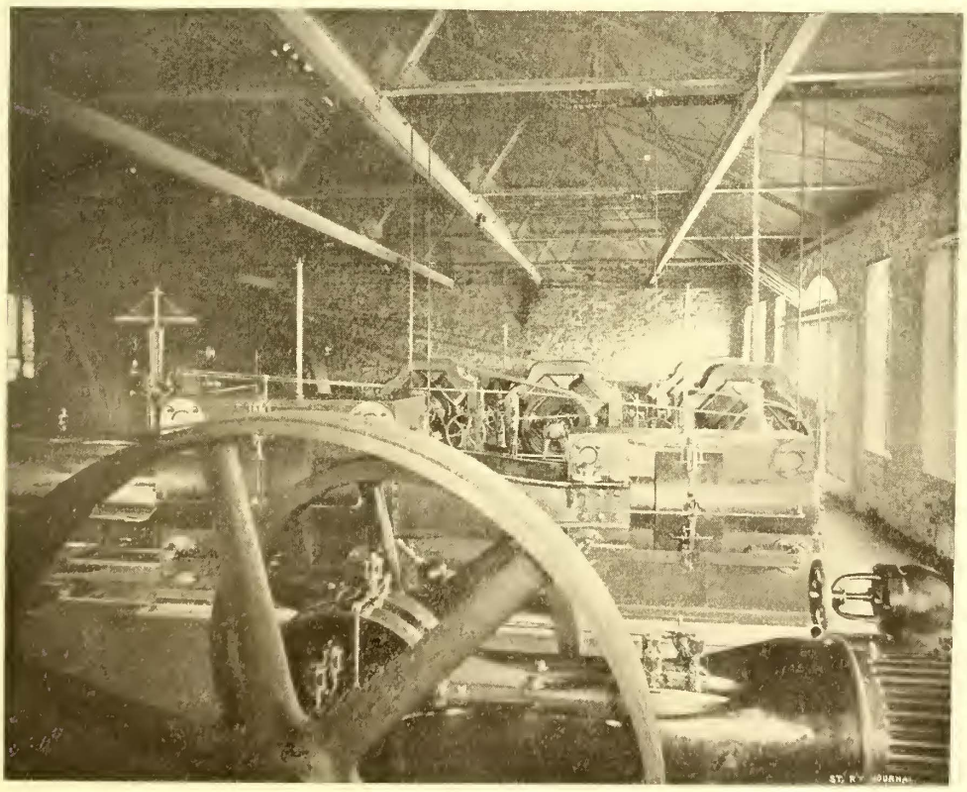


FIG 10.—INTERIOR OF STATION—LAKE ROLAND ELEVATED RAILWAY.

This station stands 500 ft. from the line of the tracks on Baltimore Street, and the three cables are carried to Baltimore Street in a concrete tunnel, 5 × 5 ft., under Eutaw Street. The Baltimore Street rope runs up Eutaw Street across Baltimore Street, and comes back on the curve leading into Baltimore Street, being used in carrying the cars around the curve. The Madison Avenue rope goes straight up Eutaw Street to Madison Avenue, and the West Baltimore Street rope goes to the western terminus of the line without a curve. The slow Baltimore Street rope turns up Gay Street at its eastern end, the fast rope on that line being taken after the turn into Gay Street. The Madison Avenue rope has 80 ft. of 100 ft. radius curve, 440 ft. of 250 ft. radius, and 23,869 ft. of tangent, making a total length of 24,389 ft. The West Baltimore Street rope is 23,285 ft. long, without a curve. The Baltimore Street rope has 153 ft. of 40 ft. radius curve, 84 ft. of 60 ft. radius, 4 ft. of 250 ft. radius, and 8,454 ft. of tangent, making the total length 8,695 ft.

The Baltimore Street station is of the same general style, and its equipment is identical with that of the Eutaw Street house, except in point of size, as only two ropes are

driven from the former. The engines are 22 and 36 × 60 ins., and the cable driving drums are 13 and 14 ft. in diameter. The 13 ft. drum drives the Gay Street cable at 9 miles an hour. This rope goes east on Baltimore Street to Gay, and thence up Gay. This rope has 1,000 ft. of curves of various radii—85 ft. of 60 ft., 195 ft. of 100 ft., 85 ft. of 175 ft., 635 ft. of 250 ft. radius, and 26,009 ft. of tangent, making a total of 27,009 ft. The East Baltimore Street rope, which runs east from this power house to Patterson Park, in East Baltimore, has a speed of 11 miles. Its curves are as follows: 203 ft. of 60 ft. radius, 105 ft. of 75 ft., 80 ft. of 100 ft., 45 ft. of 175 ft., 35 ft. of 200 ft., 230 ft. of 259 ft., and 13,234 ft. of tangent, making a total length of 13,932 ft.

The North Charles Street station is similar in construction to the other two. The driving gear in this station was supplied by the Robert Poole & Son Company, Walker differential drums being used. The engines have cylinders 20 and 30 × 60 ins. The steam plant and other fixtures are the same as used in the other stations already mentioned. Only one rope is driven from this house. It is driven from drums 8 ft. 6 ins. diameter, the speed being 9½ miles. This station has a car house attached, 180 × 56 ft., with four plain tracks and two open for inspection. This division of the road has the largest amount of curves, the length of each radius being as follows: 442 ft. of 43 ft. radius, 151 ft. of 60 ft., 44 ft. of 100 ft., 70 ft. of 150 ft., 32 ft. of 175 ft., 250 ft. of 200 ft., 125 ft. of 250 ft., and 22,294 ft. of tangent, a total length of 23,408 ft.

The track on the lines of this company is laid with seventy-five pound girder rails from the Pennsylvania Steel Company, a twenty-four inch splice with six bolts being used. Cast iron yokes are used, and the conduit is made of Portland cement concrete with a foundation of American cement for the pavement. The Red and White lines were built by E. D. Smith & Son, of Philadelphia, and the Blue line by E. Saxton, of Kansas City. Thirty-six inch pulleys are used on the curves, with spiral grooved pulleys wherever the rope has a tendency to ride high. On the fast ropes fourteen inch carrier sheaves are used and ten inch on the slow ropes.

One of the troublesome incidents of construction for the engineers of this road was the crossing of the cable lines of the Traction Company. There are five such crossings, the Traction Company having the upper rope at all but one. The North Charles Street line crosses the line of the Traction Company at Fayette Street. The cars of the Baltimore City Passenger Railway approach on the north side of this crossing with a rising grade of 2 per cent. and a curve of 250 ft. radius, the approach from the south side being on an up grade of 1¼ per cent. The worst crossing, however, is at the intersection of the Traction Company's tracks on Fayette Street and those of the White line on Eutaw Street. At this point there is a depression in the tracks of the Traction Company, which brings the cable of that line close to the top of the slot rail, and as the White line has the lower rope, the crossing presents two problems: First, to keep the Traction Company's rope permanently down from the slot, and, second, to depress it at the passage of the White line cars. The second problem is the usual one, and is met in the usual way by the use of a hand depressor of ordinary type. The high position of the upper rope brought it above the convenient point for contact with the pulley of the hand depressor, and necessitated the use of a special device designed by Chief Engineer Connett, of the Baltimore City Passenger Railway. The accompanying engravings show the construction of the hand depressor and the fixed depressing wheel, and with the following explanatory notes the working of the device will be apparent: East of the crossing there is an offset of four and three-quarters inches in the slots of the Traction Company's line, and a small depressor wheel is placed in the normal line of the Traction Company's cable at this point, which is fourteen feet from the center of the crossing. During the passage of a car the offset carries the grip clear of this depressing wheel, and after passing the cable returns to its place in the depressing sheave. The depressing wheel is 8½ ins. in diameter, with a 5½ in. face and 1⅝ in. depth of groove. It is mounted on the end of a $1\frac{15}{16}$ in. steel spindle, $21\frac{7}{32}$ ins. long, running in boxes set on the top line of the yokes. This gives the cable a fixed position 11 ins. below the top of the slot and brings it within reach of the hand depressor. This device has worked without defect, and thus far the cable has never slipped the depressing wheel. The construction of the hand depressor is shown by the engraving.

The new rolling stock for the cable lines of this company consists of sixty-two open grip cars and the same number of sixteen foot closed trailers. Trains of two cars are run on all the lines, the termini having no loop, but straight tracks with two crossover switches. These cars were built by the J. G. Brill Company, and are of the pattern used in Washington, Cleveland, Chicago and other cities. The running gear was furnished by the Baltimore Car Wheel Company, and Whitney wheels are used. The cars are handsomely finished in mahogany, and are of tasteful design. Ten additional grip cars have recently been received from the John Stephenson Company, which are of similar pattern, and a number of the old horse cars

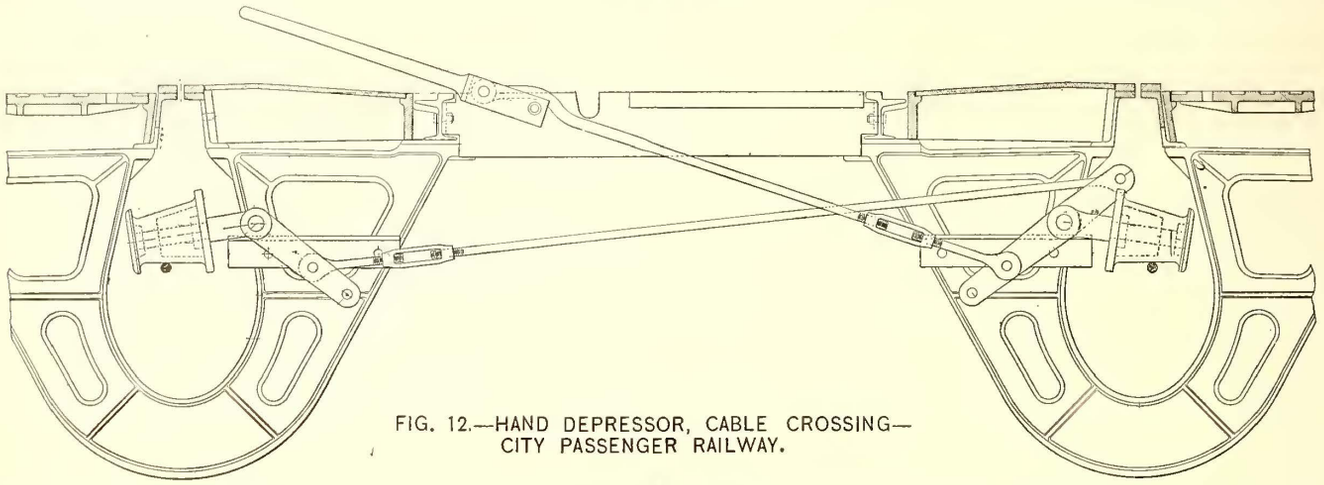
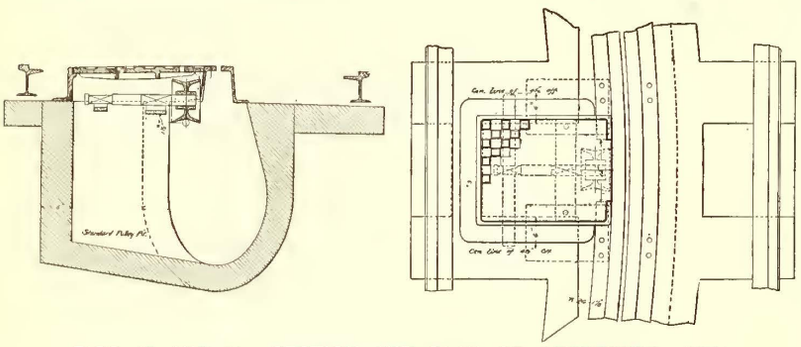


FIG. 12.—HAND DEPRESSOR, CABLE CROSSING—CITY PASSENGER RAILWAY.



FIGS. 13 AND 14.—SECTION AND PLAN OF DEPRESSOR—CITY PASSENGER RAILWAY.

formerly used by the company have been rebuilt for use as trailers. A double side-jaw grip, designed by the engineers of the railway company, is used. Reversible soft steel dies are used, the life being about twenty days. Roebling ropes are used on all the lines. The first set were Lang lay, but some ordinary lay were bought for the second set. Lang lay will be used throughout hereafter.

The electric lines of the Baltimore City Passenger Railway Company, now in course of construction, will form an important system of about twenty-one miles of track. The Green line, which traverses the city diagonally from Druid Hill Park to Canton, has been relaid with ninety pound Johnson girder rails on ties, by E. D. Smith & Son, and the Yellow line, which extends from the southern limits to the center, and thence to the northeast of the city, has been relaid with seventy-two pound Johnson girder rails on three inch chairs, by E. Saxton. The Hall Springs line embraces most of the Yellow line and a northern extension which will be rebuilt this spring.

The power house for the electric lines is being erected at Light and Heath Streets in the southern part of the city. The engine room proper will be 72 ft. wide, 116 ft. long on one side and 134 ft. on the other. There will be a boiler room, 45 × 112 ft., a coal room, 58 × 58 ft., a machine shop, 72 × 34 ft., and a car barn 227 ft., long by 64 and 50 ft. wide. It is also the intention of the company to erect extensive car shops at this point in the future, but plans for this have not yet assumed definite shape. The power plant will consist of three Reynolds-Corliss simple engines, 30 × 60 ins., belted to three 500 K. W. Westinghouse generators. There will be eight Campbell & Zell 250 H. P. boilers with Roney stokers. The engine room will have a ten ton overhead traveling crane built by the Maryland Steel Company. There have been ordered for the electric lines of the company fifty eighteen foot Brill cars, with No. 21 Brill trucks which will each carry two thirty horse power Westinghouse motors.

The extensive improvements which have been made by the Baltimore City Passenger Railway Company during the past two years are noteworthy for the high character of the work. There has been no stinting of money, and those portions of the system that have been completed stand as good examples of modern practice in street railway construction. A. N. Connett, the chief engineer of the company has much to be satisfied with in the troublesome problems he has solved during construction.

BELTS.

All the belts used in the station of the City & Suburban Railway are Charles A. Schieren & Company's perforated electric belts, and are twenty-five inch, double. All the belts employed in the plant of the Lake Roland Elevated Railway are of the same manufacture.

SUPERINTENDENT HANNAN, of the New York State Department of Public Works, gives considerable space in his annual report to a discussion on the electric propulsion of canal boats on the Erie Canal. He estimates that the boats can be operated for about ten cents per mile per boat, and at a speed of three and a half miles per hour.

THE Montreal Park & Island Railway, operating between Montreal and Sault au Recollets, was put into operation last month. This company proposes to establish a freight service between midnight and 5 A. M., so as not to interfere with the regular passenger traffic. The road will bring in buttermilk and farm products, as well as manufactured articles, and arrangements will be made, it is said, with the Montreal Street Railway Company to run into the center of the city.

An Electric Road in a New Field.

The Mousam River Railroad, which connects the town of Sanford, Me., with the nearest freight station on the Portland & Rochester Railroad, and extends to the town of Springdale on that same road, marks a new departure in electric railway economics in having a large freight, express, mail and baggage business, besides the regular passenger travel. A short description of this road was given in a recent issue, but through the kindness of Superintendent E. K. Day we are enabled to present the following additional particulars:

Sanford is a manufacturing town of about 5,000 inhabitants, and is situated on the Mousam River, at a distance of about three miles from the nearest passenger station on the steam road. The Sanford Plush Mills, the principal industry of the place, are about one and three-quarters miles from the freight station on the steam road.

ELECTRIC FREIGHT LOCOMOTIVE AT SANFORD, ME.

All of the baggage, express and mail business of the town is handled by this road, using for this purpose trail cars attached to the regular closed motor cars.

The freight and coal hauling is done by a special electric locomotive in ordinary freight cars, making a direct haul from the railroad junction to the point of delivery. All coal and merchandise is brought in and all shipping done in this manner. An idea of the amount of business done in this line may be gained from the fact that from February 28 last, when it commenced to haul freight, to December 15, 23,586,377 lbs. had been handled in 1,332 freight cars, an average of nearly six cars and fifty tons per working day. This is certainly a remarkable showing, and opens up a new field for electric transportation in many sections where towns doing large business are situated at a distance from the railroad. The passenger traffic for the eight months from May 30 was 111,725, with an average of eighty-five car miles per day.

This road and all of its equipment are built in the best possible manner. The power station is a wood and brick building, 117 × 54 ft. in size, and is situated on the line between Sanford and Springdale. The power plant consists of one seventy horse power Corliss engine, made by the Swampscott Machine Company, of South Newmarket, N. H., and one 150 H. P. Humphrey water wheel, which together drive two 100 H. P. Westinghouse multipolar generators.

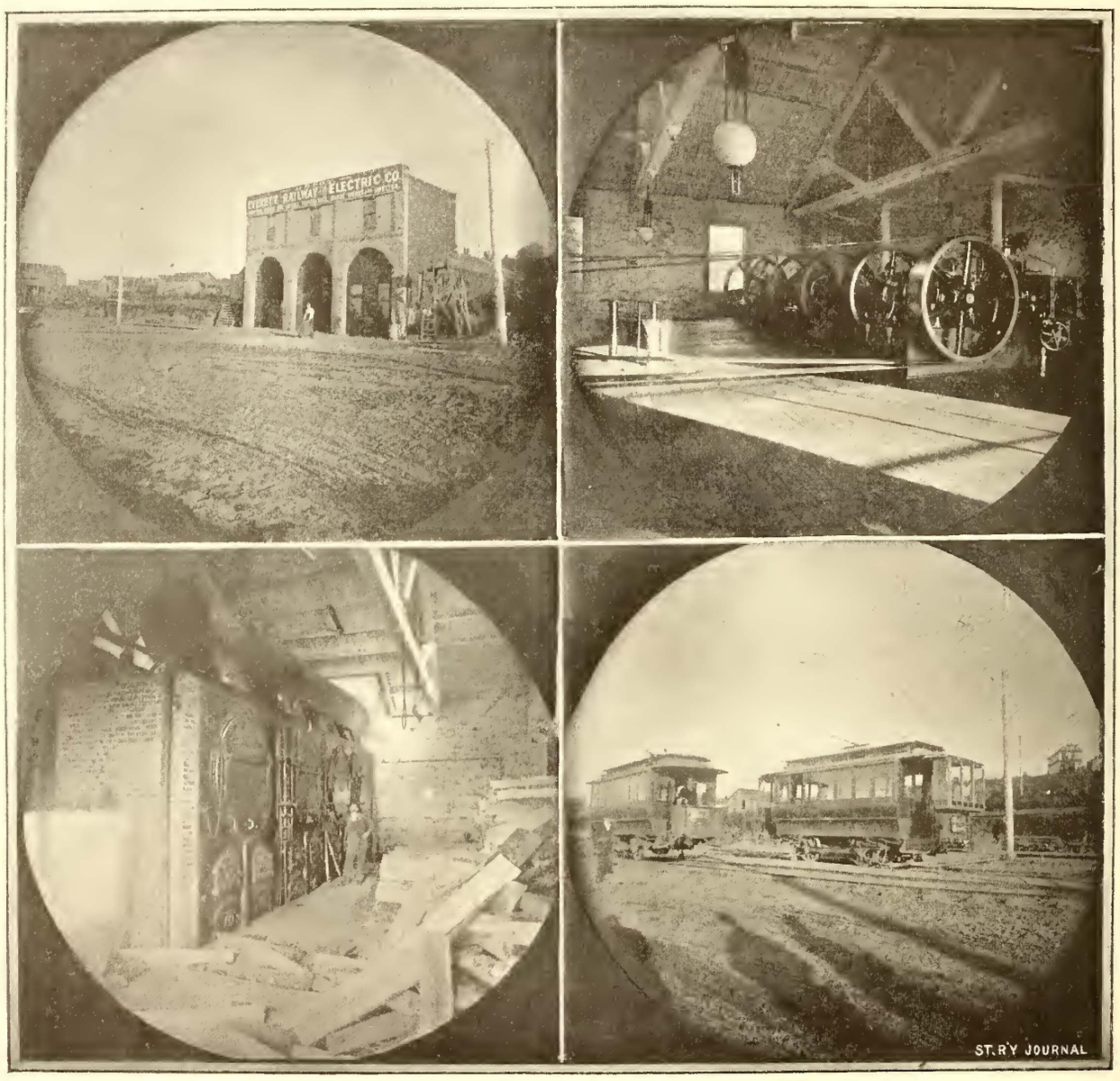
The trolley wire is No. 0 and the feed wire No. 0000, all from the John A. Roebling's Sons Company. The poles are of hard pine and chestnut with clamp brackets.

The roadbed is of the same construction as for a steam road, with sixty pound T rails laid on cedar ties spaced two feet to centers, and equipped with patent lock switches, The length of line is 2.47 miles single track, maximum grade 5½ per cent. for 700 ft., smallest curve 104 ft. radius. The bonding is with No. 0 soft copper, riveted and soldered on each end and also connected to six copper plates $\frac{5}{16}$ ins. × 6 ft. square, sunk three feet in the ground near the river. The car house is forty feet square, with three tracks, and having three pits lighted by electricity.

since February 28, 1893, and the total expense for maintenance, including turning one commutator, has been but $8.64.

The Everett (Wash.) Electric Railway.

The city of Everett, Wash., is situated on a peninsula about four miles long and one and a half wide, formed by the Snohomish River, which empties into Puget Sound at this point. The town is largely owned



VIEWS ON THE LINE OF THE EVERETT ELECTRIC RAILWAY—EVERETT, WASH.

The rolling stock consists of two twenty-seven foot, closed motor cars, built by the Briggs Carriage Company, of Amesbury, Mass., each with two twenty horse power, single reduction Westinghouse motors. There are also two open trailers and two box baggage and express trailers. All cars are lighted and heated by electricity, Ahearn heaters being used. Bemis trucks, with sand boxes, and Dorner & Dutton track scrapers, are used on all cars.

The electric locomotive used, of which we show an illustration, is furnished with two thirty horse power Westinghouse single reduction motors. The drivers are three feet in diameter with five and a quarter inch axles. It is twenty-seven feet long over all and weighs 20,100 lbs. The normal speed is fifteen miles per hour. The cab is heated and lighted by electricity. Sand boxes, bell, track scrapers and snow plow are parts of its equipment. The locomotive hauls, regularly, four cars loaded with thirteen tons of coal each up a 5½ per cent. grade, and has started 104 tons one time. It has been in use by the Everett Land Company, a syndicate of New York capitalists, whose intention is to build up a large industrial city at this point. This company has recognized the fact that a well developed electric railway system is a most important factor in the growth and development of a city, and has installed at Everett an electric railway system, which has materially advanced the growth of the city. For a considerable extent the line lies through uninhabited territory. One branch runs from the Wire Nail Works, located on the Sound, directly across the peninsula to the river. Two other lines branch off half way between these two points, one going in a southerly direction about two miles to a large paper mill belonging to the Puget Sound Pulp & Paper Company, the other extending north about the same distance to the Smelter & Reduction Works and the Pacific Steel Barge Works, the Pacific home of the famous steel ships, the "whalebacks."

The plant was constructed by J. L. Colby, of 36 Wall Street, New York. The constructing engineer was Prof.

Leo Daft, the well known inventor and pioneer in early electric railway work. Work was commenced about the middle of January, 1893, and the plant was turned over to the operating company July 3. Since that time it has been in continuous operation without a stop, day or night.

The power station, which is of brick with a truss roof, measures 97 × 56 ft. It is located on Federal Street, between Hewitt and California Street. The stack is five feet in diameter and measures ninety feet in height. The engine room contains three cross compound Ball engines, having cylinders of the following dimensions: One 12 and 20 × 12 ins., one 11 and 19 × 12 ins., and one 13 and 22 × 12 ins. The first engine drives three arc light machines of the Standard Electric Company's make, each having a rated capacity of fifty 2,000 C. P. lamps. The second engine is belted to a Westinghouse 225 ampere, multipolar railway generator. The third engine is belted to two 1,000 light Westinghouse alternators for incandescent lighting. All three of the engines are speeded to run at 300 revolutions per minute. Hoyt's belts are used. The engines are rated at 125, 150 and 200 H. P. each.

The exhaust is carried under the floor to the condenser pit, located between the engine and generator foundations, where it enters two surface condensers manufactured by the Barr Pump Company. The salt water, which is used for condensing purposes, is taken from a crib built out in Puget Sound, 1,000 ft. from the power house. In the condenser pit are also located the grease extractors, oil and water filterers and the hot well pump.

The switchboard is a handsome piece of California redwood, highly polished, on which are located Westinghouse instruments of latest design, all of which are mounted on marble bases. It stands ten feet from the wall, allowing easy access to all connections.

The boiler room, which measures 32 × 56 ft., contains a battery of four hand made return tubular boilers, seventy-two inch shell, sixteen feet in length and containing eighty-two four-inch flues. These were supplied by the Washington Iron Works, of Seattle. Fir and pine wood is exclusively used for fuel. The boiler feedwater is obtained from several springs back of the boiler room, but connection has been made with the city mains for use in cases of emergency. Two Barr pumps are used for the boiler feed. Tests have shown that 60 per cent. of the feedwater for the boilers is obtained from the condensed steam from the condensers.

Directly off from the engine room is a small store room and engineer's office, measuring 10 × 10 ft., and a work room measuring 10 × 40 ft. Here all the testing of the arc lamps, transformers, etc., is carried on, and every facility provided for repairs, rewinding armatures, etc.

The car house is located two blocks south of the power house, and measures 57 × 100 ft. It is of brick and wood, two stories in height, and contains two tracks, each having a capacity of three cars, with repair pits under each track. On the first floor is also located the manager's, superintendent's and bookkeeper's office The second story is used for a store room and rewinding room.

The rolling stock of the company consists of five cars, from the works of the American Car Company, of St. Louis. These have sixteen foot car bodies, and are all finished inside with cherry and oak veneer, with plush upholstered seats. The exterior coloring is yellow. Each car is mounted on a McGuire Columbian truck, with a six foot wheel base and thirty-three inch wheels, and is equipped with two twenty horse power, single reduction Westinghouse motors. The vestibules were made from designs furnished by the superintendent, making a very attractive looking car. Nuttall trolleys and Lewis & Fowler stationary registers are used. The sand boxes, which were designed by the president, H. C. Wybro, are of novel design, and have given excellent satisfaction. They are hopper shaped, with a gas pipe leading from the valve located at the bottom of the hopper, so that the sand strikes the track about four inches in front of the wheels. The valve is operated by a pin projecting about two inches above the platform floor, and is operated by the foot of the motorman.

The line consists of seven and four-tenths miles of double track, with a maximum grade of 9 per cent., extending for a distance of 250 ft. It is laid with forty pound girder rail, connected with six bolt fishplates and laid on 5 × 7 in. Washington fir stringers, which are in turn supported on 5 × 7 in. × 7 ft. ties of the same width, spaced two feet between centers. The return circuit is made by bonding each joint with channel pins and connecting to a copper supplementary at every fifth joint. Wherever the double track is used the rails are double and cross bonded at regular intervals.

The overhead trolley wire used is a No. 0, and was purchased from J. A. Roebling's Sons Company. The line appliances were supplied by the Railway Equipment Company, of Chicago, and Washington fir poles are used.

As this city is the new Pacific Coast terminus of the Great Northern Railway, it is expected that the car line running to the Barge Works will eventually be extended across the river, where the Great Northern Railway owns considerable land, on which its shops and roundhouses will probably be constructed.

An Excellent Cable Record.

The Lang lay rope, manufactured by George Cradock & Company, which, as noted in the December issue, was then running on the tunnel division of the North Chicago Street Railway, was taken out on December 2,

CABLE USED ON THE CHICAGO TUNNEL LINE FOR NINETY-EIGHT DAYS.

having been ninety-eight days in service. This is regarded as an exceedingly good result considering the conditions and the heavy traffic incident to the World's Fair, it having lasted longer than any other rope previously employed on this division. Had it not been for a heavy snow storm, during which the management were afraid to risk the rope, it would have lasted for several days longer.

The service in the La Salle Street tunnel, as is well known, is most severe, as the cable not only operates all the cable cars for all the North side lines of Chicago, but passes about four sharp curves under great tension and under a depression pulley at the bottom of the tunnel. The rope was 9,760 ft. long, ran at the rate of seven miles per hour, and the first splice ran eighty-three days. It is one and three-eighths inches in diameter, of the Lang lay and is composed of six ten wire strands wound around a hemp center. The engraving on this page is from a photograph of a section of the cable sent us from Chicago, and as will be seen, none of the strands are broken, and the wear is very evenly distributed. Two of the Cradock ropes in the same place lasted, one, ninety-three days and the other seventy-three days, when it was still in good condition, but was ruined by the carelessness of a gripman. The North Chicago Street Railway Company has just placed an order for five new Cradock ropes for use on the tunnel loop, and also for a main line rope, 22,000 ft. in length.

In this connection it is interesting to note that a rope by the same makers, employed on the lines of the Tramway Funiculaire de Belleville, Paris, ran 365 days, having been put to work September 21, 1892, and taken up September, 21, 1893. The succeeding rope on this line, manufactured by another firm, broke in eighty-five days, and has been followed by a second rope of the Cradock manufacture.

An Investigation of an Egyptian Franchise.

By Arthur Hodges.

My attention was recently called to the fact that the Egyptian Government had granted a concession for the construction of a street railway in Cairo, and invited bids for the privilege of building and operating the same. Thinking that there might be a possibility of a remunerative venture in a city of 500,000 inhabitants, with a summer influx of 50,000 travelers, even though it was located in Egypt, I determined to investigate the subject, and having done so, it strikes me that there may be something of interest in it for the readers of the Journal, as indicating the difference in value between a street railway franchise in America and a "concession" in Africa.

The concession starts out by saying that the person to whom the concession is made "is authorized, at his own risk and peril, without any responsibility on the part of the government, and without the present authorization being considered as constituting any privilege or monopoly whatsoever, to construct" a street railway upon certain designated streets. It is stipulated that the "grantee of this permission shall not be allowed to claim any indemnity whatsoever * * * * by reason of the condition of the street, and the influence which it might exercise over the preservation and maintenance of the railways, nor by reason of the opening of new ways of communication or of the establishment of new services of transportation in concurrence with that of the grantee, nor by reason of the interruptions of service which might result, * * * * by the city authorities or by companies or individuals duly authorized; neither for *any cause whatsoever* resulting from the free use of the public highway." In case the track is disturbed by private companies or individuals "the reconstruction of the track is to be at the charge of the grantee," and in case the street is torn up by the city authorities or government, "the repairing and reconstruction of the street and the track is to be at the charge of the grantee." The government reserves the right to disturb the tracks, or to authorize others to do so, at any time, without constituting a claim for damages, and the "grantee must constantly maintain, at his own expense, in good running order, the lines of track and the paved belt, the construction of which is imposed upon him, in such manner as that the public travel is always easy on that part of the public highway occupied by the street car line." "At the time of construction, the grantee is bound to raise carefully the materials composing the pavement where the line is to be laid, to sort them, and transport them to the places which will be indicated by the city authorities." "Before signing the contract" the person to whom the authorization is to be made "shall deposit in the safe of the Ministry of Finances, as security, a sum of three thousand Egyptian pounds, either in gold not bearing interest, or in bonds of the Egyptian debt, valued at the current price of the day. He can detach the coupons when due." The work is to be commenced within nine months from the date of the authorization, and to be completed within two years, and "in case of his default in conforming to either one of the periods of time indicated, the benefit of the authorization shall be declared forfeited as to him." "In case of forfeiture, the security will be confiscated, and the works already completed will become in full right the property of the government, in which case it is clearly understood that there shall not be due any indemnity to the grantee or anyone for him." "Forfeiture will also be pronounced if *at any time whatsoever* the operation of the lines is interrupted *totally* or *partially* during an interval of six months." "In case of failure or insolvency of the grantee, the authorization shall of full right become null and void, without any indemnity as well." The grantee is not permitted to sell or dispose of his rights to any other parties without permission of the government, under penalty of forfeiture. "The government reserves the privilege, in case of necessity, of which it is and will remain supreme judge, to do away with any part or all of the roads conceded." In such case the indemnification is to be decided by "experts mutually chosen," and if necessary, "a third to be named by the President of the Mixed Tribunal of Cairo, to decide between the first two." "Forfeiture will be pronounced by decision of the Council of Ministers, and from that decision there shall be no appeal whatever." All decisions of every nature are to be made by the government or its agents, and from these decisions there is in no case any appeal.

In consideration of these *valuable* concessions and authorizations, the "grantee" agrees to pay to the government an "annual bonus" of a certain percentage of the gross receipts of the business (such percentage to be agreed upon before signing the authorization), a certain additional "annual bonus" also to be agreed upon, and one-half the profits above 7 per cent. It is also agreed that "at the expiration of the thirtieth year the government will enter into free possession and become owner in full right of the lines and roads, of the fixtures, of all constructions erected on the grounds of the state, and of the cars or other rolling stock, calculated at the rate of five cars to each three kilometers' length of the road, which the grantee shall be bound to turn over to it in a good state of preservation, all of which without the government having to pay any sum or idemnity whatsoever to the grantee of this concession. It will be the same in the cases of forfeiture or cancellation." There is to be a fine of two Egyptian pounds for each case of non-compliance with the clauses of the authorization or infraction of the regulations of the supervisors. The fines and other expenses of snpervisors, experts and so forth, are to be levied upon the security which must be made good within one month. The capital upon which the profits of the business are to be reckoned is the first cost of the road, to be determined by a tribunal appointed by the government, and which is to include a sum necessary for "the amortization in thirty years of the capital of the enterprise." There is also allowed a "floating capital necessary to carry on the business, but not to exceed 5,000 Egyptian pounds."

The total length of track I estimate to be about eleven miles. It is to be single track with necessary turnouts. The whole construction, including pavement, is to be approved by the authorities. The minimum radius of curves is to be twenty-five meters. The cars are to be of the best model, are to have a separate compartment for ladies who are alone, and are to be kept clean "outside and inside." The employes must be dressed in uniform and must be "polite and respectful to the public." The traction may be by animals or electricity. The speed shall "not exceed eight kilometers (a little less than five miles) an hour." "No departure of a car shall take place before sunrise nor after 1 o'clock in the morning." "The Ministry of Public Works will fix annually the minimum number of trips which must be made each day on each line; it will also fix the hours of departure." The joining of two or more cars in the same train is prohibited. The maximum fare, whatever the distance, is limited to "a piastre and a half" (about seven and a half cents), and "for distances up to two kilometers the fare shall not exceed a half piastre" (about two and a half cents). "Soldiers and policemen in uniform shall be carried at half rates." "Children, accompanied, under four years of age, shall be carried free, if they are held on the knees." "Postmen and telegraph messengers on duty and their packets, as well as agents charged with the supervision of the operation of the street railways, shall be carried free. For this purpose the grantee of this concession shall send to the Ministry of Public Works fifty passes, which will be distributed to the employes having to make vse of them."

One ludicrous feature is the requirement that "the conductor of each car must be furnished with a horn to signal the approach of the car, and assure the clearing of the way."

To those who may be anxious to embark in a scheme which promises so much, I am sorry to say that bids must be in before February 1, 1894.

I do not propose to say anything further about the concession, but to present it to the readers of the Journal, leaving them to make their own comments upon it.

THE INTRINSIC VALUE OF STREET RAILWAY INVESTMENTS.*

BY EDWARD E. HIGGINS.

SECOND PAPER.

In examining the statistics of local street railway systems serving a population of from 25,000 to 50,000, it is found that in the smaller cities success is still more or less problematical, while in the larger it is much more certain though hardly yet universal. There is no sharp population line marking the change from frequently unprofitable to generally profitable street railway operation, but for present purposes it seems best to subdivide class III into two sections and first consider

Class III a. Surface Railways in American Cities of from 25,000 to 35,000 Inhabitants.

There are thirty-five cities in the United States having a population of from 25,000 to 35,000 by the census of 1890. Twenty-one are in the Eastern States, seven in the Southern, six in the Central and one in the Western. All are served by extensive and well developed street railway systems. The total track mileage now exceeds 2,000, of which 75 per cent. is operated by electricity, 10 per cent. by horses, and the balance by various systems of motive power.

Twenty-two of these cities are represented in the Table of Statistics, although but sixteen appear in the class now under consideration. The population of five cities, with their suburbs, exceeds 35,000, while another is connected with a metropolitan system, so that its statistics cannot be given separately. Of the street railway systems in the remaining thirteen cities not represented in the table, one has suffered a number of vicissitudes within the past three years, and did not operate in 1892, although now (1894) in operation by electricity, and the statistics of the remaining twelve cannot be obtained in a sufficiently complete form for present purposes. One city of less than 25,000, is also brought into this class by the added population of its suburbs.

At the end of the various fiscal years ending in 1890, fourteen of the seventeen systems represented in the table were in operation wholly by horses, one was operated chiefly by horses but owned a short steam line, one was operated wholly by electricity, and one was changing to electricity, its horse and electric mileage being about in equal proportions. By the end of the fiscal year of 1892 the conditions were completely reversed. Eleven systems were in substantially complete operation by electricity, only two by horses, three were in the process of change from horse to electricity, and one was operating by horses, steam and electricity. The astonishing rapidity of this change of motive power is also seen in the statement that while, in 1890, 161 miles of track were in operation by horses as against but 37 miles by electricity, in 1892, 248 miles were operated by motive powers other than horses as against but 50 miles by horses.

HORSE RAILWAYS OF 1890.

The horse railways of 1890 were capitalized with moderation. 35 per cent. of the total mileage had no funded debt whatever, the funded debt of 28 per cent. was less than $10,000 per mile, and that of the remaining 37 per cent. ranged from $10,000 to $20,000 per mile of track. There was little, if any overcapitalization of costs in these figures, and a study of the operating statistics will, therefore, indicate quite clearly the intrinsic value of the horse railways of this class.

Of the fifteen horse railway systems under consideration, five earned less than $1.00 per capita gross in 1890, eight between $1.00 and $2.00 per capita, and two over $3.50 per capita.

The five systems earning less than $1.00 per capita may be dismissed with a brief word of explanation. Their small earning power was due chiefly to the shortness of the riding distances (2 to 5 miles only in all but one case), and to the inferiority of the car service given. The latter exceeded 4 miles per capita in but one case of the five, against from two to four times that figure with the more prosperous railways of this class. The operating expenses of four of the five systems consumed from 75 to 80 per cent. of the passenger income, the fifth *apparently* operating with greater economy at 67 per cent. The net earnings, though comparatively small, ranging from $2,700 to $9,000, were sufficient for a return on the respective capital liabilities of from 3 to 11 per cent., averaging over 6 per cent. It should be noted here that, although these five systems made a somewhat insignificant showing in 1890, the introduction of electricity has benefited them all very materially. Their passenger income in 1892 ranged from $1.25 to $2.33 per capita, and their net income was greatly increased. The measure of this increase will be discussed immediately.

The eight systems which earned from $1.00 to $2.00 per capita, fairly represent the average horse railway development of this class. That they were capable of much greater usefulness under electricity will soon appear, but they were managed with great economy and probably attained the fullest measure of success possible to them with horse operation. Their gross passenger income ranged from $30,000 to $60,000, the average earning power of the entire group being nearly $1.50 per capita, $5,300 per mile of road, and $.16 per car mile, the latter varying within wide limits from $.09 to $.25. It is noteworthy that the three roads showing the smallest income per car mile, gave a service far superior to that of the others, and all three are situated in the Central States. We find here the first indication of the exceptionally good street railway service, which is being given by many of the Western roads, some of which have probably gone too far in their attempt to serve the public, and will find it wise and necessary to reduce the service. The operating expenses of this group are widely different, but the larger number apparently operated at from $.15 to $.20 per car mile, and at from 75 to 85 per cent. of the passenger income. The net income in three of the eight cases exceeded $10,000 and ceased to be wholly insignificant. The net income per car mile was fairly uniform, varying from $.029 to $.056, and the return on the capital liabilities was, in all but three cases, above 5 per cent. on a moderate capitalization.

The two systems reported which earned over $3.50 per capita are evidently exceptional. Case No. 51 is a Western city system which, even in 1890, had been developed to an unusual extent for a horse railway, operating over 15 miles of road, and giving a service of 34 car miles per capita. With such a stimulus to traffic and in an enterprising and commercially prosperous city, it is perhaps not impossible that the passenger income should rise to over $90,000, this sum being equivalent to but $.104 per car mile, a very low figure, and $6,000 per mile of street, a moderately high figure. The cost of this exceptional service is shown in operating expenses which consumed 96.1 per cent. of the passenger income, leaving a net income of but $4,021, equivalent to a return of less than 1 per cent. upon capital liabilities of $36,100 per mile of track. This result is not, of course, satisfactory, and it is evident that the large passenger income has been obtained at too great a cost. Unfortunately, the 1892 returns for this road, which has been completely equipped by electricity, are not obtainable, but there is no doubt that the net results are much better than in 1890.*

Case No. 58 is that of a city situated near a large

*Since writing the above I have received information, which throws a decided suspicion on the credibility of the report to the census department of case No. 51. It is believed that both the gross passenger income and the car mileage have been overstated.

TABLE II.—AMERICAN STREET RAILWAY SYSTEMS

PART I.—STATISTICS OF CAPITALIZATION.

See "Intrinsic Value of Street Railway Investments." Horse Railways are given in Roman figures.

Case Number	Miles of Track					Miles of Street	Capital Stock			Funded Debt			Capital Liabilities			Floating Debt		Case Number
	Horse	Electric	Cable	Miscel.	Total		Total	Per Mile Track	Per Capita	Total	Per Mile Track	Per Capita	Total	Per Mile Track	Per Capita	Total	Memo.	
A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q	R	S	T
48	10.1				10.1	7.5	100,000	9,900	4.00				100,000	9,900	4.00	39,411	Net.	48
	10.4				10.4	7.7	100.000	9,600	4.00				100,000	9,600	4.00	38,747	"	
49	7.5				7.5	6.5	200,000	26,700	8.00				200,000	26,700	8.00	21,250	B.A.P	49
	.5	10.3			10.8													
50	5.3				5.3	5.1	50,000	9,400	1.90	51,500	9,700	2.00	101,500	19200	3.90	s 1,887	Net.	50
		6.7			6.7	6.4	50,000	7.500	1.90	200,000	29,900	7.70	250,000	37,300	9.60	17,498	"	
51	14.5			3.3	17.8	15.5	342,250	19.200	13.20	300,000	16,900	11.50	642,250	36,100	24.70			51
	1.0	17.2			18.2													
52	5.5				5.5	4.9	75.000	13,600	2.80				75,000	13,600	2.80	27,992	Net.	52
		6.5			6.5	4.9	250,000	38,500	9.30	113,000	17 400	4.20	363,000	55,800	13.40	s 3,523	"	
53		12.1			12.1	10.0	200,000	16.500	7.10	185,000	15,300	6.60	385,000	31,800	13.80	114,000	B.A.P	53
		13.9			13.9	13.5	200,000	14,400	7.10	185,000	13,300	6.60	385 000	27,700	13.80	250,000	?	
54	6.3				6.3	5.8	50,000	7,900	1.70	50,000	7,900	1.70	100,000	15,900	3.40	10,453	B.A.P	54
	6.5				6.5		50,000	7,700	1.70	50,000	7.700	1.70	100.000	15,400	3.40			
55	6.7				6.7	6.3	60,000	9,000	2.70	30,000	4,500	1.40	90,000	13,400	4.10	s 1,681	Net.	55
	5.4	6.0			11.4	10.8	135,000	11,800	4.70	30,000	2,600	1.00	165,000	14,500	5.70	7,239	"	
56	12.5				12.5	10.5	208 000	16,600	6.90	100,000	8,000	3.30	308,000	24,600	10.30			56
		16.0			16. 0		200,000	12,500	6.70	125,000	7,800	4.20	325,000	20,300	10.80			
57	3.5				3.5	3.3	74,261	21,200	2.50				74,261	21 200	2.50	3,433	Net.	57
		z 6.5			z 6.5	6.0	180,000	27,700	6.00	42,500	6,500	1.40	222,500	34.300	7.40	s 3,538	"	
58	29.6				29.6	18.4	400,000	13,500	12.90	545,000	18,400	17.60	945,000	31,900	30.50	120,997	Net.	58
	23.6	7.0			30.6	19.2	400,000	13,100	12.90	750,000	24,500	24.20	1,150,000	37.600	37.10	69,291	"	
l 59	16.0	18.1		3.8	37.9	31.3	747,500	19.700	2.40	845,000	22,300	2.70	1,592,000	42.000	5.10			l 59
	3.0	32.0		10.5	45.5													
60	z 11.1				z 11.1	z 11.1	200,000	18,000	6.30				200,000	18,000	6.30			60
		25.0			25.0	20.0	1,000,000	40,000	31.30	500,000	20,000	15.60	1,500,000	60,000	46.90			
61	12.2				12.2	11.3	110,100	9,000	3.30				110,100	9,000	3.30			61
		16.8			16.8	15.5	385,000	22,900	11.70	385,000	22,900	11.70	770 000	45,800	23.30			
62	11.1				11.1	11.4	68,000	6,100	2.00	100,000	9,000	3.00	168,000	15,100	5.10	12,370	Net.	62
		10.6			10.6	15.7	400,000	37,700	12.10	400,000	37,700	12.10	800,000	75,500	24.20	88,924	"	
63	2.5				2.5	2.0	38,000	15,200	1.20				38,000	15,200	1.20			63
		9.0			9.0		300,000	33,300	9.10	300,000	33,300	9.10	600,000	66,700	18.10			
64	7.0				7.0	3.5	100,000	14,300	3.00	100,000	14,300	3.00	200,000	28,600	6.10	90,000	B.A.P	64
		52.7	1.1		53.8		610,000	11.300	18.50	288,000	5,400	8.70	898,000	16,700	27.20			

s. Current assets exceed current liabilities. z. Approximate. l. This report does not include two small steam motor roads, one in hands of receiver, the other insignificant.

metropolis. The system has always obtained a heavy summer excursion traffic from the larger city, as well as much of the daily transportation business tributary to the metropolis. The reason for its large gross income is therefore explained, but here again we have even more unsatisfactory results than in the case just discussed with respect to net income. A service of 32 car miles per capita, costing $.15 per car mile, has consumed more than the entire gross income in 1890, leaving a deficiency of nearly $2,000, while in 1892 the net income is merely nominal. In this particular case, one cause of the heavy operating expenses has been the exceedingly wretched condition of the company's roadbed, situated in streets which were practically unpaved, and which were in winter frequently choked by snow and ice to an extent which made traffic impossible. The system is now being equipped electrically, and in an exceptionally complete and thorough manner, and it is believed with reason that its net earnings under the new conditions will be sufficient to make a fair return on both the old and the new investments.

THE ELECTRIC RAILWAYS OF 1890.

These were but two in number. Case No. 53 operated about 10 miles of road; was capitalized at $31,800 per mile of track; gave a service of 22.6 car miles per capita; earned $3.39 per capita, $.15 per car mile, and $9,500 per mile of road; but the operating expenses in that year, which was a year of change to electricity, consumed a little more than the entire income, leaving a small deficiency. It is evident from the previous discussion that this electric road rose above the average of the horse railways of 1890, at least in passenger income.

Case No. 59 was, in 1890, a combination horse and electric road. It operated 31.3 miles of road, capitalized at $42,000 per mile of track; it served the public with nearly 45 car miles per capita; and by reason thereof earned $4.35 per capita, which is less than $.10 per car mile, and but $4,300 per mile of street; while its operating expenses consumed nearly 95 per cent. of the passenger income, and left but $8,232 of net income, equivalent to one-half of 1 per cent. on the capital liabilities. Unfortunately, again, the 1892 report of this road is not given.

SERVING FROM 25,000 TO 35,000 POPULATION.

PART II.—STATISTICS OF OPERATION.

Electric, Cable and Steam Railways are given in italics.

Case Number	Population Served	Area Served	Population Per Mile Street	Population Per Square Mile	Year Ending	Car Mileage Total	Car Mileage Per Capita	Passenger Income Total	Passenger Income Per Mile Street	Passenger Income Per Car Mile	Passenger Income Per Capita	Operating Expenses Total.	Operating Expenses Per Car Mile	Operating Expenses % Passenger Income	Net Earnings Total	Net Earnings Per Car Mile	Net Earnings % Passenger Income	Net Earnings % Cap. Liab.	Case Number
a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u
48	25,000	....	3,300	.....	9-30-1890	175,434	7.0	37,560	5,000	.215	1.50	31,305	.179	83.0	6,256	.036	16.7	6.3	48
	25,000	....	3,200	.....	9-30-1892	195,398	7.8	43,537	5,700	.223	1.74	37,020	.190	85.0	6,518	.033	15.0	6.5	
49	25,000	....	3,900	.....	6-30-1890	373,982	15.0	33,578	5,200	.090	1.34	23,096	.062	68.7	10,777	.029	32.1	5.4	49
	.....	....	.....	.....	*9- 1893*	.....	.....	.....	.....	....	.....	.....	....	.....	.....	....	....	....	
50	26,000	....	5,100	.....	9-30-1890	89,425	3.4	11,833	2,300	.132	.45	9,460	.106	80.2	2,735	.031	23.2	2.7	50
	26,000	....	*4,100*	.....	*9-30-1892*	.....	.....	*32,427*	*5,100*	....	*1.25*	*26,063*	....	*80.6*	*6,819*	....	*21.1*	*2.7*	
51	26,000	....	1,700	.....	6-30-1890	883,250	34.0	92,188	6,000	.104	3.55	88,556	.100	96.1	4,021	.005	4.4	.6	51
	.....	....	.....	.....	.....	.....	.....	.....	.....	....	.....	.....	....	.....	.....	....	....	....	
52	27,000	....	5,500	.....	6-30-1890	219,000	8.1	23,842	4,900	.109	.88	16,044	.073	67.2	7,972	.036	33.5	10.6	52
	27,000	....	*5,500*	....	*6-30-1892*	.....	.....	*43,474*	*8,900*	....	*1.61*	*34,536*	....	*79.3*	*8,985*	....	*20.6*	*2.5*	
53	*28,000*	....	*2,800*	.....	*6-30-1890*	*634,000*	*22.6*	*95,000*	*9,500*	*.150*	*3.39*	*95,700*	*.151*	*100.7*	d *400*	.....	.....	....	53
	28,000	....	*2,100*	.....	*12-31-1892*	.....	.....	*110,000*	*8,100*	....	*3.93*	.....	....	.....	.....	....	....	....	
54	29,000	....	5,000	.....	6-30-1890	229,656	7.9	45,118	7,800	.197	1.56	36,804	.160	81.6	8,814	.038	19.5	8.8	54
	29,000	....	.....	.....	6- 1892	.....	.....	.....	.....	....	.....	.....	....	.....	.....	....	....	....	
55	29,000	....	3,500	.....	9-30-1890	126,338	5.7	30,962	4,900	.246	1.41	25,596	.203	82.6	5,807	.046	18.7	6.5	55
	29,000	....	*2,700*	.....	*9-30-1892*	*200,380*	*6.9*	*58 059*	*5,400*	*.290*	*2.00*	*40.426*	*.202*	*69.5*	*18,170*	*.091*	*31.3*	*11.0*	
56	30,000	....	2,900	.....	6-30-1890	409,098	13.6	50,139	4,800	.122	1.67	39,430	.096	78.6	13,358	.033	26.7	4.3	56
	30,000	....	.....	.....	*6- 1893*	.....	.....	.....	.....	....	.....	.....	....	.....	.....	....	....	....	
57	30,000	....	*9,100*	.....	6-30-1890	107,200	3.6	20,544	6,200	.192	.68	16,697	.156	81.5	4,555	.043	22.2	6.1	57
	30,000	....	*5,000*	.....	*6-30-1892*	.....	.....	*57,051*	*9,500*	....	*1.90*	*35,960*	....	*63.1*	o *21,091*	....	*36.9*	*9.5*	
58	31,000	....	1,700	.....	6-30-1890	996,000	32.1	151,351	8,200	.152	4.87	151,844	.152	101.0	d 1,780	.....	.....	....	58
	31,000	....	1,600	.....	6-30-1892	.....	.....	178,500	9,300	....	5.77	176,033	....	98.3	2,395	....	1.3	.1	
1 59	*31,000*	....	*1,000*	.....	*6-30-1890*	*1,393,476*	*44.8*	*134 782*	*4,300*	*.097*	*4.35*	*127,749*	*.092*	*94.8*	*8,232*	*.006*	*6.1*	*.5*	1 59
	.....	....	.....	.....	.....	.....	.....	.....	.....	....	.....	.....	....	.....	.....	....	....	....	
60	32,000	....	2,900	.....	6-30-1890	.....	.....	46,302	4,200	....	1.45	44,326	....	95.7	2,760	....	5.9	1.4	60
	32,000	....	*1 600*	.....	*8-23-1893*	.....	.....	.....	.....	....	....	.....	....	.....	.....	....	....	....	
61	33,000	....	2,900	.....	6-30-1890	127,319	3.9	28,211	2,500	.222	.85	22,114	.174	78.4	6,097	.048	21.6	5.5	61
	33,000	....	*2,100*	.....	*6-30-1892*	.....	.....	*76,974*	*5,000*	....	*2.33*	*49.510*	....	*64.3*	*27,464*	....	*35.7*	*3.6*	
62	33,000	....	2,900	.....	6-30-1890	150,440	4.5	33,144	2,900	.221	1.00	28,828	.192	87.0	5,088	.034	15.4	3.0	62
	33,000	....	*2,100*	.....	*6-30-1892*	.....	.....	*70,100*	*4,500*	....	*2.13*	*57,616*	....	*82.1*	*14,850*	....	*21.2*	*1.9*	
63	33,000	....	17 000	.....	6-30-1890	94,900	2.9	12,124	6,100	.128	.37	9.153	.096	75.6	2,971	.031	24.5	8.0	63
	33,000	....	.....	.....	*6- 1892*	.....	.....	.....	.....	....	.....	.....	....	.....	.....	....	....	....	
64	33,000	....	9,400	.....	6-30-1890	374,400	11.3	59,757	17,100	.160	1.81	39,081	.104	65.4	20,835	.056	34.8	10.4	64
	33,000	....	.....	.....	*11- 1892*	.....	.....	.....	.....	....	.....	.....	....	.....	.....	....	....	....	

l. This report does not include two small steam motor roads, one in hands of receiver, the other insignificant. d. Deficiency. o. From operation.

THE ELECTRIC RAILWAYS OF 1892.

The fully reported electric railways of 1892 are but six in number, and as all are the successors of fully reported horse railways in 1890, the discussion of their characteristics can be best made by direct comparison of the two financial statements.

The combined capital liabilities of these six railways averaged, in 1890, $13,900 per mile of track. This sum probably represented quite closely the actual cash expenditures which the several companies had charged to "Cost of Road and Equipment" up to that date, although many items which should have properly been charged to operating expenses were very likely carried to the capital account during the early history of the various companies, as horse roads in cities of this size can ordinarily be built and equipped at from $10,000 to $12,000 per mile of track.

In facing the problem of adopting electricity as a motive power, the managers of horse railway properties, both in this and in other classes, soon learned that it was necessary to provide nearly enough money to entirely rebuild and re-equip their roads *de novo*. The actual selling value of their tangible assets shrank to insignificant proportions. Electric motors were too heavy for the old cars, and the latter had no selling value; the introduction of heavy electric cars made it necessary to reconstruct the roadbed and to sell the old rails at scrap prices; the old barns and car houses were usually sacrificed; and fortunate was the manager who could obtain for his horses even one-third of their original cost. Nevertheless, the old security holders had to be provided for, and, naturally enough, the new investment was added to the old and the capital liabilities were made to represent what was really the cost of building duplicate roads plus the cost of extensions. If this had been all, if new securities could have been sold at par, if the prices for apparatus and construction work had been on an entirely cash basis, and if the promoters had not generally required large profits, the percentage returns on the new capitalization, even with the duplication of investment account above described, would probably have been, in nearly every case, increased, particularly in the larger places. Unfortunately, however, there

were many cases where these exceptionally favorable conditions did not obtain. The most common form of financing these enterprises was to issue mortgage bonds having a par value somewhat greater than the valuation placed upon the old properties, plus the estimated requirements for making extensions and equipping by electricity. Stock was then issued, frequently for about the same par value as the bonds, although the proportions varied according to the fancy of the promoters. The theory of the latter was that the sale of the bonds at a moderate discount would provide all the necessary money for the entire work, and that the net income would largely exceed the fixed charges, so that substantial dividends could be earned on the stock. This theory was doubtless held with entire honesty by nearly all those who have so actively promoted street railway enterprises, and it should be said that the value of their estimates of the earning power of these reorganized properties has been established in many cases, particularly in the larger cities. Moreover, it by no means follows that the present mortgage indebtedness of electric street railways is not frequently considerably less than the total cash investment in the properties, even aside from those companies whose capital stock was always intended to represent actual money. The original estimates of cost have frequently been greatly exceeded in practice, so that assessments upon the stock subsequent to reorganizations, or the creation of a floating debt, have been absolutely necessary.

It is not surprising, therefore, that we find the funded debt of the six systems under consideration increased from an average of but $4,100 per mile of track in 1890 to an average of $19,900 in 1892, nor that the average capital liabilities were increased from $13,900 per mile of track in 1890 to $43,700 in 1892. It is evident, however, that under the new conditions the percentage of net earnings to the funded debt is a much fairer measure of the intrinsic value of the properties than is the percentage to capital liabilities. In this case it is probable that the average funded debt per mile of track ($19,900) represents approximately the present cost of duplicating the tangible assets of the six electric roads, and the capital stock may be said, therefore, to represent the franchises.

Now the earning power of these six properties has greatly increased since the change of motive power. The gross passenger income in 1890 was $148,536—an average of $24,756 for each road, $3,500 per mile of street, and $.83 per capita. The gross passenger income in 1892 was $338,145—an average of $56,358 for each road, $5,700 per mile of street, and $1.90 per capita. A portion of this increased income was due to an increase in the average length of the roads from 7.1 miles to 9.9 miles, but by far the larger part was undoubtedly caused by the improved service which is always given by the reorganized properties.

The ratio of the combined operating expenses to the combined passenger income, which was exactly 80 per cent in 1890, was reduced to 72.2 per cent in 1892. Three of the six systems operated at from 63.1 per cent. to 69.5 per cent. and the remaining three at about 80 per cent.

The combined net earnings of the six systems was $97,379 in 1892, as against but $32,254 in 1890, an average of $16,230 and $5,376 respectively. This is encouraging in the main, four of the six systems having reached a condition where their net earnings are not wholly subject to contingencies impossible to foresee and guard against. But, the net earnings in 1892 are equivalent to a return of only 3.8 per cent. on the combined capital liabilities, as against a return of 5.2 per cent. on those of 1890, and at first sight it would seem that the change of motive power has not been as yet an unmixed benefit to the security holders. Bearing in mind, however, the previous discussion and with the knowledge that many of the properties have been in operation for too short a time to have reached the full measure of their earning power, the results are not unsatisfactory. If we may consider the funded debt as the true gauge of the actual cash investment in these properties we have here, in the first year of electric operation, a return of 8.3 per cent. as against but 5.2 per cent. on the probable true investment account in 1890.

GENERAL CONCLUSIONS.

What then can be said of the intrinsic value of the properties of this class. It is obviously unfair to allow the results of but eight systems out of a possible twenty-eight to have too much influence on our judgments. Nevertheless, in the light of all the information at command, I believe the following conclusions will be found nearly correct:

1. Properly developed and well managed electric railway systems in manufacturing cities and towns of this class, operating under average conditions, and giving a service of from 10 to 12 car miles per capita should be able to earn about $2.50 gross per capita, and from $6,000 to $7,000 per mile of road. Under exceptionally favorable circumstances, or where a large summer traffic can be developed by special attractions the passenger income may exceed this figure.

2. Electric railway systems of this size cannot be permanently maintained and operated, except under rarely favorable conditions at less than 75 per cent. of the passenger income. This statement is perhaps surprising but will be fully justified, I believe, by longer experience and for reasons which will be more fully explained in another chapter.

3. Assuming, therefore, that the safe net income will be 25 per cent. of the gross, we obtain $.625 as the net income per capita reasonably to be expected. This is 5 per cent. on $12.50, which is the measure of the total investment per capita permissible to the street railways of this class, if overcapitalization of earning power is to be avoided. Now it is easily possible to build and equip electric railway systems in cities of this class (at the rate of, say, one mile of track for each 2,500 inhabitants served) for a cash expenditure at present prices of somewhat less than $12.50 per capita. For example, a twelve mile street railway system in a city of 30,000 inhabitants can be built in most cases for about $250,000 It should be able to earn $75,000 gross and $18,750 net. The return on the investment would be, therefore, about 7.5 per cent., and this is roughly the average intrinsic earning power of the properties of this class.

4. Finally, it may be said in general that investors should refuse to consider any small electric railway proposition which does not involve: (a.) The service of a present population of at least 25,000 inhabitants; (b.) a traffic necessity for at least 5 miles of track and 5 cars; (c.) the direct service of a population not less than 3,000 per mile of track; (d.) the free gift, without burdensome conditions, of a franchise running for thirty years or more; (e.) the privilege of using a roadbed construction costing, ready for service, not more than $7,500 per mile of track.

AMERICAN STREET RAILWAY SYSTEMS SERVING FROM 25,000 TO 35,000 POPULATION.	1890. Horse.	1890. E. C. M.	1892. Horse.	1892. E. C. M.
MILES OF TRACK.				
No. of miles operated	161.4	37.3	50.4	247.8
FUNDED DEBT PER MILE OF TRACK.				
No. of miles not reporting	....	....	....	74.5
" " having no funded debt	52.4	....	10.4	.....
" " " an indebtedness less than $5,000	6.7	....	....	11.4
" " " " " from $ 5,000 to $10,000	35.2	....	6.5	76.3
" " " " " " 10,000 to 15,000	7.0	....	....	13.9
" " " " " " 15,000 to 20,000	47.4	12.1	....	31.5
" " " " " " 20,000 to 30,000	.....	37.9	30.6	23.5
" " " " " " 30,000 to 40,000	.....	....	....	19.6
CAPITAL LIABILITIES PER MILE OF TRACK.				
No. of miles not reporting	....	....	....	74.5
" " capitalized at less than $10,000	51.7	....	16.9	6.7
" " " at from $10,000 to $ 15,000	42.1	....	30.6	95.1
" " " " 15,000 " 20,000	43.9	50.0	....	....
" " " " 20,000 " 30,000	11.0	....	....	23.3
" " " " 30,000 " 40,000	.....	....	....	51.1

AMERICAN STREET RAILWAY SYSTEMS SERVING FROM 25,000 TO 35,000 POPULATION.	1890. Horse.	1890. E. C. M.	1892. Horse.	1892. E. C. M.
POPULATION SERVED PER MILE OF STREET.				
No. of roads not reporting	..	....	1	6
" " serving less than 1,000 inhabit. per mile of street	....	....	....	....
" " " from 1,000 to 2,000 " " "	2	1	1	1
" " " " 2,000 " 3,000 " " "	4	1	....	4
" " " " 3,000 " 4,000 " " "	3	....	1	....
" " " " 4,000 " 5,000 " " "	....	....	....	1
" " " " 5,000 " 6,000 " " "	3	....	....	2
" " " " 6,000 " 8,000 " " "	....	....	....	....
" " " " 8,000 " 10,000 " " "	2	....	....	....
" " " over 10,000 " " "	1	....	..	....
CAR MILEAGE PER CAPITA.				
No. of roads not reporting	1	....	2	13
" " giving a service of less than 5 car miles per capita	5	....	....	....
" " " of from 5 to 10 " " "	4	....	1	1
" " " " " 10 " 15 " " "	2	....	....	....
" " " " " 15 " 20 " " "	1	....	....	....
" " " " " 20 " 25 " " "	....	1	....	....
" " " " over 25 " " "	2	1	....	....
PASSENGER INCOME.				
No of roads not reporting	....	....	1	7
" " earning less than $15,000 gross per annum	2	....	....	....
" " " from $15,000 to $20,000 gross per annum	....	....	....	....
" " " " 20,000 " 30,000 " " "	3	....	....	....
" " " " 30,000 " 40,000 " " "	4	....	....	1
" " " " 40,000 " 50,000 " " "	2	....	1	1
" " " " 50,000 " 75,000 " " "	2	....	....	3
" " " " 75,000 " 100,000 " " "	1	1	....	1
" " " " 100,000 " 125,000 " " "	....	....	....	1
" " " " 125,000 " 150,000 " " "	....	1	....	....
" " " " 150,000 " 200,000 " " "	1	....	1	....
PASSENGER INCOME PER MILE OF STREET.				
No. of roads not reporting	....	....	1	7
" " earning less than $3,000 per mile of street	3	....	....	....
" " " from $3,000 to $ 4,000 per mile of street	....	....	....	....
" " " " 4,000 " 5,000 " " "	4	1	....	1
" " " " 5,000 " 6,000 " " "	2	....	1	3
" " " " 6,000 " 7,000 " " "	3	....	....	....
" " " " 7,000 " 8,000 " " "	1	....	....	....
" " " " 8,000 " 9,000 " " "	1	....	....	2
" " " " 9,000 " 10,000 " " "	....	1	1	1
" " " " 10,000 " 15,000 " " "	....	....	....	....
" " " over $15,000 " " "	1	....	....	....
PASSENGER INCOME PER CAR MILE.				
No. of roads not reporting	1	....	2	13
" " earning less than 10 cents per car mile	1	1	....	....
" " " from 10 to 15 " " "	5	....	....	....
" " " " 15 " 20 " " "	4	1	....	....
" " " " 20 " 25 " " "	4	....	1	....
" " " " 25 " 30 " " "	....	....	....	1
PASSENGER INCOME PER CAPITA.				
No. of roads not reporting	....	....	1	7
" " earning less than $1.00 per capita	5	....	....	....
" " " from $1.00 to $1.50 per capita	4	....	....	1
" " " " 1.50 " 2.00 "	4	....	1	2
" " " " 2.00 " 2.50 "	....	....	....	3
" " " " 2.50 " 3.00 "	....	....	....	....
" " " " 3.00 " 3.50 "	....	1	....	....
" " " " 3.50 " 4.00 "	1	....	....	1
" " " " 4.00 " 4.50 "	....	1	....	....
" " " " 4.50 " 5.00 "	1	....	....	....
" " " over $5.00 "	....	....	1	....
OPERATING EXPENSES PER CAR MILE.				
No. of roads not reporting	1	.	2	13
" " operating at less than 10 cents per car mile	4	1	.	....
" " " from 10 to 15 cents per car mile	3	....	....	....
" " " " 15 " 20 " "	6	1	1	....
" " " " 20 " 25 " "	1	.	....	1
PERCENTAGE OF OPERATING EXPENSES.				
No. of roads not reporting	....	...	1	8
" " operating at less than 60 % of pass. income	....	....	...	..
" " " from 60 to 65 % of pass. income	....	....	....	2
" " " " 65 " 70 % " "	3	....	....	1
" " " " 70 " 75 % " "	....	....	....	....
" " " " 75 " 80 % " "	3	....	....	1
" " " " 80 " 85 % " "	5	....	....	2
" " " " 85 " 90 % " "	1	....	1	....
" " " " 90 " 95 % " "	....	1	....	....
" " " " 95 " 100 % " "	2	....	1	....
" " " over 100 % " "	1	1	....	....
NET EARNINGS.				
No. of roads not reporting	....	....	1	8
" " showing a loss from operation	1	1	....	..
" " earning less than $5,000 net	6	....	1	....
" " " from $5,000 to $ 75,00 net	4	....	1	1
" " " " 7,500 " 10,000 "	2	1	....	1
" " " " 10,000 " 15,000 "	2	....	....	1
" " " " 15,000 " 20,000 "	....	....	....	1
" " " " 20,000 " 30,000 "	...	....	....	2
PERCENTAGE OF NET EARNINGS TO CAPITAL LIABILITIES.				
No. of roads not reporting	....	..	1	8
" " earning nothing on capital liabilities	1	1	....	....
" " " less than 2½ % on capital liabilities	2	1	1	1
" " " from 2½ to 5 % on capital liabilities	3	....	....	3
" " " " 5 " 7½ % " "	5	....	1	....
" " " " 7½ " 10 % " "	2	....	....	1
" " " " 10 " 12½ % " "	2		....	1

Statement From St. Louis.

We herewith present a table showing the number of passengers carried and trips made by tne street railways of St. Louis for 1893, also the total for 1892, showing the annual increase. Hard times have reduced travel to a great extent, the usual increase record of 10,000,000 passengers per year not being sustained in 1893.

	Trips.	Passengers.
Baden & St. Louis R. R.	21,462	465,554
Cass Ave. & Fair Grounds Ry.	590,652	7,585.2 0
Citizens' Ry.	740,426	8,746,551
Jefferson Ave. R. R.	185,082	1,857,912
Lindell Ry.	1,124,656	14,270,478
Missouri R. R.	1,123,612	14,927,465
People's Ry.	224,678	4,663,638
St. Louis R. R.	791,404	11,940,249
St. Louis & Suburban Ry.	255,996	8,030.182
Southern Ry.	3 4,785	5,427,259
Union Depot R. R.	795 845½	17.766,612
Total	6,168,598½	95,681,170
Total for 1892	5,382,698	91,683,7 5
Increase over 1892	785,900½	3,997,465

Street Railway Recommendations by New York Railroad Commissioners.

In the annual report of the Board of Railroad Commissioners of the State of New York, recently issued, considerable attention is paid to street railroads, and a number of recommendations were made concerning their government and regulation. These recommendations may be summed up as follows:

All electrically operated cars on double track lines should be equipped with gates so that entrance and egress can be had only on the off side of the rear platform, and also that no one but the motorman be allowed to ride on the front platform. Efficient guards, or safety fenders, should be attached to the tracks of all electric and cable cars as soon as possible. The speed of the cars shall not exceed four miles per hour in crossing streets.

When two or more lines cross or meet an agreement shall be made as to which line has the right of way, and the cars of all other lines shall come to a full stop before entering or crossing the other tracks. Inspectors shall be employed in sufficient numbers by all cable and electric companies, and all employes on cars shall wear a uniform, cap at least. Cars passing in opposite directions shall not meet on street crossings. At congested points a sufficient number of employes shall be placed to ensure public safety.

The speed of all cars shall be reduced to a minimum on all curves where the view is obstructed. The use of some form of air brake shall be considered by the managers of all cable and electric roads.

All applicants for positions as motormen shall be subjected to a thorough examination for fitness. The applicant shall then be placed in a shop or power house until familiar with the system, and then put on a car with an instructor who shall certify to his ability to serve on the lines of least travel at first. All cars on roads having grades of over 3 per cent. shall be equipped with sand boxes and sand. Stops shall be made only at crossings, or where blocks are long at designated points. The propriety of stopping with the front platform at the first crossing is considered, but no recommendation is made.

Drivers of vehicles in cities are recommended to use caution in driving from cross streets to streets on which there are cable or electric lines. Twelve miles per hour is fixed as the limit of speed in suburban districts. The local authorities should regulate the speed in cities. A mechanical speed governor is recommended. The use of gas or electricity is recommended on surface and elevated cars.

A Novel Use for Electric Cars.

In Bath, Me., the electric street cars are used, it is said, by the city authorities to inform parents on stormy days whether school will keep. They have had big signs painted, bearing on one side the legend, "No School," and on the other, "One Session." These, with the appropriate side displayed, are placed on the forward fenders of electric cars, so that the public along the line of the railway only have to watch to know whether to send their children out or not.

A COMPANY for building a street railway in Puerto Principe, Cuba, was incorporated, December 1, 1893, with the following officers: President, Elpidio Marin; secretary, E. J. Loinaz del Castillo; treasurer, Ramon Pareias; superintendent, Enrique Loinaz. The capital will be $35,000 and the length of the line four miles of track. The cars will be operated by horse power.

The Broadway Cable Road Completed.

The year of 1893 was one of marked importance in the transportation annals of New York City, and will always be remembered as the inauguration year for cable traction downtown in New York City. The decision to install a cable railway on Broadway was made several years ago, and at that time it was predicted by many that on account of the many obstacles the undertaking would never be attempted. Work was commenced, however, May 1, 1891, and the first cars put in operation during June last. The engineering difficulties in the way, instead of proving to be less, were actually greater than was anticipated, but were all successfully overcome, and the results attained prove the wisdom of the management of the road in making the installation.

During the last three or four years we have published various articles giving the plans and recording the progress of the work. The principal articles appeared on the following pages: Vol. IX., pp. 4, 203, 360, 469, 517; Vol. VIII., pp. 66, 278, 339, 428, 536, 688; Vol. VII., pp. 290, 424, 546; Vol. VI. 556. In this number of the Street Railway Journal is published a general resumé of the work performed, together with an outline of the plans of the Metropolitan Traction Company for cable lines on Columbus and Lexington Avenues, New York.

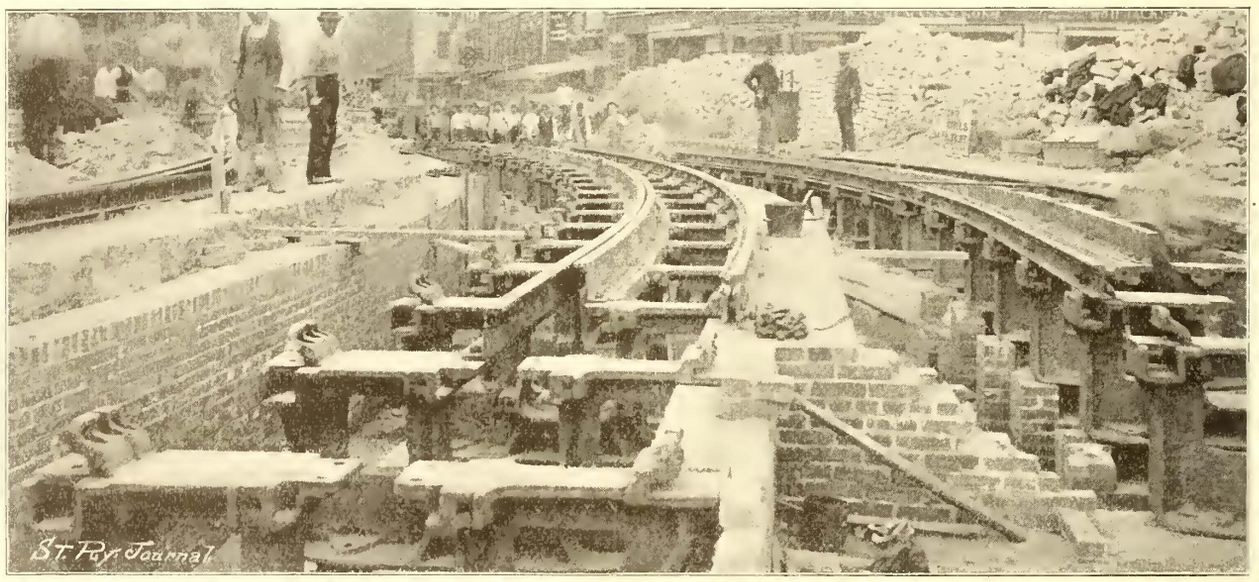


FIG. 1.—SCENE NEAR UNION SQUARE DURING CONSTRUCTION—BROADWAY CABLE RAILWAY, NEW YORK.

The route of the cable line of the Broadway & Seventh Avenue Railway Company is from South Ferry to 45th Street on Broadway, thence to 59th Street on Seventh Avenue.

The type of yoke used on the straight line weighs about 550 lbs. The distance from the top of the slot rail to the bottom of the opening is twenty-four and a quarter inches, to the base of the yoke thirty and a quarter inches. The width of the opening is fifteen and a half inches. The curve yokes weigh about 975 lbs. each.

On straight line work the yokes, which are spaced 4 ft. 6 ins. apart, are mounted on concrete piers 18 ins. in width by 3 ft. 9 ins. in length, and 6 ins. high. The manhole walls are 12 ins. thick, the foundations measuring 6 ft. × 5 ft. 7 ins. The conduit has a sheet-steel lining.

The old paving stones taken up during the progress of the work of laying the railway were broken on the ground by a stone breaker driven by a portable engine, and formed part of the stone used in the concrete. The materials forming the concrete were mixed in a machine made by the Cockburn Barrow & Machine Company of Jersey City.

The tram rails are of the grooved type, weigh ninety-one pounds per yard, and were rolled by the Johnson Co. They are laid with suspended joints, being connected by a joint clamp manufactured by the McConway & Torley Company, of Pittsburgh, Pa., and by four bolt splice bars. The slot rails are sixty-seven pounds in weight to the yard and are of the Johnson type. At 59th Street there is a crossover, and at Bowling Green a balloon loop made up of six curves with radii from 160 to sixty feet.

The curve yokes employed are supported upon brick foundations, each fifty-five and a half inches wide and twenty-six inches high, which in turn rest on a concrete floor six inches deep, extending under all the curve yokes. A passageway has been left on the inside of all the curves, by which access is easily had to the curve pulleys for the purpose of inspection, repairs, etc., as will be seen by reference to Fig. 1. The retaining walls are twelve inches thick.

The cable carrying sheaves on straight line are fourteen inches in diameter to the bottom, and are of cast iron with chilled rims.

The most difficult and expensive portion of the work connected with the roadway construction consisted in the removal of the many gas, water, steam and sewer mains, electric conduits and other sub-surface pipes necessary. The excavation of the street upon the line of route of the road, revealed a regular net work of pipes of all sizes and every variety, which had to be moved before the regular work of conduit construction could be commenced. This task was one of herculean magnitude, and its successful performance reflects great credit upon the engineering ability of all who participated in the work.

The cable system adopted is of the duplex type, two ropes being carried on separate sets of sheaves twenty-one feet six inches apart longitudinally, and three and a half inches laterally.

At the curves the carrying sheaves are mounted in horizontal planes, the sheaves for one rope being above those for the other rope, but with eccentric axes. A device known as a flipper, and consisting of a casting, forming a sort of elongated guide arm, is mounted on a shaft between two yokes at the entrance to the curve. This flipper is kept in position by two spiral springs, and its operating edge is shaped like a long cam to give easy motion when operated by the passing grip. The operation of the device is as follows: When the grip on the car entering the curve strikes the cam on the face of this flipper, it turns it out of the way, and in passing allows the flipper to spring back into place. If the outer cable is held in the grip at the time, it is guided by the flipper into the lower curve pulley; on the other hand, if the inner cable is held in the grip, it falls inside the flipper arm and is guided into the groove of the upper curve pulley.

The ropes used on the Broadway line are six in number, of which three are constantly in use, the others being held in reserve. The three sections are

from 59th to 36th Streets on Seventh Avenue, from 36th to Houston Streets on Broadway and from Houston Street to South Ferry. All ropes used were manufactured by the J. A. Roebling's Sons Company, and the Trenton Iron Works, and are one and a half inches in diameter. This is probably the largest diameter of cable ever used for street railway purposes. The lengths of the ropes on the several sections are 15,000 ft., 21,000 ft., and 22,000 ft.

The grip employed was devised by the engineers of the Broadway & Seventh Avenue Railway Company. The lower jaw is stationary and the upper jaw movable. Throw-offs are located on each side of the grip, and are operated by the gripman or automatically, in case the gripman should neglect this duty at a cable crossing or other point where the cable should be thrown off. Automatic action is accomplished by wedges located in the conduit and adapted to slide under a cross piece of the grip, raising the upper jaw and operating the throwoffs.

It was the original plan to operate the section of track between Bowling Green, the present southern terminus of the cable railway, and South Ferry by an independent cable operated from a power station to be located on Front Street. The plan has been altered, however, so that this section of road will be operated from the main power station by carrying the main ropes to South Ferry as above described.

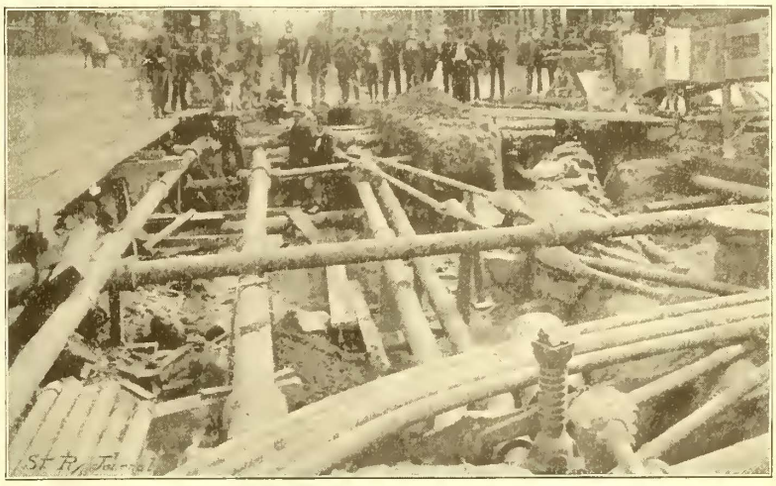


FIG. 2.—NETWORK OF PIPES NEAR UNION SQUARE—BROADWAY CABLE RAILWAY, NEW YORK.

The cars run on a twenty-eight second headway during the busy portion of the day. The cable service is maintained from 5 A. M. to 3 A. M. An average of 100,000 passengers is carried during each day during these hours. Horse cars are run every twenty minutes from 3 A. M. to 5 A. M. About 145 cars are required for the daily traffic on Broadway, and each car makes six trips. The cars were supplied by the John Stephenson Company, of New York, and the Laclede Car Company, of St. Louis, and are mounted on Stephenson, Peckham and Bemis trucks. The cars measure thirty feet six inches over all, and have a width of car body of seven feet. The height of the car from the track to the top of the roof is ten feet four and a half inches. A characteristic feature is the extra large platforms, these being four feet one inch in the center, and protected on the left-hand side by a wire gate. The doors are double and work simultaneously. The windows on each side are eight in number. The interior of the car is finished in maple, with paneled ceilings and trimmings of solid bronze, the seats and backs are covered with Wilton carpet. The bonnets are supported by the pillars from the dashboards.

The wheels are thirty inches in diameter. A very popular feature of the car is the illumination, which is by Pintsch gas. Each car has three chandeliers, with four burners each. Sterling registers and Sterling and DeWitt sand boxes are used. One of the cars, using Peckham trucks, is shown in the accompanying engraving. These trucks have an eight foot wheel base instead of a nine foot; the wheel of those first adopted by the company and the spring support is fifteen feet nine inches instead of ten feet, that of the old trucks. The object of this change is to better support the bodies of the cars.

The Peckham Company is also putting on some trucks with even more of a spring support than that mentioned, the support being seventeen feet six inches, the wheel base remaining eight feet. The truck, without the car body, was illustrated in our November issue, and is similar to the standard Peckham 6A truck, the changes mentioned above only having been made to better adapt it for use on Broadway. There are at present fifteen of this style of truck in use on the Broadway road, and they are giving great satisfaction. The officers of the road speak very highly of their easy riding qualities and the easy and efficient action of the brakes.

A very interesting result noticed in the traffic is that it does not vary 1 per cent. in amount from 8 A. M., to 6 P. M. This is true not only in the total traffic, but also in the traffic of the different sections.

There are two stations for operating the line. The uptown station is in a building owned by the company, bounded by Seventh Avenue, 50th Street, Sixth Avenue and 51st Street. The power plant occupies the eastern end of the building, the western portion being devoted to car storage, repair rooms, offices, etc. The cable is run from the eastern end through a blind conduit to the main line on Seventh Avenue. A full description of the power equipment of this station was given in our January, 1893, issue. As will be remembered, the plant is in duplicate in every particular, and half of the power equipment can be used to drive either cable of the duplicate cable system. The engines were supplied by the Dickson Manufacturing Company, of Scranton, Pa., and are two in number. The cylinder dimensions are 36 × 60 ins. The engines run non-condensing, at sixty revolutions per minute, and develop 1,000 H. P. each when running under 125 lbs. pressure. The flywheel of each engine measures twenty feet in diameter, and weighs fifty tons. Each engine drives one end of a long shaft extending entirely across the engine room and measuring

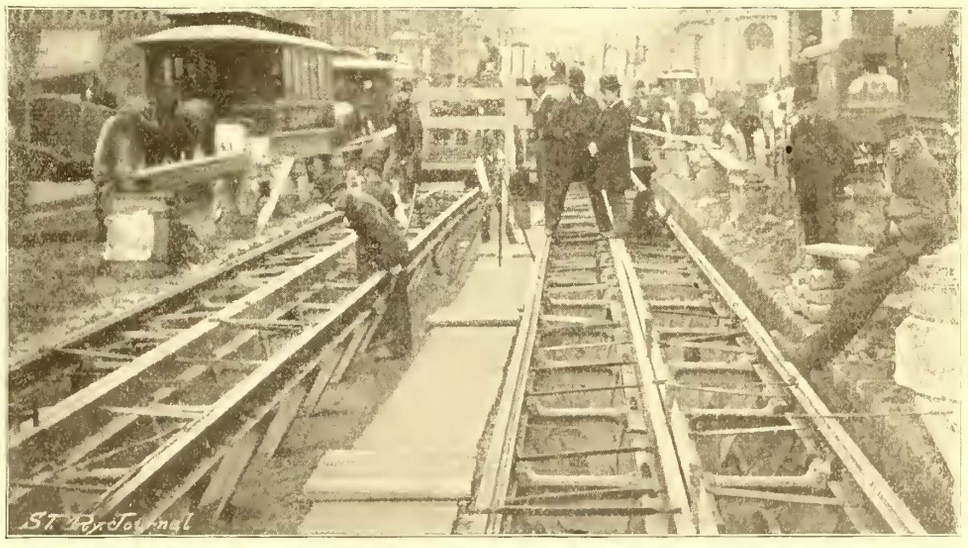


FIG. 3.—SCENE NEAR POST OFFICE DURING CONSTRUCTION—BROADWAY CABLE RAILWAY, NEW YORK.

eighteen inches in diameter in the journals and twenty inches in the swell.

This shaft is divided into six sections, connected by plate couplings, and carries four driving drums ten feet in diameter. These are not keyed to the shaft, but engage it by means of a friction clutch, operated by rack and pinion, with a hand wheel. The main driven drums

FIG 4.—CABLE CAR—BROADWAY CABLE RAILWAY, NEW YORK.

are thirty-two feet in diameter, and weigh sixty-five tons each. Each is driven from a driving drum on the main shaft by thirteen two-inch Lambeth cotton ropes. The main drums are keyed to the cable driver shafts, which are made of cast steel, and, like the engine shaft, are eighteen inches in diameter. The cable drivers are each twelve feet in diameter, and are keyed directly to the shafts. They are of the solid drum type, and are furnished with removable rims. By means of an auxiliary engine placed at the center of the engine shaft, while one cable and set of drums are in operation, the idle drums can be revolved and the idle cable drawn in for inspection and repairs without employing the idle engine.

The tension run for each cable is 100 ft. in length. On the frame of the tension carriage is fixed a reel, about which one end of the tail rope is wound. From the tension carriage the tail rope is carried to the tension tower, which is forty-five feet in height, and constructed of wrought iron. The weights are semi-circular in form, with a radius of fifteen inches, and weigh seventy-five pounds each.

The boiler room measures 45 × 100 ft., and contains six Heine boilers of 250 H. P. each. Here are also located a Goubert 1,000 H. P. feedwater heater and two Snow duplex pumps. The stack is of wrought iron and 150 ft. in height. The machinery at this and the downtown station was built and installed by the Pennsylvania Iron Works, of Philadelphia, under the direction of B. W. Grist and E. A. Moore.

The main power station is located at the corner of Houston Street and Broadway, in the magnificent office building erected by the Broadway & Seventh Avenue Company, and is all below the street level. The engine room measures 141 × 150 ft., and is thirty-six feet in height. The general arrangement of the machinery is similar in many respects to that of the machinery at the uptown power station, except that four cables instead of two are driven and a jackshaft is used. The engines, which are four in number, are of the single expansion Dickson-Corliss type, and may be run condensing. Their cylinder dimensions are 38 × 60 ins., and each has a rated capacity of 1,200 H. P. The flywheel of each engine is twenty feet in diameter and weighs 100,000 lbs. Further particulars in regard to these engines were published in our May, 1892, and March, 1893, issues.

Each condenser is operated by a pair of 12 × 12 in. upright engines, the piston rods of which extend through the floor and drive two 12 × 12 in. air pumps, to which is attached a 26 in. Knowles patent jet condenser.

The cable engines are arranged in pairs, each engine operating one end of a common shaft, eighteen inches in diameter in the journals and twenty-four inches in the swell, carrying a twenty-six foot rope drum. Each engine shaft is divided into three sections, so that either engine can supply power to the drum. These two rope drums drive drums of the same size on the jackshaft by means of twenty two-inch Lambeth cotton ropes. Also mounted loose on the jackshaft are four nine foot drums, with thirty-two grooves each. These drums are capable of being put into rigid connection with the shaft by means of friction coupling devices, similar to those in use in the uptown station. The jackshaft is divided into six sections, connected by plate couplings, so that power can be transmitted to either nine foot drum by either engine. Each of the nine foot drums is connected by thirty-four two-inch cotton ropes to the main driven drums, four in number, keyed to the cable driver shafts. These main driven drums are thirty-two feet in diameter, and made up in twelve sections. The rim segments are made the entire width of the wheel, which has two distinct sets of arms. The cable drivers are twelve and sixteen feet in diameter and are provided with solid rims containing each five grooves. Arrangements have been made for turning the idle drums by means of auxiliary engines, as in the uptown power station. The tension device is also similar to that in the uptown power station.

The boiler room contains twelve Heine boilers in two batteries of six boilers each. Each boiler is of 250 H. P.

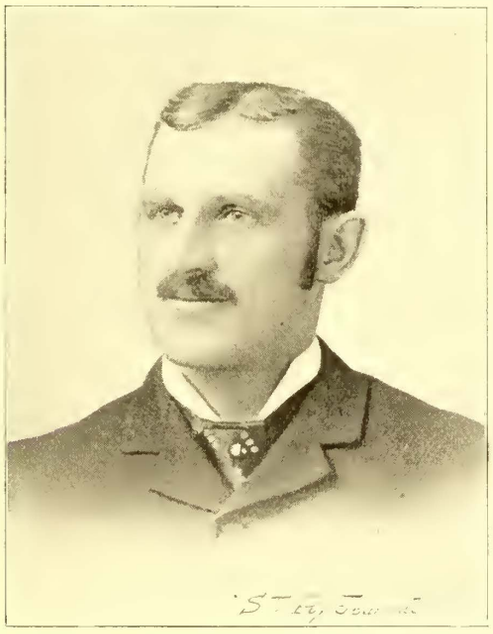
FIG. 5.—GLIMPSE OF DRAUGHTING ROOM—BROADWAY CABLE RAILWAY, NEW YORK.

capacity. Goubert heaters, Snow pumps and Westinghouse separators are used.

The structure containing the cable driving machinery, at the corner of Houston Street and Broadway, is, without doubt, the handsomest power station building, of any kind, in the world. It is similar in general arrangement and appointments to the most modern office buildings of New York, and, in fact, every floor above the basement is devoted to business purposes. A large furnishing establishment occupies the ground floor, and the upper floors

are rented for offices. The executive and engineering headquarters of the Broadway & Seventh Avenue Company, the Metropolitan Traction Company and associated lines are now located here. The building is eight stories in height, and constructed in Renaissance style. The lower part is of granite, and in the upper part buff brick with terra cotta trimmings has been used. The architects were McKim, Mead & White.

A special method of construction was adopted to avoid the possibility of the vibrations of the cable machinery being transmitted to the building. The foundations of the building, for this reason, have been made entirely independent of those of the machinery. The floors of the building are supported on forty-five interior piers and twenty-eight piers built into the exterior walls. The exterior piers consist of steel columns fixed on a grillage of iron bars, all resting on the lower part of the exterior walls. The interior piers are constructed of large cylinders of wrought iron or steel sunk into the



H. H. VREELAND.

earth and filled with sand below and concrete above. On the top is a grillage of iron beams, and resting on each are massive iron bases, weighing in the neighborhood of 3,000 lbs; steel columns surmount these bases. The cylinders vary in interior diameter from eight feet six inches to twelve feet. By their use the sand foundation is prevented from spreading. Their use also divides the sand on which the building is to be supported from the sand foundation of the machinery floor. Bridges of iron beams, resting on brick walls, are constructed around the columns supporting the building, the purpose being to prevent any part of the machinery floor from touching the main columns. The building foundation is seven feet six inches thick at the base and three feet eight inches thick at the level of the sidewalk.

The work of constructing this power station involved a great many difficulties. The excavations had to be carried to a depth of forty feet, and considerable water filtered into the excavation, and had to be removed by the pumps. The amount of water thus raised averaged at one time 1,250,000 gals. in twenty-four hours. On the north side of the lot was a building, whose adjacent wall, 100 ft. high, and 200 ft. long, had to be shored up, under pinned, and its foundations carried down twenty-two feet below their former depth. This was a long and difficult undertaking, but was most successfully accomplished without any settlement of the building, so far as the most careful measurements could determine.

Another engineering feat of great difficulty which was successfully encountered, was the street excavation under Broadway for the deflection vaults. These excavations extended out a horizontal distance of forty-eight feet from the main wall of the building under the sidewalk and street pavement which for several feet beyond the east track of the cable line is supported on trusses and girders. Special provision had to be made for water, gas and pneumatic tubes, which were encountered, the largest of which was a thirty-six inch main, located almost directly under the east track of the road. This main was shored up while the brick foundation upon which it now rests, and which also forms the back wall of the wheel pit, was built under it. The other tubes and pipes were either carried above the pit or at one side on trusses or below the floor.

As the cable machinery was put in operation while the building was still far from completion, the engines had to be run and the complicated work of cable station operation carried on actually under canvas spread for protection against the falling bricks and mortar of the bricklayers at work. In spite of these adverse conditions, it is a fact which speaks well for the railway company's

J. D. CRIMMINS.

engineers, that not a moment's delay has occurred to the road since the machinery was started, from any fault of the station apparatus.

OFFICERS.

The officers of the Broadway & Seventh Avenue Railway Company are: President, H. H. Vreeland; vice-president, D. B. Hasbrouck; secretary, C. E. Warren; treasurer, H. S. Beattie; superintendent, Henry A. Newell. All construction work has been and is in charge of Major Geo. W. McNulty, chief engineer, ably assisted by H. W. Brinckerhoff, N. S. Latham, Albert Carr and C. I. Earll. The engineer of operation is F. L. Hart.

The Broadway & Seventh Avenue Railway is leased to the Metropolitan Street Railway Company, a corporation recently formed; being a consolidation of the Houston Street, West Street & Pavonia Ferry, the Broadway and the South Ferry Railroad Companies. The Metropolitan Street Railway Company has the same officers as the Broadway & Seventh Avenue Company.

The Metropolitan Traction Company is a Philadelphia corporation, controlling through ownership of stock the following street railway companies of New York: The Metropolitan Street Railway Company, with its leased lines; the Broadway & Seventh Avenue, the Sixth Avenue, the Ninth Avenue and 23d Street Railway Companies; the Metropolitan Crosstown Railway Company, with its leased lines, the 42d Street & Grand Street Ferry and the Central Park, North & East River Railroad Companies. The officers of the Metropolitan Traction Company are: President, C. R. Henderson; first vice-president, P. A. B. Widener; second vice-president, D. B. Hasbrouck; secretary and treasurer, C. E. Warren.

H. H. Vreeland, the executive head of the operating company, is thirty-six years of age, and is a thorough railroad man by training, having done actual service in all the various departments of railroad work. He began his career in 1874 in the service of the Long Island Railroad Company, remaining there until 1881, when he resigned

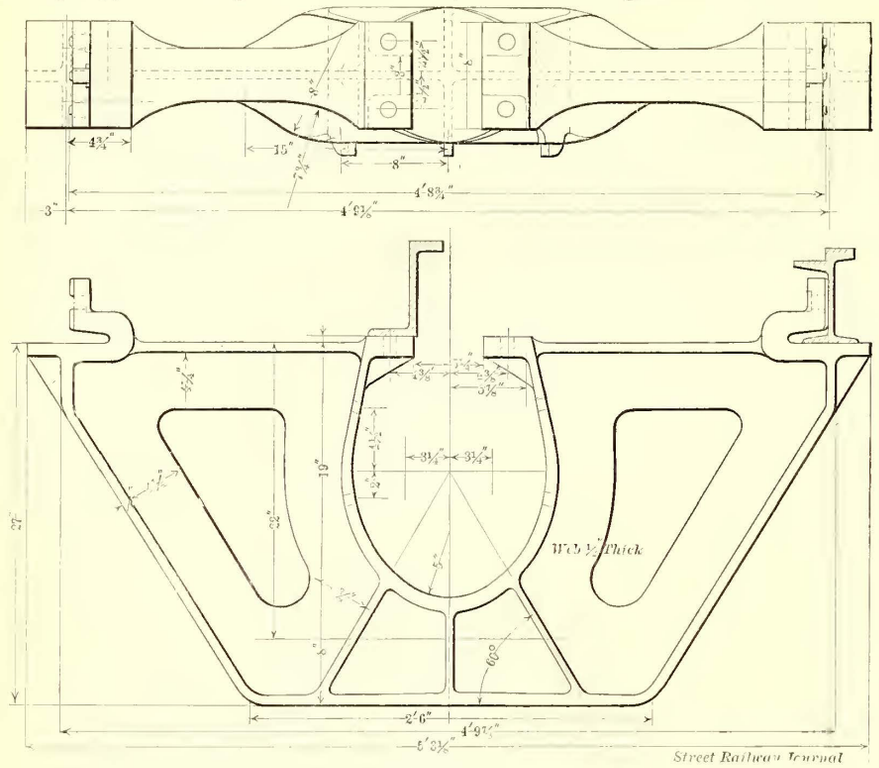


FIG. 6.—YOKE ADOPTED FOR COLUMBUS AND LEXINGTON AVENUES CABLE RAILWAYS, NEW YORK.

to enter commercial pursuits. He soon returned to railroading, however, in the service of the New York City & Northern Railway. Here he filled a number of positions, being constantly promoted until the last two years of his services with the company, when he was its general manager. He was elected to his present position in June, 1893.

J. D. Crimmins, who performed the street construction for the Broadway cable road, is a native of New York City, and has been prominently identified with many of the improvements of that city during the last twenty-five years as a large contractor for public works. In connection with installing the cable conduit, he also took the city's contract for repairing Broadway from 32d Street to Bowling Green. In 1892 he was elected president of the Metropolitan Traction Company, the Broadway & Seventh Avenue Railway Company and other roads comprised in that system, which positions he has since resigned to give more attention to a number of other street railway properties in New Jersey and elsewhere in which he is largely interested.

HISTORY.

Many attempts were made to secure a franchise for operating a street railway on Broadway from 14th Street to the Battery, but none were successful until one was secured by the Broadway Railway Company, incorporated May 8, 1884, with Jacob Sharp as president. This company secured the consent of the local authorities in December of the same year. There were charges that bribery had been used to secure this right, and Jacob Sharp, the promoter of the company, was tried on the charge and convicted, but obtained a stay, and died from pneumonia before the new trial came off.

The road was built, and on or about June 22, 1885, cars were run by the Broadway & Seventh Avenue Railway Company, in accordance with an agreement previously made with the Broadway surface railway. In 1889, the road was sold at public auction, and purchased by the present owners, and now forms part of the Broadway & Seventh Avenue system.

PROPOSED EXTENSIONS.

The management of the Broadway & Seventh Avenue Railway Company has drawn up plans for proposed cable railways on Columbus and Lexington Avenues, and the work of construction has already been actively begun. Fig. 6 gives section and plan of the yoke to be used.

The Ninth or Columbus Avenue line will extend from the corner of Seventh Avenue and 53d Street, on 53d Street to Ninth Avenue, whence it will extend on Columbus Avenue to 110th Street. A power station will be erected at the corner of Lenox Avenue and 116th Street which will operate the line from the lower terminus at 53d Street to the Harlem River. The section from the corner of 53d Street and Seventh Avenue to 110th Street and Ninth Avenue will be driven temporarilly from the present uptown power station of the company, described above.

The Lexington Avenue line will extend from the corner of 23d Street and Lexington Avenue north to the Harlem River, with a branch on 106th Street from Lexington Avenue to the East River. Two stations will be built, one at the corner of Lexington Avenue and 26th Street, the other uptown. The duplex system of cable operation will be used on both lines.

EMERGENCY WAGON.

The engraving Fig. (7) shows an improved form of wrecking wagon as built for use on the Broadway cable road, New York City, by the Gleason & Bailey Manufacturing Company, Seneca Falls, N. Y. The general design of these wagons is similar to the patented fire insurance patrol wagons built by this company. Unlike an ordinary wagon, the men enter from both rear and sides, instead

FIG. 7.—EMERGENCY WAGON—BROADWAY & SEVENTH AVENUE RAILWAY, NEW YORK.

of from the end of the body only. The seats run the entire length in the center of the wagon and form spacious tool boxes underneath the top covers, the men riding back to back. The top of this center tool box can be made more accessible by having the seat, which forms the cover, made sectional and hinged; under this long box or seat is a false bottom forming a long locker for carrying poles or any long tools. Back of the driver's seat are

wrought iron saddles with straps for holding horse blankets; a locomotive swinging alarm bell is hung under the toe board under control of the driver's foot. The foot piece of the brake extends across the footboard, so that the driver can operate the same from either side of the seat, or with both feet, at pleasure. The wheels are "Warner" patent of XXX quality, three feet two inches and four feet two inches in diameter, respectively, with 2½ × ¾ overlapping, round edge steel tires and brass open hub caps. The axles are two and a quarter inches, of imported refined iron, having bronze nuts secured by a linch pin. The springs are extra oil tempered, and so hung in connection with the Gleason & Bailey patent truss gearing, that the apparatus draws and rides like a light carriage. The body of the wagon is eleven feet six inches long, five feet four inches wide, and nineteen inches deep. There are brass railings around the driver's seat and surmounting the wagon body, supported by composition stanchions. The steps are all covered with corrugated rubber matting. Back of the rear wheels is placed a heavy metal mudsplash. Over all the wheels are sprung substantial metal mud fenders, supported by wrought iron brackets on the body of the wagon. Iron step pads and handles for mounting to the driver's seat and different openings in the wagon, are placed in accessible positions. A patent wind shield, bulls-eye and tubular lanterns are hung either side of the seat, so placed as to throw a powerful light forward; these lanterns are provided with non-heating handles, so that they can be taken off and used when occasion requires. Every feature and equipment of these wagons is novel, and the production of this company. The whip socket has a patent rein holder attached. Lockers for special tools, wire baskets, and iron framework for carrying hose bridges, etc., can be added to the wagon if required.

The Early Pioneers of the Electric Railway.

The names and achievements of the founders of electric railroading in this country, if not familiar to all electric railroad managers and engineers, are at least known to most of those engaged in the industry. But comparatively few, we imagine, among our readers are acquainted with the personality of the pioneers of the electric railway. All, with the exception of Mr. Van Depoele, whose death robbed the world of a most assiduous inventor and worker, are living and in the full vigor of their activity All are engaged in some branch of electrical research.

The public indebtedness to these early workers for their successful efforts to transform the street railway business, can hardly be over estimated.

THOMAS A. EDISON.

Thomas A. Edison, whose inventive genius has been fertile in so many branches of electrical science, early turned his attention to the electric railway. The development of the dynamo machine as an economical agent for the production of electricity, led the way to the adoption of electric power for transportation, and Edison was among the first to see the extensive use to which the new power could be put. In 1880 Mr. Edison built an electric locomotive and track, the latter being less than half a mile in length, at Menlo Park, N. J. The rails were insulated from each other, and each was connected with the poles of a dynamo, making one rail positive and the other negative. The voltage was 125, and the motor was an Edison dynamo of the Z or sixty light type. This locomotive was afterwards much improved.

In prosecuting his claim for patents, soon after the starting of this road, Mr. Edison found two other inventors, Messrs. Siemens and Field, with claims covering largely the features for which his application was filed. The claims of the first named were denied by the courts to which recourse was had, and, as outlined below, consolidation was later made between the Edison and Field interests, resulting in the formation of the Electric Railway Company of the United States.

Soon after this the "Judge" was built by the newly formed company, and, as mentioned below, was exhibited at Chicago in 1883, carrying large numbers of passengers. Mr. Edison, though since devoting most of his energy and time to other fields of electrical development, has kept up his interest in electric railways, and has taken out a number of patents for important improvements in this line.

STEPHEN D. FIELD.

Stephen D. Field was born January 31, 1846, at Stockbridge, Mass., where most of his life up to his seventeenth year was passed. In 1863, he went to California and entered the service of the California State Telegraph Company. He remained in California until 1879, being most of the time engaged in the promotion ol various electrical enterprises. He is the inventor, among other successful mechanism, of the multiple call answering back signal box, the dynamo system of furnishing currents for the operation of telegraph lines, the dynamo quadruplex, which has been adopted as standard by the Western Union Telegraph Company, and many features of the electric railroad of the present day.

The first public record of the modern dynamo electric railway is claimed by Mr. Field to be his United States patent of July 13, 1880, wherein is shown the complete organization of a practical electric railway. The specification clearly shows how such an organization should be constructed while the drawings show a working conductor, stationary generator, electrically propelled car, trolley pole and trolley running on the under side of the working conductor. Directions are given for bonding the rails for a return circuit, and the working conductor is described as insulated mechanically as well as electrically.

This patent was thrown into "interference" with several rival inventors, the result being to so embarass and restrict Mr. Field in his operations that long before the issuance of his patent the business was so firmly established in the hands of powerful corporations as to place the unfortunate inventor so far in the back ground that nothing was left for him but recourse to the courts to establish his rights. A law suit, having this end in view is now in progress in the United States courts.

Mr. Field's first dates in the United States patent office are a caveat filed May 21, 1879, and patent application filed March 10, 1880, and issued after a prolonged interference in 1889. In May, 1880, Mr. Field commenced the construction at Stockbridge, Mass., of an experimental electric railway, but was delayed by various causes, so that the road was not put in operation until 1881, when it ran for some time very successfully. At the Chicago Railway Exposition, in 1883, the Electric Railway Company of the United States, which then represented both the Field and Edison interests, as mentioned above, exhibited an electric locomotive, the "Judge," weighing about three tons and operating by a third rail. This locomotive was put in operation June 9, 1883, drawing a trail car, and carried over 26,000 passengers during the two weeks in which it ran. The Field and Edison interests were afterwards separated, the patents of the former being retained by Mr. Field and those of the latter by the Edison Electric Light Company, now represented by the General Electric Company.

FRANK J. SPRAGUE.

Ensign Frank J. Sprague, a graduate of the Annapolis Naval Academy, class of '78, installed his first electric railway in the Durant sugar refinery on East 24th Street, New York, in May, 1886. Pivoted trucks underneath a platform car were used, and the method of gearing and motor support adopted was similar to that now in use, so that this equipment may be regarded as the prototype of the present direct geared type of motor car equipment. Previous to the date mentioned above, Mr. Sprague had become well known in the electric field through his investigations in electric railway and motor work, and in being the patentee of a large number of valuable inventions relating to the electric transmision of power, he being the first to bring out a constant speed motor for stationary work.

In the summer of 1886, Mr. Sprague commenced a long continued series of experiments on the 34th Street branch of the New York Elevated Railway, with a car equipped with a pair of pivoted trucks, and in the spring of the following year the Sprague Electric Railway & Motor Company took a contract for equipping the Passenger Railway, of St. Joseph, Mo., and the Union Passenger Railway, of Richmond, Va. The latter was for eighty motors, eleven miles of track, and 375 H. P. generating plant, and the road was to be completed in ninety days, at a cost of $110,000. These roads were started experimentally in the fall of 1887, but the Richmond road not regularly until the beginning of February, 1888. The electric railway at Richmond was by far the largest which had up to that time been equipped, and as the results attained were largely instrumental in giving electric railway construction the impetus which it has since had, and in convincing street railway managers of the successful commercial results obtainable with electric power, it seems fair to say that to Mr. Sprague, more than to any other one man, is due the credit of inaugurating the enor-

E. M. BENTLEY.
W. H. KNIGHT.
J. C. HENRY,

F. J. SPRAGUE.
T. A. EDISON.
C. J. VAN DEPOELE.

LEO DAFT.
S. D. FIELD.
S. H. SHORT.

mous development of the electric railway industry in this country which has excited the amazement and admiration of foreign engineers and workers in the "tramway" field.

The characteristics of the Sprague motor equipment, as used in elevated railway experiments in New York, and in the railway at Richmond, and which, it is claimed, were new in electric railway practice up to that time were: An independent truck with motors exteriorly centered upon the driven axles so as to maintain parallelism between the driving shaft and the driven axles; flexible support of part of the weight of the motors on the truck to allow perfect freedom in following the motions of the axles, suspension being below the car springs; the method of flexible suspension, avoiding all shock and jar and danger of stripping gearing, and the maintenance at all times of a spring touch to prevent back lash of the gears; direct single reduction of gearing; the use of fixed brushes for both forward and backward running. This equipment marked the abolition of ropes, belts, sprocket wheels and chains for the reduction between armature and axle. Besides the characteristics already mentioned, the Richmond road exhibited the following unique peculiarities: A feeder system with main and working conductor, the latter being of silicon bronze; main and working conductor system also applied to the rails; a universally movable trolley carried in the center of the car body; a series multiple and commutated field magnet method of control; single movement control for both speed and direction of movement.

Mr. Sprague's first proposal for a centrally located, upper pressure, contact trolley taking current from a conductor above the track, and following the line of all tracks and switches, was in connection with a suggested electrical equipment for the underground railroad in London in 1882 and 1883.

When the Sprague Electric Railway & Motor Company was absorbed by the Edison General Electric Company, Mr. Sprague was retained by the latter company as consulting electrical engineer, but wishing to be independent, he resigned the position at the end of a year, to devote himself to the solution of other problems, but remained in touch with consulting work as president of the corporation of Sprague, Duncan & Hutchinson, Limited.

In spite of extended work in other lines of electrical research, Mr. Sprague retains his fondness for the electric railway field, in which he has performed such valuable services, and it is rumored that he will re-enter the tramway field. He is an enthusiastic advocate of the use of electric power for heavier work, and in connection with Doctors Duncan and Hutchinson has nearly completed a 1,000 H. P. electric locomotive, for the North American Company for experimental work. On this subject, however, he avoids all visionary propositions, his belief being epitomized in a statement made in his inaugural address as president of the American Institute of Electrical Engineers, in Chicago, in 1892: "It narrows itself down to the one question of the number of train units operated between the terminal points." He has also devoted more thought than probably any other electrical engineer to the solution of the New York rapid transit problem, and his plans, if adopted by the Rapid Transit Commission, would undoubtedly result in the removal of this, at present, perplexing question from the minds of New Yorkers. He is the representative in this country of the Greathead system as exemplified in London.

Mr. Sprague's recent work, like that in the early electric railway field, displays great originality of thought, combined with a fertility of invention in the application of mechanical and electrical principles, and his ambition now is to make the hydraulic elevator an obsolete machine. Associating himself with Chas. R. Pratt, he attacked the hardest elevator duty, and the new Postal Telegraph building has challenged the hydraulic elevator on its own grounds in one of the largest plants in New York by machines illustrating one of the most interesting examples of the direct application of electric power to mechanical work, and of departure from established standards. The Sprague Electric Elevator Company is now building a substantial factory at Bloomfield, N J., where, it is rumored, some new inventions of Mr. Sprague's will be brought out, which will revolutionize the methods of this important industry.

Mr. Sprague's inventions have rewarded him from a financial standpoint, and he has amassed a considerable fortune which is unhesitatingly spent in developing new work. He is married, has one son, and lives in a very handsome residence, the former residence of a son of General Grant, on West End Avenue, in New York City.

LEO DAFT.

Leo Daft was born in Birmingham, Eng., in November, 1843. His father was Thomas B. Daft, a prominent civil engineer. Mr. Daft early showed a leaning toward mechanical and electrical pursuits, and in 1858 entered the University College, at London, where he had many opportunities for special instruction, and where he became acquainted with Sir William Siemens, who lent him considerable electrical apparatus for carrying on his experiments.

Mr. Daft came to America in 1866, and first engaged in railroad engineering, afterwards in various minor enterprises. He went to England in 1879, but upon his return to this country, about two months later, the developing activity in electrical matters attracted his attention, and recalled him to his old profession. His first connection was with the New York Electric Light Association, which was soon merged into the Daft Electric Light Company, with works first in New York, then in Greenville, N. J., and later in Marion, N. J. The company was almost immediately and exclusively devoted to the development of electric power, and established several electric power stations in Boston, New York, Worcester and elsewhere. In 1883, Mr. Daft built an electric locomotive called the "Ampere," for use on the Saratoga & McGregor Electric Railroad, and in the following year installed a short line at Coney Island. In the early part of the spring of 1885, Mr. Daft was requested to furnish an electric equipment for the Baltimore Union Passenger Railway Company, and on August 8, 1885, this road was put into operation. The first motor cars used were the "Morse" and the "Faraday," and a third rail was used to conduct the current to the car. The Daft system was adopted on a number of roads, and the Daft locomotive, "Ben. Franklin," was operated for some time on the Ninth Avenue elevated road, in New York City.

Mr. Daft is now engaged as a consulting electrical engineer on the Pacific Coast, with headquarters at Seattle, Wash., and has turned his attention chiefly to long distance power transmission and large railway and light installations. One of these latter has recently been completed at Everett, Wash., under his supervision, and is in very successful operation.

WALTER H. KNIGHT AND EDWARD M. BENTLEY.

The names of Walter H. Knight and Edward M. Bentley are closely associated in the early history of electric railroading, in which they took a prominent part. In 1883 Mr. Knight resigned from the electrical department of the Patent Office to take charge of some electrical engineering work, and, forming with Mr. Bentley the Bentley-Knight Railway Company, was soon engaged in electric railroad experimenting.

The first electric road of the company was built in the fall of 1883, in the yard of the Brush Electric Works at Cleveland, where Messrs. Bentley and Knight equipped a street car with a Brush motor, and built a short section of conduit. The first public line equipped by the Bentley-Knight Railway Company was the Quincy Street extension of the Garden Street line of the East Cleveland Company's system.

Work on this road was begun in the early summer of 1885, and on August 1, of the same year, a street car was put in operation. This car was immediately used in the business of the company, and, so far as was possible, was kept in continuous operation. The road was, of course, largely an experiment, and many changes were made to ascertain the best form of gearing, motor control and line construction, but it was operated regularly as part of the service of the railway company, and was the first commercial electric railway in this country. It was about two miles long, with a branch track, and the current was taken by a collecting device passing through a slot in the conduit, making contact with the conductors there.

Messrs. Bentley and Knight were next engaged in the construction of a trolley road at Woonsocket, R. I., and then in the construction of a combined trolley and conduit road at Allegheny, Pa. The latter was on the Federal Street line, and operated successfully for several years. A combined trolley and conduit road at Boston, and an overhead trolley road at Lowell were afterwards installed by the Bentley-Knight Company. Soon afterwards this company was absorbed by the Thomson-Houston Electric Company.

Mr. Knight was a resident in Boston at the time that the West End Railroad Company of that city was proposing the equipment of its line with the cable system, but President Whitney's attention having been directed to the advances being made in electric traction, a trip was made to the Bentley-Knight road at Allegheny, Pa., and the Sprague road at Richmond, Va. Before his return Mr. Whitney had concluded to change over to the electric system, and Mr. Knight was delegated to select a site for the power station and draw up general plans. Soon after the absorption of the Bentley-Knight Company by the Thomson-Houston Company, mentioned above, Mr. Knight became chief engineer of the railway department of that company, a position which he still holds in its successor, the General Electric Company.

Mr. Bentley, after the absorption of the Bentley-Knight Railway Company, engaged in the practice of law, and is now a member of the firm of Bentley & Blodgett, attorneys, Boston.

JOHN C. HENRY.

John C. Henry was born in Woodstock, Ont., in 1848. He learned telegraphy at an early age, and was connected with several railroads as train dispatcher. In 1869 he entered the service of the Union Pacific Railway Company, of the Eastern Division, as electrician. During his connection with this road, which lasted about ten years, he brought out a number of valuable inventions, including the Henry Velocimeter. This device has been slightly modified by Mr. Boyer, who was in Mr. Henry's employ, and is well known as the Boyer Speed Recorder. During his service as railway electrician, Mr. Henry devoted a great deal of study to the subject of the application of electric power to the operation of cars.

In 1884-5, Mr. Henry, who was then a resident of Kansas City, constructed there an electric railway, using overhead wires. This road is claimed to be the first of the kind ever constructed. In the fall of 1885, he made some experiments in heavy electric railroading on a branch of the Fort Scott Steam Railroad, where heavy freight cars were operated. Mr. Henry later, in 1886, equipped the Kansas City Fifth Street Railroad with his street railway system. Here he employed, it is claimed, for the first time the following features which are still in common use: The trolley wires were of No. 1 hard drawn copper and were supported centrally over the street from insulators and span wires to poles placed along the curb lines; the trolley engaged the sides and bottom of the wires and was so held by spring pressure; the current was supplied by compound wound, constant potential dynamos; the motors were series wound and were journaled on the car axles at one end, the other end being spring supported; the gearing was encased and ran in oil; the practice of using two pairs of tapering brushes was discarded and a single pair which abutted the commutator was substituted. An independent switch was added to reverse the motor instead of shifting the brushes.

In 1887, Mr. Henry removed to San Diego, Cal., and constructed a number of electric roads, one of which contained 9 per cent. grades which were surmounted by his motors and trail cars with success. The system of underground feeders was first introduced on one of those roads. In 1889, Mr. Henry removed to New York, where he has since been engaged, not only in electric railroad investigations and improvements, but as an expert to some of the largest electric corporations. Mr. Henry took out a number of fundamental patents during his early electric railway work and his claims as the inventor of the main features of the trolley system of to-day, are now before the United States Court, in a suit which is being defended by the Westinghouse Electric & Manufacturing Company. He is most assiduous in his profession, and has taken out many patents for improvements in electric railway work during the last few years. He is a resident of Westfield, N. J.

CHARLES J. VAN DEPOELE.

Charles J. Van Depoele, whose death occurred March 18, 1892, in the vigor of his activity as an electrical engineer, was born in Litchervelde, Belgium, in 1846. His father was a railway engineer. Mr. Van Depoele came to this country in 1871 and settled at Detroit.

Becoming interested in the electric light, he constructed a dynamo in 1880, and soon after moved to Chicago and aided in the organization of the Van Depoele Electric Light Company. The first railway operated under the Van Depoele system was an experimental road installed in Chicago in the winter of 1882–3. In the fall of 1884, Mr. Van Depoele installed a conduit railway at the Toronto Exposition, and in the following year converted the same to an overhead trolley road, the wires being supported from brackets. The current was collected by an under-running trolley. Three cars and a motor car were run, and the road carried over 10,000 passengers per day. A speed of about thirty miles per hour was attained. In the fall of 1885, Mr. Van Depoele experimented on the streets of South Bend, Ind., with a number of motor cars. Later roads were installed in Montgomery, Ala.; Windsor, Ont.; Detroit, Mich.; Appleton, Wis., and Scranton, Pa. Mr. Van Depoele's first road used the over-running trolley; later the under-running trolley was employed.

In 1888, the Thomson-Houston Electric Company purchased all of Mr. Van Depoele's electric railway patents, and from that time until his death Mr. Van Depoele was connected with that company as electrician and inventor. Mr. Van Depoele was a prolific inventor and a tireless worker. He probably did more to boom the business in its infancy than any other man.

SIDNEY H. SHORT.

Sidney H. Short was born in Columbus, O., October 8, 1857. He received his entire education in that city, being one of the early graduates from the Ohio State University. While still young, he displayed inventive genius by developing one of the first telephones. His patents are now the property of the American Bell Telephone Company, of Boston, Mass. For two years prior to his graduation he was employed at the Ohio State University as instructor in the Physical Laboratory. Immediately after being graduated, Mr. Short accepted the vice-presidency of the Denver University, filling the chairs of physics and chemistry until the work became too much for one man, when he resigned the chemical work and gave all his attention to the department of physics. He remained with the University for five years. In the spring of 1885, he constructed a short electric railway here. The track was made of T rails laid on cross ties, the two conductors being supported on insulators between the rails.

The car had four wheels and a rigid truck; the motor was geared with one pinion and one gear to the axle. The car body was eight feet long, and fitted with a rheostat lever and reversing lever. The success of the road was so great that a party of capitalists induced Mr. Short to give up his professorship and develop a street railway system. The conduit system was adopted and five miles of track were laid on 15th Street, in Denver, and operated with considerable success. The difficulties with insulation in the conduit in wet weather, and the imperfections of the early types of motors and generators led to electricity being finally abandoned and the cable substituted. This was in turn given up, and the road is again equipped with electricity, the overhead trolley system being used.

In 1889 Mr. Short returned to Columbus, where, under the firm name of S. H. Short & Company, a short line about two and a half miles in length, using the overhead system and series motors, was built. In 1888 Mr. Short constructed another line on the overhead series system in St. Louis. In June, 1889, he made Cleveland his home, and organized the Short Electric Railway Company, with a capital of $5,000,000. The manufacturing was done by the Brush Electric Company. Railways were built in Muskegon, Mich., Indianapolis, Jamestown, Rochester, N. Y., and many other cities, the Rochester railway calling for the installation of 200 motors, an order then unprecedented. The motors were of the double reduction type, and the cars were run on the multiple arc system. In 1891 Mr. Short put upon the market a single reduction motor, and at the Pittsburgh Convention in the same year, his first gearless machine was shown. As the original inventor of this, the gearless, type of machine, it will, doubtless, always bear his name.

In the summer of 1892 Mr. Short sold his entire interest in the Short Electric Railway Company to the Thomson-Houston Electric Company, of Boston, Mass., and thereby severed his connection with the company. He has since been engaged in developing, for the Brush Electric Company, the largest arc light dynamo ever built. This machine has a capacity of 125 lights of 2,000 C. P. each, but it has been operated successfully carrying a load of 150 lamps, all burning at their full candle power.

Since completing this machine, Mr. Short is turning his attention to new and very important developments in the electrical field, which he hopes to soon bring before the public.

A New Rapid Transit Plan for New York City.

The latest plan presented to the New York Rapid Transit Commissioners comes from a syndicate represented by R. T. Wilson. This syndicate proposes to deposit $1,000,000 to be forfeited if it fails to sign the contract for the construction of the road when the execution thereof shall be authorized by the vote of the people of the city.

The syndicate proposes to commence the construction immediately upon the execution of the contract, and to build that portion between the City Hall and 14th Street within two years, between 14th and 59th Streets, and south of the City Hall, within three years and the uptown section within four years from the time of signing the contract. As soon as the routes mentioned pay 4 per cent. on the cost an additional mile on either side of the city will be built, and as soon as that extra distance pays 4 per cent. on its cost an additional mile be built, and so on until the northern termini are reached. The city is requested to loan the syndicate two-thirds of the cost of each mile of track when approved, in 3 per cent., fifty year, gold bonds, with the provision that the loan from the city shall not be over $2,500,000 per mile on any part below 42d Street, and $2,000,000 per mile on any part above. It is also provided that the loan from the city shall not exceed $30,000,000, the syndicate agreeing to pay the interest on the bonds and redeem them at maturity.

The plan proposes an underground road having a double deck, two-track tunnel, sufficiently below the street to clear all pipes, etc., the method of propulsion to be electricity or some other power not requiring combustion, and the motors to be capable of a uniform speed of forty miles per hour, exclusive of stops, for long distances.

Care of Street Car Motors.

At a recent meeting of the Massachusetts Street Railway Association some very interesting discussion was had on the care of street railway motors on the different lines represented.

Robert C. Brown, of the West End Street Railway Company, stated that the equipment of that line consists entirely of W. P. 50 motors, and that the practice is to inspect to a certain degree—especially as regards brushes, leads and other parts which are likely to get out of adjustment easily—every day. Every third day the car is "over the pit" and is thoroughly inspected from trolley wheel to rail. Every other third day the brush holders are removed, at the same time this inspection goes on, and cleaned. Also the journal caps, and so far as possible, the motor, in general, receives a thorough wiping. Once every thirty days the motors are taken apart, the lower half of the shell being dropped into the pit. When this is done, all the parts of the motor are inspected and thoroughly cleaned. The brasses are removed, the oil wells cleaned out, the commutator and armature thoroughly cleaned, and the whole motor put in as cleanly a condition as possible. This is followed finally by a coat of asphaltum paint. This paint is used at all cleanings, a little each time, as it gives a good surface to the iron, and leaves it in a condition that allows of its being more easily cleaned. At the same time the axle gears and pinions, both of which are of steel, are closely examined for loose bolts, loose keys, wear and other depreciations. Two men can do this work in two and a half hours. The foreman gives the whole car a thorough inspection at the same time.

As a protection against water, the openings at each side of the motor are covered with snug fitting canvas shields. A canvas curtain is also hung from the car body at the commutator end. These guards work well in practice and keep the water out. In the snow plows the motors are on the floors of the body, and need very little attention in service.

E. C. Foster, general manager of the Lynn & Boston Street Railway, stated that that company had some fifty cars equipped with F 30 motors, and seventeen with No. 6 Sprague, all of which have been in service from three to five years, and the remainder, with W. P. 30, W. P. 50 and G. E. 800 motors.

The F 30's require a great deal of care and attention; as the capacity of the armatures is somewhat limited, they become heated, and as a result, will short circuit and burn out. The intermediate shaft and gear are also a source of expense, and the pans are a source of annoyance; in fact, they seem to be made up of delicate parts which seem to create trouble and annoyance to those having them in charge. Certainly, for the winter season, they are not adapted and cannot be operated with any profit in a northern climate. In the summer season it might be profitable to have a limited number of open cars equipped with them, to be run on special occasions, but for regular service they are not as satisfactory as those of modern types. The cost of keeping them in repair is about three times as great as it is with the W. P's.

The W. P. 30 motors have given very good service, yet, are not considered of sufficient capacity to do the work required of them, in operating over grades of 5 per cent. with trailers; the last season, during the summer months, the company operated ten seat cars with trailers, and with the type K controller, and they did the work very nicely, but they were not of sufficient capacity to do it continuously without impairing the usefulness of the motors.

The W. P. 50's are very profitable motors, and, the cost of maintenance is less than with the other types and they are given very hard service.

The G. E. 800 seems to be the ideal motor, as it is very efficient, having a greater capacity than the W. P. 50, is a more "speedy" motor, and has about 1,000 lbs. less weight, which is something to be considered. Great difficulty is experienced in maintaining perfect joints. When it is necessary to have the weight in order to obtain traction, that weight is created by the burden of passengers in the car. When the passengers are not there, the weight of the car is burden enough to give proper traction. An average schedule of eight miles per hour is maintained, although in remote localities a speed of twelve miles is sometimes attained.

P. F. Sullivan, general manager of the Lowell & Suburban Street Railway Company, stated that the repairs and maintenance of their road was cared for on the following system: In the car house skilled mechanics are in charge who are responsible for results. The object is that when a car leaves the shop newly equipped, such equipment shall be thoroughly done, through the best material and workmanship, and after that a thorough inspection. Motors, trucks and cars are numbered and an official record is then begun, and date and description of any repairs made are kept, comparisons formed, and causes sought.

The work is only half done when a car leaves the shop and is passed into the hands of relatively unskilled help. It is assumed that a man before taking charge of a car is absolutely ignorant, has no interest in the apparatus, and the aim is to teach him so that he will look out for his motors and create a rivalry so that a man will boast of his record.

A green man is placed on the car in charge of a competent motorman, taught the names and methods incidental to car control, and is recommended as being competent to take charge of the car. He is then placed in the repair shop under the direction of the foreman, and shown all the parts, their relation to each other, and in order that he may realize more fully what certain carelessness would amount to, he is given the list price of the various parts. When in the shops such men take the place of helpers in all branches, and are paid accordingly.

To help to create an interest there are prizes for the motormen whose cars have had the best records in point of expense, delays, etc. All loss of mileage or taking off of cars is reported directly to the manager's desk, who exacts an accounting for the cause from the superintendent.

By following the above methods it has been possible to adopt a standard of car mile expenses, and the different foremen are given to understand that if the expenses are kept below such a figure they may expect a present at the end of the fiscal year. The equipment consists chiefly of W. P. 30 motors, Bemis standard trucks, thirty-three inch wheels. Nearly all cars are equipped with type K controllers, and all have gear cases. The cars were previously equipped with the former style of Bemis truck, thirty-inch wheels, but it was found in the line of economy to change.

N. E. Weston, superintendent Lawrence division of the Lowell, Lawrence & Haverhill Street Railway, mentioned considerable trouble from water getting on the commutator and brush holder during sleet storms in winter and also from the salt put on the tracks destroying the insulation of the wires underneath the cars, and stated that a strip of No. 1 duck, painted with fireproof paint, hung between the motor and the wheels on either side, formed a sufficient protection. This road uses S. R. G. 15 and W. P. 25 motors, two to each car.

The S. R. G. requires a seventy ampere fuse, and the W. P. a 100 ampere fuse. Great care has to be exercised that the men do not use the larger fuse on the smaller motors, as they are liable to do if not watched closely. If this is done, and the small motors become overloaded, they are apt to burn out. There are at the barn three night men. One of them looks after the cleaning of the cars, sweeping the floors, washing the windows and taking care of the stoves; the other two go through all the cars, lift all traps, and make a thorough examination of every part—lead wire, brushes, brush holders, etc.—and find all troubles that they possibly can. If they find a car that cannot be easily repaired, they put a sign on it, "leave this car in," and the repairs are made during the day by the electricians. These men oil all bearings every night, using in all oil cups a motor compound from the Vacuum Oil Company, that costs eight cents per pound; for the other bearings a cheap dark machine oil is used. All trucks, brakes and brakeshoes are also examined every night.

The car barn is so arranged that there is pit room enough to hold twelve cars. These pits are all heated by steam, and the men can walk under the cars easily, using a drop light, and making careful inspection of everything.

When an armature is burned out, the car is placed over the pit, and the armature is lowered down with chain falls and taken from under the car, through the pit, then to the armature room, and a new one put in its place.

James F. Shaw, treasurer of the Wakefield & Stoneham Street Railway, made some interesting statements with regard to the use of electric heaters on the Haverhill & Amesbury road, which line has used these heaters for the past two winters on a run of eighteen miles, having no difficulty in keeping the cars warm on the coldest days. The heaters used are the Burton, Cochrane and New England. The Burton heater to heat moderately takes four amperes, and on extremely cold days ten, more or less. The New England heater takes three amperes for each side of the car, which may be run in series or multiple. Several other lines are using electric heaters and although they cost slightly more than stoves, they are more satisfactory.

Chicago's Street Railway Traffic in 1893.

In this issue are published the reports of the three principal Chicago street railway lines The following comparison of the traffic returns will be found of interest:

	Passengers carried.	Increase.
Chicago City Railway	120,596,270	32,577,409
West Chicago Street Railroad	107,053,461	12,534,987
North Chicago Street Railroad	60,311,673	9,892,216
Total	287,961,404	55.004,612
	Gross earnings.	**Increase.**
Chicago City Railway	$ 6,059,989	$1,659,046
West Chicago Street Railroad	5,235,633	615,408
North Chicago Street Railroad	3,014,889	493,277
Total	$14,310,511	$2,767,731
	Car miles.	**Increase.**
Chicago City Railway	26,304,090	5,483,380
West Chicago Street Railroad	16,813,134	1,230,993
North Chicago Street Railroad	9,224,173	676,382
Total	52,341,397	7,390,755
	Operating expenses.	**Increase.**
Chicago City Railway	$3,422,040	$612,609
West Chicago Street Railroad	2,829,982	205,671
North Chicago Street Railroad	1,412,755	78,703
Total	$7,664,777	$896,983

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

Address all communications to

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We Heartily Appreciate the almost unanimous endorsement by street railway managers of our forthcoming financial supplement, "American Street Railway Investments" It has been made evident to us, in the large number of letters which we have received in answer to our circular letters of inquiry, that our belief in the necessity of such a publication is well founded, and that our purposes and methods have been understood and approved. It is already certain that this supplement will be the most complete and valuable compilation of financial information concerning street railways ever produced.

Through the Death of William Richardson, recorded in our January issue, the street railway industry parts with a member which it could ill afford to lose, and one whose place can not be refilled. Mr. Richardson was one of the few remaining members of that older generation in the street railway field who, engaged in the business some thirty years or so ago, when its importance and future were not appreciated and by keen foresight, combined with careful management made it one of the leading factors of municipal advancement and prosperity. Mr. Richardson lived to see the opening of a new era in street railway development, by the adoption of a motive power not dreamed of when he began his work as a street railway manager, and a progress made during the last six years equal in magnitude to all those in the preceding twenty-five. Mr. Richardson did not try to confine the benefit of his thought and experience to his own road. He was a most enthusiastic member of the National and State Street Railway Associations, of whose meetings he was a regular attendant, and in whose proceedings and councils he took an active part. He was a firm believer in that far-seeing policy of giving others the results of one's experience, and was not above benefiting by the advice of others in return. An example of his foresight and discernment is shown in his early advocacy of electric power for car propulsion and its adoption on the road of which he was president as soon as municipal permission was obtained, though used for so many years to animal power. Mr. Richardson deserves the thanks of the members of the street railway fraternity for the many benefits which he has conferred on them, and his memory will be cherished as of one who was a friend of all.

The Electric Railway Field has now reached such gigantic proportions, and the science of electric railway construction and operation has advanced so rapidly, that it is hardly possible to realize the fact that the industry is still very young. Less than ten years ago the inventors, to whom we are indebted for our apparatus of to-day, were engaged in working out the fundamental principles of electric railway design and operation and there was not a single electric road in regular operation. The honor roll of workers in this field is a long one, and one of which every American and every street railway man may well be proud. To no one man and to no one set of men can be attributed the credit of creating the electric railway of to-day. Like all great undertakings, it is the product of many minds. To many of those engaged in the operation of extensive systems this early work remains obscure and half or entirely forgotten. To recall to the minds of such the early struggles and problems in the electric railway field, we publish in this issue the portraits and short biographical sketches of nine of the pioneers in this country, and to whom the greater portion of the early development of the electric railway is due. This, like other branches of electrical development, seems destined to be a battle ground for patent litigation, and while the questions of law involved in these suits remain unsettled, there is certain to remain a degree of indefiniteness as to the ownership of the legal rights in certain inventions. Credit for actual work performed and progress made in the art, however, should be given, independent of the fact as to whether an invention, if made, was of such a character as to secure a patent for its exclusive use to the inventor. We should, therefore, give the due meed of praise to all those by whose efforts the great industry represented by our electric railways was established.

The Attention of Street Railway Managers in Southern cities should be turned to the various methods of increasing the patronage of their lines, which have proved so efficacious in other sections of the country, particularly in the West. It is not unusual to find Western city systems earning from $5 to $10 per capita, owing to excellence of management, frequency of service, high schedule speed, and sometimes the establishment or development of public pleasure grounds, beer gardens or picnicking resorts by the street railway companies themselves. The negro population in the South is not infrequently an element of strength rather than weakness, because of the well known fact that a "darkey"—the most improvident of mortals—will spend his last "picayune" for the pleasure of coursing over the country on the delightfully mysterious electric car. The constantly increasing number of Northerners who pass their winters in the South will patronize the local railways as a daily diversion if they are provided with clean and easily riding cars. When all is said and done, much depends on the ingenuity of the street railway manager in educating his permanent public to ride more and more frequentiy. In too many cases the cars are running on too long headway, and

while it may seem an expensive experiment to reduce the schedule intervals from fifteen minutes to ten, seven and a half, or five minutes, especially on systems which are barely paying expenses, the change will frequently be found unexpectedly profitable. Where the headway is too long, people will walk rather than wait, but especially within the city limits they can frequently be educated to ride freely, if given proper facilities. It is not to be expected however, that the street railway industry in the South will develop more rapidly than the other industries which have had a much shorter lease of life, but nothing should be left undone which will assist in the building up of "the New South" which has progressed so rapidly during the past few years.

The Preliminaries for the Thirteenth Annual Convention, of the American Street Railway Association are now nearly all arranged, following the meeting of the Executive Committee at Atlanta on the 24th of last month, and the indications are that the next will be largely attended and an interesting and successful convention. The only discouraging feature in connection with the arrangements is the distance (three miles) from the principal hotels to the Exposition buildings, in which the meetings are to be held. But as the street railway companies will present the delegates with complimentary tickets to and from the Exposition grounds, this factor will not militate against the success of the meeting. Judging from the enthusiasm of the local committee, and the assurance that everything possible will be done to make the coming of the delegates to this beautiful Southern city a delight, it is safe to predict that nothing will be wanted at that end of the line to give character to the meeting and render the exhibit of supplies remunerative to the manufacturers and dealers. One important matter that will add to the social features of the convention, will be the presence of street railway men from numerous Southern cities who have not heretofore been identified with the interests of the Association. Atlanta being centrally located in reference to Southern cities, together with the special efforts which the local committee will make to bring the claims and benefits of the Association to the attention of Southern roads, will, doubtless, bring them together, as noted above. Efforts will be made to engage some of the most prominent Southern orators to respond to the toasts at the banquet, so that a good opportunity will be given to listen to some of the fluent speakers for which this region is so justly noted. The subjects selected on which special committees are to report, cover a wider range than those presented at the last convention, and only practical street railway men will be appointed on the committees, the papers will be of a practical character and within the comprehension of all, so that a full discussion may be expected on all the subjects. The committee, however, has wisely selected one subject for discussion which will be open to all without the formality of a paper, so that no one may want for the opportunity to take part in the proceedings. There is also to be an executive session, which will remove the restraint under which the delegates usually labor, and this will, doubtless, bring out reports of operation and experiments more fully than has ever been done before. It is to be regretted that circumstances have compelled the executive committee to drop the subject of an Industrial Institute for the present. It is only laid on the table, however, and can be called up and progressed when the financial conditions of the country shall have become more favorable to such an enterprise. It is not too soon to begin preparations for the Atlanta Convention, and managers and superintendents should see to it that appropriations are made early and arrangements perfected for as many as possible to attend. The Southern railroads will, doubtless, grant more liberal concessions in the way of passenger and freight rates than ever before, so that nothing need stand in the way of a very large attendance, and a very full exhibit of street railway appliances and supplies.

The Responsibility of Resisting Unjust Taxation of street railway franchises is on each and every company manager, and cannot be evaded in any individual case without establishing a precedent which will probably be used to the serious injury of companies in other cities. That the financial necessities of municipal governments are often so pressing as to make it highly desirable, from their point of view, to obtain a larger revenue from quasi-public corporations, is no reason why the burdens sought to be imposed should be abnormal or crushing. In our January issue we pointed out the serious evils resulting from a policy of excessive taxation of franchises. In no better way can we illustrate these evils than by a diagnosis of the diseased street railway industry in England. There, the policy of municipal ownership or control of corporations serving the public—particularly tramway companies—has been carried to its highest development. All, or nearly all of the tramway companies were organized under the Parliamentary Act of 1870, which limits their franchises to twenty-one years and empowers municipalities to purchase their properties at the end of that time or at the end of each subsequent seven year period at the then valuation, exclusive of any allowance for past or future profits of the undertakings or any compensation for compulsory sale or other consideration whatsoever. The tramway companies have been compelled to adopt, in small cities as well as large, a type of roadbed construction costing not less than $25,000 per mile of track, low fares have been insisted upon, and finally, special taxes have been imposed by many of the municipalities, still further fettering the companies. Now, the effect of these onerous conditions has been disastrous in the extreme to both tramway companies and the people, the latter suffering more, if anything, than the former. Except in the larger cities, a return of 5 per cent. on the actual cash investment in the tramway properties is unusual, the net profits being, in many cases, insignificant, if not indeed negative. Capital is not attracted to this field because of the uncertainty as to the action which may be taken by the municipalities at the expiration of the franchise periods. For the same reason the tramway companies will not extend or perfect their systems, are giving inadequate service to the people, and are allowing their road and equipment to deteriorate. They will not extend their lines into the suburbs, and the population density of the English cities is, therefore, far greater than with us, so that the life of the people is restrained and fettered to an extent which cannot be appreciated except in comparison with the enormous development of our own municipalities brought about by street railway methods which are twenty years ahead of those in England. An example will illustrate how great are these differences,

The city of Birmingham has been held up to the world as a model city, well governed according to English ideas. The city of Boston, Mass.,occupies a somewhat similar position with us. The population of the two cities, with their suburbs, is not greatly different, Birmingham being the larger by about 75,000. The five tramways of Birmingham operate a total of about fifty-five miles of road, or one mile for each 12,500 inhabitants; the one system of Boston operates 137 miles of road, or one mile for each 4,500 inhabitants. The combined Birmingham tramways are serving the public with about five car miles per capita population as against twenty-eight car miles per capita in Boston; and as a result of this service Birmingham tramways are carrying about 37,000,000 passengers per annum, equivalent to fifty-three rides per capita population, while Boston street railways are carrying 120,000,000 passengers, equivalent to 192 rides per capita population. Do not these figures mean that, other conditions being equal, the people of Boston are far happier, more fortunate and more prosperous than those of Birmingham? What would we think in this country if Brooklyn was served with but thirty miles of street railway, as is Glasgow; if San Francisco had but ten miles, like Sheffield; if Detroit had but eleven miles, like Bristol; if Rochester had but nine miles, like Leicester; all these being cities of corresponding size? Nor are such examples of English city tramway cities isolated or unfairly quoted. They are types, more or less perfect, of all, and in considering the results of the English policy of high taxation of franchises, the most unreasonable city governments here cannot but turn back in dismay before imposing fresh burdens on a street railway industry which has done so much to make life worth living in America.

Legal Pointers.

By Wm. M. McKinney.

Excessive Speed of Electric Cars.—The fact that cars propelled by electricity are capable of being run at greater speed than other vehicles in the highway, and that the public convenience demands for passengers carried in such cars, what is called "rapid transit," has, it seems, led many electric railway companies into the erroneous notion that their cars may be run at such speed as will satisfy this public demand, and that other persons lawfully using the highway in the customary modes, must govern themselves and use the highway accordingly. While there are *dicta* in some judicial opinions which seem to support these extraordinary propositions, yet, there can be no doubt they are not sound law. Courts and juries and the public generally are beginning to demand that excessive speed of electric street cars, which becomes dangerous to life, shall be stopped. Justice Magie, of the New Jersey Court of Errors, makes the following eminently sound observations upon this question, in deciding the recent case in *Newark Passenger Ry. Co.* v. *Block*: "I am unable to subscribe to the motion which, carried to its logical conclusion, would permit this company, and other companies running cars in public highways propelled by electricity, cables, etc., to run at any rate of speed which they may deem a demand, undefined and unrecognized by law, to require. The right to use the highways by such cars is not paramount to the rights of others in the customary use thereof. It must be used in a manner consistent with such rights of others. Such a paramount right as is contended for could not, in any judgment, be granted without compensation, and it surely cannot be acquired from a vague notion of a public demand for rapid transit. There is no just analogy between the right of a street railway running such cars longitudinally along the highway and the right of a railroad company running its trains across a highway at grade. The latter company acquires by condemnation a right to run its tracks over the lands covered by the highway, and so burdens it with an additional easement. By legislative grant it uses the easement so acquired in the passage of trains run at great speed, and to a certain extent the public easement of passage is at such crossings modified. No grant for the acquisition and use of such additional easement has been made to the street railways, and in the absence of such grants no right to run cars at excessive rates of speed exists. Their only right in this respect is to run at such rate as will not interfere with the customary use of the highway by others of the public with safety."

Electric Railways—Rights of Property Owners. It may be settled beyond dispute that the construction and operation of a street railway by electricity and the erection of poles and wires along the sides of the streets when authorized by law, does not impose an additional servitude on the land, and affords abutting owners no legal ground of complaint nor right to compensation. (*Williams* v. *City Electric St. Ry. Co.*, 41 Fed. Rep. 556, 43 Am. & Eng. R. Cas. 215; *Taggart* v. *Newport St. Ry. Co.*, 16 R. I. 668, 43 Am. & Eng. R. Cas. 208; *Detroit City Ry. Co.* v. *Mills*, 85 Mich. 634, 46 Am. & Eng. R. Cas. 608; *Lockhart* v. *Craig St. Ry. Co.*, 139 Pa. St. 419, 47 Am. & Eng. R. Cas. 57.) The placing of poles in the middle of the street for the purpose of using electricity for street car propulsion does not impose a new servitude on the land in the street; the question whether an additional burden is imposed or not cannot be determined by the motive power employed. (*Halsey* v. *Rapid Transit St. Ry. Co.*, 47 N. J. Eq. 380, 46 Am. & Eng. R. Cas. 76.) Accordingly an injunction will not lie to restrain the construction and operation of such a railway on the ground that no provision has been made for securing such compensation. (*Lockhart* v. *Craig St. Ry. Co.*, 139 Pa. St. 419, 47 Am. & Eng. R. Cas. 57.) The poles necessary to support the wires used are not such an interference with the access to abutting property as constitutes an invasion of private rights, and it cannot be insisted that they are a detriment because in platting lots and selling them it may be necessary to take them into consideration. (*Detroit City Ry. Co.* v. *Mills*, 85 Mich. 634, 46 Am. & Eng. R. Cas. 608.) A temporary injunction to prevent the erection in the street in front of plaintiff's lot of a pole to sustain the wire of an electric motor system for street cars, is properly vacated where plaintiff has no further inducement to press his case, and the effect of the injunction is to obstruct or delay a public improvement or utility. (*Tracy* v. *Troy & L. Ry. Co.*, 54 Hun. 550.) In Michigan, it is said that a land owner has no right to enjoin the use of electricity as a motive power for a street railway unless he can show some present injury to his property therefrom. A mere apprehension that the injury may result in the future is not enough to warrant the issuance of a perpetual injunction. (*Potter* v. *Saginaw Union St. Ry. Co.*, 83 Mich 295.) And where a land owner permits a company operating a street railroad to expend large sums in putting in electrical appliances before he files a bill to prevent its using electricity as a motive power, an injunction will not be issued if the injury to his property, by means of the use of such motive power, will almost be insignificant in comparison with what the injunction will entail upon the company, and he has an adequate remedy at law. (*Potter* v. *Saginaw Union St. Ry. Co.*, 83 Mich. 295.)

An owner of a corner lot who owns to the center of the streets is entitled to no further relief against an electric street railway company, whose track is wholly on the opposite side of the center of the street, which has removed all its poles and wires from in front of such owner's lot, than an order perpetually enjoining the company from thereafter erecting in front of such premises any poles or wires without the consent of the owner. (*Barber* v. *Saginaw Union St. Ry. Co.*, 83 Mich. 299.)

C. E. Loss, of Chicago has bought the Freeport (Ill.) horse line, and intends to convert it into an electric road.

THE COMING CONVENTION.

RECENT MEETING OF THE EXECUTIVE COMMITTEE AT ATLANTA, GA.

The Executive Committee of the American Street Railway Association held a meeting at the Kimball House, Atlanta, January 24, for the purpose of making arrangements for the thirteenth annual convention of the Association, which is to convene in the city of Atlanta, October 17—19, 1894. The members present were: Henry C. Payne, president of the Association, Milwaukee, Wis.; Wm. Stephenson, vice-president, Washington, D. C.; Lewis Perine, Jr., Trenton, N. J.; Thomas H. McLean, Indianapolis, Ind; W. Y. Soper, Ottawa, Can.; Wm. J. Richardson, secretary, Brooklyn, N. Y.

Letters of regret were received from the other members of the Committee as follows: D. F. Longstreet, Denver, Colo.; James R. Chapman, Grand Rapids, Mich.; Edward Whitaker, St. Louis, Mo.

The committee spent the forenoon in visiting the different hotels and proposed places for holding the session of the convention and for locating the exhibits. The Aragon Hotel was selected as headquarters, and it was decided to hold the meetings and have the exhibition of supplies in Machinery Hall at the Exposition grounds, about three miles from the center of the city. The Exposition buildings are ample for all possible exhibits, and one L of Machinery Hall will be partitioned off as a place of meeting. The grounds are reached by two lines of street cars, and by the Richmond & Danville Railroad, whose tracks run directly into the grounds, so that exhibits can be delivered to the Exhibition Hall directly from the cars.

At the afternoon session the following subjects were selected, upon which special committees will be appointed to report:

"A Standard of Street Railway Accounts;" H. I. Bettis, Atlanta, chairman.

"The Best Method of Treating Accidents and Complaints."

"Street Car Wheels and Axles."

"The T Rail Construction of the Terre Haute Street Railway Company;" W. F. Burke, superintendent of the Terre Haute Street Railway Company," chairman.

"Can the T Rail Be Satisfactorily Used in Paved Streets?"

"Suburban Electric Railways."

"Mail and Express and Passenger Service on Street Railway Cars."

The following subject for general discussion was selected:

"Transfers and Commutation," and C. K. Durbin, of Denver, was selected to open the discussion. It was also decided to hold an executive session of the Association, on Thursday morning, the 18th, to which delegates are requested to come prepared to discuss fully, without reserve, any subject relating to the operation and conduct of the street railway business, and of their own roads in particular. It was also decided that not more than twenty minutes should be given to the reading of each paper. A special committee was also selected, consisting of the secretary of the Association, and Lewis Perine, Jr., to prepare a report upon "Street Railway Mutual Fire Insurance." It was resolved in view of the financial condition of the country, that the question of a street railway institute be laid on the table for the present.

T. E. Crossman was selected as official stenographer for the coming year.

It was also resolved, if satisfactory arrangements could be made, to make an excursion to Chattanooga on Friday, following the adjournment of the Association, where an opportunity could be given the delegates to visit Lookout Mountain, the neighboring battle fields, and other attractive features of the location, whence the delegates could return home by various routes.

In the evening the members of the Committee were entertained at a banquet at the Kimball House by the officers and directors of the Atlanta Consolidated Street Railway Company, at which Judge H. E. W. Palmer, presided. There were also present, by invitation, H. I. Bettis, W. A. Hemphill, of the *Atlanta Constitution*, H. H. Cabaniss, business manager of the *Atlanta Journal*, C. B. Fairchild of the STREET RAILWAY JOURNAL, Wm. M. Kingston, representative of the Johnson Company, of Atlanta, and W. Cameron, of Jamestown, N. Y.

A very excellent menu having been discussed, brief remarks were made by the host and some of the guests. The committee were assured of a very warm welcome to Atlanta, and were requested to report to the Association that the local representatives looked forward with a great deal of pleasure to the coming of the convention to Atlanta, and assured them that every possible attention would be shown and every facility provided to make the coming of the delegates to this beautiful city an enjoyable event. It was also mentioned that it was proposed to hold an exposition in Atlanta in September, October and November of 1895, in which every state in the Union would be invited to participate, and also some of the neighboring states of South America, the purpose being to make the exposition second only to the World's Fair.

As an evidence of the good feeling between the sections, it is also proposed to extend an invitation from the Confederate Veterans' Association and the city of Atlanta for the Grand Army of the Republic to hold their national encampment in Atlanta in 1895.

In another column will be found a description of Atlanta and her street railway system. In this connection it may be mentioned that there are many interesting historical points about the city that can be visited. These include the forts and embankments in a good state of preservation, that were occupied during the siege and defense of Atlanta in 1864. Grant Park, one of the public parks, embraces Fort Walker, which is in a commanding position, and in which may be seen several of the cannon employed in the siege, and which are still in position, although the carriages are fast going to decay.

HOTELS.

The Atlanta hotels are ample enough in capacity to accommodate all who may attend the convention, and only regular rates will be charged. The headquarters, as before noted, are to be at the Aragon, which is on Peachtree Street, at the corner of Ellis, adjoining the finer residence portion of the city, and about five blocks from the Union Depot. This hotel is comparatively new, thoroughly furnished, and at present has 100 rooms, but an addition is being erected which will be open in time for the convention, which will contain 100 additional rooms. The rates at this hotel are from $3 to $5 per day, American plan, and from $1.50 to $3.50 per day, European plan. There is an excellent café in connection with the hotel.

The Kimball House is the largest and most prominent hotel in the city, and is located on Pryor Street, opposite the Union Depot, and close to the business center of the depot. The balconies open on to an interior court, and the ledges are very wide, providing ample room for receptions and promenades.

The Kimball House has 450 rooms, with accommodations for 1,000 guests, and the rates are from $2.50 to $5.00 per day, American plan, according to the size and location of the rooms.

There are also several other hotels at which the delegates can secure accommodation. The principal ones are: The Markham House, the Arlington, the Leland, the Marion, the Albemarle and the Cooledge.

Application for space in Machinery Hall for exhibits should be made to Wm. J. Richardson, secretary of the American Street Railway Association, Brooklyn, N. Y. Those who desire to secure rooms in either of the hotels should address Joel Hurt, president of the Atlanta Consolidated Street Railway Company, Atlanta, Ga., or make application directly to the hotels.

Atlanta, Ga.

THE PRESENT HOME OF THE AMERICAN STREET RAILWAY ASSOCIATION.

The fact that the American Street Railway Association is to hold its thirteenth annual convention at Atlanta in October next, makes this city of peculiar interest to street railway men and others engaged in allied industries. Atlanta, the capital of Georgia, is an ideal convention city, and as it is centrally located, with lines of railways radiating in every direction, it can be readily reached from all parts of the country. The distance from New York is 876 miles; from Chicago, 733; Cleveland, 720; Kansas City, 932; Galveston, Tex., 683, and San Francisco, Cal., 2,810. As this is the first time that the Association has convened at the South, managers of street railways in the Southern cities will doubtless attend in larger numbers than ever before. In fact, a number of representative street railway men in the South have already signified their intention to have their roads represented. The same is true of supply men in general. It is probable that the exhibit of street railway appliances will surpass that of any previous convention, while a rare opportunity is presented for Northern manufacturers to meet their Southern customers.

Atlanta is a very interesting city, and has had a phenomenal growth since the war, being not unlike many of the new cities of the Northwest. In public buildings, fine business blocks and beautiful homes, it has few equals, while its location gives it one of the most delightful climates to be found on the continent. It is known as the Gate City of the South, and is the commercial center of a vast region, embracing counties in Tennessee and Alabama, as well as the Northern half of Georgia. It is hard to tell why the city was located here, except that it was the terminal of one of the early steam roads built in the state, but there is no river or other natural feature that would suggest a site for a large city; hence, its growth is doubtless due to the enterprise and hustling qualities of its native and adopted citizens.

The United States Census of 1890 gave the city a population of 68,000, but a later canvass, for the purpose of compiling a city directory, gives the present number at 106,000. A safe estimate is probably in the neighborhood of 100,000, and of this number, about one-third are of the colored race. The latter, however, in proportion to their numbers, patronize the street cars about as much as the white people, and all ride together in the same car, with the rear seats reserved, usually, for the colored passengers.

As a street railway town, Atlanta leads all the Southern cities, with the exception of New Orleans, and it is this feature in which we are now especially interested. The aggregate trackage for the city and immediate suburbs is about 100 miles, and the lines are operated by three companies with electric power, with the exception of a short dummy line.

THE ATLANTA CONSOLIDATED STREET RAILWAY COMPANY

operates sixty-three miles. This company was formed by the consolidation of several other lines in 1891, and the management of the system is in the hands of Joel Hurt, president, with E. Woodruff, vice-president; T. K. Glenn, secretary; R. J. Lowry, treasurer, and H. N. Hurt, superintendent. Mr. Hurt, the president, is also interested in a number of other large industries in the city and state, and is regarded as one of Atlanta's most progressive citizens. To him Atlanta is greatly indebted for some of her fine blocks and public improvements.

The first electric car was run in Atlanta on August 24, 1889. Other construction followed rapidly after this, until all the lines in the city limits had been rebuilt. The Consolidated Company now operates forty cars over twelve divisions, all of which are run on a fifteen minute headway. The electric cars from the different lines meet at a common center at the corner of Broad and Marietta Streets, where the tracks are connected by a very complicated piece of special work, illustrated in Fig. 3, which was designed and built by the Johnson Company.

Various types of rails have been employed in the street construction on the different lines, including the T rails, the Providence girder and other types of girder rails, including section Y. The prevailing type, however, is a forty-five pound section D, of the Johnson girder type. The T rail in the paved streets rests on wooden

FIG. 1.—THE ARAGON—ATLANTA.

THE OFFICIAL HEADQUARTERS OF THE ASSOCIATION.

stringers, and in the suburbs is spiked directly to the ties. In the construction with granite block paving the upper edge of the stringer is chamfered off, and the lower inside corner of the block is removed, so that the pavement comes flush with the rail when laid, and the flange of the wheel makes its own groove by pressing down the blocks (Fig 4). The stringer construction is standing up exceedingly well, but the standard for future construction is the electric girder rail with the Johnson standard joint. Very good success has also been had with the Providence girder rail, with which a very long cast iron joint chair has been employed, which was designed by the engineer of the company. In all recent construction the ends of the rails have been butted together, leaving no space for expansion. Owing to the long headway, the rail joints on the various lines do not give as much trouble as is experienced in other cities where a two or three minute headway is the practice.

The rolling stock of the Consolidated lines consists of cars manufactured by a number of different makers, including those made by Stephenson, Brill, Pullman and Jones. There is also one car which was made by the Fiegal Car Company, which is kept as a special car and chartered to excursion parties. This car is finely finished, and was exhibited at the New Orleans Exposition some years since. The company has recently refitted some of

the ten foot horse cars which are equipped with a single motor without a motor truck. These cars are to be operated on one of the suburban lines, without conductors, fare conveyors and boxes being employed. One or two of the large cars are also equipped with conveyors, which save the expense of a conductor, and on some of the lines two conductors collect the fare for three cars, changing off at certain points. Most of the cars are mounted on Bemis trucks, and the company manufactures its own wheels.

The principal power station, from which most of the lines are operated, together with two of the car barns and repair shops, is located in an open field, three miles from the center of the city, near the Exposition buildings, being seven miles from some of the terminals to which the power is transmitted. The station is on the line of one of the steam roads, and from this coal is delivered directly into the boiler room. The power station and principal car barn are of brick, while other buildings are of wood. These are equipped with an automatic sprinkling device, as a protection against fire. There are a foundry and two small oil houses, which are built of brick, and which are detached from the other buildings.

FIG 2.—GRADY MONUMENT AND POST OFFICE—MARIETTA STREET, ATLANTA.

The present power equipment consists of two Cooper engines of 300 H. P. each, which are run at ninety revolutions, and from which the power is transmitted by means of leather belts to a forty foot countershaft, and from this, in both directions, to seven generators, which are of the D 62 Thomson-Houston type. Munson belting, and also belting manufactured by the Southern Belting Company, of Atlanta, is employed. One of the engines is provided with two eccentric levers, so that the intake and exhaust valves are operated separately, resulting, in the opinion of the station engineer, by whom the second rod was applied, in an improved service. There is no reserve power, both engines being constantly run. The boiler equipment consists of three return tubular boilers of 125 H. P. each, which were manufactured by the Bigelow Company of New Haven, Conn. The fuel consists of Jellico (Tenn.) and nut slack coal, which costs, delivered, $1.75 per ton.

It is the intention of the company to increase the capacity of the station in the spring, by the addition of a 500 H. P. engine, coupled direct to a 500 K. W. generator, and by replacing the present generators with two of 300 K. W. capacity, which are to be belted direct from the present engines.

The company is at present manufacturing nearly all its own supplies, including car wheels, gears and trolley wheels, and nearly all the appliances with which the work is done have been designed by the chief engineer of the company, Thomas Elliott. These include many ingenious devices not usually found in private foundries, together with a foundry practice that is exceedingly interesting, and which, if copied, will doubtless prove of great value to the street railway interests at large. The foundry is a plain building, 40 × 40 ft., and the cupola appliances are rather crude, but the flasks and moulding apparatus are of a high order. The car wheels are cast in iron flasks with home made chills, the material being scrap and enough pig iron to make a durable metal. The proportions employed are about 400 lbs. of scrap to 200 lbs. of pig iron. Two annealing pits and cranes for handling the wheels are provided, and the output is about twelve thirty inch wheels every two days. The wheels are provided with a thicker flange than is usually found on commercial wheels, and so far, the home made article is giving very excellent service, the life averaging from five to seven months. The motor wheels weigh about 300 lbs. and cost about $3.00 each. In the opinion of the engineer it does not pay to grind down the treads of old wheels. Very little trouble has been had so far with slid flat wheels, only one pair having been taken out for this cause. A hard brake shoe is employed, and the motormen are instructed never to skid the wheels. The axle gear wheels are cup shape, cast solid, with a five-eighths inch web, and after being bored out are pressed on to the axles. In the process of moulding, an iron pattern is employed, which is made about a quarter of an inch large to allow for shrinkage. The sand being packed about the pattern, a brass ring with corresponding gear teeth is placed on the surface, and the mould is removed by means of a tripod screw jack, the feet of which rest on the ring, while the lifting rod is inserted in a threaded opening cut in the center of the pattern. By this means the pattern is lifted from the mould without wrapping, which leaves the sand so smooth that the gear teeth do not require cutting. The solid gears of this pattern weigh about seventy pounds less than the commercial split gears, and so far are giving excellent service. It is found that the gears usually outlast three sets of wheels, but in case a gear is broken, the split gear is supplied until it becomes necessary to renew the wheels, when a new gear wheel is pressed on. Pinion blanks are bought, and the teeth are cut in at the company's machine shop, by means of a home made gear cutter, which is supplied with two circular cutters, which are worked in train, and finish the cut at one passage.

The mould for casting trolley wheels is of iron, and made in three parts, each of which is provided with handles. The metal having been poured in the mould the upper part of the mould is lifted off and the split ring which forms the groove is removed, when the casting rolls out and

the parts are adjusted for a second pouring. By this means the trolley wheels are cast about as fast as old time hunters moulded the bullets for their rifles. The casting is very smooth, and much more durable than when cast in sand, the theory being that the iron mould chills the metal somewhat. Other small castings besides trolley wheels are also made, including the armature and axle bearings.

The brasses for the armature bearings are cast with an eccentric shell which is about a quarter of an inch thick on top, and half an inch on the bottom side. This shape, it is claimed, gives about three times the wear of the usual bearing, or three-sixteenths of an inch in place of one, usually allowed. When first put in service, the armature is mounted close to the upper field, and as the box becomes worn the shaft comes to the center, and can be run until the armature approaches the lower field.

The frame bearing brasses also differ from those ordinarily employed. These are cast in the form of a sleeve which embraces the axle from the gear wheel to the opposite car wheel, the ordinary collar next the wheel being omitted, thus furnishing a stationary bearing for the gear cases, giving a dusttight fit and reducing wear. This sleeve is turned to fit the axle, and is provided with an oil cup on the upper side, which introduces the lubricant, and is so arranged that the waste oil is led directly into the gear case. The gear cases are cast of composite metal of old scrap which makes them light and durable.

In winding the armatures, the insulated wire is first thoroughly waxed, which, it is claimed, improves the insulating qualities and makes a more durable motor. Insullac is employed for covering the wires, and the armature is not baked.

The above are some of the shop kinks that are employed, with a view to economy in repairs, and strikingly illustrate how a little ingenuity, properly applied, renders a company comparatively independent.

The tool equipment of the repair shop consists of two lathes, one a thirty-four inch machine of Fay & Scott manufacture, and the other an eighteen inch, manufactured by Lodge & Davis; one 24 × 24 in. planer of the same make, and one twenty-four inch, back gear drill press. There is also a hand drill press and a Watson & Stillman wheel press. In the opinion of the engineer, a wheel press is an important adjunct to a repair equipment, and he thinks it would pay any road running six cars or more to employ a cheap wheel press. There is also a gear cutter, as described, and a number of small tools. For boring out the axle sleeves, a rod with right and left threads is employed, which runs out the shavings made by the cutting tool in both directions. The shop tools are operated by a ten horse power stationary motor. Axles of iron are considered preferable to those of steel, and so far the company has had only one broken axle. Tracks are provided for communication between the different buildings at the station, on which a small electric flat car is run for the purpose of transferring parts to and from the repair shop.

EMPLOYES.

White men only are employed for motormen and conductors, and their pay is twelve cents an hour, and they work fourteen hours per day. The track laborers are mostly colored men who receive $0.80 to $1 per day.

FIG. 3.—CORNER BROAD AND MARIETTA STREETS, ATLANTA, GA.

The fare is five cents, except on the dummy line, which runs to the neighboring town of Decatur, seven miles distant, upon which ten cents is charged, unless tickets are purchased, which, in lots of fifty, are sold at five cents. No transfers are given, except in connection with this dummy line.

The Atlanta Traction Company, which is under the general management of T. B. Felden, president, controls about nineteen miles of track, and operates ten or twelve motor cars which are equipped with the Detroit and Edison motors.

The Collins Park & Belt Railroad Company, under the management of J. W. Darr, receiver, operates fifteen miles of track with nine cars which are equipped with Short motors. Particulars of these systems will be given in our March issue.

PAVING.

About fifty miles of Atlanta streets are paved with granite blocks, the material for which has been furnished from neighboring quarries, making the cost exceedingly low, which at present is about $1.50 per square yard, or, at least, this is what the street railway company is required to pay the city for paving its portion of the street. The blocks are mostly laid on a sand foundation which does

not produce as even a surface as when laid upon a concrete foundation, as is now the practice in most of the Northern cities. There is also considerable asphalt paving, and on the street car lines this is laid, in some cases, with granite blocks next the rails which are toothed into the asphalt. In some of the recent construction the blocks

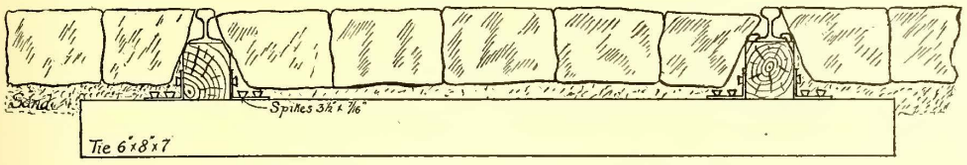


FIG. 4.—CROSS SECTION OF TRACK—ATLANTA CONSOLIDATED RAILWAY.

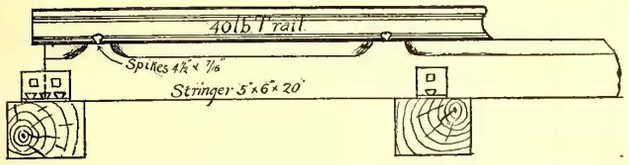


FIG. 5.—LONGITUDINAL SECTION OF TRACK—ATLANTA CONSOLIDATED RAILWAY.

are omitted, and the material is laid against the rails. The county authorities are paving some of the streets just outside the city limits with chert paving. This consists of a foundation of broken stone surfaced with chert, a silicious material quarried in the northwestern part of the state. This material has cementing qualities, and after being put in service becomes hard and smooth.

The granite quarries of Georgia, it is claimed, produce a material far superior for paving purposes, to the New England granite. From these quarries paving material is provided for most of the Southern cities, and to cities as far North as Cincinnati, Columbus, and Dayton, O. The principal quarries are located at Lithonia and Stone Mountain, about twenty miles east of Atlanta.

Stone Mountain, is conceded to be the largest deposit of merchantable granite to be found in the world. The mountain proper consists of a black, mottled, dome shaped rock, entirely denuded of vegetation, 1,400 ft. in height and seven miles in circumference at the base, and on the north the side is very steep It is estimated to contain over 7,000,000,000 cu. ft. of exposed granite above the surface level of the surrounding plain. The rock is free from impurities, and lies in regular, heavy, vertical masses and sheets with a splenrift, and capable of being quarried in enormous dimensions. At Lithonia there are about 500 acres of exposed granite, and being in an exceptionably favored position, the stones are quarried for 20 per cent. less than can be done elsewhere. As now worked, the Stone Mountain quarries have an output of 25,000 paving blocks per day; and those at Lithonia a capacity of 30,000, both of which outputs can be increased to an almost unlimited extent. The rock, as here found, is of a light gray color of uniform grain, free from lamination, and is adapted to all kinds of structural and street work. The entire deposit is owned by the Venable Brothers, of Atlanta, who have provided every facility for prosecuting the work and transporting the product to the shipping stations. It is estimated that there are over 1,000,700,000 sq. yds. of granite paving laid in the different cities, material for which has been supplied from these quarries, and the supply is seemingly sufficient for any demands that may arise for centuries to come.

FIG. 6.—GRANITE QUARRIES NEAR ATLANTA.

New Cars for the Philadelphia Electric Lines.

The contracts for the cars for the People's Traction Company and the Electric Traction Company, of Philadelphia, were given out last month. The closed cars of the former will be 125 in number, and will be built by the St. Louis Car Company. All of the cars will be high and easy of ventilation. The doors will be double and four feet six inches high in the clear, giving sufficient space for tall men to enter without striking their hats. The cars will be finished in mahogany, and the seats of spring rattan, covered with red plush. The cars will be twenty feet long inside, seating, comfortably, twenty-eight passengers. Each car is to be lighted by ten electric lights, arranged in three clusters. There will also be a light on each platform.

The open, or summer cars, ordered number 165. The St. Louis Car Company will build 125, and the Lamokin Car Company forty. Their design will be alike. These

cars will be ready in the early summer. They will be twenty-eight feet long over all, with ten reversible cross seats.

Both closed and open cars will be mounted on four wheel trucks, supplied by the J. G. Brill Company, and the Peckham Motor Truck & Wheel Company. All of these cars will have double motor equipments. One-half of the winter cars will have double motor equipments furnished by the General Electric Company, and the other half double equipments furnished by the Sperry Electric Company.

The forty closed cars which the Electric Traction Company has ordered from the Pullman Company for the 10th and 11th Streets line, will be of the same general design and color as those now running on 13th and 15th Streets. Inside they will be eighteen feet long, and over all twenty-six feet.

The trucks will be of the McGuire Columbian pattern. Two General Electric motors, of twenty-five horse power each, will be used on thirty of the cars, and two Curtis motors, of thirty horse power each, on ten of the cars.

A New Anti-Oscillating Device.

End oscillation or rocking is one of the greatest difficulties that truck builders have to contend with in the present day of long car bodies, and an inspection of the leading patterns of trucks will show the various devices adopted to obviate this difficulty.

We illustrate herewith a device recently patented and put in operation on one of the cars of the North Side Railway Company, Fort Worth, Tex. This attachment is the invention of Geo. B. Hendrix, general superintendent of that road, and B. F. Chollor, of the same city, and as shown is exceedingly simple in construction. It consists essentially of a pair of double levers, one on each side of the car, which are hinged in the center and fulcrumed over the boxes. The outer ends of the levers are attached to the ends of the car body by means of spring brackets as shown. By this very simple device, it may be seen that one end of the car cannot move up or down without the other end moving in the same direction, thus effectually obviating all tendency to rock. The device has recently been applied to one of the worst "rockers" on the company's line, with the effect to entirely obviate that trouble. The patentees claim for this invention that it permits the use of very short trucks, simplifies the manufacture by doing away with extension tops, extra spring, etc., extends the life of the car body and absolutely prevents rocking.

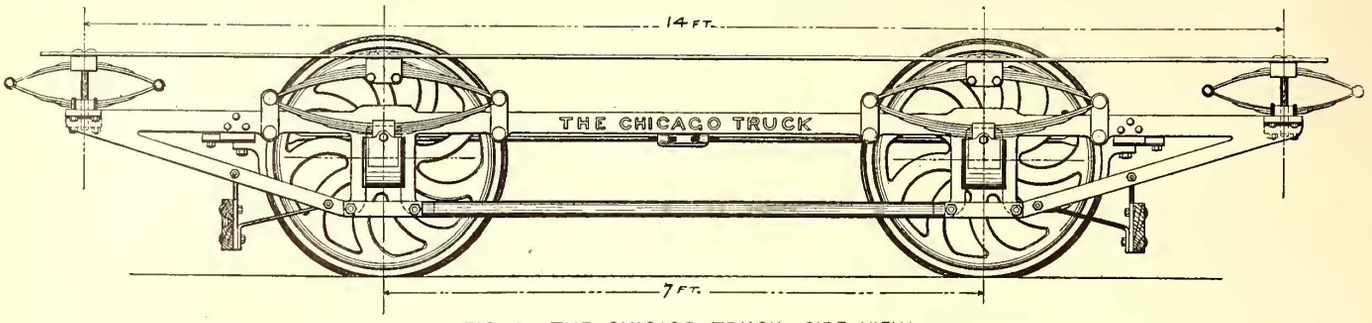


FIG. 1.—THE CHICAGO TRUCK—SIDE VIEW.

A New Truck.

The Chicago Electric Truck Company has entered into the manufacture of high class electric motor trucks. Its line will embrace five styles, under patents of Geo. H. Graham. The illustrations show this company's No. A truck which is designed to meet the varied conditions and requirements of electric railways, especially as to simplicity, durability and economy of operation.

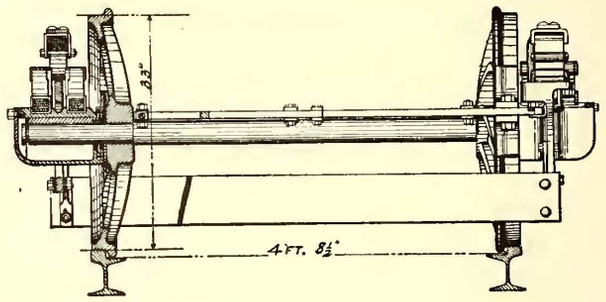
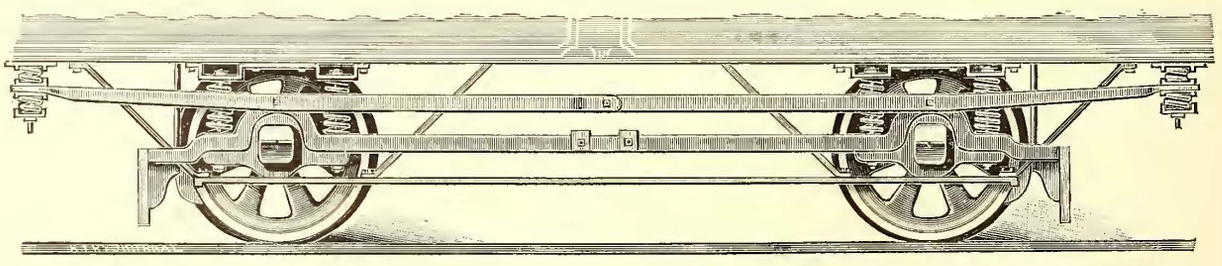


FIG. 2.—CROSS SECTION OF CHICAGO TRUCK.

The truck, it will be noticed, is extremely simple, having a solid forged steel frame, with long cantilever extensions, no castings and few bolts. This truck also permits of easy access to motors and the ready removal of wheels. The entire weight is cushioned on the axle boxes by the springs, thereby adding greatly to the life of both rolling stock and permanent way. The main springs are each composed of three half elliptics, two of which are placed a distance apart and rest on the axle box, with the frame passing over the box between them, while the third is inverted over the frame, and its ends are brought between the ends of the lower springs and held by the same pins or bolts. Two links or hangers, acting as washers to separate the adjacent ends of the three half elliptic springs forming the group, are suspended from the pins, and carry the upper bar of the main frame.

The makers claim that this truck will carry a longer car without oscillation, or the same car with less oscillation than any other on the market, because the frame, instead of being cushioned by spiral springs on the axle boxes, which would allow it to rock or oscillate on the axle box as a fulcrum, is suspended by half elliptic springs which gives it an extended support, so that a fifteen foot spring base can easily be used with a seven foot wheel base. The weight of the car body does not come on the main frame, except the portion borne by the end elliptic springs, but is transmitted directly to the axle boxes



NEW ANTI-OSCILLATING DEVICE.

through the combination springs, preventing strains and allowing the use of a lighter frame. Oscillation is destroyed where it begins by the arrangement of the springs. When the wheel passes over an obstruction or uneven rail joint, and is forced upward, the lower half elliptic springs, by which the frame is suspended, are compressed and therefore lengthened in relation to the frame, and the upper half elliptic springs, being on the same pins, are also lengthened, which would cause their centers, where the car body rests, to lower. This is compensated by the slight rise at the ends of the springs, due to the upward pressure of the lower springs, so that, in fact, the car body remains in the same relation vertically to the rail, and the tendency to oscillate is overcome. These springs are so constructed that this action does not interfere with the independent movement of the car body and truck frame unless the motion is imparted by the wheels, as above described.

The Works of the Barney & Smith Car Company.

The work of the Barney & Smith Car Company is well known in many sections of the country through the handsome cars supplied from its factory to different roads. We illustrated in our last issue a car built by the company for the Dayton & Soldiers' Home line, in Dayton, as a sample of the high grade of work which this company is turning out regularly. The extent of the business of the Barney & Smith Car Company can be readily gained from an inspection of the accompanying engraving, which is a birdseye view of the works of the company at Dayton, O.

Characteristics of the Barney & Smith cars are their durability and high finish. The Barney and Smith truck was also illustrated in our January number.

THE Egyptian government will award a contract for a tramway from Mansourah to Menzaleh with local branches.

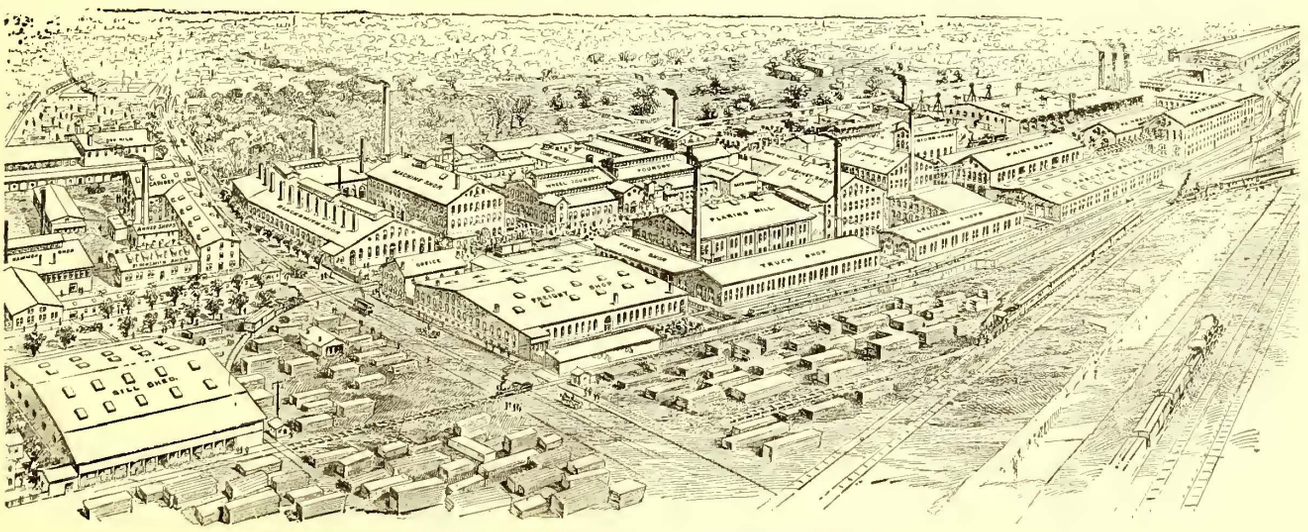
Car for Bangor, Pa.

The accompanying engraving shows one of a number of cars now being built for the Bangor, Pen Argyl & Water Gap Electric Railway, of Bangor, Pa., by the J. W. Fowler Car Company, of Elizabethport, N. J. These cars are tastefully trimmed and decorated, and present a very handsome appearance. They are twenty-eight feet eight inches in length over all, with sixteen foot interiors and vestibules four feet two inches in length. The side sills are so arranged that the car bodies rest directly on the truck without blocking, and the vestibule platforms are constructed in such a manner that the steps are only thirteen inches above the track.

ELECTRIC CAR FOR BANGOR, PA.

The roofs are of the monitor type with rolled glass lights, and are provided with four steel carlines, $\frac{3}{8} \times 1$ in., extending across the car and bolted at each end to plate rails. The inside wood work is of ash and cherry finished in natural colors. The ceilings are of maple decorated with delicate scroll work of aluminum. Bronze trimmings are furnished throughout. The seats are upholstered in Wilton carpet, and the floors are provided with floor trap doors, affording easy access to the motors.

The vestibules have two stationary windows and three drop sashes, and are furnished with doors for winter and folding gates for summer. The inside wood work is of paneled ash and cherry, finished in natural colors. The main panel is painted with granite red with gold scroll work ornaments, and gold number shaded with carmine and two shades of green. The striping is of gold edged with black, with fine line of white. The cove panel is of white with ornamented aluminum letters edged with



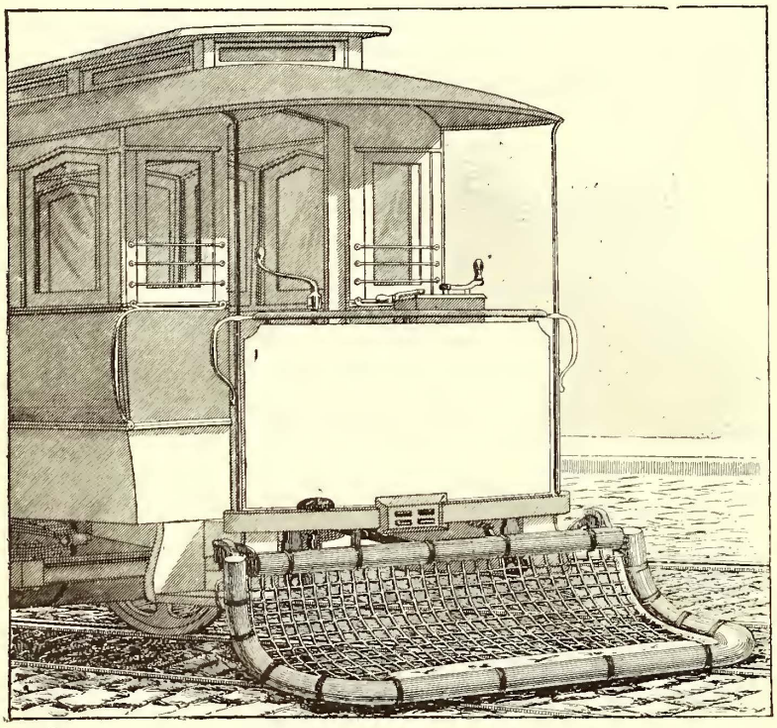
WORKS OF THE BARNEY & SMITH CAR CO.

black and shaded with two shades of green. The steps and sills are painted drab with Tuscan red striping, and the entire car is finished with three coats of varnish. Each car is provided with ratchet brakes, two De Witt sand boxes, radial drawbars, couplers and head-lights.

A New Type of Fender.

The accompanying engraving shows a new type of car fender, which has given excellent results in trials in Baltimore, and is manufactured by the Leonhardt Pneumatic Safety Car Fender Company of Baltimore, Md.

The fender is composed of a strong iron frame, cradle shaped, extending the full width of the car and hooked to the front platform, as shown. Its edges are bound, front, side and top, with three inch pneumatic tubing, or air cushions, with a pliable rope net stretched across the



NEW TYPE OF FENDER.

frame. All parts are interchangeable and adjustable, so as to be easily fitted to any car. If repairs should be come necessary, they can be made without any delay to the car, for the fender can be unhooked and replaced by another is less than two minutes. The great advantage this fender possesses over all others is the pneumatic tubing or air cushioning, which is generally admitted to be the best substance human ingenuity has been able to devise, to yield a soft cushioned blow.

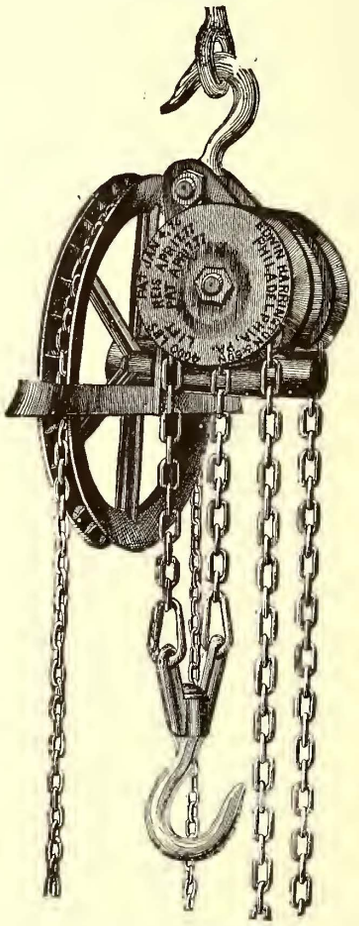
The height of the front edge of the fender, above the street level is adjustable and ordinarily measures two and a half to three inches. Owing to the up and down motion, the fender when struck by an object drops to the ground, and is held there by a self locking device until released by the motorman, thus compelling the object to drop or roll over into the netting and remain there until the car is stopped. In addition to this automatic device, the motorman can by placing his foot upon the treadle, press the fender down and lock it at the same time. When the fender is thus down, two rollers attached to the under side run along the track, preventing the fender from wedging itself under the car.

At public tests in Baltimore and Washington, a number of men and boys were run down in various positions and picked up by the fender without the least scratch or bruise, while the car was running at a speed of from eight to twelve miles an hour.

Double Chain Screw Hoists.

Our illustration shows the Harrington double chain, screw hoisting machine manufactured by Edwin Harrington, Son & Company, Incorporated, builders of iron working machinery, of Philadelphia, Pa. These hoists are made weighing from 35 to 925 lbs., to lift from 500 to 20,000 lbs. The hooks and worms are all of steel, as are all the smaller sizes of worm gears. All the worms and worm gears are cut and turned to templates. The chains are made with extra care. A double chain is always used as a protection against accidents.

The care in selection of material and excellence of the product have led to the adoption of these hoists by the United States Government as the best article of the kind on the market. A recent letter to this company from the Berlin Iron Bridge Company, signed by its president,



DOUBLE CHAIN SCREW HOIST.

states that a number of these hoists are in use in the shops of that company, and that this company has no hesitation in saying that they are the best in the world, the best it has ever used. That these machines have a world wide reputation is shown by the fact that among recent exportations several have been sent to the mining companies of South Africa.

Rumors of a Consolidation in Baltimore.

Rumors of a scheme to consolidate the Baltimore Traction Company, the City Passenger Railway, the City & Suburban Railroad Company and the Lake Roland and the Central Railway lines, in Baltimore, were current last month. The total capitalization of the consolidated companies would be about $12,000,000. The scheme proposes a single set of officers, with an executive board composed of representatives of each company in the combine.

THE West End Street Railway Association has been organized, and will hold meetings the third Wednesday of each month. The officers are: President, J. M. Studley, Jr.; vice-president, Paul Winsor; treasurer, J. N. Neal; secretary, N. P. Quick.

An Independent Air Pump and Jet Condenser.

The apparatus shown consists of an independent air pump and jet condenser of large capacity. The exhaust steam from the main engines, pumps, etc., is admitted into the top of the condenser, and on its descent is met by a fine spray of cold water coming in the opposite direction through a copper spray pipe. The complete mechanical mixture of the steam and injection water is obtained. The water deprives the steam of nearly all its latent heat, condenses it, and a vacuum is formed. The air pump removes the condensed steam and injection water from the condenser, the action being continuous. The condenser is provided with the Davidson vacuum breaking device, consisting of a copper float and valve, opening to the atmosphere. Should the water in the condenser rise above a safe level, the ball float, acting on the valve, secures the immediate connection with the outside atmosphere, which destroys the vacuum in the condenser, and stops the flow of injection water. It is, consequently, impossible for the water to back up and prime the engine cylinders and cause the serious damage so common in some forms of condensers. With this machine a great saving in fuel or an increase of power can be had at a small cost where water is available.

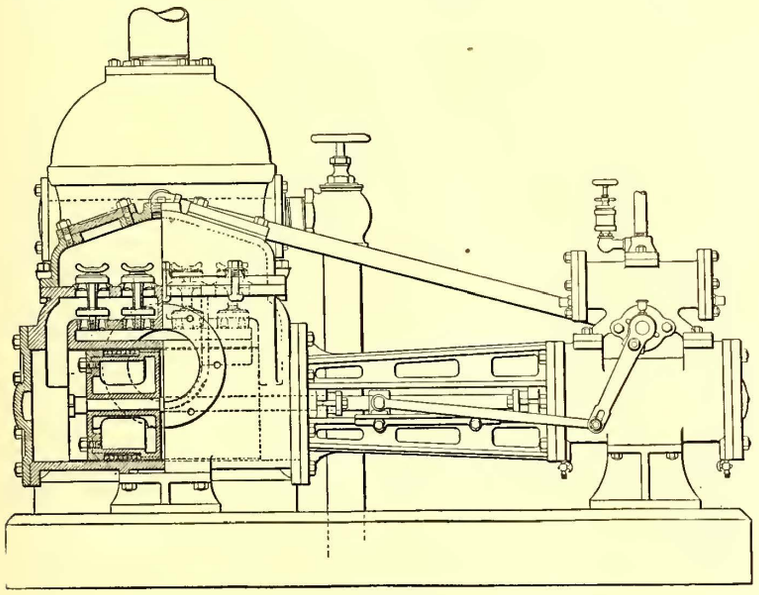


FIG. 1.—SIDE VIEW OF DAVIDSON AIR PUMP AND CONDENSER.

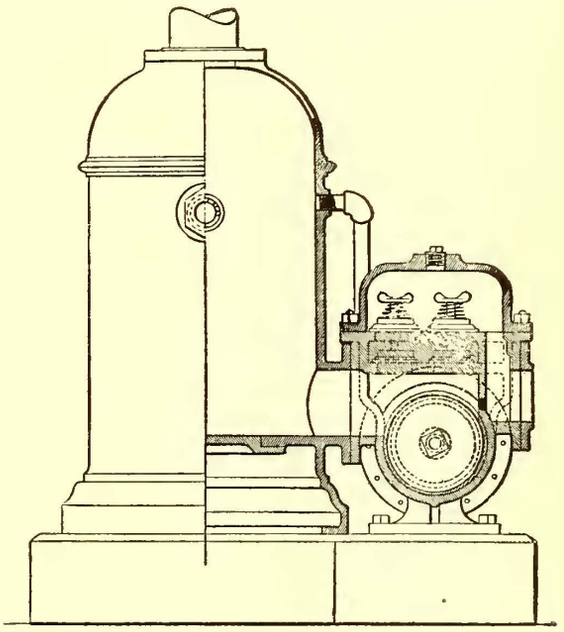


FIG. 2.—TRANSVERSE SECTION OF AIR PUMP AND CONDENSER.

When the steam in an ordinary non-condensing or high pressure engine has performed its work in the cylinder, it is ejected into the atmosphere against atmospheric pressure; it is usually reckoned at fifteen pounds per square inch. It is a well known fact that this resistance, together with the back pressure in exhaust passages and pipes, is just so much power taken from the steam on the engine piston. This condenser removes the back pressure and forms a constant vacuum, equal to thirteen or fourteen pounds per square inch, on the exhaust side of the piston, and the steam can, consequently, be expanded to nearly the absolute zero of pressure, thereby obtaining its full expansive power. By the application of this condenser an increase of from 25 to 30 per cent. in power is guaranteed. Where additional power is not required, a saving in fuel of 20 to 25 per cent., or a great reduction in boiler pressure, may be obtained. This, in many cases, is very desirable. The condenser has been tested under varying conditions, and its superior qualities fully demonstrated. The power required to operate this condenser and air pump is claimed to be not more than 2, or perhaps 2½ per cent. of the engines connected to the condenser, against 5 to 7 per cent. in the ordinary condensing engine with its air pump a component part, and this power is not taken from the engine, but direct from the boiler.

The quantity of injection water required depends upon its capacity for cooling, which is governed by its temperature. In this latitude the water required for this condenser will be about twenty to twenty-five times the amount required for the boiler, and the condensing water, after leaving the condenser for the hot well, should be about 100 degs. temperature, which can be used for boiler feeding.

When a close heater of any pattern is already located, it need not be laid aside, as it will act as a surface condenser between the engine and the independent condenser, and increase the temperature of the feedwater so it can be returned to the boiler at a temperature of about 150 degs.

A single condenser can be used for two or more engines, pumps, etc., one or all of which may be stopped without interfering in the least with the action of the condenser. Being wholly independent of the engine, it can be started to free the cylinder from water, and form a vacuum before starting the engine. In its operation it assists in regulating the running of the engine, particularly when the load is variable.

This condenser requires no steam pump (which is required in some forms of condensers) to lift its injection water. It will lift from any point that can be reached by pumps in general use. It requires no attention whatever beyond starting and stopping. Once started, and the steam and injection water adjusted, the apparatus is automatic. It can be set up by any mechanic, it being only necessary to select the most convenient place for water connections and lead the exhaust from the engine to it. In most cases it requires no masonry foundation. It occupies but little more floor space than a common steam pump. It is noiseless in its operation, and its location in the engine room is entirely unobjectionable. It can, by the use of two gate valves or a three-way cock, be shut off at will, leaving the engine simply non-condensing, and by the use of the Davidson automatic exhaust relief valve, this change can be made automatically.

The Davidson independent air pump and jet condenser is in use in many prominent electric street railway and power stations, notably the Ishpeming Street Railway Company, Ishpeming, Mich.; Wilmington Street Railway Company, Wilmington, N. C.; Utica Street Railway Company, Utica, N. Y.; Toronto Street Railway Company, Toronto, Can., and the Akron Electric Light Company, Akron, O.; Erie Electric Light Company, Erie, Pa.; Oskosh Electric Light Company, Oskosh, Mich.

This apparatus has given very satisfactory results in every case where it has been adopted, and the manufacturer, M. T. Davidson, Brooklyn, N. Y., finds business extremely good.

A New Roller Bearing.

The subject of roller bearings is an old and well worn one in the mechanical field, yet there is an immense range of adaptability and use open to a durable, cheap and practical bearing of this form, for aside from first cost and complication, the questions of friction, wear of parts and consumption of oil are decidedly in favor of the roller bearing.

We present herewith illustrations of a new bearing of this class, that seems to possess a number of features of merit. This bearing is known as the Hyatt roller bearing, and is manufactured by the Hyatt Roller Bearing Company, New York. This bearing is adaptable to all kinds of machinery, although its greatest ability is claimed for steam and street car and trolley bearings.

One great point claimed by the makers of this bearing in its application to steam and surface roads is the very small resistance to starting, thus saving the great wear on motors, cables, etc. The end thrust of the axle has been found by experience to be but slight and easily carried by the cap of the box, as shown in the cut.

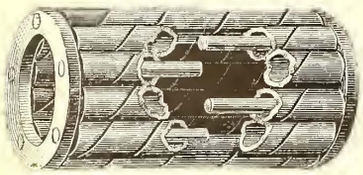


FIG. 1.—ROLLER BEARING FOR TROLLEYS.

When used for bearings where the pressure is light, the rollers are interposed between the cast iron inner surface of the box and the shaft. Where the pressure is heavier, as on car boxes, etc., spirally wound sleeves of the same material as the rollers are placed over the journals and as a lining for the boxes.

The spring rollers are made of a spirally wound ribbon of homogeneous steel and are not specially hardened, it being claimed by the makers that owing to the large surface in contact, due to the elasticity of the roller and the rolling friction, that this is not necessary. This greatly cheapens the manufacture and allows the shafting bearing to be placed on the market for the same, and the car box at a slightly higher price as the ordinary babbited form. The rollers have some longitudinal spring, giving perfect contact with the shaft and obviating the tendency to work out of parallelism, and thereby wear either at both ends of the box or the middle of the shaft, a fault so common in rigid roller bearings. The rollers are held in place by guides consisting of light rings at either end, with pins of smaller diameter than the inside of rollers projecting from them.

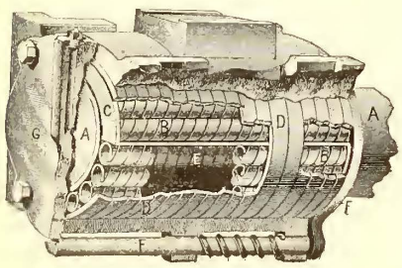


FIG. 2.—ROLLER BEARING FOR CAR BOXES.

The question of wear is very small, as a set of bearings run for 5,000 miles under a car of the Paterson Central Road, showed a wear of but two one-thousandths of an inch on the rollers. In case of wear either the lining or the roller may be easily removed and replaced with new ones at small cost. A trolley bearing of this pattern on the Brooklyn City road has outlasted two sets of ordinary bearings and is still good. This company has also had a set of its bearings running for five months on the jackshaft in the Edison lighting station, at Paterson, N. J., and giving great satisfaction. A set of these bearings applied to a transfer table at the 50th Street station, of the Broadway road in this city, enables one man to move it, where before four were required.

The boxes as shown in our illustration are made to fit the pedestals of all the well known forms of trucks.

The municipalities of Ekaterinoslaw and of Elisavetgrad, Russia, propose to grant franchises for the operation of tramways on their respective territories.

The New Castle Car Manufacturing Company.

The New Castle Car Manufacturing Company has had a remarkable success since it commenced operations two years ago. The company's works have turned out a large number of handsome, well built and durable cars which are now running on some forty different lines, some of them being the best known in the country. This company's trade has not been confined to any one section or state, but the lines on which its cars are running are widely scattered throughout the United States. The company was forced by the number of its orders to double its capacity in the spring of the year 1893. At this time the present painting department, with all the modern improvements and necessary conveniences for getting out things promptly and in first class style, was constructed. The company's rapid progress had been uninterrupted until the recent fire at its works, mentioned in our last issue, which completely destroyed the planing mill and machinery shop. The company is now building a much more extensive mill, and is equipping it with all the necessary machinery for a high grade of work. This mill, it is expected, will be in operation by February 1, at which

F. A. HOVER,
GENERAL MANAGER, NEW CASTLE CAR COMPANY.

time the company will be better equipped than ever for turning out first class work in the least possible time.

The company is composed of young men who are enterprising and anxious to establish a reputation surpassed by none. The general manager of the company, F. A. Hover, whose portrait we present herewith, was one of the organizers of the company, and to his enterprise and ability the success attained is in large part due. Mr. Hover was born in 1865, near Jamestown, Pa., and graduated with honors at Westminster College in the class of 1887. Mr. Hover then moved to New Castle, Pa., where he was engaged for some time in the study of law, but being attracted by the activity of business life, opened one of the largest carriage and wagon repositories in the city of New Castle. The year following, Mr. Hover, with a number of others, organized the New Castle Car Company. Mr. Hover is also prominent politically, and has been a member of the New Castle Common Council.

Two of the cars recently turned out by this company were illustrated in our last issue, one being for the Wheeling, Martin's Ferry, Bridgeport & Bellaire Street Railway Company, and the other for the Norristown & Bridgeport Railway Company. These cars are tasteful in finish and have attracted much favorable comment.

At a meeting of the New Castle Car Manufacturing Company, held last month, the following were elected officers of the company for the ensuing year: President, S. P. Emery; vice-president, G. W. Buffinger; secretary and treasurer, E. N. Baer; general manager, F. A. Hover.

A Swiss aluminum manufacturing company is reported to have reduced its price for aluminum to forty-five cents per pound.

A New Line of Overhead Appliances.

Fig 1 shows the type "W" trolley clamp recently put on the market by the Ohio Brass Company, of Mansfield, O. This clamp, which is especially designed for heavy traffic, consists of two jaws of bronze metal hinged on an interlocking pin which passes through the enlarged head of the stud bolt. The clamping effect is secured by

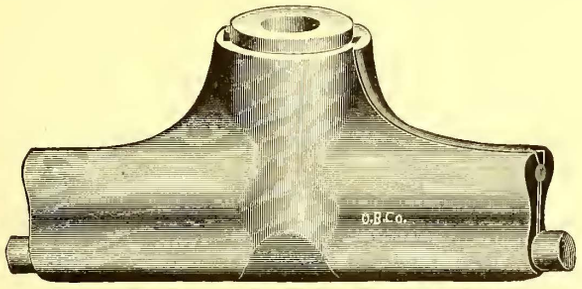


FIG. 1.—TROLLEY CLAMP COMPLETE.

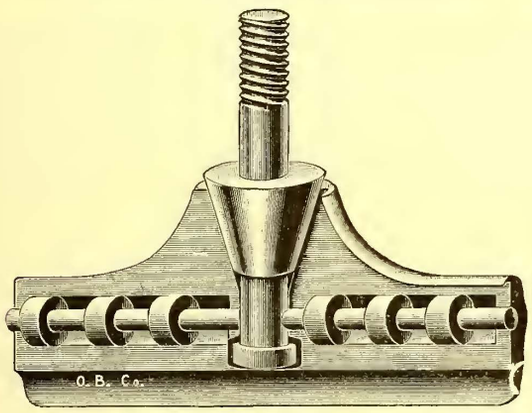


FIG. 2.—WITH SIDE DETACHED.

screwing the insulator on the stud, which forces the cone-shaped wedge down and spreads the upper part of the jaws apart, thus securely gripping the wire.

The great objection to mechanical clamps, that of causing the trolley wire to spark when passing over it, has been overcome without sacrificing the strength of the clamp. By partially unscrewing the cap of the insulator the clamp can be adjusted or entirely removed from the trolley wire. Its length is four and a half inches, its height two inches.

The electrical and mechanical construction of these hangers has been carefully worked out. The hanger

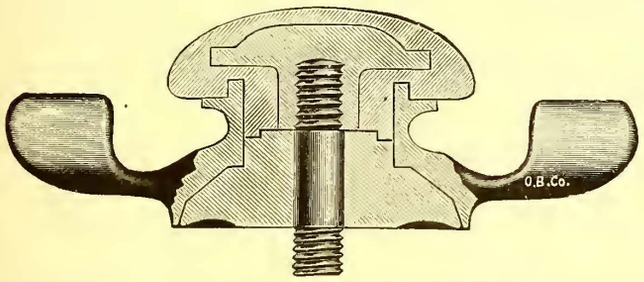


FIG. 3.—SECTION OF LINE INSULATOR.

bodies are made from the best malleable castings, giving strength with lightness. The insulating pieces are moulded from a specia compound selected after the most exhaustive tests. The top and bottom insulators are dovetailed together and also into the hanger body in a special manner, thus preventing any surface leakage. The iron casting, which is moulded into the insulating cap, is larger than the inside diameter of the collar. This does away with the possibility of the hanger stud pulling through and allowing the trolley wire to drop to the street. The insulator caps and washers for the type "W" hangers are all interchangeable.

The Ohio Brass Company, of which Frank C. Black is secretary and general manager, has in print a handsome catalogue describing its line of manufacturing specialties, which include all necessary appliances for overhead equipment. These are in use on some of the largest roads in the country and giving good satisfaction. Another important article this company will soon put upon the market is a new rail bond, which is very simple and easily handled, and makes, it is claimed, a perfect electrical joint. All overhead material is tested by a Riehle & Company's testing machine before leaving the shop.

The sales department will be under the management of Charles K. King, who has had a wide experience in the street railway field. He was at one time railway expert for the Northwest Thomson-Houston Company, with headquarters at St. Paul. Mr. King will also manage the electrical department of the concern.

The company will begin a vigorous campaign about February 15, when several representatives will be started on the road. The company will be also prepared to manufacture special pieces needed in street railway construction from specifications or models.

Graduated Car Springs.

The use of graduated springs on car trucks is by no means a new thing. On the old horse cars probably three-fourths of all the cars in use were so equipped, but with the advent of electricity and the use of much heavier cars and trucks, springs of less elasticity were employed.

With the requirements by the public for the maximum ease and smoothness in the riding of the cars, the graduated spring is again growing in favor.

We show illustrations of the Vose "graduated" spring manufactured by the Vose Spring Company, New York. These springs are in use on a number of the principal cable roads throughout the country and are giving

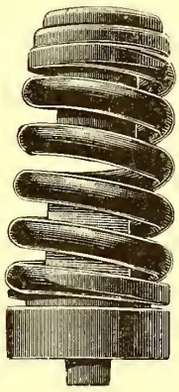


FIG. 1.

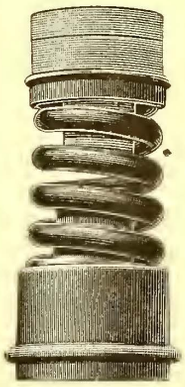


FIG. 2.

FIG. 3.

satisfaction by their easy riding qualities. The cuts show the pattern of spring used on the Stephenson and Bemis trucks on the Broadway cable road (Figs. 1 and 2), and also a form used on the Chicago City Railway in which the relief spring, usually of rubber, is replaced by a steel coil (Fig. 3). The main springs are of the patented "graduated" conical form, of which this company makes a specialty.

The Vose Company also makes a large number of different styles of springs suitable for different styles of trucks. For electric trucks a form consisting of an outer conical spring, with one iron and one rubber inner cone, instead of two rubber cones is recommended. This company also makes a specialty of elliptic springs for all kinds of trucks and drawbar, trolley and brush-holder springs, also machinery springs of every description, and rubber springs for horse and electric cars.

A REGULAR monthly meeting of the Massachusetts Street Railway Association was held at Young's Hotel, Boston, February 1. The special subject for discussion was, "Bonding Rails and Track Construction." Several members will read papers and gave short talks on the above subjects.

The California Wire Works.

The California Wire Works was incorporated in 1883 with a paid up capital of $500,000. It is the successor of the Dennis Wire Works, established in 1852, and of the California Wire Works and Eckfeldt & Graves, established in 1856, and manufacturers of wire work, wire cloth, etc., of A. S. Hallidie, manufacturer of wire ropes and cables, established in 1857, and of the Pacific Wire Mills and of Robinson & Hallidie, manufacturers of barb wire, established in 1881, all these different concerns being located in San Francisco, and were merged into the California Wire Works, in 1883.

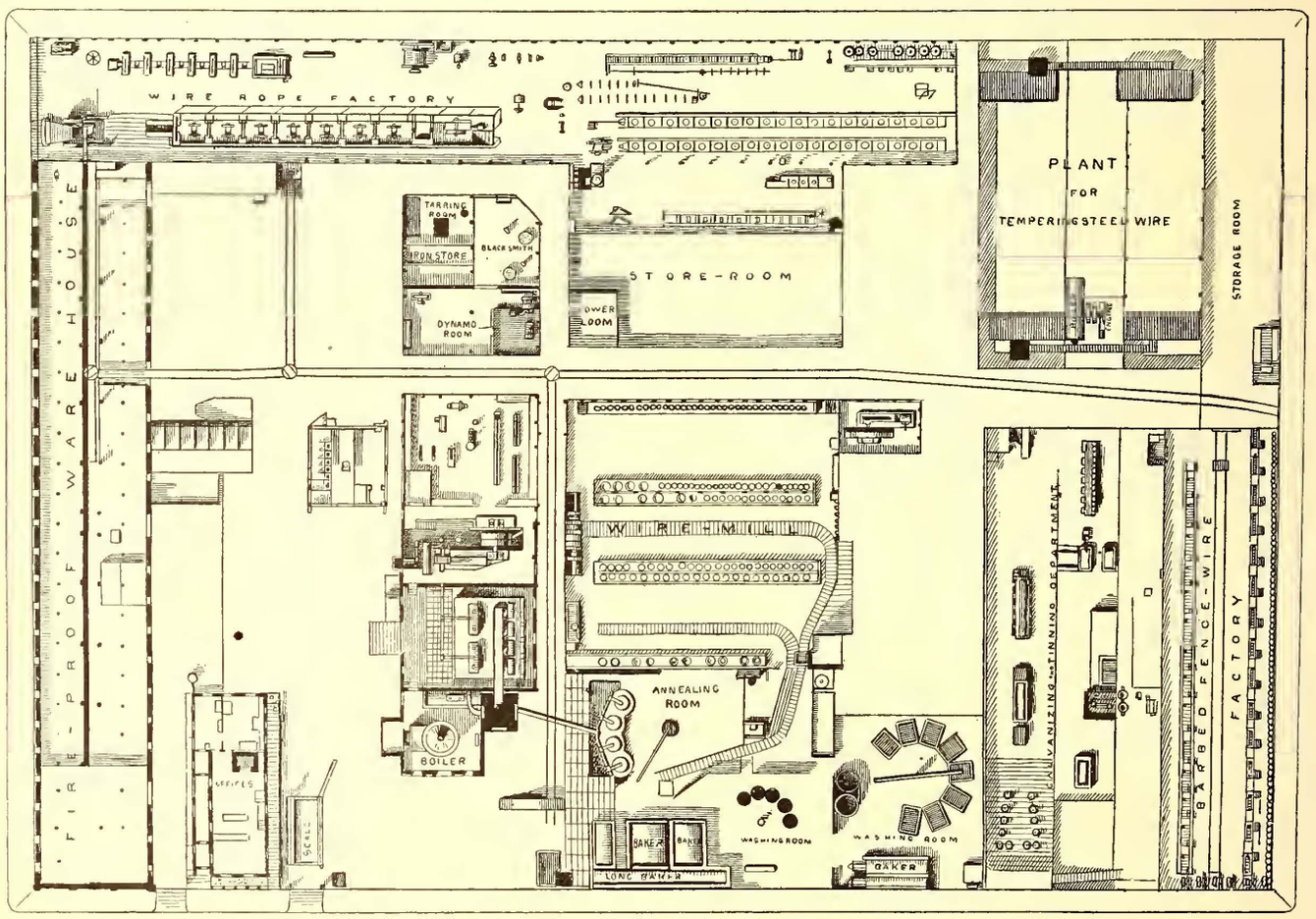
This company erected works in San Francisco occupying a block of land at the north end of the city and covering an area of two and a quarter acres.

The plant consists of a wire mill, barb wire and wire nail works, galvanizing works, wire cloth and netting factory, steel wire patenting or tempering plant and extensive wire rope and cable works. The machinery in the latter department has been specially designed and is patented by A. S. Hallidie, the inventor of the cable railway system, and most of the cables used on the Pacific coast are made on it.

This company has earned an excellent reputation for the excellency of its work, and in its cables especially it stands very high. It has for thirty-six years been manufacturing wire ropes and cables, and under the direct management of Mr. Hallidie has maintained a singularly good reputation. The steel wire patenting plant has been added within the past few years and enables the company to produce the best of steel wire, every piece of which is tested before going into a cable and is required to reach a certain standard. The works are driven by a 600 H. P Corliss condensing engine and by other engines of 100, 50, 30, 12 and 5 H. P. respectively. In the wire mill are wire blocks for drawing wire and in the nail shop thirty-five nail machines, and in the barb fence department thirty-three barb wire machines.

The capacity of the wire rope department is much beyond the requirements of the Pacific Coast, and recently the company has been filling orders for cables for the cable railways east of the Rocky Mountains, among which are fourteen cables for the St. Louis Cable Railway.

The concern gives employment to 350 men, and is one of the important industries of San Francisco.



PLAN OF THE CALIFORNIA WIRE WORKS—SAN FRANCISCO.

Tramway Interests in Greece.

The only tramways now in Greece are those in Athens and Piraeus, and connecting these two cities. The organization of a new tramway company is being proposed, however, in Patras. The Athens Tramway Company, which owns the lines mentioned above, was organized in 1884 by M. Z. Demerp, with a capital of 3,000,000 francs. The number of miles covered by the cars of this line last year was 1,260,700; the number of passengers carried, 2,643,100; the average number of cars in daily operation, twenty-one.

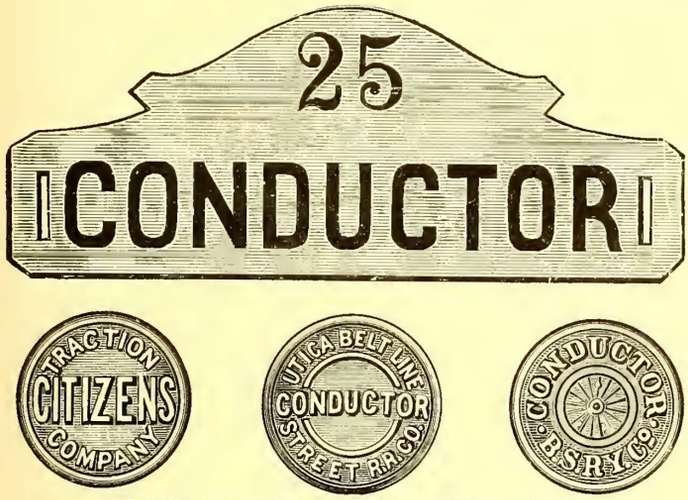
The same company owns a steam tramway line between Athens, new Phaleron and old Phaleron.

The New Orleans & Carrollton Railroad, which was put into operation electrically last summer, is working very successfully. The company's receipts have increased over 100 per cent., and the system is so popular that a return to horse power would not be tolerated by the inhabitants of that city. It will be remembered that this railway company is one of the oldest in the country, having been organized in 1833 to build a steam railroad.

The Chicago General Street Railway Company started its 22d Street line June 24, 1893, with two old horse cars. The first trolley car was operated November 22, and a second trolley car was added November 30. During December the company started a regular trolley service with Pullman cars mounted on Peckham cantilever trucks and equipped with Sperry whaleback motors.

Uniform Supplies.

The supply of uniform buttons, badges, caps, ticket punches, transfer checks, etc., forms an important item for the consideration of street railway managers, and with the increasing number and classification of employes on the larger roads is no mean item of expense. One of the oldest houses in this line is S. A. French, of New York, having been established in this line since 1850. The long



BADGE AND BUTTONS FOR CONDUCTORS.

experience of this house enables it to furnish a variety of styles in every line of uniform supplies, second to none.

We illustrate herewith several styles of uniform buttons adopted by leading street railway lines. This concern also furnishes every conceivable style of metal and embroidered cap and coat badge, as well as a line of uniform caps. A combination reversible button is one of the specialties of this concern. This button has a plain rubber back with the regular stamped metal front, on a screw shank, and can easily be unscrewed and reversed when off duty. A line of metal fare and transfer checks is also manufactured, which have been used on a number of roads with great satisfaction.

Combined Brake and Fender.

A safety device which will cut off the source of power which propels the car, brake the car in the most effective manner, and so prevent any person from being crushed beneath the wheels in case of collision, is shown in the accompanying cut. The device, which is controlled by D. McFarlan Moore, of New York, is simple in construction and inexpensive.

It is operated automatically by pressure upon the hinged projecting fender, or by the motorman at will.

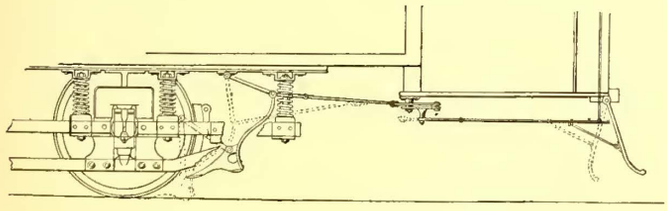


FIG. 1.—COMBINED AUTOMATIC BRAKE AND FENDER

Either method moves the rod under the car platform, cuts off the current or releases the cable and swings the shoes down upon the track under the wheels which run up slightly on the shoes, blocking the car. The heavier the load, the more effective the braking, particularly if the under surface of the shoe is slightly roughened. For this purpose the shoe may be constructed so that the roughened surface bears upon any desired part of the rail to prevent excessive wear.

The mechanism at the point directly under the body of the car, where the rod running from the hinged fender connects with the rod running to the shoes, is shown separately in Fig. 2. Here is a simple lever for the purpose of obtaining greater movement and of throwing the weight of the shoes upon a dead center, it being kept there by the slight spring shown in the cut. This arrangement keeps the shoes in their proper position when raised, offers a ready means of adjustment, both as to movement of of parts and delicacy of action, and prevents any operation except in the manner appointed. The shoes, as already stated, may be lowered or raised by the motorman, by means of the lever upon the platform. The handle of this lever is hinged so as to drop into a slot to prevent it being turned accidentally, and this does not interfere with the operation by the hinged fender automatically.

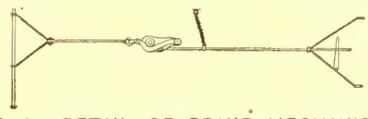


FIG. 2.—DETAIL OF BRAKE MECHANISM.

IN the case of John N. Stewart versus the town of Ashtabula, *et al.*, which was decided in favor of the defendants in the Superior Court, and was carried to the Supreme Court, of Ohio, a decision is expected soon. It will be remembered that Mr. Stewart was owner of a street railway in the village of Ashtabula, and that owing to differences between the village authorities and the railway company in regard to the grade of the tracks the rails of the road were torn up (May 21, 1891) after the line had been in operation eight years. There are a number of interesting features in the case, and the decision of the Supreme Court will be watched with interest.

The National Statistical Association.

This is the title of a corporation organized at Washington, D. C., and of which Allen R. Foote is vice-president and manager. The work of the company will include the collection, recording and tabulation of such legislative, legal and statistical information as may be found to be of greatest service to its clients, and the furnishing of such information to them. During the compilation of his book on "The Law of Incorporated Companies Operating Under Municipal Franchises," Mr. Foote collected a great deal of matter which is of interest to street railway managers, and such changes as may occur in the laws of the different states on the subjects treated, will be issued in annual volumes, as a supplement to the present work. The Association will also supply special information on any special subject which may be desired in its line of work.

This is one feature of the work that may be undertaken by the National Statistical Association, which is of particular importance to the corporations of the state of New York, and can be utilized at a very opportune time; that is, in collecting information for proper arguments or measures to be presented to the Constitutional Convention of the State. It is our judgment that the experience Mr. Foote has had in compiling the laws and judicial decisions of all states in the Union, pertaining to public service corporations, in addition to the statistical work he has done, gives him exceptional qualifications for undertaking to look after corporate interests in all such matters brought before the Constitutional Convention, and it will undoubtedly be to the interest of every public service corporation in the state to immediately put itself in touch with the Statistical Association by becoming one of its clients, in order to put the Association and Mr. Foote in proper position to represent their interests in the matter above indicated. We are credibly informed that every corporation to which this subject has been presented to date, has become a client of the Association.

A New Fender.

A fender of new design was recently tested on the Wakefield (Mass.) & Stoneham Street Railway. The officers of this road express their satisfaction with the operation of this fender, and say it is the best and most satisfactory they have yet seen. It consists of two parts, the fender, which is hung from the truck instead of the car body, and the bunter, as it is called, a screen of wire supported by springs to break the force of the blow.

On striking any object the force of the blow is broken by the bunter, and the fender, which is dropped at the same instant, catches it and holds it free from the ground. At the back end of the fender is a wire screen to prevent the body from being thrown beneath the wheels, and a woolen apron running the entire length of the car keeps it free of the wheels in case it is thrown aside by the fender.

In a recent test made with dummies, about the size and shape of a man's body, the dummies, whether placed in a standing position or lying on the track, were in every case either picked up or thrown off the track by the fender, the car running at full speed at the time.

Annual Reports of the North and West Chicago Street Railroad Companies.

The annual meeting of the North Chicago Street Railway Company was held January 9. Pres. C. T. Yerkes presented his report as follows:

"Gentlemen:—In making my annual report to you it is with great satisfaction I am able to give you such a one as more than carries out my predictions of a year ago.

"At that time we were expecting the World's Fair, with all its bustle, and demands on us for facilities to carry the people to Chicago, as well as the large number of visitors who were expected, to different parts of our road would be very heavy. While our expectations were great, the realities were greater, and we closed the year with figures which must be most satisfactory to our stockholders. The receipts have increased to a very extensive degree, while the expenses have been kept down to such an amount as would hardly have been anticipated.

"A considerable increase in the number of cars was made, and as you will perceive by the statement which will be presented, the mileage has been much increased.

"To sum up this part of our business, which is, I suppose, the most important of any of the items which you will examine, I can say that the increase in receipts amounts to $493,277.85. while the increase in expenses or, in other words, the amount which it cost to produce that sum, was $78,703.36.

The receipts of the company for the year were	$3,014,789.50
While the total expense of operating the road was	1,412,755.80
Leaving for fixed charges, dividends and surplus to income account	$1,602,033.70
The total number of miles run in 1893 was	9,224,173
The total number of miles run in 1892 was	8,547,791
Which is an increase over last year of	676,382
The total number of passengers carried in 1893 was	60,311,673
The total number of passengers carried in 1892 was	50,419,457
Being an increase over last year of	9,892,216

It is very satisfactory to the management to know that this great increase of business was done even more economically than had been done in previous years. Where a corporation is making a large amount of money and its business is very profitable there is always danger of extravagance in some of its departments, but I am happy to say that the business of the road has been conducted in the past year at proportionately less cost than at any other time.

"While the present year is not as full of promise as the past, yet we cannot expect to have such a condition every year as we have had. Still we will not feel the difference as much as if the Exposition had been held on the North Side. I can congratulate our stockholders that it was not, and fully believe we have made more money than though it had been.

"In conclusion I might add that my opinion, given at our last meeting, in regard to the percentage at which we would be able to operate our road this year has been fully verified, as I find the percentage of expense to the gross receipts is 45.55 per cent."

According to the annual statement, the total receipts from all sources, including advertising, which aggregated $11,328.75, were $3,101,148.25. The cash balance was $1,000,000.

The biggest day's receipts of the year were on October 8, the day before Chicago Day at the fair, when $16,343 was taken in. The smallest day's receipts were on December 3, when the fares dropped to $4,382.50.

The cable lines carried 39,765,165 of the 60,311,673 passengers that were handled last year, and it cost the company just 1.788 cents to earn each nickel paid by the passengers. The expense of carrying passengers on horse car lines was given at 3.414 cents per passenger. A comparison of the cable and horse car lines is as follows:

CABLE.

Receipts	$1,980,751.80
Expense	711,217.14
Miles run	5,695,212
Trips	709,403
Passengers carried	39,765,165
Number of miles run per day	15,603
Trips	1 943
Passengers per trip	56
Passengers per mile	6,982
Receipts per day	$5,476.72
Receipts per trip	2.79
Receipts per mile: Cents	.3,478
Expense per day	$1,948.54
Expense per trip	1.00¼
Expense per mile	.12½

The principal items of expense in operating a cable line were given as follows:

Conductors and drivers	$277,050.60
Car repairs	36,500.93
Building repairs	7.044.08
Office salaries	13,534 03
General salaries	18,337.08
Rope expenditures	56,773.23

The report also showed that the company had expended $4,296.93 during the year in heating cable trains, or a little more than the profits for one day. The company paid $7,244.36 for car licenses during 1893.

The horse car statement was as follows:

Receipts	$1,032,037.70
Expenditures	701,538.66
Miles run	3,528,961
Trips	741,328
Passengers haulcd	20,546,508
Miles run daily	9,668
Daily trips	2,031
Passengers per trip	27,716
Passengers per mile	5.82
Average daily receipts	$2,827.50
Average per trip	1.39
Average receipts per mile	.2,924
Daily average expenses	1,922.02
Per trip	.9,463
Per mile	.1 988
Per passenger	.03,414

Conductors and drivers received $270,652,46 in salaries; $23,-005.16 was spent in repairing cars, The expense of heating the horse cars was $2,838.12.

ANNUAL REPORT OF THE WEST CHICAGO STREET RAILROAD COMPANY.

The annual meeting of the West Chicago Street Railroad Company was held January 9. In his annual report President Yerkes mentioned the fact that the year had been prosperous, and that company had profited by the World's Fair. Evidence of this fact is presented in the following extract from this report:

"Gross earnings for the year	$5,235,633.53
Operating expenses	2,892,982.33
Net earnings	$2,342,651.20
Payments of fixed charges, interest, etc	941,749.39
Balance applicable to dividends	$1,400,901.81

"In making charges to expense account during the last year, owing to the fact that it was realized our profits would be large great liberality was shown in charging to that account many items that might have been properly placed in construction account. At the same time, we have added to our surplus $409,342, making it now a total of $1,862 851.

"During the last year the cable roads on Blue Island Avenue and on Halsted Street have been opened, but are running in an unsatisfactory condition, owing to the fact that it is necessary to convey the cars from a point east of Halsted Street with horses. This condition will continue until the Van Buren Street tunnel is finished, when these lines can then run in perfect order. I anticipate the time of the opening of the tunnel to be in the course of two months.

"The crosstown lines, which are comparatively new, have much to our surprise and satisfaction, shown themselves able not to only pay expenses, but to earn good profits. This condition will, no doubt, steadily increase. The opening of the Lake Street elevated road was expected to cause a heavy falling off in the receipts from the territory through which it runs. We find, however, that with the exception of a decrease in the receipts on Lake Street and Randolph Street this competition is not perceptible. The roads mentioned are horse car lines, which are very unimportant in our system, and the decrease can very easily be offset by taking measures to lessen expenses. I believe the result will be that we will confine the operation of these streets in a great measure to the east end of it, thereby leaving to the elevated railroad the long hauls. Since my last report there has been an increase in the capital stock of the company, which amount has in a great measure been used to pay off the floating debt; consequently, the amount of dividend necessary to be paid on this increase amounts to a little more than the amount of interest necessary to be paid in carrying the floating debt. I think I may safely say that there is no reason why there should not be a constant improvement in the affairs of the company. The cable road will be in full operation by spring; the new crosstown lines will be doing a very profitable business, and as there is every reason to suppose the general business of the company will improve as spring opens, it is not rash to predict a prosperous year. There is no doubt whatever in my mind that the present rate of dividend—namely, 9 per cent.—can be kept up and a still larger surplus passed to the income account. I would call your attention to the fact that this surplus now amounts to a very large sum, but just what will be done with it, the directors of the company have not yet determined, but that their actions in this regard will be most satisfactory to the stockholders I am well convinced."

The following figures are reproduced from the annual statement:

		Increase.
Gross earnings	$5,235,633.53	$615,408.23
Operating expenses	2,892,982.33	205,671.73
(Operating expenses are 55.25 per cent of gross earnings.)		
Net earnings	2,342,651.20	409,736.50

FIXED CHARGES.

Rent of leased lines	$490,500.00
Coupon interest	223,151.86
Interest and taxes	228,097.53
Total	$941,749.39
Balance applicable to dividends	1,400,901.81
Dividends paid	991,559.25
Balance carried to surplus	$509,342.56

EARNINGS AND EXPENSES.

		Increase.
Gross earnings from passengers	$5,196,171.95	$610,934.89
Manure	1,609.69	764.79
Advertising	20,032.62	3,730.55
Rents	17,819.27	22.00
Totals	$5,235,633.53	$615.408.23

OPERATING EXPENSES.

		Increase.
Conducting transportation	$1,377,849.01	$128,406.29
Maintenance of way	168,454.16	1,122.15
Motive power	906,159.90	64,380.72
Maintenance of cars	158,914.71	9,236.62
General expenses, including damages	281,604.55	2,525.95
Totals	$2,892,982.33	$205,671.73
		Increase.
Net earnings	$2,342,651.20	$409,736.50

From which deduct fixed charges as follows:

Rentals	$490,500.00		
Coupon interest	223,151.86	Decrease	$30,344.81
Interest and taxes	228,097.53	Increase	77,018.75
Total charges	$941,749.39	Increase	$46,673.94
Dividends	991,559.25	Increase	266,559.25
Balance to income account			409,342.56

TRAFFIC COMPARISON.

Trips	2,018,785	Increase	201,385
Miles	16,813,134	Increase	1,230,993
Passengers	107,053,461	Increase	12,534,987
Receipts, horse			$2,969,991.47
Receipts, cable			2,265,542.06
Total			$5,235,633.53
Expenses, horse			$1,903,963.62
Expenses, cable			989,018.71
Total			$2,892,982.33
Miles run, horse			9,602,245.04
Miles run, cable			7,210,889.56
Total			16,813,134.60
Receipts per mile, horse			$0.30.69
Receipts per mile, cable			.31.18
Expenses per mile, horse			.19.83
Expenses per mile, cable			.13.71
Passengers carried, horse			61,120,388
Passengers carried, cable			45,933,073
Total			107,053,461
Receipts per passenger			$0.04.85
Maintenance of cars, each car			$87.60
Average number of horses on hand			4,385
Average number horses on wagons, cars, etc			207
Average number horses on car service daily			4,178
Average number of miles per horse, per day			12.59
Cost of feed per horse per day			$0.17.69
Cost of shoeing per horse per day			.02.76
Other cost keeping horse, per day			.17.49
Cable rope run, miles			615,536
Cost of operating rope per mile run			$0.25.44
Cost of operating power station			100,264.20
Cost of operating power station per mile of rope run			16.28
Maintenance of track per mile, horse			6.78.34
Maintenance of track per mile, cable			7.07.64
Snow and ice per mile track, horse			$1.21.93
Snow and ice per mile of track, cable			.91.68
Sprinkling per mile, horse			.49.80
Sprinkling per mile cable			.49.05

A Novel Snow Plow.

The Ashtabula Rapid Transit Company has recently completed a novel snow plow from the design of T. Fricker, general superintendent of the company. The plow is built on a trailer truck, and resembles a strong flat car about ten feet long. The plows are on each end, and so arranged that the lower half of the rear one can be lifted up clear of the track. The wings are between three and four feet in height, and extend two feet beyond the track on either side. They are strongly built of two inch plank, and the lower edges shod with iron. These wings come within two inches of the track. The tracks themselves are cleared by iron scrapers placed just behind the plow. This plow has solid drawbars at either end, and is intended to be pushed ahead of one or more cars, as occasion requires.

This road has heretofore suffered frequent delays on account of the snow which, on parts of the line, often drifts to a depth of from four to six feet.

Annual Report of the Chicago City Railway Company.

The annual meeting of the Chicago City Railway Company was held on January 16. President Wheeler submitted figures showing that last year 120,596, 270 passengers had been carried. This number is 32,577,409 greater than in 1892. Of this increase 90.69 per cent. occurred during the World's Fair period. The revenue amounted to $6,029,813.51; the cost of operating, $3,422,040.62, or 56.75 per cent. of the receipts, and the net earnings were $2,438,711.77. The average receipts a day were $16,520.03, or an average increase of $4,494.60 compared with the daily average of 1892.

The cable furnished 65.27 per cent. of the receipts, the horse car lines 26,02 per cent. and the electric lines 8.71 per cent.. The report also showed improvements made during the year in the construction of an electric power house at Wabash Avenue and 52d Street, the equipment of crosstown lines with electric motors and the reconstruction of 13.13 miles of single track for use by electric cars. Some seventy miles of feed and trolley wires were put in operation, and altogether twenty-eight and a quarter miles of single track have been changed from horse car lines to electric lines, and the number of horses in use has been reduced during the year from 2,601 to 2,266.

The following figures are produced from the annual report of the secretary:

	1893.	1892.
Total earnings	$6,059,989	$4,400,943
Operating expenses	3 422,040	2.809,431
Interest	199 237	230,873
Depreciation	.....	29,500
Net earnings	2 438,711	1,331,137
Dividends	2,100,000	840,000
Balance	$ 338.771	$ 491,137
Per cent. of expenses to earnings	56.75	63.84
Per cent. of net to gross earnings	28.60	19.01
Per cent. earned on stock	27.00	19.00
Capital stock	$9,000,000	$7,000,000

The status of the income account is given below:

Income account January 1, 1893		$2,082,669.20
Surplus December 31, 1893		338,711.77
Total		$2,421,380.97
The following items are chargeable to income-account:		
Dividend of bonds and other securities	$2,250,000.00	
Loss by fire	32,460.00	
Harness account	11,108.37	
Auditorium stock	11,250.00	
World's Fair stock	100,000.00	
Board of Trade membership	1,150 00	
		$2,405,968.58
Balance		$15,412.39

The distance traveled by the cars is given below:

	Miles.
Cable lines	19,713,610
Horse lines	5,053,050
Electric lines	1,537,430
All lines	26,304,090
Increase over 1892 of	5,483,380

RECEIPTS PER MILE.

	Cents.
Cable	19.965
Horse	31.050
Electric	34.148

EXPENSES PER MILE.

	Cents.
Cable	9.921
Horse	24.863
Electric	13.600
Passengers carried 1893	120,596,270
Increase over 1892	32,577,409
Average receipts per day	$ 16,520.03
Increase over 1892 per day	4,494.60
	Per cent.
Increase during World's Fair period	90.69
Increase balance of the year	9.31

Resolutions were adopted authorizing the directors to donate the company's $100,000 stock in the World's Fair to the Field-Columbian Museum, and also authorizing them to give the museum not more than $50,000 in cash, provided they were assured the museum would remain in Jackson Park permanently.

The directors were empowered to issue stock to the amount of $1,000,000 during the year at their discretion, the stock to be offered to stockholders at par and pro rata with their holdings. In response to an inquiry, President Wheeler said the proceeds of the stock would be applied to the equipment of additional lines with electricity in case the City Council should pass the ordinances now before it.

Street Railway News.

Extensions and Improvements.

Alton, Ill.—The officers of the Alton Electric Street Railway Company are making an effort to raise money with which to begin the construction of the North Alton line early in the spring. General Manager J. F. Porter is confident of success.

Brooklyn, N. Y.—Application has been made to the Commissioners of Highways of the town of Flushing by the Brooklyn City Railroad Company for consent to construct and operate a double track line upon Strong's Causeway, and from the line dividing the towns of Newtown and Flushing, to Laurence Avenue and the southerly boundary line of Flushing.

Buffalo, N. Y.—The directors of the Buffalo & Williamsville Electric Railway have ordered two open cars equipped with high speed motors. The cars are to be delivered by April 1.

Camden, N. J.—The Camden Horse Railroad Company has commenced the work of locating the track for the new trolley road which will run along Broadway.

Charleston, S. C.—The City Railway Company has recently received permission to equip its line with electric power. The road, it is said, will be sold to a syndicate.

Clarksville, Tenn.—The Clarksville Street Car Company is extending its line to Porter's Bluff on Red River. A force of men has also been engaged at the work on Madison extension.

Fremont, O.—The Fremont Street Railway is being changed from horse to electricity.

Hamilton, Ont.—The Hamilton, Grimsby & Beamsville Electric Railway Company has let the contract for building eleven trolley cars to Ahearn & Soper, of Ottawa, and for fifty tons of copper wire to Eugene F. Phillips, Electric Works, Montreal.

Hot Springs, Ark.—The Hot Springs Electric Street Railway Company will extend its line to the race track.

Houston, Tex.—The City Street Railway Company will put a number of new lines into operation during the coming season.

Indianapolis, Ind.—The Citizens' Street Railroad Company has purchased twenty-five new, closed, motor cars. The contract has been awarded for the boiler house for the West Washington Street power house. The contractors agree to complete the building by April 1. The house when completed will front 320 ft. on Washington Street, and will have a depth of 330 ft.

Jersey City, N. J.—It is rumored that the Jersey City, Hoboken & Rutherford Electric Railroad Company will have an elevated track from the top of the Palisades to the space adjoining the Hamburg Steamship line, in Hoboken.

Kansas City, Mo.—The Westport Council has granted a franchise to the Kansas City Electric Company to construct and operate an electric railway in that city for a period of twenty years.

Lancaster, Pa.—The Pennsylvania Traction Company is considering the advisability of running a branch of the proposed electric railway to Oxford. The plan is to connect it with the main line of the electric railway at Parkesburg.

Long Island City, N. Y.—A new corporation, in which President Robert C. Pruyn, of the National Commercial Bank, of Albany, N. Y., is prominent, has purchased the system of street railroads in Long Island City owned and operated by the Steinway Railroad Company. Extensions will probably be made.

Marlboro, Mass.—The Marlboro Street Railway Company has appointed the following committee to go over both routes surveyed for extending the line to Hudson: L. S. Brigham, E. R. Alley, O. P. Walker, S. H. Howe and Thomas T. Robinson. The road will, no doubt, be built before the time limit of its charter expires, July 1, 1894.

Mount Vernon, N. Y.—The Common Council has granted the West Chester Electric Railway Company permission to run horse cars over its tracks on Fourth Avenue on certain conditions, one of which is guaranteeing to supplant horse power with electricity by the first day of June, 1894.

Newark, N. J.—The Consolidated Traction Company has been granted the right to make a number of extensions in Clinton and elsewhere.

Northampton, Mass.—The Northampton Electric Street Railway is to be extended four miles to Easthampton and seven miles to Williamsburg. Work is to be begun early in the spring.

Norwalk, O.—The projectors of the Norwalk & Southern Electric Railway Company are taking active steps toward the building and completion of that line. According to S. W. Owen, of Norwalk, the road will join that city with Olena, Greenwich, Fairfield, New London, Steuben, New Haven and Plymouth.

Philadelphia, Pa.—Work will soon be started upon the new car house at the northeast corner of Susquehanna Avenue and 12th Street, by Contractor Charles McCaul, for the Electric Traction Company. The structure will extend from 11th to 12th Street, along Susquehanna Avenue, and to a depth of about 100 ft. A repair shop will be fitted up in one end of the big building.

Racine, Wis.—The Street Railway Company proposes to extend its line to Mt. Pleasant and Caledonia.

Sandusky, O.—At a recent meeting of the Board of Directors of the Sandusky, Milan & Norwalk Electric Railroad Co., it was ordered that all the cars on hand, seven in number, be fitted with motors and all other necessary appliances. The line is to be extended out West Main Street early in the spring.

Springfield, Mass.—The Street Railway Company has contracted for a large part of the machinery for its new electric power station, which will be built this spring. The building will be of brick, and will have a capacity of 1,600 or 1,800 H. P.

West Chester, Pa.—L. M. Paterson, president of the Pennsylvania Traction Company, has officially announced that work on the new electric railway from Harrisburg to Philadelphia, through West Chester County, will be commenced next spring, and that all the rights of way for the branch road from Parkesburg to Oxford have been secured.

White Plains, N. Y.—The petition of the New York, Elmsford, White Plains & Mamaroneck Railroad Company for a franchise to construct a railroad to be operated by electricity through White Plains, has been granted.

New Roads.

Albion, N. Y.—An electric road is proposed from Batavia to Oak Orchard Harbor, in Albion.

Babylon, N. Y.—A company is being formed here for the construction of a trolley road connecting Babylon with Brentwood and intervening places. The new road will probably be completed in a year.

Baltimore, Md.—It is reported that the proposed electric road between this city and Washington will be built this summer. The company controls the Eckington and Belt street railway systems in Washington, and it is over these lines that an entrance will be made into that city. The length of the line between Baltimore and Washington will be a fraction over twenty-eight miles. The run will be made between the two cities in one hour. The charge for a round trip, it is said, will be $1. The plans for the cars are now in the hands of the J. G. Brill Company, of Philadelphia. Among those interested are: President Newbold, T. Edward Hambleton and Howard Munnikhuysen, of Baltimore and P. A. B. Widener, W. L. Elkins and Thomas Dolan, of Philadelphia.

Bel Air, Md.—The town commissioners recently signed an agreement granting to the United States Automatic Electrical Service Company, of Worcester, Mass., a right of way through the town for an electric railway to Van Bibber. It is to be completed by April 1.

Benton Harbor, Mich.—C. P. Wright, president and projector of the new Lake Shore Electric Railway, is securing right of way for this line from St. Joseph to Stevensville. He proposes to have the line in operation by June 15, to connect with the proposed road from South Bend.

Braddock, Pa.—The Braddock & Homestead Street Railway Company was incorporated on January 22, with a capital stock of $7,500. C. Jutte, of Pittsburgh, Pa., is the president of the company. Others interested are W. C. Jutte, E. K. Morse, C. M. Buchanan and George W. Theis, all of Pittsburgh.

Brentwood, L. I.—A scheme is on foot to construct a cross island electric railroad so as to connect Brentwood and nearby points, with the south side villages of Bay Shore, Islip and Babylon. A. J. Martin has the matter in hand.

Bristol, Pa.—An ordinance permitting the Delaware River Steamboat Company to lay trolley tracks and establish an electric road in Bristol, for which the company has been contending for a year, was finally passed at the Borough Council meeting January 8.

Charlottesville, Va.—The City Council has granted the franchise to the Piedmont Construction Company to establish an electric railway line in Charlottesville. The franchise is for fifty years. Work is to be commenced within ninety days.

Chattanooga, Tenn.—The contracts have been awarded for the machinery for a new cable incline up Lookout Mountain. The incline will connect with the Chattanooga electric street railway, at St. Elmo. M. M. Henderson is president of the company.

Cleveland, O.—An extensive project is now under contemplation for this vicinity. The scheme is to run an overhead electric system from Cleveland to Berea and to Medina.

Fall River, Mass.—The Fall River & Stone Bridge Electric Railway Company has been organized with the following officers: President, D. P. Church; clerk, M. G. B. Swift; treasurer, N. B. Church. The capital stock is $100,000. Work will begin in the spring. The tracks will connect with those of the Globe Street Railway at the Fall River end and cover eight miles of road.

Flatlands, L. I.—A franchise has been granted to the Thirty-ninth Street, Brooklyn Ferry & Suburban Railroad Company.

Frederick, Md.—An effort will soon be made to revive the interest of local capitalists in the Frederick & Middletown Electric Railway.

Gardner, Mass.—The incorporators of the Gardner Electric Street Railway Company have chosen L. A. Greenwood, James A. Styles, Charles Heywood, George R. Godfrey, of Gardner, M. A. Coolidge, F. S. Coolidge, of Fitchburg and E. F. Blodgett, of Leominster, as temporary directors. They have asked the selectmen for a franchise and propose a route about three and a half miles long, connecting the three villages with each other and with the stations of both railroads.

Hagerstown, Md.—The City Council of Hagerstown has granted to O. B. Ormsby, of Pittsburgh, and S. Ritter Ickes, of Altoona, Pa., president and vice president and general manager, respectively, of the Cumberland Valley Electric Passenger Railway Company, of Carlisle, Pa., a franchise to build and operate in Hagerstown a street railway. The term of the franchise is forty years. The company to which the franchise was granted contemplates constructing electric roads at Carlisle and in several Pennsylvania counties.

Harrison, N. J.—The Jersey City, Kearney & Harrison Electric Railway Company has been granted rights in Harrison under certain conditions.

Hartford, Conn.—The Hartford Suburban Railroad Company was lately organized here. The officers are: David Henney, president; W. R. Hurd, vice-president, Wilbur E. Goodwin, treasurer, and William H. Goodrich, secretary. This company will control a number of city and suburban electric roads connecting New Britain, Middletown, Windsor, Suffield and East Hartford with Hartford.

Hinesburgh, Vt.—The project of an electric railroad between Burlington and this place is being discussed.

Homestead, Pa.—The Homestead Street Railway Company, of which J. C. Whitla, of Beaver, is the president, proposed to build an electric railway from Homestead to the Southside, where the line will connect with the Pittsburgh & Birmingham electric line. It is expected to start building the line on April 15.

Jackson, O.—The City Council has granted a franchise to the recently organized Wellston Street & Belt Line Company. This company has a capital of $1,000,000 and will run between McArthur Junction and Jackson. The directors are Harvey Wells, J. C. Clutts and H. S. Willard, of Wellston, and C. L. Currier and Isaac E. Adams, of Chicago.

La Salle, Ill.—There has been incorporated the Inter-Urban Electric Railway Company, with a capital stock of $250,000. The incorporators are: C. W. Palmer, R. M. Gardner and M. C. Van Fleet.

Merriam, Kan.—The Merriam Park, Rosedale & Kansas City Electric Railway Company is the name of a new corporation recently formed. The company will build an electric railway from Merriam to Rosedale, to connect with the Metropolitan Street Railway Company's line and possibly to build to Kansas City. The capital stock is $50,000. Some of the directors are: A. A. Pearson, E. G. Bartberger, J. C. F. Maloney, B. F. Hollenback.

Morrisville, Pa.—The Morrisville & Trenton Street Railway Company was organized January 15, with a capital stock of $18,000, to construct and operate an electric railway in Bucks County, Pa. Wm. G. Howell, of Morrisville, was elected president. Other stockholders are George W. Robertson, of Morrisville and Lewis Perrine, Jr., of Trenton, N. J.

New York, N. Y.—Lawyer Edward Lauterbach, representing a powerful syndicate, composed of leading men in the Brooklyn Elevated Railroad Company and the East River Bridge Company and others, told the Rapid Transit Commissioners, on January 10, that these gentlemen were ready to pledge themselves to bid for the franchise of the new independent, elevated rapid transit routes proposed by Mr. Bushe, and to build the roads at once. In answer to a question asked by Mr. Inman, Mr. Lauterbach said the syndicate was willing to accept the plans as already laid out, with the privilege of extension on the East Side when the route has been fully decided upon.

Pottstown, Pa.—A contract has been signed for the construction of the projected Pottstown, Boyertown & Reading Passenger Railway Company's line between Pottstown and Boyertown. C. P. Eberle, of Philadelphia, was awarded the contract.

Richmond, Va.—A bill has been introduced into the legislature for the incorporation of the Henrico Railway Company, the corporators being G. C. Vincent, W. H. Brauer, A. Monteiro, L. H. Kemp, James Mantle, G. W. Randall and others.

St. Joseph, Mich.—The projectors of the St. Joseph & Lake Shore Railway Company, who will construct an electric railway in this city the coming spring, will, it is said, build an electric line from St. Joseph to South Bend in 1894. The line will go through Stevensville, Baroda, New Troy and Three Oaks.

Salt Lake City, Utah.—A franchise has been granted to H. M. McCartney for an electric or cable road, along certain streets of the city, and northward to Bountiful.

ARTICLES of incorporation of the Jordan River Electric Generating Company were filed last month. The company is incorporated for $500,000. The force utilized will be the water running over certain dams in the Utah & Salt Lake Canal and the Jordan Canal Company, where there will be furnished about 20,000 cu. ins. of water. The officers of the company are as follows: Charles S. Wilkes, president; Frank Harris, vice-president; Hoyt Sherman, Jr., secretary; and directors: T. C. Gentsch, John Olson, George W. Ballantine, James N. Smith, Frank Knox. All are from Salt Lake, with the exception of Mr. Ballantine, who is from Denver.

Shamokin, Pa.—The Morrison Cove Electric Railway Company was incorporated December 28, with a capital stock of $175,000, to construct and operate an electric railway in Blair and Bedford Counties. E. C. Hamilton, of Shamokin, is the president of the company. Others interested are: Charles M. Clement, of Sunbury, Pa., and G. M. Smith, of Philadelphia.

Slatington, Pa.—The Slatington Street Railway Company has been organized with a capital stock of $30,000, for building and operating an electric railway in Lehigh County. R. W. Mosteller, of Slatington, is president. Others interested are Henry Bittner, John Balliet and H. W. Hankee.

Tiffin, O.—The Tiffin & Inter-Urban Consolidated Railway Company, with headquarters at Tiffin, and a capital stock of $300,000, has been incorporated. The road is to run from Tiffin to Fostoria, Upper Sandusky, Fremont, Seneca and Huron to Norwalk. Some of the incorporators are: Thomas B. Williams, Charles F. Shaw, Frank W. Brightman and Tunison T. Rosendale.

Toledo, O.—Articles of incorporation have been filed for the Toledo & Maumee Valley Railway Company. The purpose is to operate railroads by electricity or other power, having Toledo and Perrysburg for their termini and passing through the counties of Lucas and Wood. This is part of the system which will ultimately embrace Tiffin and Fostoria. The entire system will be about 200 miles in extent. The company is capitalized at $300,000. The incorporators are Wm. B. Taylor, Josiah D. Cook, George G. Metzger, Parks Foster and Grant Williams.

Trenton, N. J.—A new electrical railway, to be known as the New Jersey Railway Company, has been projected to connect Trenton and Paterson. J. L. Stadelmann, of Philadelphia, is interested, as is also E. W. Hine and Charles E. W. Smith, of Morristown. We understand that work will probably be commenced in the spring. The proposed road, if built, will be longer than any electric road in the country.

Wakefield, Mass.—Chas. F. Woodward, president of the Wakefield & Stoneham Street Railway Company, is interested in the construction of a road from Lowell to Reading.

Waterloo, Ont.—Thos. M. Burt president of the Berlin & Waterloo Street Railway Company, is interested in building an electric line nineteen miles long, connecting several towns in Ontario.

Wilmington, Del.—Unless present indications fail, the New Castle & Wilmington Electric Railway will be built and in operation by June next. Preston Lea and Willard Saulsbury, of Wilmington, are stockholders in the New Castle & Wilmington Company.

Change of Officers in a New York Road.

At the election, held January 9, for directors of the Dry Dock, East Broadway & Battery Railroad Company, the following named gentlemen on the opposition ticket were elected: Richard Kelly, George H. Prentiss, A. S. Rosenbaum, Simon Danzig, Solomon Mehrbach, John H. Waydell, Henry Steers, E. W. Sumner, Marshall S. Driggs, N. Lansing Zabriskie, Henry A Morgan, M. Feuchtwanger and John Byrns. At the meeting of the new board on January 10, Richard Kelly was elected president. He had been secretary and treasurer of the company about twenty-five years up to last May, when he resigned. John Byrns was elected treasurer. He has been a director for the past ten years, and has been secretary and treasurer since Mr. Kelly's resignation. E. T. Landon was elected secretary. He has been connected with the company for over twenty-one years as its bookkeeper, and for the past ten years as auditor.

The Bordeaux-Bouscat-Vigean Electric Road.

The adoption of the electric railway as a means of rapid transit makes but slow progress in France, but signs are not wanting to show that the initial step having been made, the supersession of the horse car will shortly be undertaken on a more extensive scale. Three electric lines are already in operation, the last having been opened on December 17 last, to be operated between the town of Bordeaux and the suburban village of Vigean.

The history of this line resembles in many particulars that of the majority of the roads in this country. But contrary to the usual experience here, it was constructed with capital entirely contributed by the property owners and residents along the road which the line followed, and the inhabitants of the towns, or rather, villages, which would benefit by the improved means of transit, without the necessity of bonding or having recourse to some financial institution. In July, 1888, the first meeting to discuss the matter was held in the little town hall of Bouscat, which was attended by the mayors of the communes of Bouscat, Eysines, Bruges, Planquefort, and by a number of landowners whose property abutted on the Route du Medoc, to consider the advisability of starting a regular car service on the Medoc Highway which at that time was unsatisfactorily served by the Bordeaux Tramway & Omnibus Company. In fifteen days the amount subscribed to attain this end reached $20,000, and the communes interested in the scheme applied to the department authorities for the necessary rights and franchise. Negotiations were then begun with several financial societies to engineer the road, but after three years of fruitless talk they were abandoned, and the inhabitants determined to build the road themselves. They formed a company under the title of the Société de Tramway de Bordeaux-Bouscat au Vigean, and solicited subscriptions for stock. The plan adopted appealed to the popular interest, and the farmers and peasants plunged their hands into the woolen stockings, and drew on the savings banks in order to subscribe for the stock, and sufficient capital was soon obtained.

The question as to what system should be adopted was speedily settled. The company's engineers, after a careful study of the systems used in Paris, Clermont-Ferrand and Marseilles, reported in favor of electricity as more economical, more rapid and more easily exploited. Three manufacturing firms were then requested to bid on the installation—the Cie. Francaise pour l'Exploitation des Procédés Thomson-Houston; the Société Alsacienne des Constructions Mécaniques of Belfort, and the Sautter, Harle & Cie. and Ateliers d'Oerlikon. The contract was awarded the first named, the American apparatus of Gen-

eral Electric Company's manufacture being considered far superior to any other.

Work was at once begun, and the station and line pushed forward to completion without delay. The station is situated at about an equal distance between the extremities of the line, at 304 Route du Medoc. The boiler equipment consists of two Babcock & Wilcox boilers, furnishing steam to two McIntosh & Seymour compound, non-condensing engines, each of 150 H. P., at 275 revolutions. These are directly belted to two four-pole, compound General Electric railway generators, each of 100 K. W., running at 600 revolutions. The switchboard is built up of standard General Electric panels, one for each dynamo.

The line starts from the corner of the Rues David Johnston and Croix-de-Seguey, in Bordeaux, and runs as far as Vigean, a distance of 4,820 metres, 220 of which only are in Bordeaux itself; the remainder of the line follows the Route du Medoc. The rails are of the Humbert and Vignole type, laid upon steel ties, at a gauge of one metre. The grades are insignificant and the curves few. The line is single track, with seven turnouts, exclusive of those at the extremities. The smallest distance between turnouts is 300 metres, the greatest one kilometre. The stations, *i. e.*, where transfers are delivered, at or on the Boulevar, the Chemine de la Charmille, the Chemin des Ecus, the Chemine de Bruges St. Germaine and finally at Vigean. The overhead construction is purely American, the trolley wire being suspended from galvanized iron span wires stretching between side poles.

The motor cars are constructed for forty persons, and have no "Imperiale." Each is fitted with a W. P. 30 General Electric single reduction motor, controlled by two of the latest type series parallel controllers. The speed has been fixed at an average of twelve kilometres per hour, but this is exceeded on the less frequented portions of the line. Twenty cars each way perform the daily service, and on Sundays and holidays each motor car is coupled to a trailer. The cars are from the shops of M. Gustave Carde, at Bordeaux, and are mounted on trucks of American pattern, built by M. J. Leclaire, of Montreuil sur Bois, near Paris.

The installation of this road is a veritable triumph for this country. It shows that so far as the industry has progressed in Europe no motors nor generators have yet been constructed which can successfully compete with those made by the General Electric Company. The character of this installation and its immediate success are due to the care which the General Electric representatives in France have taken to make it combine the perfection of the American practicality with the good taste of the French. M. E. Hospitalier, of *l'Industrie Electrique*, in commenting on this road, says: "During the past four years one electric road per year has been inaugurated in France. This will be increased tenfold this year."

The Street Railway Strike at Bridgeport.

A strike, which, at one time, looked as if it would be very serious, occurred last month on the lines of the Bridgeport Traction Company, of Bridgeport, Conn. The street railway system in this city, as will be remembered, was purchased some time ago by a syndicate, in which Newark capitalists are largely interested. The lines are now operated by horse power, but rights have been granted to change to the trolley system, and the company is preparing to equip some fifty miles of electric road. The company has suffered a good deal from dishonest employes in the past, and some time ago took vigorous measures to discover the culprits, and as a result nine employes were discharged for cause.

The employes improved the occasion of the absence from the city of the president of the company, Colonel Heft, on January 20, to tie up the road, although there had been a standing agreement with them that there should be no strike on less than one week's notice. Fortunately Andrew Radel, general manager of the Newark & South Orange Railway Company, who is also largely interested in the Bridgeport Traction Company, was in Bridgeport, and immediately telegraphed to the Reliable Detective Agency, of New York, to send some of its men to the assistance of the company. This detective agency had been largely instrumental in proving the charges against the discharged men.

The employes made a desperate effort to prevent the running of cars, and used violence to attain this end. The police seemed powerless to repress the trouble. Several trips were made January 21, however, and on January 23 the regular service of the road was resumed with Agency detectives on each car, acting as driver and conductor. This resolute stand had its effect, and on the afternoon of the 23d the employes decided to give up the strike. The terms laid down by the company were accepted by the men, comprising their employment as individuals and not as the members of any union, and including the dismissal of the nine men who had brought themselves into disfavor.

A little further trouble was experienced after the 23d, but at the date of going to press the cars were running regularly with non-union operatives.

Two Power House Breakdowns.

Our correspondents furnish us with the details of two power house accidents which happened recently.

The first of these breakdowns was in the power house of the Des Moines Street Railroad Company, Des Moines, Ia.

Everything was running smoothly about ten o'clock in the morning of December 23 when, without warning, the flywheel of the 30 × 60 engine went to pieces. The cylinder of the engine was not damaged in the least, but the flywheel was a total wreck, and some of the minor parts of the engine were broken. The accident is said to have been caused by a flaw in the casting. Fortunately no one was killed although two men were in the room at the time of the accident. None of the other machinery was hurt in the least, and in an hour after the accident the reserve engines were connected to the line shaft and were running the road.

The second occurred at Sedalia, Mo., in the power house of the Sedalia Railway Light & Power Company, and was in the form of a double breakdown. This company has two 125 H. P. engines. On December 24, the main valve of one of them broke, causing a breakdown of that engine. A new valve was immediately sent for and was in transit when, on December 28, the back end of the connecting rod of the other engine broke, causing the piston to punch out the back cylinder head, and the breaking of the crosshead and guides. The valve for the first did not arrive until twelve hours later and the road was obliged to shut down for that time. This was the first shutdown experienced in the four years of operation of this road, and coming in the middle of the holiday season caused some inconvenience.

Personal.

Mr. John A. Brill called at our office last month while in New York.

Mr. R. A. Crawford, of the R. A Crawford Manufacturing Company, called on us last month. He reported an increased demand for the Crawford fender.

Mr. F. J. Loinaz del Castillo, secretary of the Puerto Principe Street Railway Company, of Puerto Principe, Cuba, was a visitor at our office last month.

Mr. F. S. Terry, has severed his connection with the Ansonia Electric Company, and has accepted the position of secretary of the Sumbeam Lamp Manufacturing Company, of Chicago.

Mr. C. Densmore Wyman, general manager of the General Electric Launch Company, proprietors of the electric launches which plied upon the lagoons at the World's Fair last summer, has moved to New York City, and has headquarters now at 44 Broad Street.

Mr. W. A. H. Bogardus, who has been secretary of the Brooklyn City Railroad Company for a year, has been made general manager, owing to the increase in the number of lines caused by recent consolidations, and Cyrus P. Smith will succeed him as secretary. There will be two superintendents, instead of one, hereafter. Superintendent Cameron will have charge of the lines in the central and southern parts of the city, and William Morrison, who has been superintendent of horses, will have charge of the Eastern District lines.

Obituary.

Col. Thomas C. Boone, treasurer of the Buckeye Engine Company, died at his residence in Salem, O., December 20. Mr. Boone was related to Daniel Boone, and was born in Adams County, Pa., in 1823. When he was four years of age the family removed to Ohio, settling first near Damascus, and later removing to Salem, where he received his education. He engaged in several business enterprises until the breaking out of the war, when he entered the service as lieutenant-colonel of the 115th Ohio Volunteer Infantry. He was soon promoted to the rank of colonel, and served throughout the war with credit. At the close of the war he became a member of the firm of Boone & Gormer, at Salem, and remained in that connection until 1870, when he went into the then newly organized Buckeye Engine Company, being elected secretary at the first meeting, in which capacity he served until his death. Mr. Boone was connected with several other enterprises, and was a member of a number of organizations.

New Publications.

Catalogue of the McGuire Manufacturing Company's Electric Street Car Trucks.

This is a tastefully gotten up catalogue containing views and descriptions of the different forms of improved trucks manufactured by this company, and thirty two half-tone views of cars on different roads throughout the country that are using these trucks on their cars, together with many words of commendation of their good riding qualities from the management of the roads. A list of 290 roads that are using these trucks, to which this company respectfully refers, is also printed.

Points on Perforated Electric Belting. Published by Charles A. Schieren & Company, of New York.

This catalogue is of handy size, handsomely printed, and contains a great deal of information in regard to the perforated electric belting of Charles A. Schieren & Company, which has achieved such a high reputation. Engravings are given showing a portion of the hide used in its manufacture, as well as a number of engravings of large belts supplied by the company. Among the list of customers we notice a large number of electric railway companies, showing that there is a large demand for Schieren belts in this line, and that street railway men are fully alive to the merits of perforated electric belting.

Elementary Lessons in Steam Machinery and the Marine Steam Engine. By J. Langmaid and H. Gaisford, MacMillin & Company, London and New York. 262 pages.

These lessons were prepared for the naval cadets in H. M. S.

"Britannia," by the authors, who are both engineers in the Royal Navy. The theory of steam machinery is treated in a simple but thorough manner, and a great deal of practical information is given on the details of construction and the mechanism of a marine engine. The volume concludes with a short description of the construction of a battle ship. The work is fully illustrated, handsomely bound and printed, and should form a valuable text book for the use of students of marine engineering.

Zeitschrift fur Kleinbahnen, for January, 1894, Vol. 1, No. 1, published by Julius Springer, Berlin, Germany,

The first number of this new German periodical, is in the form of a neatly printed eighty page pamphlet with a light blue cover. This journal is intended to furnish a record of the progress and details of the practice of the rapidly growing German tramway industry. By its prospectus it aims to cover all branches of the field and to keep fully up to the times on all lines of tramway practice. Among the articles of the first number is an article on "The Condition of the Street Railway Industry in North America," by Dr. Kollman, director of the Frankfort railways, who visited this country last summer; and one on the operation of tramways by steam motors, etc. An especially valuable feature of the publication, which will be continued in each number, will be a series of abstracts of articles concerning street railway and engineering practice, taken from the principal technical journals of the world, in which the American press is prominently represented.

The Horse in His Relation to Economic Agriculture and the Industries of Transportation. By E. Lavalard, manager of the General Omnibus Company, of Paris, member of the National Agricultural Society of France, etc. Two volumes, 938 pages.

This work, which forms one of the valuable Bibliothèque de l'Enseignement Agricole published under the direction of the National Agricultural Institute, of France, contains a most thorough discussion of horses, with practical hints as to the selection of animals, their care, treatment of diseases, method of shoeing, etc. Stables, their construction, arrangement and best methods of ventilation and heating are also discussed in a very thorough manner. Mr. Lavalard is a well known authority on this subject, and his position at the head of the largest omnibus and street railway company in France enables him to speak with practical knowledge of the subject. Among other interesting experiments made under Mr. Lavalard's direction was one on determining the actual power expended by the horses on the Paris street cars and omnibuses. On the former it was found that the average work performed by each street car horse while in service, was 592 ft. lbs. per second. The average coefficient of traction of the loaded car was, in this case, 19.6 lbs. per ton of 2,000 lbs. The average daily work of the horses was a little over 3,330,000 ft. lbs., with an average speed of 9½ ft. per second. With the two horse omnibuses it was found that there was an average expenditure of 685 ft. lbs. per horse per second at an average speed of 7½ ft. a second. The total daily work of each horse was about 4,350,000 ft. lbs. With the three-horse 'busses the daily work of a horse was found to be about 3,835,000 ft. lbs., with the same an average speed of 7½ ft. per second.

Equipment Notes.

The Billings & Spencer Company, of Hartford, Conn., has disposed of its interest in the Spencer nail puller to C. M. Spencer, of Windsor, Conn.

The Curtis Electric Manufacturing Company, has closed a contract for the equipment of ten cars with the Electric Traction Company, of Philadelphia.

The Shultz Belting Company, of New York, has gotten out a very handsome and tasteful calendar advertising its Shultz patent sable rawhide belting. This calendar is handsomely lithographed in colors, and would make an ornament to any office wall.

The Complete Electric Construction Company, of New York, has opened a Western office at 1,401 Monadnock, Chicago, and placed Clift Wise in charge. Mr. Wise is well known to the electrical men, and is meeting with a cordial welcome in Chicago and the West.

J. A. Hanna, Eastern manager of the McGuire Manufacturing Company, has opened an office at 1050 Drexel Building, Philadelphia. Mr. Hanna is well known in the street railway field, and he writes us that he would be pleased to have all his friends call at his new quarters.

The Eastern Electric Cable Company, of Boston, has recently declared its quarterly dividend of 2 per cent. This company has no difficulty in obtaining orders, and we understand has made arrangements for handling promptly the large influx of business expected in 1894.

The Simplex Electrical Company, of Boston, has moved from 620 Atlantic Avenue to handsome and commodious quarters at 75 to 81 Cornhill. Mr. Mason, the manager of the company, will be very glad to welcome any visitors interested in street railway appliances at this new office.

William Sellers & Company, incorporated, of Philadelphia, are building a fifty ton traveling crane for the Cataract Construction Company, of Niagara Falls, N. Y. Some very interesting particulars in regard to this crane are published in a recent issue of the London *Engineering*.

Stern & Silverman, of 707 Arch Street, Philadelphia, Pa., have been appointed agents for the Ball & Wood engines in Philadelphia. This firm is doing a large business, and was one of the contractors, as mentioned in our last issue, for the overhead work of the Philadelphia Traction Company.

Currier, Mayo & Company, of Boston, have succeeded J. A. Grant & Company as New England representatives of McIntosh, Seymour & Company, of Auburn, N. Y., whose engines are well known. These manufacturers report business as improving, and that the prospects are excellent for the coming year.

The Safety Car Heating & Lighting Company, of New York City, has lately equipped 103 cars for the North Chicago Street Railway Company, which are giving excellent satisfaction. It is the intention of the North Chicago Company to equip its entire road, consisting of about 900 cars, with this system in the near future.

The Goubert Manufacturing Company, of New York City, reports a good business in its improved feedwater heaters, the sales for 1893 being over 100,000 H. P. This company is also the sole manufacturer of the popular Stratton steam separator, the sales of which during 1893 were nearly double those in former years.

The Euphrat Life Saving Car Fender Company, of New York, has moved its New York office to Room 254, 29 Broadway, New York. George W. Lockwood, the general manager of the company, reports an increasing interest being felt in this fender which seems to answer all the requirements of a life guard for cable and electric cars.

The Fiberite Company, of Mechanicville, N. Y., is meeting with the usual demand for its appliances. This company is sole manufacturer of fiberite interior electric wire ducts and fiberite street railway line insulators. The value of the fiberite compound has been demonstrated by continued use, and its popularity is constantly increasing.

A. Groetzinger & Sons, of Allegheny, Pa., have prepared for their friends and customers a neat little souvenir of the new year, consisting of a handsome paper weight. This is not only useful but ornamental, and is a decided addition to a desk, reminding the user at the same time of the excellent Dermaglutine gears and pinions manufactured by this well known firm.

The New Process Raw Hide Company, of Syracuse, N. Y., held its annual meeting January 9, and the following directors and officers were chosen: Directors, T. W. Meachem, ex-Mayor W. B. Kirk, Emil Laass, Mayor Jacob Amos, C. H. Duell, C. L. Stone, A. C. Vosburgh. Officers: President, T. W. Meachem; vice-presinent, Hon. W. B. Kirk; secretary and treasurer, A. C. Vosburgh.

E. F. DeWitt & Company, of Lansingburgh, N. Y., are meeting with a very favorable reception for their sand box. This appliance has been installed on a number of roads, and is giving good results in a large number of the principal cities in the East. One of the latest orders received by Mr. DeWitt is one for Bangor, Pa. The cars for this road are described elsewhere in this issue.

The Ellis Car Company, of Amesbury, Mass., builder of street railway cars, all sizes and styles, for summer or winter service, writes us that it has the following cars in stock that it can finish out and ship at short notice: Five nine bench, open car bodies with closed ends, ten ten bench, open car bodies with closed ends, five sixteen foot box car bodies, ten nineteen foot box car bodies and one twenty-five foot box car body.

The Frost Veneer Seating Company, of New York, has no trouble in retaining the wide popularity which its veneers enjoy. These are used extensively for car seats, ceilings and settees, and are found most desirable for this purpose. The chief claims of advantages made are, that it is much easier to keep clean, more durable and desirable. This company received the first premium on veneers at the World's Fair.

Wm. T. Dulaney, of New York, has been granted permission by the Board of Aldermen, of Brooklyn, to excavate one mile of streets within the limits of that city to lay a conduit and wires on a new system. Models are being prepared for the railroad commission and Mr. Dulaney is to appear before that body and to explain definitely his method, for the purpose of receiving its consent to operate street railway cars in the principal cities of the state.

Best, Fox & Company, of Pittsburgh, Pa., who installed the pipe work at the power station of the Worcester Traction Company, of Worcester, Mass., also performed all the installation of piping at the power station of the Philadelphia Traction Company at 15th and Mt. Vernon Streets, Philadelphia, including the steam exhaust and water piping. This firm does a large business, and its works at 25th and Railroad Streets, Pittsburgh, cover a considerable territory.

George Westinghouse, Jr., of Pittsburgh, Pa., has acquired absolute control of the Westinghouse Machine Company, one of the most profitable of the several Pittsburgh corporations comprising the Westinghouse industries, by purchasing outright Ralph Bagaley's stock in the company. Mr. Westinghouse's holdings now amount to nine-tenths of the company's stock. Ralph Bagaley has been identified with the company since its organization in an official capacity as treasurer and general manager.

Eugene Munsell & Company, of New York, dealers in mica for electrical purposes, are having a large demand for sheet mica. This is manufactured and sold in segments of the proper form for immediate use for repairing the following armatures: Thomson-Houston types, F. 20, F. 30; W. P. 30, W. P. 50, and for Westinghouse No. 3, and for street car rheostats. This firm also supplies all grades of sheet mica cut in assorted sizes, for electrical purposes, and will be glad to send samples upon application.

The R. A. Crawford Manufacturing Company, of Pittsburgh, Pa., has made its first shipment to the Philadelphia Traction Company,

of 100 wheel guard fender boards. This company will ship about 200 more about a month hence, until all cars are equipped. The Citizens' Street Railway Company, of Indianapolis, and the Pittsburgh & Birmingham Street Railway Company, of Pittsburgh, have ordered all of their cars equipped with the Crawford pick-up fenders. The first consignment will be shipped in February.

Wm. Hazelton, 3d, has secured rooms on the thirteenth floor of the Havemeyer Building, New York, where he would be glad to see his many friends in the street railway business. Mr. Hazelton has recently been appointed Eastern sales agent of the Fulton Truck & Foundry Company, of Cleveland, O., and anticipates a large demand in the East for the new appliances of this concern. Mr. Hazelton, who is also American representative for the Arbel wheels, of France, reports an increased interest in these wheels on the part of the American street railway public.

J. W. Parker & Company, of Philadelphia, agents of the Ball Engine Company, have now assumed charge also of the business of that company in New York City and its territory. This firm will establish a New York department, with a resident sales agent, but both offices will be under the direct management of J. W. Parker. The business will be known as J. W. Parker & Company, of New York and Philadelphia, general Eastern agents for the Ball Engine Company, and contractors in general for complete electric railway and lighting steam power plants. No change will be made in the location of the offices in either city.

The Baltimore Car Wheel Company, of Baltimore, Md., has issued a striking advertisement of its "Lord Baltimore" truck in the form of a two sheet folder. The covers are printed in gold on black, and the insides show finely finished cuts of two forms of this truck intended for open and closed cars. The back cover contains a description of the principal points of this truck, among which the extra long spring support, eight feet more than the wheel base, on six half elliptic springs and the placing of the brake gear above the axles facilitating removal of the wheels. A number of other points of advantage are also clearly stated.

The Joseph Dixon Crucible Company, of Jersey City, about a year ago issued a pamphlet on lubricating graphite. It embodied an elaborate scientific opinion by Prof. R. H. Thurston on the value of graphite as a lubricant, and much interesting information on the subject from practical men. The pamphlet has had a large circulation, and the company has been enabled to obtain from well known men a vast amount of additional knowledge on the uses of graphite. Another pamphlet, twice the size of the former, will be issued early in February, and a copy will be sent free of charge to all interested in the subject of friction and lubrication.

The Graham Equipment Company, of Boston, Providence, Philadelphia and Chicago, has been incorporated under the laws of the state of Rhode Island, with a capital of $100,000 paid up. The officers are J. H. Graham, president; G. S. A. Gardiner, vice-president and treasurer; E. G. Rogers, secretary. The main offices of the company are at 258 Washington Street, Boston, and 232 Carter Street, Philadelphia. Works have been established in Boston and Philadelphia, and orders have already been secured, which it is said will pay 10 per cent. on the capital stock. One concern alone, which is equipping four street railway lines, has given an order for 200 trucks.

Albert & J. M. Anderson, of Boston, Mass., send us a handsomely gotten up four page circular containing their New Year's greeting to their patrons. This circular is handsomely printed, and contains cuts and descriptions of their "Ætna" insulating materials and "Ajax" specialties, and their celebrated Boston trolley and steel trolley poles. It also reproduces a letter from the consulting engineer of the Brooklyn City and West End Street Railway companies endorsing their Brooklyn strain insulator, and gives the results of some very satisfactory tests of the strength and resistance of this insulator, recently made by the Massachusetts Electrical Engineering Company.

The Consolidated Car Heating Company, of Albany, N. Y., at a meeting held January 9, 1894, declared its regular semi-annual dividend of 3 per cent. payable February 15, 1894; transfer books to close from February 1 to February 16. The affairs of the company were reported in a prosperous condition. The company writes us that it has begun suit in the United States Circuit Court against the Chicago & West Michigan Railway for infringement of the Sewall coupler patents. The infringement consists of using an imitation of the Sewall steam coupler recently put upon the market. Such railway is the first to continue the use of the imitation coupler after proper notification, and the Consolidated Car Heating Company at once determined to take action to protect the patents issued to D. D. and J. H. Sewall.

The Hughes & Rigby Engineering Company, Limited, of Baltimore, Md., agent for the Siemens & Halske Electric Company, of America, writes that it is now building a road from Boonsboro to Keedysville, Md., for which it is under contract with the South Mountain Railway & Electric Light & Power Company. This is an electric road, three miles long, four feet eight and a half inches gauge, fifty-eight pound T rail. The equipment will be three motors, six trailers. The Siemens & Halske electric apparatus and the Stirling boilers will be used. The president is George W. Jacobs, Jr.; secretary, Geo. A. Davis, and treasurer, C. E. Shafer. This company also has contracts to build an electric road from Frederick to Middletown, and one from Middletown to Myersville, Md. The prospects for business for the coming year, the managers write us, are most favorable.

The Berlin Iron Bridge Company, of East Berlin, Conn., is, as usual, doing a great deal of work in building construction. We learn that the new works of the Stanley Electric Manufacturing Company, at Pittsfield, Mass., will be entirely of iron, designed and built by this company, and that it is also putting the roof on a building for the United States Government, at Fort Wadsworth, N. Y. This building is 41 × 231 ft., the roof being made entirely of iron, iron trusses covered with corrugated iron. This company has also received the contract for an iron roof for the boiler and engine room of DeLand & Company, at Fairport, N. Y. This roof will be covered with the Berlin Iron Bridge Company's patent anti-condensation corrugated iron. The Citizens' Gas Company, of Brooklyn, N. Y., has also placed the order for an iron roof for its new producer house with the Berlin Iron Bridge Company. This building is 69 × 151 ft., with an iron roof covered with slate.

The General Electric Company, of New York and Schenectady, has secured a large slice of the street railway car equipment contracts awarded during the last ten days in Philadelphia. Of 250 contracted for the People's Traction Company 125 equipments with the G E. 800 motors and type K. controllers were purchased from the General Electric Company, while the remaining 125 were allotted to the Sperry Company, of Cleveland. Of eighty equipments required by the Electric Traction Company, of Philadelphia, seventy will be furnished by the General Electric Company. The People's Traction Company had already contracted for three of the great 1,500 K. W., General Electric generators. The General Electric Company has also secured contracts during the past week covering twenty car equipments for the Union Railroad Company, of New York; twenty-five car equipments for the Steinway Railroad, of Long Island; one 700 H. P. generator for the Steinway Railroad, of Long Island; eight M. P., 300 K. W. generators for Cincinnati, O., and ten car equipments for St. Louis, Mo.

The Campbell & Zell Company, of Baltimore, Md., finds that there is a good demand for the Zell improved water tube safety boilers, in spite of the general depression in trade. A view of the boiler house of the Eutaw Street power station, Baltimore, is shown on another page of this issue, with a view of the boilers supplied by the Campbell & Zell Company. Other orders recently received by this company are the following: Keiffer Brothers, New Orleans, La., 50 H. P.; Wm. Henderson, 317 H. P.; Citizens' Street Railway, Indianapolis, Ind., 1,500 H. P.; Val Blatz Brewing Company, Milwaukee, Wis., 1,164 H. P. The Zell boiler claims absolute safety from destructive explosion, rapid generation of steam and economy of maintenance and operation. There are no upright tubes in the path of the hot gas, at the rear end, through which the water circulation must be maintained upwards in a direction opposite to that naturally taken by the steam. The water drums are placed parallel to the incline of the water tubes. The steam, after disengaging itself from the water at the upper end of the water drums, passes into superheating tubes—a feature peculiar to the Zell—where any entrained water is evaporated, then passes to a steam drum supported at each end by a water leg connecting with the water drums, but well out of the path of the hot gases.

E. H. Wilson & Company, of Philadelphia, call our attention to the fact that in the description published last month of the equipment of the Philadelphia Traction Company, of Philadelphia, no mention was made that a number of Lamokin cars are used by this company. The Lamokin cars are giving very excellent results, and are very handsome and tasteful in design and finish. This company has also closed an order with the People's Traction Company, of Philadelphia, for forty ten-seat, open car bodies, and with the Concord Street Railroad, of Concord, N. H., two "Columbian" open cars, being duplicates of the open car at the Chicago Exposition in general style. Another recent order is with the Delaware County & Philadelphia Electric Railway Company of Philadelphia, for twenty-four closed cars, twenty-five foot six inch bodies, mounted upon McGuire adjustable trucks, cushion steel wheels. The company is receiving many inquiries from all over the country asking for prices and deliveries on its Columbian open and closed vestibuled cars such as exhibited at the Chicago Exposition, these being its latest styles of cars. The company is now delivering eight vestibuled cars to the Schuylkill Traction Company, and the balance of an order for the Gloucester, Woodbury & Camden Railway. It is also delivering to the East Harrisburg Railway Company some double truck, twenty-five foot cars, and has just delivered to the Springfield Street Railway Company, of Ohio, two of an order for four sixteen foot, vestibuled cars.

The Standard Paint Company, of New York, reports that notwithstanding the general financial depression of the past year, its business, electrically, especially with the electric street railroads, has been remarkably good. This company has received some very large orders from many of the best known street railroads in the United States for P. & B. compound, paint and motor curtain cloth. The latter material has taken especially well with the street railroads everywhere. Some time ago the company sent out samples to every electric road in the United States, and it received more returns from them than from any lot of samples ever sent out. The use of the P. & B. paint in Philadelphia, for covering rail bonds was mentioned last month. Although the outlook for business in general is not yet what might be termed bright, we understand the company has several good deals on hand for this year, which will largely increase its sales. This company has just completed arrangements with the Metropolitan Electric Company, 186 and 188 Fifth Avenue, Chicago, to act as its general Western agents for P. & B. electrical compound, armature and field coil varnish and P. & B. tape. The Metropolitan Company has placed with this company an order for a stock of products, which it intends to push extensively throughout the West, and will at all times carry a large supply of P. & B. goods on hand. The Metropolitan Company, through its president, Wm. H. McKinlock, is so well known to the trade everywhere in the West, that it is believed this arrangement will be of great benefit not only to the Standard Paint Company, but to the

trade in general. The Standard Paint Company has also re-opened its Chicago office at 871 The Rookery, which will be in charge of William Weierbach, who has been one of the company's Eastern representatives for the last seven years, and is, therefore, thoroughly acquainted with all of its goods.

WESTERN NOTES.

The Shultz Belting Company, of St. Louis, Mo., has just received an order from England for 2,800 ft. of belting, and an order from Russia for 15,000 ft. of belting. This company also writes us that trade is looking up and orders are coming in freely, and the outlook for business is fair.

The Chicago Electric Truck Company, of Chicago, has moved its office to room 1,436, Monadnock Building, that city. The No. A truck of this company, described elsewhere in this issue is meeting with a large sale, and seems to be well adapted for the work for which it was designed.

The Star Electric Lamp Company, of Chicago, manufacturer of the Sunbeam lamp has changed its name to the Sunbeam Lamp Manufacturing Company. The policy of this company is to furnish lamps superior in quality. Recently some discoveries have been made, as the result of the extensive experiments this company has carried on, which are claimed to greatly improve the quality and add to the value of its lamp.

The Brownell Car Company, of St. Louis, is sending some very fine cars to the Cincinnati, Newport & Covington Street Railway Company, of Covington, Ky. They are models of the car builders' art, and are very similar in design and model to the beautiful car the car company exhibited in the Transportation Building at the World's Columbian Exposition. This is the third order the car company has received from the railway for cars of this style.

The Western Advertising Company, of St. Louis, has recently taken possession of its new offices, 316 Union Trust Building, that city, and is making a specialty of street car advertising. The company now has exclusive contracts for advertising in the street cars of St. Louis and Louisville, Ky. W. S. Hill is the general manager, and will be glad to negotiate at any time with parties who desire to avail themselves of the great advantage of advertising in street cars.

The Steel Motor Company, of Cleveland, O., is, as usual, well supplied with orders. Among the equipments now on its books are twenty street railway equipments for use in Cleveland, and three for Allentown, Pa. The company also started work on 100 controllers, thirty of which are nearly finished. The president of the Steel Motor Company is A. L. Johnson; vice-president and general manager, Samuel Harris, well known from his early work in the electric street railway field.

The St. Louis Register Company, of St. Louis, Mo., has moved its office from the Houser Building to 217 North 3d Street, that city. This company has recently secured the contract for the equipment of all the new cars of the Philadelphia Traction Company with its register. This contract was secured after long investigation of the merits of the different registers manufactured, on the part of the Philadelphia Traction Company, and the St. Louis Register Company is to be congratulated upon having secured the contract.

The Star Electric Lamp Company, of Chicago, manufacturer of the new Sunbeam incandescent lamp, with luminous vapor, claims that this lamp has two great advantages which commend its use on electric street railways. First, the lamp can be overrun without in any way injuring its quality, and, secondly, the luminous vapor checks rapid vibration of the filament, giving it all the advantages of the anchored filament lamp without its disadvantages. In all other respects these lamps are claimed to be superior to either the vacuum or gas lamps.

The Stanwood Manufacturing Company, of Chicago, Ill., describes its well known types of car steps in a recent catalogue published by the company. The catalogue is illustrated by a number of handsome engravings of the steps, diagrams giving measurements, etc. The Stanwood steps, as is well known, consist of steel strips for the step tread in a frame now made of rolled steel in place of malleable iron. The hangers, which were also made of malleable iron, are now now made of pressed steel with double flanges. The addition of a straight strip of steel extending through the center and the entire length of the step tread prevents sagging. The step is used on 468 roads.

The Metropolitan Electric Company, of Chicago, Ill., has been transacting its business heretofore under disadvantages on account of the necessary separation of the sales and ware rooms from its offices, owing to leases existing when this company bought out the Enterprise Electric Company, which are satisfied. The company has leased a new store and ware rooms that will accommodate these interests and give it more direct supervision over its affairs, with the additional advantage of increased space which will permit it to carry larger stocks of staple articles and exhibit specialties, insuring customers more prompt attention than ever before. The new address of the company is at 186–188 Fifth Avenue, Chicago.

The Bass Foundry & Machine Works, of Fort Wayne, Ind., are having excellent success with their car wheels, and many street railway companies speak in the highest terms in their favor. A sample of letters which they often receive is that written by Jas. P. McQuaide, president of the Norristown, Bridgeport & Conshohocken Traction Company, a customer of the Bass Foundry & Machine Works, who writes as follows: "We have run five cars equipped with your wheels more than 20,000 miles. We have five grade crossings and old style horse railroad wheels, which show absolutely no wear. We would recommend them for every and any condition. We will use them for all new cars no matter what the cost. Take your friends to Norristown to see our cars." Other users speak in equally high terms of the wheels.

Sargent & Lundy, Western agent for McIntosh, Seymour & Company, of Auburn, N. Y., has just installed a 215 H. P., compound, condensing engine for driving dynamos in the power station of the Belle City Street Railway Company, Racine, Wis. The engine was put into operation eighteen days after the receipt of the order. Taking into consideration the distance of the factory from Racine, and the fact that special castings had to be made and alterations effected to suit specifications, this may be regarded as a great triumph for the company, illustrating both the promptness of Sargent & Lundy, and also of McIntosh & Seymour, in filling the order. This firm has lately moved into elegant offices at No. 13 on the ground floor of the Monadnock Block.

The Charles Munson Belting Company, of Chicago, has no difficulty in finding a ready market for its oak tanned leather belting. The "eagle" trade mark of this company is generally recognized as a guarantee of good quality of material. Every belt that this company manufactures is guaranteed to be short lap; that is, there is no piece of more than four feet two inches in length including the lap. The managers of this company advise every purchaser to examine his belt very carefully and see that there is no piece of leather longer than four feet two inches in the entire length of the belting that they receive. There is a large difference in the quality of the goods, after striking the four foot two inch line on the hide. The Munson Company writes us that it would be glad to give any who inquire, full information regarding short lap belting and its advantages.

The Link Belt Engineering Company, of Chicago, Philadelphia and New York, has recently issued a neat little pamphlet describing Holmes fibre graphite for bearings, of which it has recently taken the general sales agency. The fibre graphite is made in the form of bushings to be readily fitted to hangers, pillow blocks, etc., in the same manner as babbit metal linings. This material runs absolutely without oil and will wear indefinitely. They also include dimensions and prices of a line of countershaft and plain hangers, floor stands, post hangers, pillow blocks and ball and socket boxes fitted with fibre graphite bearings and a line of cylindrical fibre graphite bushings of all sizes and dimensions adapted to be fitted to existing bearings. They also illustrate dynamo and motor brushes, fan boxes, cable road sheave and pulley bearings and a number of other specialties fitted with bearings of this compound. This material is highly recommended for bearings running at any speed, at a pressure up to fifty pounds per square inch.

The Cushion Car Wheel Company, of Indianapolis, Ind., sends us a catalogue and descriptive pamphlet of its cushion car wheels which are applicable to steam, elevated and street railway use. These wheels have a cast iron center and a heavy steel tire. The cushion is in the form of a ring, of dense combination of rubber placed between the tire and the center which are held together by rivets which fit the holes in the center closely, but have enough play in the holes in the tire to allow for the cushioning. This wheel rides easily over rough track, and wears but little on the tire. It is claimed that one of these wheels will outwear five or six ordinary cast iron wheels, with one tire. The new tires may be placed on old centers in any ordinary repair shop. A number of testimonials are published from different street railroad companies expressing great satisfaction with the running and wearing qualities of these wheels, and the excellent traction of the steel tire over the ordinary iron wheels. One set of wheels on the Citizens' Street Railroad Company's lines, in Indianapolis, have made about 50 000 miles, and show only one-sixteenth of an inch wear. Another set in Joliet, Ill., have run 51,000 miles, and show no perceptible wear on the tires.

The Link Belt Machinery Company, of Chicago, Ill., has lately moved into new quarters at 21 to 23 S. Jefferson Street. Here the managers of the company are hard at work fitting up their new offices which include an elegant salesroom. This is large and showy, giving plenty of room to display a large line of samples, and at the same time allow plenty of space to carry a good stock of the company's special machinery, such as shafting, pulleys, hangers, link belt machinery specialties, etc. The object of the company is to carry a good stock in the store, so as to be able to fill all orders promptly. The windows in this salesroom are large and of plate glass, making it very pleasant, and at the same time affording good light to show stock. Eugene J. Pearce will have entire charge of this department, where he will be pleased to meet all those in the market for special machinery. This company reports a very fair trade. It is now equipping the M. H. Purcell Matting Company, of Chicago, with complete power transmitting machinery driven by rope. The pulleys, shafting, hangers are all of this company's own designs. The company has also equipped the Chas. Counselman & Company's new elevator, at South Chicago, complete with power transmission, also a grain elevator for a steam boat of the Graham & Morton Transportation Company, Benton Harbor, Mich.

The Wallace Electric Company, is the title of a new company which has opened offices at 104 Michigan Avenue, Chicago, Ill., and which has been organized for the purpose of conducting a business in electrical goods as manufacturer and manufacturers' agent. This company's line embraces a full equipment of electrical street railway appliances and supplies, and a few carefully selected specialties, as well as lighting supplies. The officers and management of the company are well known to the trade. The general manager, J. B. Wallace, has been actively identified with electrical industries from the earliest experimental stages of electric lighting in this country. Wm. S. Hine, the president, has had a large experience in this business through his con-

nection with the U. S. Electric Lighting Company and the Westinghouse Electric & Manufacturing Company as general district agent. Max. A. Berg, secretary of the company, is well known as the former manager of the street railway department of the Ansonia Electric Company, and M. M. Wood, whose special devices are rapidly becoming the standard for street railway construction, will be the company's electrical engineer in this department. The company writes that it is not an electrical supply dealer, but as a manufacturer and manufacturers' agent, is in a position to sell directly to large consumers and the trade at manufacturers' prices, and without an intervening profit.

The St. Louis Car Company, of 3,023 North Broadway, St. Louis, has its shops well filled with work at the present time. Among its recent orders is one for sixty twenty-four foot closed cars for the Union Depot Railroad Company, of St. Louis. These are to be mounted on Robinson radial trucks. The car company has built over 250 cars for the Union Depot Company up to date. There are also some very handsome closed cars being sent to the Citizens' Street Railway Company, of Indianapolis, Ind. These are twenty feet in length, and are equipped with vestibules. They are painted a very dark red, with gilt lettering. The trucks to be used under these cars are of the St. Louis Car Company's improved type. This truck, in its form just discarded, has met with great favor among the street railway fraternity. The extended spring base was not found long enough in the discarded type, and a new casting has been adopted, so that the elliptic springs can be mounted thereon and prevent the car from pitching. There are other improvements, such as a new method of attaching the fender to the framework of the truck, so that it can be removed when broken and replaced by another, not being in the body of the truck, and thus in breaking not rendering the latter useless. The hangers for the brake shoes are a departure as regards their great strength and method of attachment. The brake mechanism has also been greatly improved upon, and presents no obstruction to the motors. The company is splicing forty-eight foot cars for the St. Louis & Suburban Railway. They will seat fifty-two passengers each, and be models of comfort.

The Walker Manufacturing Company, of Cleveland, O., has progressed quietly but rapidly in its proposal to add an electrical department to its immense plant for the manufacture of street railroad dynamos, motors and other electrical transmission machinery. The first machines to be placed on the market are now nearing completion, and within a short time the company will be in active business in this line of work. It was predicted at the time of the announcement that the Walker people would prove an unusually strong factor in the electrical field, and this prophecy is borne out by the fact that business has already been offered the company, both from Eastern and Western roads. Judging from recent reports, there appears to be no doubt in the minds of those in any way interested, of the immediate and unqualified success of the new machines. To all who have seen them, the general designs are eminently satisfactory, and the rapid progress of the work has called forth the most favorable comments. The closest attention has been paid to mechanical detail. The improvements suggested and already carried out are claimed to be a distinct advance on any existing types of the older companies, in fact, this verdict was rendered only a few days ago, by prominent railway men and future purchasers who visited the company's shops to note the progress of the work. One especially noticeable feature is the ease and facility with which the work is being done. There have been no unusual delays in assembling the various parts, and fewer annoyances in construction than generally attend the first output. Among other features, this characteristic of the Walker Company has brought forth the good opinion of experts. The wheel type idea has been followed in the designs for generators, and this plan will prevail throughout. So far it has been impossible to obtain details of construction, as the company's officers are not yet ready to give out specific information.

Wm. Sharpe, of Chicago, who is successor to the business of W. E. Reid & Company, of that city, as agent for the J. H. McEwen Manufacturing Company, of Ridgeway, Pa., writes us that he has just completed an installation of three McEwen automatic, high speed engines, single expansion, direct connected to the Waddell-Entz dynamos, of ninety horse power each, for the Chicago West Side Street Railroad Tunnel Company. These three engines are of the new style McEwen engine, being a radical change for the better from the old style, while maintaining all the good points embraced in the old style. The new style engine has some additional features which undoubtedly place the McEwen engine in the front ranks of center crank, automatic engines. Owing to the very close regulation of the McEwen engine, it is meeting with very great favor in the Chicago market, and has established a good record and a splendid reputation for itself. Among a few installations made in Chicago might be mentioned the three 12 × 14 single cylinder engines at the Windemere Hotel, direct connected to the Waddell-Entz dynamos, and also a late installation made at the LaGrange Light & Water Works station, there being a 16 × 18 at that place. Since Mr. Sharpe has had the agency of this engine he has sold upwards of thirty-five engines, from the smallest, 9 × 10, to a 250 H. P. compound. For street railroad work, the company has had a number of successful installations, which are giving excellent satisfaction, owing to their good regulating qualities and general merits. One of these is at Escanaba, Mich., and is doing very satisfactory work. Another good installation was made at the old Pittsburg coal mine, at Hymera, Ind., which is operating electric lights, mining machinery and an electric locomotive for hauling loaded cars out of the mine. This latter part of the work is very trying on any engine or any generator. The engine hauls twelve cars loaded with coal up a 5 per cent. grade for nearly one mile, without, it is claimed, the flicker of a lamp. The owners of this mine, Messrs. Buchanan Brothers, of the Tacoma Building, Chicago, speak in the highest and most flattering terms of it, and say that its regulation is something wonderful.

List of Street Railway Patents.

Issued by the U. S. Patent Office, December 5, 1893, to January 16, 1894, inclusive.

Prepared by E. W. Cady, Patent Solicitor, 99 Nassau Street, New York City.

December 5, 1893.

Rail Sweeper—Henry A. Bruhus, Milwaukee, Wis. No. 509,871.

A street car having brackets depending therefrom and horizontal plates connected therewith, carrying in bearings a lever controlled rock-shaft which supports rotary brushes driven by clutch mechanism and gearing from the car axle.

Car Fender—Frederick W. Brown, Cambridge, Mass. No. 509,996.

A vehicle having sockets and provided with a car fender having wheels or the like adapted to run on a track, and also provided with hooks entering said sockets, said hooks having a loose connection with the vehicle whereby the latter can be swayed or tipped laterally without tilting the fender.

Conduit Electric Railway—William R. De Voe, Shreveport, La., assignor of seven-twelfths to C. W. Dawley, Dallas, Texas, and Patrick B. Cash, Shreveport, La. No. 510,061.

Combines with conduit irons forming the sides of the conduit and having elongated slots therein, and insulating material supported in said slot and looped clips secured to said material for supporting the line conductor.

Sanding Device for Cars—Herbert H. Hennegin, St. Louis, Mo. No. 510,258.

An improved sanding utensil having a sand releasing device adapted to be vertically reciprocating and simultaneously revolved.

Electrically Operated Railway Switch—Henry L. Falco, Brooklyn, N, Y. No. 510,384.

Combines with a car and an electro-magnetic switch moving mechanism, a contact maker formed of a sliding spring pressed rod, a fixed insulated contact spring, a movable contact spring carried by the rod, a yielding contact levers and contact plates.

December 12.

Cable Tramway—Wm. N. Colam, London, Eng. No. 510,469.

Embraces a switch or rail and slot points, two arms mounted on vertical shafts one on each side of the cableway, the said arms carrying tongues or flanges adapted to engage with a projection on the under side of the slot point to pull the said point over to either side of the slot, levers mounted on the said shafts below the cableway and coupled together by a link to insure their simultaneous action, an arm mounted on one of the said shafts and connected to a bell crank operating lever by a connecting rod, spring stops mounted on the said connecting rod, a vertical shaft carrying at its top end an arm connected to the switch or rail point and an arm mounted on the bottom of this vertical shaft and having a slotted end through which the connecting rod carrying the spring stops passes and is operated by the said spring stops.

Electric Railway Conduit—Wm. R. DeVoe, Shreveport, La. No. 510,634.

An electrical conduit provided with metallic cross ties, having central recesses located above the base of the tie, and a slotted metallic conduit located in the said recesses.

Conduit Electric Railway—John P. Mitchell, San Francisco, Cal. No. 510,647.

Embraces a car and conductor, a vertical trolley standard having a screw threaded cap formed upon its lower end, and a hemispherical deflector slightly above said cap, a cylinder of glass having its upper end screw threaded to engage said cap, a second cap screw threaded upon the lower end of said cylinder and carrying a trolley wheel and wires passing through the cylinder to the lower cap.

Automatic Safety Guard for Cars.—Ira P. Clarke, Alameda, assignor of one-third to John H. Kostar, Oakland, Cal. No. 510.675.

Consists of a frame or receptacle composed of C shaped arms suspended from the truck and movable backward by yielding about their upper ends, with their lower ends forwardly projecting over the roadbed, and connected by a crossbar and rollers journaled on the crossbar, and a backwardly yielding flap suspended from above and in front of the upper portion of the guard frame or receptacle.

Closed Conduit System for Electric Railways—Robert H. Elliott, Birmingham, Ala. No. 510,850.

Comprises an insulated main conductor running approximately parallel to the track, a series of broken conducting pins having one portion electrically connected to said main conductor, and the other portion nominally insulated from said first portion; a conducting shoe carried by the car and electrically connected to one terminal of the electric motor or motors, a pin projecting from the roadbed and adapted to be struck by said shoe, and a lever connecting said latter pin and said broken pin, and adapted to bring the two portions of the broken pin into electrical connection with each other and with said shoe.

Cleaning Device for Railway Conduits—John C. Love, Philadelphia, Pa., assignor to the Love Electric Traction Company, Chicago, Ill. No, 511,341.

Comprises a bar attached to the car and extending into the con-

duit through the slot thereof, a brush or scraper pivoted to the bar within the conduit, a link pivoted at one end to the free end of the brush or scraper and having at its other end a pivotal or sliding engagement with the bar, and means for locking said link at either limit of its movement.

DECEMBER 19.

ELEVATED RAILWAY SYSTEMS—Burr F. Barnes, Circleville, O. No. 510,878.

The combination with a car having receiving and delivery doors, means for opening both, a bell crank lever adapted to be engaged and moved by the former, and a rod connecting said lever and the delivery door.

FENDER FOR STREET CARS—William B. Miles, Holyoke, Mass. No. 510,922.

A fender comprising a frame which is connected to the car to swivel horizontally, and pivotally connected to the swivel frame so that it may have an up and down swinging movement. A spring is provided for pressing the fender downward and flanged rollers are placed at the forward lateral extremities of the fender for engaging and running on the car track.

ELECTRIC LOCOMOTIVE—Charles F. Winkler, Troy, N. Y., assignor to the United Columbian Electric Company, of New Jersey. No. 510,947.

A single electric motor provided with two rotary armatures geared respectively with two car axles and with a single field magnet acting upon both of said armatures. The field magnet is formed in two parts flexibly connected together, and in combination with said car axles.

BRUSH HOLDER FOR DYNAMO ELECTRIC MACHINES—Frank E. Averill, Syracuse, N. Y. No. 510,952.

Comprises the combination of a supporting spindle, a brush holder frame loosely mounted on the spindle and having one extremity adapted to support the brush; a fixed arm mounted on the spindle and arranged between the two extremities of the holder frame, and a spring provided having one end connected to the arm and the other to the opposite extremity of the holder frame.

ELECTRIC RAILWAY SWITCH AND CROSSING—William W. Hendrix, Bowling Green, Ky. No. 511,017.

A switch or crossing consisting of stationary blocks connected with the ends of the wire, sliding blocks abutting against the stationary blocks and adapted to be moved by the jaws of the trolley, a coil spring having one end attached to the sliding block and the other to another part of the switch or crossing, the spring being adapted to pull the sliding block back in place when the block is disengaged from the jaws.

ELECTRIC RAILWAY TROLLEY—William W. Hendrix, Bowling Grenn, Ky, No. 511,018.

An attachment for trolleys consisting of two jaws hinged one on each side of the trolley, the upper ends of the jaws having their front edges beveled to the rear, while these upper ends are adapted to overlap the wire; suitable springs are provided for connecting the jaws above their hinged point.

ELECTRIC RAILWAY TROLLEY—William W. Hendrix, Bowling Green, Ky. No. 511.019;

An overhead trolley having its lower end pivoted in a swiveled boot, the trolley pole having bearing against its under side, one end of the coiled spring, the coils of the spring passing around the pivot and the other end of the spring bearing against the bottom of the boot.

STREET RAILWAY TRACK—William C. Wood, Brooklyn, N. Y., assignor to the Lewis & Fowler Girder Rail Company, same place. No. 511,068.

In street railway track comprising box rails and clamp chairs, a tongue switch composed principally of a casting approximately H shaped in general cross section, and provided at top with a laterally swinging tongue, and at bottom with an internal boss integral with its horizontal web to co-act with the pivot of said tongue, and with external clamp engaging flanges.

METAL RAILWAY TIE—Hippolyte A. De Raismes, Elizabeth, N. J. No. 511,072.

Consists of the combination with a metallic railway tie formed with end loops and provided with slots, of a chair formed with rail engaging flanges and with other flanges adapted to enter the slots in the metallic tie; locking keys are also provided.

SIGNAL FOR CABLE RAILWAYS—Joseph Sachs, New York. No. 511,163.

The combination with a vehicle and a cable for moving the same, of signal boxes adjacent to the cable, an electric circuit connecting the signal boxes with the central station and devices that can be actuated from either end of the car for operating the signal boxes by the movement of the cable and car.

RAIL SHOE AND BRACE—Andrew B. Snider and William H. Roberts, Bartholow's, Md. No. 511,170.

Consists of a plate having on one side a simple hook-shaped flange on the rail base and having on the other side a shoulder, forming between them a rail seat; spike holes are provided at the edge of the shoulder which opens into the rail seat.

ELECTRICALLY OPERATED RAILWAY SWITCH—Chas. A. Stone, Newton, and Edwin S. Webster, Boston, Mass. No. 511,173.

Comprises a main current conductor, which has sections insulated from direct electrical connection therewith, a connecting loop between the main conductor and each of the sections with a plurality of electromagnets in circuit; differentially adjusted armatures for the magnets; two or more shunt lines from the connecting loops, each having in circuit a circuit closer which is operated by one of the armatures, and a magnet of a railway switch, and a rheostat upon the car adapted to be switched into an electric circuit, in parallel with the motor circuit, for the purpose of operating the railway switch.

ELEVATED RAILWAY—John N. Valley, Jersey City, N. J. No. 511,179.

The supporting posts of this roadway are arranged in pairs inclined toward each other; the girders are adjustable vertically and project beyond the posts to form clamp sections; these clamp sections are attached to the girders both at the outside and the inside of the post.

SANDING DEVICE FOR CARS—James R. Dougherty, St. Joseph. Mo. No. 511,199.

A sand box adapted to revolve independently of its bottom and has bevel gears and shafting and frictional gearing, which when operated by the bell crank lever provided for that purpose, is brought into continuous contact with the car axle. By this means the sand box is operated so as to keep the sand in working order.

BRUSH HOLDER FOR ELECTRIC MOTORS—James J. Robison and Fred. B. Perkins, Toledo, O. No. 511,214.

A brush holder which has a practically rectangular shell, and an arm connected therewith having flanged sides; a lever is pivoted to the end of the arm, and a spiral spring connects the lever with the base of the arm; a transverse bearing is carried at the free end of the lever to bear upon the brush within the shell.

FASTENING FOR RAILROAD RAILS—Leander E. Whipple, New York. No. 511,226.

The combination of a plate adapted to be seated and secured upon the tie and provided with a flange, and clamping plates secured upon the first named plate beneath the flange with their edges in position to engage the foot of the rail.

RAILROAD TIE—Leander E. Whipple, New York. No. 511,227.

In a railroad tie, the combination with the body portion, the two curved plates united at their edges, of a vertical plate applied to the end of the body portion and extending below the same and provided with lips embracing the outer sides of the curved plates.

CLOSED CONDUIT ELECTRIC RAILWAY—William S. Smith, Berkeley, Cal. No. 511,254.

This consists of the combination of an insulated main conductor extending along the roadway, a secondary or working conductor, a branch conductor between the main and secondary conductors, a sealed box surrounding the branching point of the main and branching conductors and a switch or cut-out at both ends of the branch conductor, one inside of the box and one outside thereof.

METALLIC TIE AND FASTENER—Thomas M. Brintnall, Medina, O., assignor of three-fourths to Blake Hendrickson, same place, Rollin S. Giffin, Cleveland, and Howard C. Bradley, Warren, O. No. 511,317.

Comprises a railroad rail fastener for securing one flange of a rail, comprising a channel block, dog spike and a key, the channel block being provided with an upper and a lower gripping jaw and side lugs, and across its back with a lug or bead near its lower end and a groove near its upper end to receive the key; and the dog spike provided with an outwardly extending shoulder and having its lower end reduced in thickness to give it a spring action and formed across its back with a recess near its lower end and a groove near its upper end to receive the key.

DECEMBER 26.

CONDUIT RAILWAY TROLLEY—John C. Love, Chicago, Ill., assignor to the Love Electric Traction Company, same place. No. 511,342.

Embraces an electric conductor and vehicle, a travelling contact device comprising a grooved contact piece or shoe, and means for supporting the same, comprising a main arm adapted to swing in a vertical plane, and consisting of two parts connected by a transversely arranged pivot adapted to allow lateral oscillatory movement in the outer end of the arm, a horizontally arranged arm pivoted to the outer end of the main arm and adapted to swing in a vertical plane and to which the said shoe is connected by a vertical pivot and springs yieldingly sustaining said main and horizontal arms.

TROLLEY FOR CONDUIT RAILWAYS—John C. Love, Chicago, Ill., assignor to the Love Electric Traction Company, same place. No. 511,343.

Comprises a car, slotted conduit and conductor, a traveling contact device embracing a bar extending through the slot of the conductor, a support for said bar mounted on the car, and laterally movable thereon, a vertically movable trolley or contact piece supported on said bar and bodily movable laterally with reference to the part of said bar, and a spring applied to throw said trolley or contact piece upwardly into contact with the said conductor.

TROLLEY BAR CARRIER FOR CARS—John C. Love, Philadelphia, Pa., assignor to the Love Electric Traction Company, Chicago, Ill. No. 511,346.

Embraces a trolley bar carrier capable of lateral movement at both ends, and means for automatically confining the advance end of the carrier when the direction of movement of the car is reversed.

LIFE GUARD FOR STREET CARS—Charles W. Howe, Waltham, Mass. No. 511,428.

Comprises a fender supported in engagement with slideways on the car body, and a lever and rod connection between the fender, the

car truck and the car body, whereby the vibrations of the car body do not affect the position of the fender, relative to the surface over which the car moves, and the fender is maintained in substantial parallelism with such surface.

Life Guard or Fender for Cars—James F. Ingraham, West Peabody, Mass. No. 511,432.

Comprises a swinging guard, consisting of a frame provided with independent, vertically movable bolts or rods, a pivoted or hinged scoop guard, and connections between the swinging guard and scoop guard, whereby when the former encounters an obstruction, it may unhinge or release the latter.

Conduit for Electric Railways—Henry D. Oler, Paterson, N. J. No. 511,452.

Consists of a conduit with wooden blocks fastened in the same the entire length of the conduit, in which blocks is formed a groove extending the length of the conduit, a conductor held in said groove, a part of which conductor is insulated and the remaining part exposed, sliding blocks in the groove, plates hinged in the conduit and connected with the sliding blocks, a wheel passing through the slot of the conduit and adapted to act on the hinged plate, a shaft for said wheel and spring bearing blocks mounted on parts of the car, in which bearing blocks the said shaft is mounted.

Car Fender—George E. Cates and Diederrich Renschenberg, Brooklyn, N. Y. No. 511,586.

Combines with the brake applying mechanism, a semi-circular fender pivotally connected at its rear end to a fixed support beneath the car, springs connecting the fender with the car in advance of its pivotal connection, a bearing located upon the fender in advance of its pivot, and a bearing on the truck which is located lower than the fender bearing, the brake chain extending rearward over such fender bearing and under the truck bearing.

Cable Railway—Charles I. Earll, New York. No. 511,596.

Embraces a grip slot having successive oppositely disposed lateral curves, a pair of cables located below the grip slot, and a cable shifter in position at said curves for shifting the cables from and into the path of the grip.

Cable Railway—Charles I. Earll, New York. No. 511,597.

Embraces a grip slot with successive deflections, a pair of driving cables, a laterally movable cable shifter in position at said deflections and having two sheaves set out of alignment as set forth, for shifting said cables into and out of the path of the grip, and means for actuating the cable shifter to carry the cables transversely of the tracks.

Fender for Street Cars—David Flanders, Watertown, Mass. No. 511,604.

Consists of a tilting two-part frame hinged together and to the car, and means to hold the parts in extended position, a spring adapted to tilt the frame into operative position, a notched bolt secured to the frame, and a locking dog to normally engage said bolt and hold the frame in inoperative position against the action of the spring.

Car Fender—James W. McKinnon, New York, assignor of two-thirds to Sarah B. McLeod and Ann M. Downs, same place. No. 511,640.

Consists of a fender adapted for pivotal or hinged engagement with the car at its rear ends, spring cushions carried by the fender and adapted to be interposed between it and the car, and an adjusting mechanism connected with the forward portion of the fender, whereby it may be raised and lowered.

Street Railway Car—George Moore, Boston, Mass., assignor of one-half to G. Waldon Smith, same place. Reissue No. 11,396.

A car constructed with upright frames of circular form from near the floor on one side of the car to a corresponding point on the opposite side of the car, and movable side sections on the opposite sides of the car, arranged to slide upon said upright frames and to partly pass each other and overlap when in their raised position under the roof of the car.

January 2, 1894.

Railway Frog—Walter C. Meeker, Jersey City, N. J., assignor to the Lewis & Fowler Girder Rail Company, Brooklyn, N. Y. No. 511,784.

A railway frog constructed of two box girder rails, halved together, the web of one of said rails being cut and bent, instead of being entirely cut away, so as to bear against the outside of the web of the other rail, and secured thereto.

Trolley Mechanism for Electrically Propelled Vehicles—Curtis H. Veeder, Lynn, Mass., assignor to the General Electric Company, of New York. No. 511,824.

Combines with a stationary socket, a stationary contact standard concentrically arranged therein, a tubular post rotatable in the socket and carrying a cap to make contact with the standard, a trolley arm pivoted on said post, and insulated electrical connections between the trolley and the cap.

Street Railway Special Work—William C. Wood, Brooklyn, N. Y., assignor to the Lewis & Fowler Girder Rail Company, of same place. No. 511,831.

Combines in a frog or other piece of street railway special work, constructed mainly of box girder rail, a rail continuous at top excepting a shallow intersection notch or notches, an adjoining rail connected with the rail first named at the intersection, a wedge or wedges interposed between the rails within the crotch or crotches, and horizontal bolts uniting wedge and rails.

Trolley Catcher—George E. Gay and John H. Parsons, Augusta, Me. No. 511,941.

Embraces in a trolley rope reel, a fixed shaft, a disk or arm having one or more projections on its side and rigidly attached to said shaft, the reel winding springs, a spring connecting sleeve, a casing or drum adapted to revolve on said shaft, and a dog adapted to engage with the projections on the disk or arm when thrown outward by rapid turning of the reel, in connection with the trolley rope or cord.

Heating and Ventilating Apparatus for Street Railway Cars—Joseph A. Long, Brooklyn, N. Y., assignor to Aaron H. Eastmond, same place. No. 511,961.

Comprises a casing adapted to set beneath the seat of the car and having a lining of asbestos or similar material, and air pipes extending laterally from the same beneath the car seat, a frame having openings and forming the base for the casing, a heater supported by the frame, and having an ashpit below the heater accessible from outside the car, and a fuel hopper and door accessible from within the car.

Cable Grip—Alfred N. Humphreys, Irwin, Pa. No. 512,112.

A grip comprising a frame terminating in a jaw, an arm pivoted to the frame and terminating in a jaw which is opposite the frame jaw, a screw carried by the frame and engaging the jaw, and a coupling bar secured to the frame and provided with coupling heads.

January 9.

Method of Laying Railway Rails in Paved Streets—George C. Warren, Utica, N. Y. No. 512,343.

A T headed rail, a support therefor, a retaining wall parallel with and a little removed from the head of the rail, a concrete grouting resting in whole or in part on the base web of the rail and partially filling the space between the retaining wall and side of the rail, and an elastic mastic resting on the concrete grouting and occupying the space between the side and head of the rail and the retaining wall.

Street Pavement—Bedford P. Thiebaud, Springfield, O. No. 512,568.

A pavement consisting of paving blocks having recesses or incisions, and railway rails provided with flanges or ribs at a point between their tread and base, adapted to enter the said recesses or incisions in the blocks.

Street Pavement—Bedford P. Thiebaud, Springfield, O. No. 512,569.

A pavement consisting of a plurality of blocks having recesses in their adjacent vertical faces, and a separate key insertable into matching recesses, in combination with a railway rail and anchor devices secured adjacent thereto and extending into the recesses of the adjacent blocks.

Car Brake—Harry Thompson, Brooklyn, assignor to himself and John F. Ambros, New York. No. 512,588.

Combines with the brake levers and brakes of a car, a screw of quick pitch capable of being slid without turning, an internally threaded pinion arranged to turn on the screw, but prevented from sliding thereon, a spur wheel and a crank shaft for operating the internally threaded pinion and the brake connections.

January 16.

Life Saving Device For Tramways—Louis Martineau, La Roche, France. No. 512,836.

Comprises clasping arms adapted to be held on the front of a locomotive or car, means for holding the arms normally open, and a yielding releasing device for the holding means.

Cable Car Transfer Device—John T. Schweizer, Wilmington, Del., and Jacob H. Burger, Philadelphia, Pa. No. 512,910.

Comprises in connection with a cable beneath a railway track, passing below a transverse cable, and a chamber beneath the lowermost cable, an endless sprocket chain, idler wheels supporting the chain which is depressed below the transverse cable, mechanism within the chamber driven by one cable and actuating the sprocket chain, and two spaced pivoted arms on the side of the car that may be set to engage the sprocket chain.

Electric Railway Trolley—Walter Van Benthuysen, New Orleans, La. No. 512,923.

Embraces a tubular swinging arm, a sliding jointed rod mounted therein, a trolley wheel carried by the sliding rod, and springs for holding the tubular arm in a central position and for projecting the sliding rod.

Cable Grip—Frank T. Hogg, Brownsville, Pa. No. 513,014.

Consists of hinged jaws, a shaft arranged in one of said jaws, an eccentric formed on said shaft, a wheel attached to one end of said shaft and a pawl pivoted to lock the same, and a suitable means for operating the said wheel, and to attach the grip to the under side of a vehicle.

An Electric Railway Trolley—George W. Mackenzie, Beaver, Pa., assignor of two-thirds to Moses P. Sloan and Thomas C. Sloan, same place. No. 513,023.

A trolley having independent rollers with inclined downwardly converging surfaces. Said rollers having removable wearing surfaces, and are so located as to form a tapering opening between them to receive the trolley wire.

QUOTATIONS OF STREET RAILWAY STOCKS.

ALBANY STOCKS AND BONDS.—Corrected by SPENCER TRASK & Co., Bankers and Brokers, corner State and James Streets, Albany, N. Y., Jan 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Albany R. R. Co	100	750,000	Q Feb.	1½	1890	113	114
Watervleit Turnpike & R. R. Co	100	240,000	.....	...	1863	3	.....

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Albany R. R. Co., 1st Mort	1865	40,000	J. & J.	5	1905	100	.....
" " " 2d Mort	1873	20,000	M. & N.	7	1893	100	.....
" " " 3d Mort	1875	28,500	J. & J.	7	1895	100	.....
" " " 4th Mort	1880	11,500	M. & S.	6	1905	100	.....
" " " 5th Mort	1888	50,000	M. & S.	5	1913	100	.....
" " " Consol Mtg	1890	350,000	J. & J.	5	1930	102	.....
" " " Debenture.	1891	200,000	M. & N.	6	1901	112	.....
Watervliet Turnpike & R. R., 1st Mort	1889	350,000	M. & N.	6	1919	108	111
Watervliet Turnpike & R. R., 2d Mort	1889	150,000	M. & N.	6	1919	108	111

BALTIMORE STOCKS AND BONDS.—Corrected by HAMBLETON & Co., Bankers, 9 South Street, Baltimore, Md., Jan. 18. Stock quotations are prices per share,

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Balto. City Pass. Ry. Co	25	1,000,000	Quart.	3	.....	80	90
Union Pass. Ry. Co	50	750,000	.....	...	.....	.....	.....
Balto. Traction Co. (Cable)	25	5,000,000	Quart.	1	.....	16½	17

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Central Pass. Ry	1882	250,000	J. & J.	6	1912	107	108
" " " cons. mort	1892	500,000	.....	5	.....	109	109½
Union Ry. Co. 1st mort	.....	50,000	M. & N.	6	.....	102	105
City & Sub. Ry. Co. gen. mort	.....	1,500,000	J. & D.	5	1922	103½	104
Balto. Traction Co. (Cable)	1889	1,500,000	M. & N.	5	1929	108	109
Balt. Trac. Co., No. Balt. Div	1892	1,750,000	J. & D	5	1942	100	100½
" " "	1891	1,250,000	M. & S.	6	1901	102¼	102½
City Pass. R. R. Co	1891	2,000,000	"	5	1911	110¾	111

BOSTON STOCKS.—Corrected by R. L. DAY & Co., 40 Water Street, Members of Boston Stock Exchange. Jan. 18. Stock quotations are prices per share

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
West End Pref	50	$6,400,000	J. & J.	4	1887	76	77
West End Com'n	50	9,085,000	J. & J.	3	1890–1892	47½	48

BROOKLYN STOCKS AND BONDS.—Corrected by C. E. STAPLES & Co., 215 Montague Street, Brooklyn, Jan. 18. Stock quotations are per cent. values.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Brooklyn City R. R. Co	10	6,000,000	Q.—J.	2	.....	160	.....
Brooklyn Traction Co., pref	100	3,000,000	.....	...	1893	.....	60
" " common	100	6,000,000	.....	...	1893	14	.....
Coney Island & Brooklyn R. R. Co	100	500,000	Oct. 1.	4	.....	.....	155
Long Island Traction Co	100	30,000,000			1893	19	.....

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Broadway R. R. Co	.....	350,000	J. & J.	5	6 m. notice	100	.....
Brooklyn Traction Co	1893	3,000,000	.....	...	.....	.....	.....
Coney Island & Brooklyn R. R. Co., 1st bonds	.....	300,000	J. & J.	5	Jan. 1909	.....	102
Coney Island & Brooklyn R. R. Co., certificates	.....	300,000	J. & J.	6	July, 1894	.....	.....
South Brooklyn Central R. R. Co., 1st	.....	125,000	F. & A.	7	Aug. 1897	104	.....
South Brooklyn Central R. R. Co., 2d	.....	150,000	F. & A.	6	July, 1941	100	.....
Brooklyn City R. R. Co., 1st	.....	3,000,000	J. & J.	5	July, 1916	108	.....

CHARLESTON STOCKS AND BONDS.—Corrected by A. C. KAUFMAN, Charleston, S. C., Jan. 18. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Charleston City Ry. Co	50	$100,000	J. & J.	0	.....	.....	70
Enterprise Ry. Co	25	250,000	.....	...	.....	.....	7

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

CHICAGO STOCKS AND BONDS.—Corrected by WILLIAM B. WRENN, 167 Dearborn Street, Chicago, Ill., Jan. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Chicago City	100	$9,000,000	Q.—J.	3	.....	325	326
Chicago Passenger	100	1,000,000	A. & O.	2½	.....	160	.....
North Chicago City	100	500,000	Q.—J.	7½	.....	500	.....
North Chicago Street	100	5,500,000	J. & J.	4	.....	244	244½
West Division City	100	1,250,000	Q.—J.	8¾	.....	625	.....
West Chicago Street	100	13,189,000	Q.—F.	1½	.....	148¾	149

BONDS.	Date of Issue	Amount Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Chicago City	.....	4,619,500	J. & J.	4½	.....	100	.....
Chicago Passenger	1883	400,000	F. & A.	6	1903	102	.....
North Chicago City, 1st mort.	.....	500,000	M. & N.	6	1900	105	.....
" "	.....	1,850,000	M. & N.	4½	1927	96	.....
North Chicago Street 1st mort	.....	2,350,000	J. & J.	5	1906	100½	.....
West Chicago Street	.....	4,100,000	M. & N.	5	.....	100½	.....
West Chicago Street, Tunnel.	.....	1,500,000	F. & A.	5	.....	100	.....
" " " Deb. 6's	.....	2,000,000	J. & D.	6	.....	101¼	101½

CINCINNATI STOCKS AND BONDS.—Corrected by GEO. EUSTIS & Co., Bankers and Brokers, 26 West Third Street, Cincinnati, Jan. 18. Stock quotations are per cent. values.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Cincinnati	50	$6,750,000	Q.—J.	5	.....	98⅝	99½
Mt. Adams & Eden Park	50	1,600,000	Q.—J.	5	.....	100	100¼
Mt. Auburn Cable	100	300,000	.....	...	.....	.....	.....
Cin. Inclined Plane Ry	100	500,000	.....	...	.....	50	65
" " " Pref.	100	100,000	.....	6	.....	75	85
Cin. Newport & Cov. St. Ry.	100	3,000,000	.....		.....	18½	20

BONDS.	Date of Issue	Amount Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Cincinnati Street	.....	50,000	J. & J.	7	July, 1894	100	.....
" "	.....	50,000	J. & J.	7	July, 1895	101⅜	104
" "	.....	50,000	J. & J.	7	July, 1896	104	106
" " extended	.....	100,000	J. & J.	4	.....	97½	100
	.....	150,000	J. & J.	5	.....	100	103
Mt. Adams & Eden Park	.....	50,000	A. & O.	6	July, 1895	101	103
" " "	.....	50,000	A. & O.	6	July, 1900	107½	110
" " "	.....	100,000	A. & O.	6	July, 1905	111½	112½
" " 10-20's	.....	200,000	J. & D.	6	Je. '94-1924	102½	.....
" " Cable.	.....	280,000	M. & S.	5	Mar. 1906	104¼	105
Cin. Inclined Plane Ry	.....	125,000	J. & J.	7	July, 1899	105	109
" " "	.....	300,000	J. & J.	6	Jan. 1914	101	101½
Mt. Auburn Cable	.....	200,000	J. & D.	5	June, 1907	.....	.....
" " 5-20's 2d.	.....	100,000	A. & O.	7	Ap. '93-1908	.....	.....
S. Covington & Cincinnati	.....	250,000	M. & S.	6	Mar. 1912	111	112½

CLEVELAND STOCKS AND BONDS.—Corrected by W. J. HAYES & SONS, Bankers, Cleveland, O., Jan 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
The Cleveland Electric Ry. Co.	100	12,000,000	.....	....	1893	49	51
The Cleveland City Ry. Co	100	8,000,000	.....	....	1893	53	55

BONDS.	Date of Issue	Amount Out-standing	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
The Cleveland Electric Ry. Co.	1893	2,000,000	M.—S.	.05	1910	101	102⅛
" " City " "		2,349,000	.....				

DETROIT STOCKS.—Corrected by Cameron Currie & Co., Bankers and Brokers, 82 Griswold Street, Detroit, Jan. 18.

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

HOLYOKE STOCKS.—Corrected by J. G. Mackintosh & Co., Bankers, Holyoke, Mass. Jan. 18.

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

LOUISVILLE STOCKS AND BONDS.—Corrected by Almstedt Bros. Stock and Bond Brokers, 510 West Main Street, Louisville, Ky., Jan. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Louisville St. Ry, Co., pref...	100	$1,000,000	A. & O.	5	Jan. 1891	84	85
Louisville St. Ry. Co., com....	100	5,000,000	.....	...	Jan. 1891	32	33

Bonds.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Louisville St. Ry. Co., 1st mort	1890	6,000,000	J. & J.	5	1930	96	96½
Louisville City Ry. Co. Cons .	1884	1,000,000	J. & J.	6	1909	112	113
Central Passenger Ry. Co....	1888	400,000	M. & N.	6	1908	112	113
New Albany St. Ry. 1st Mort.	1888	150,000	J. & J.	6	1913	85	90

NEW HAVEN STOCKS AND BONDS.—Corrected by H. C. Warren & Co., Bankers and Brokers, New Haven, Conn. Jan 18. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
F. Haven & Westville R. R. Co.	25	$400,000	J. & J.	4	.....	50	55
State Street Horse R. R. Co....	25	23,000	J. & J.	3	.....	40	.....
New Haven & W. Haven R. R. Co	25	.....	.....	...	.....	...	.....
New Haven & Cent'lle H. R. Co.	.....	.....	.....	...	.....	.....	.....
Whitney Ave. Ry. Co.....	50	25,000	.....	...	.....	7	.....
Bridgeport Horse R. R. Co.....	100	140,000	.....	...	.....	.....	.....
Hartford & Wethersfield Horse R. R. Co.....	100	200,000	J. & J.	3	.....	125	.....

Bonds.	Date of Issue	Amo'nt Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
State Street Horse R. R. Co...	1874	20,000	J. & J.	7	Jan., 1894	104	.....
New Haven & W. Haven R. R. Co	1892	500,000	M. & N.	5	Nov. 1912	100	102
Bridgeport Horse R. R. Co.....	.....	50,000	.....	6	.....	.....	.....
Hartford & Wethersfield Horse R. R. Co., Deb. Series A.....	1888	100,000	M. & S.	5	Sept., 1908	.....	.....
Hartford & Wethersfield Horse R. R. Co., Deb. Series B....	1890	100,000	M. & N.	5	May, 1910	.....	.....
Hartford & Wethersfield Horse R. R. Co., Deb. Series C.....	.....	100,000	M. & N.	5	May, 1910	.....	.....

NEW ORLEANS STOCKS AND BONDS.—Corrected by George Le Sassier, 174 Common Street, New Orleans, La., Jan. 22. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Carrollton R. R. Co.	100	1,200,000	Quart.	1½	1867	125	.....
Crescent City R. Co.....	100	1,150,000	"	1½	.866	96	98½
Canal & Claiborne R. R. Co..	40	240,000	Semi.	2½	1888	40	43
New Orleans City & Lake Co.	100	1,500,000	Quart.	1¾	1860	119	124
Orleans R. R. Co.....	50	185,000	"	2	1868	50	60
St. Charles Street R. R. Co ..	50	600,000	"	2½	1863	70	75

Bonds.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Canal & Claiborne Sts. R. R.	1892	150,000	M & N	6	1912	105	.....
Crescent City R. R. 1st Mort.	1883	75,000	M & N	6	'95-'99	100½	.....
do do new	1886	40,000	M & N	6	1896	100½	.....
N. O. City R. R. Co.....	1879	416,500	J & D	6	1903	114	.....
N. O. & Carrollton R. R. Co..	1882	250,000	F & A	6	'97-'06	.....	.....
St. Charles Street R. R. Co...	1881	120,000	J & D	6	'92-'01	.....	.....

MONTREAL STOCKS AND BONDS.—Corrected by Gordon Strathy & Co. Members Montreal Stock Exchange, 9 St. Sacrament Street, Jan. 18. Stock quotations are per cent. values.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Montreal St. Ry. (p'd up sh.)	50	$2,000,000	M. & N.	4	May, '91.	161⅝	163

Bonds.	Date of Issue	Amount Outstanding.	Interest Period.	%	Principal Due.	Bid.	Ask'd
Montreal St. Ry.....	1885	£60,000	.....	5	1905	.....	.....

NEW YORK STOCKS AND BONDS.—Corrected by James McGovern & Co., 6 Wall St., New York, Dec. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Bleecker St. & Fulton Ferry...	100	900,000	J. & J.	¾	.....	.....	30
Broadway & Seventh Avenue..	100	2,100,000	Q.—J.	2½	.....	.....	180
Cen'l Park, North & East River	100	1,800,000	Q.—J.	1½	.....	135	.....
Central Crosstown.....	100	600,000	Q.—F.	1¾	.....	135	.....
Dry Dock, E. B'way & Battery.	100	1,200,000	Q.—F.	2	.....	120	125
42d & Grand St. Ferry.....	100	748,000	Q.—F.	4	.....	300	.....
42d St., Manhat. & St. Nich. Av.	100	2,500,000	.....	...	.....	.....	67
Eighth Avenue.....	100	1,600,000	Q.—J.	3	.....	240	.....
Houston, W. St. & Pav. Ferry.	100	1,000,000	Q—F.	2	.....	200	.....
Second Avenue.....	100	1,862,000	Q.—J.	1	.....	.....	102
Sixth Avenue.....	100	1,500,000	Q.—J.	1¾	.....	.....	215
Third Avenue.....	100	5,000,000	Q.—M.	4	.....	138	140
23d St.....	100	600,000	Q.—F.	2½	.....	.....	300
Ninth Avenue.....	100	800,000	Q.—J.	1½	.....	123	.....
Union Railway Co.....	100	2,000,000	.....	...	.....	.....	.....

Bonds.	Date of Issue	Amount.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Bleecker St. & Fulton Ferry...	.....	700,000	J. & J.	7	July, 1900	.....	108
B'way & 7th Ave., 1st mort....	.....	1,500,000	J. & D.	5	June, 1904	100	.....
2d mort.....	.....	500,000	J. & J.	5	July, 1914	100	.....
Broadway Guaranteed 1sts....	.....	1,125,000	J. & J.	5	July 1924	100	.....
" 2ds interest as rental	.....	1,000,000	J. & J.	5	July, 1905	90	.....
Cen'l Park, North & East River	.....	1,200,000	J. & D.	7	Dec., 1902	110	.....
Central Crosstown—1st mort..	.....	250,000	M. & N.	6	Nov., 1922	115	.....
Dry Dock, E. B'way & Battery. 1st mort.....	.....	840,000	J. & D.	7	June, 1893	105	.....
Scrip (can be called at par)..	.....	1,200,000	F. & A.	6	Aug. 1914	.....	.....
42d St. Manhat. & St. Nich. Av 1st mort.....	.....	1,200,000	M & S.	6	Sept., 1910	108	.....
2d mort. income bonds.....	.....	1,200,000	J. & J.	6	1915	.....	65
Eighth Ave., Scrip.....	.....	1,000,000	F. & A.	6	Aug., 1914	100	105
Houston, W. St. & Pav. F'ry, 1st	.....	500,000	J. & J.	7	July, 1894	100	.....
Second Avenue, 1st mort.....	.....	1,600,000	M. & N.	5	Nov., 1909	.....	102
Third Avenue.....	.....	5,000,000	J. & J.	5	Jan., 1937	105	.....
23d St.....	.....	250,000	M. & N.	7	May, 1893	100	.....
Union Railway Co.....	.....	2,000,000	F. & A.	5	Feb., 1942	.....	103

PHILADELPHIA SECURITIES.—Corrected by Huhn & Glendinning, 143 South Fourth st. (Bullitt Building), Philadelphia, Jan. 18. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Citizens'.....	50	$500,000	Q.—J.	4	1858	265	270
Continental.....	50	1,000,000	J.—J.	6	1873	126	130
Frankford & Southwark.....	50	1,250,000	Q.—J.	5	1854	335	340
Germantown.....	50	1,500,000	Q.—J.	2¼	1858	109	112
Green & Coates...	50	500,000	Q.—J.	3	1858	120	125
Hestonville...	50	2,050,000	.....	...	1859	33	38
Lombard & South.....	25	500,000	A.—O.	8	1861	90	90
People's Traction Co.....	50	10,000,000	.....	...	.....	28	29
Philadelphia City.....	50	1,000,000	J.—J.	7½	1859	151½	153
Philadelphia & Gray's Ferry..	50	617,500	J.—J.	3½	1858	79	79
Philadelphia Traction (50 pd.)	50	7,000,000	M.—N.	3	1883	93⅝	94
Ridge Avenue.....	50	750,000	Q.—J.	5	1872	221	235
Second & Third.....	50	1,060,200	Q.—J.	5	1853	199	210
Thirteenth & Fifteenth.....	50	1,000,000	J.—J.	9	1858	225	225
Union.....	50	1,250,000	J.—J.	9½	1864	195	200
West Philadelphia.....	50	750,000	J.—J.	10	1857	100½	101
Metropolitan (N.Y.) Traction	100	30,000,000	Q.—F.	1	.....	106¼	107
Baltimore Traction.....	25	5,000,000	.....	1	1889	16⅝	16⅞
Buffalo (N. Y.) Railway.....	100	6,000,000	.....	...	.....	40	55
Newark (N. J.) Passenger....	100	6,000,000	.....	...	.....	25	29
Pitts. & Birmingham Trac. Co.	50	3,000,000	J.—J.	...	.....	16	17

Bonds.	Date of Issue	Amount Outstanding	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Baltimore Traction 1st Mort .	1889	1,500,000	M.—N.	5	1929	108	109
" " Imp.	1892	1,250,000	M.—S.	6	1901	102⅔	103
Balt. Tr., No. Balt. Div., Gold	1892	1,750,000	J. & D.	5	1942	100	101
Germantown, 1st mort.....	.....	67,000	J.—D.	5	1904	105	.....
" 2d mort.....	.....	160,000	A.—O.	5	1899	103	.....
Hestonville, 1st mort.....	.....	300,000	M.—N.	6	1895	104	.....
" " "	.....	124,500	J.—J.	6	1901	105	.....
" 2d mort..... ...	.....	75,000	M.—S.	6	1902	105	.....
People's, 1st mort.....	.....	219,000	J.—J.	7	1905	115	.....
" " "	.....	285,000	J.—J.	5	1911	100	.....
" Cons. mort.....	.....	247,000	M.—S.	5	1912	95	.....
West Philadelphia, 1st mort..	.....	246,000	A.—O.	6	1906	117	.....

OMAHA STOCKS AND BONDS.—Corrected by RICHARD C. PATTERSON, Banker and Broker, 907 N. Y. Life Building, Omaha, Neb., Jan. 18.

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

BONDS.	Date of Issue	Am't Out-stand-ing.	Inter'st Paid.	%	Principal Due.	Bid.	Ask'd
Omaha St. Ry. Co.	1889	2,250.000	M. & N.	5	M'y 1, 1914	95	98

PITTSBURGH STOCKS AND BONDS.—Corrected by JOHN B. BARBOUR, Jr., 306 Times Bldg., Pittsburgh, Pa., Jan. 18. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Central Traction R. R. Co	50	1,500,000	.....	..	.....	19	20
Citizens' Traction R. R. Co	50	3,000.000	J. & J.	3	.....	58½	59
Pitts. & Birmingham R. R. Co	.....	3,000,000	.....	...	.....	14¾	14⅝
Pittsburgh Traction R. R. Co.	50	2,500,000	.....	3	.....	55	57
Federal St. & Pleasant Valley	25	1,400,000	J. & J.	3	.....	17⅝	18
Pittsburgh, Allegheny & Man	.....	3,000,000	...	1¼	.....	37¼	38
West End R. R. Co.	50	200,000	J. & J.	...	.....	.....	.....
Second Avenue R. R. Co.	50	300,000	J. & J.	3	.....	.....	.....
Penn Incline Plane Co.	50	250,000	.....	...	.....	.....	.....
Monongahela Incline Plane Co	50	140,000	F. & A.	...	.....	..	.....
Fort Pitt Incline Plane Co	50	60,000	.....	...	.....	.....	.....
Mount Oliver Incline Plane Co	50	100,000	J. & J.	3	.....	.....	.....
Pittsburgh Incline Co.	100	150.000	J. & J.	5	.....	.....	.....
Duquesne Traction Co.	.....	3,000,000	.....	...	.....	20¾	21

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Citizens' Traction R. R. Co	1887	1,250,000	A. & O	5	1927	107½	.....
Pittsburgh Traction R. R. Co.	1887	750,000	A. & O.	5	1927	104	.....
Pitts. & Birmingham Traction Co.	1892	.....	.....	7	.....	94½	95
Pleasant Valley Ry.	1892	1,250,000	J. & J.	5	1919	.....	100
P., A. & M. R. R. Co.	1891	1,500.000	J. & J.	5	1931	102¾	104
Duquesne Traction Co.	1890	1,500,000	J. & J.	5	1930	98½	100
Second Ave. Electric R. R. Co	1889	1,500,000	J. & J.	5	1909	.....	.....
Central Traction Co.	1889	375,000	J. & J.	5	1919	.....	.....
Union R. R. Co.	1881	100,000	A. & O.	5	1901	.....	.....
West End R. R. Co.	1887	75,000	J. & J.	5	1922	100	102
Birmingham, Knoxville & Allentown Tract. Co.	.....	.....	.....	6	.....	.....	.....
Fort Pitt Incline Plane Co.	1881	30.000	.....	6	1901	..	.....
Mount Oliver Incline Plane Co	1871	44,500	M. & N.	6	1901	.....	.....
Penn Incl'e Plane Co. 1st Mort	1883	125,000	.....	6	1903	.....	.....
Monongahela Incl'e Plane Co	1887	50,000	A. & O	5	1892	.....	.....
Monongahela Incl'e Plane Co.	1887	50,000	A. & O.	5	1897	.....	.....
Pittsburgh Incline Co.	1889	250,000	J. & J.	6	1919	.....	.....

PROVIDENCE STOCKS AND BONDS.—Corrected by CHACE & BUTTS, Bankers, Providence, Jan. 18.

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

BONDS.	Date of Issue	Amo'nt Out-stand'g	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
United Traction & Electric Co.	1893	8,050,000	M & S	5	1993	...	100
Newport St. Ry. Co.	.....	50.000	.....	5	1910	102½	.....

ROCHESTER, BUFFALO, PATERSON, COLUMBUS, WORCESTER AND BOSTON STOCKS AND BONDS.—Corrected by E. W. CLARK & Co., 139 So. Fourth St. (Bullitt Building), Philadelphia, Jan. 18.

Company.	Par.	Capital.	Period.	% last div	Date of Issue.	Bid	Ask'd
STOCKS.							
Rochester (N.Y.) Ry.	100	5,000,000	.....	...	1890	24	30
Buffalo (N.Y.) Ry.	100	6,000,000	.....	...	1891	40	44
Paterson (N. J.) Ry.	100	1,250,000	.....	...	1891	20	25
Columbus (O.) St. Ry.	100	3,000,000	Q.—F.	1	1892	23	25
North Shore Traction Co. (Boston) Pref.	100	2,000,000	A.—O.	6	1892	.....	80
do do Common.	100	4,000.000	.....	...	1892	13	20
Worcester Traction Co. Pref	100	2,000,000	F.—A.	6	1892	.....	90
do do Common.	100	3,000,000	.....	...	1892	20	30
Consol. Trac. Co. (N. J.)	100	.....	.....	...	1893	35	40

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid	Ask'd
Rochester (N.Y.) Ry.	1890	3,000,000	A & O	5	1930	88	95
Buffalo (N.Y.) Ry.	1891	5,000.000	F & A	5	1931	95	99
Paterson (N. J.) Ry.	1891	850,000	J & D	6	1931	90	100
Newark (N. J.) Pass. Ry.	1890	6,000,000	J & J	5	1930	89	90
Columbus (O.) St. Ry.	1892	2,600,000	J & J	5	1932	85	90
Consol. Trac. Co. (N. J.)	1893	.....	J & D	5	1933	85	88

SAN FRANCISCO STOCKS AND BONDS.—Corrected by PHILIP BARTH, Broker, 440 California Street, San Francisco, Cal., Jan. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
California St. Cable Co.	100	1,000,000	Monthly	5	.....	.....	105
Central R. R. Co.	100	1,000,000	.....	...	.....	.....	.....
Geary St., Park & Ocean R.R. Co	100	1,000,000	.....	1	.....	.....	100
Market Street Cable Co.	.....	.....	.....	...	.....	31	32¾
Ferries & Cliff House R. R. Co.	100	2,500,000	.....	...	.....	...	.....
Omnibus Cable Co.	100	2,000,000	Monthly	4	.....	.....	.....
Presidio & Ferries R. R. Co.	100	1,000,000	.....	...	.....	.....	.....

Bonds.	Date of Issue	Am't Out-stand-ing.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Ferries & Cliff House.	.....	650,000	M. & S.	6	1914	95	100
Market Street Cable Co.	.....	3,000,000	J. & J.	6	1913	117	121
Omnibus Cable Co.	.....	2,000,000	A. & O.	6	1918	.....	115
Powell Street R. R.	.....	700.000	M. & S.	6	1912	.....	118
Park & Ocean R. R.	.....	250,000	J. & J.	6	1914	.....	110
Park & Cliff House R. R.	.....	350,000	J. & J.	6	.....	93½	.....
Cal. St. Cable R. R.	.....	.....	.....	5	.....	100½	.....

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

Company.	Par.	Capital Issued.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Cass Ave. & Fair Grounds.	100	2,500,000	.....	...	1876	50	60
Citizens'	100	1,500,000	Oct. '93	4	1887	75	85
Jefferson Avenue.	100	112,000	Dec. '88	2	1885	125	150
Lindell	100	2,500,000	.....	...	1890	68	70
Missouri.	100	2,000,000	Q.—J.	2	1891	180	200
People's.	50	1,000,000	Dec. '89	50c	1889	20	25
St. Louis.	100	2,000,000	J. & J.	3½	1890	155	160
Fourth Street & Arsenal.	50	150,000	.....	...	1872	5	10
Union Depot	100	4,000,000	.....	...	1890	150	200
St. Louis & Suburban.	100	2,500,000	.....	...	1891	25	35
Southern, Pfd.	.....	800,000	.....	...	.....	90	92
" Com.	.....	700,000	.....	...	.....	82	85

BONDS.	Date of Issue	Amount Out-stand ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Cass Avenue & Fair Ground.	1892	1,800,000	J. & J.	5	1912	96	98
Citizens' Cable.	1887	1,500,000	J. & J.	6	1907	102	103
Fourth St. & Arsenal.	1888	50.000	J. & J	6	1898–1903	98	100
Lindell	1890	1,500,000	J. & J.	5	1895–1910	98	99
Missouri Cable.	1887	500,000	M. & S.	6	1907	100	102
People's 1st mort.	1882	125,000	J. & D.	6	1902	100	101
" 2d mort.	1886	75,000	M. & N.	7	1902	100	105
People's Cable.	1889	800,000	J. & J.	6	1889–1914	90	95
St. Louis Cable.	1890	1,500,000	M. & N.	5	1900–1910	100	102
Union Depot.	1890	4,000,000	A & O.	6	1900–1910	104	105
Southern.	1884	200,000	M. & N.	6	1904	100	102
Southern.	1889	300,000	M. & N.	6	1909	100	104
St. Louis & Suburban.	1891	1,400,000	F. & A.	5	1921	95	97
St. Louis & Suburban (Incomes)	1891	300,000	.....	6	.....	70	75

WASHINGTON STOCKS AND BONDS.—Corrected by CRANE, PARRIS & Co., Bankers, 1344 F Street, N.W., Washington, D. C., Jan. 18. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Wash'ton & Georgetown R.R.	50	500,000	Q. F.	5	1863	300	325
Metropolitan R. R.	50	750,000	Q. J.	2	1864	83	96
Columbia R. R.	50	400,000	Q. M.	1	1870	.....	.....
Capitol & North O St. R. R.	50	500,000	Q. J.	...	1875	.....	33
Eckington & Soldiers' Home.	50	352,000	.....	...	.....	.....	33
Georgetown & Tenallytown.	50	200,000	.....	...	.....	.....	33
Rock Creek R. R.	100	401,700	.....	...	.....	.....	.....
Glen Echo R. R.	50	100,000	.....	...	.....	.....	.....

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Wash'ton & Geo'town conv't.	'83–'91	3.000,000	J. & J.	6	1899-1929	135	155
Eckington & Soldiers' Home.	.....	150,000	J. & D.	6	1896-1911	....	100
Capitol & North O St. R. R.	1921	240,000	J. & J.	6	1921	.....	90
Metropolitan R. R. convert.	1901	200,000	J. & J.	5	1901	103¼	104
Anacostia R. R.	.....	200,000	A. & O.	6	1901-1931	.....	.....
				6			

Financial.

CORNELIUS SWEETLAND has been appointed receiver of the Interstate Street Railway Company, of Pawtucket, R. I.

$ $ $

THE earnings of the Cincinnati (O.) Covington & Newport Street Railway for the quarter ending December 31, are given as $52,-113.67.

$ $ $

T. W. WRENNE has been appointed by Judge Lurton, of the United States Circuit Court, receiver of the United Electric Railway, of Nashville, Tenn.

THE consolidation of the Brooklyn (N. Y.) City Railway system and that of the Brooklyn, Queens County & Suburban Railway Company, which includes the Broadway and Jamaica systems was effected January 15.

$ $ $

AT the annual meeting of the stockholders of the Brooklyn City Railway Company, held January 9, S. L. Husted, Jr., was elected director to take the place of Mr. Lyman resigned. The rest of the old Board was re-elected.

$ $ $

THE Massachusetts State Board of Railway Commissioners has granted leave to the Union Street Railway Company, of New Bedford, to issue $350,000 worth of new stock and $350,000 of bonds, authority to do which was recently petitioned for.

$ $ $

THE Buffalo (N. Y.) Railway Company submits the following statement of its operations for November: Gross earnings, 1893, $122,-297.87; 1892, $110,810.85; increase, $11,487.02. Operating expenses, 1893, $72,664.49; 1892, $68,399.68; increase, $4,264.81. Net earnings, 1893, $49,633.38; 1892, $42,411.17; increase, $7,222.21.

$ $ $

THE Columbus (O.) Street Railway Company submits the following statement of its operations for December: Gross earnings, 1893, $43,529.19; 1892, $43,217.39; increase, $311.80. Operating expenses, 1893, $27,384.80; 1892, $29,898.21; decrease, $2,513.41. Net earnings, 1893, $16,144.39; 1892, $13,319.18; increase, $2,825.21.

$ $ $

THE Buffalo (N. Y.) Railway Company submits the following statement of its operations for December: Gross earnings, 1893, $123,634.22; 1892, $114,809.72; increase, $8,824.50. Operating expenses, 1893, $76,541.86; 1892, $73,615.96; increase, $2,925.90. Net earnings, 1893, $47,092.36; 1892, $41,193.76; increase, $5,898.60.

$ $ $

THE Hudson (N. Y.) Electric Railway Company has filed its report with the Railroad Commissioners for the last quarter. The gross earnings from operation were $4,808.69; operating expenses, $2,477.30; net earnings from operation, $2,331.39; net income, $1,479.88. For the corresponding quarter last year the net income was $2,487.57.

$ $ $

THE Pittsburgh (Pa.) & Birmingham Traction Company submits the following comparative statement of its operations for November: Gross earnings, 1893, $23,216.49; 1892, $27,809.46; decrease, $4,592.97. Operating expenses, 1893, $13,666,18: 1892, $14,374.32; decrease, $708.14. Net earnings, 1893, $9,550.31; 1892, $13,435.14; decrease, $3,884.83.

$ $ $

THE following statement shows the operations of the Brooklyn (N. Y.) Traction Company for the month of December: Gross earnings, 1893, $76.945.09; 1892, $58,073.16; increase, $18,871.93. Expenses, 1893, $47,723,78. Net earnings, 1893, $29,221.31. We have no data showing the operating expenses and net earnings for the corresponding month of 1892.

$ $ $

THE Kansas City (Mo.) Cable Railway Company reports for the six months ending December 31, 1893: Gross, $239,992; operating expenses, $157.226; net, $82,765; a decrease of $15,084 as compared with the same period last year; income account for the six months shows balance to credit of surplus of $421 after paying interest on bonds and dividend of 3 per cent. on stock.

$ $ $

THE North Shore Traction Company submits the following statement of its operations for November: Gross earnings, 1893, $81,180.67; 1892, $76,915.46. Increase, $4,265,21. Operating expenses, 1893, $55,-616.79. Net earnings, 1893, $25,563.88. We are unable to give the operating expenses and net earnings for 1892, as the various companies now comprising the system were operated separately.

$ $ $

ON January 20 the Union Trust Company of St Louis, filed suit against the Richmond (Va.) Electric Street Railway Company, asking judgment on the bonds of the company, amounting to $212,000, and asking for the appointment of a receiver to take charge of the road and operate it under the direction of the court. By agreement the present superintendent, A. D. Titsworth, was appointed receiver.

$ $ $

THE North Shore Traction Company reports as the results of its operation for December, 1893, as follows: Gross earnings, 1893, $78,-556.19; 1892, $80,194.44; decrease, $1,638.25. Operating expenses, 1893, $58,786.23. Net earnings, 1893, $19,769.96. We are unable to give the operating expenses and net earnings for 1892, as the various companies now comprising the system were operated separately.

$ $ $

THE annual report of the Portsmouth (Va.) & Port Norfolk Railway for 1893 shows a marked increase over the earnings of 1892, notwithstanding the hard times. The County Fair grounds have been located on the line of road, and a bridge connecting West Norfolk is in immediate prospect. $5,500 worth of stock was recently sold at par, and it is now probable that enough stock and bonds will be sold to convert the motive into electricity.

$ $ $

THERE has arisen a controversy between the tax department of the city of Baltimore and the street railway companies of that city, regarding the taxation of the tracks of the several companies and assessing them as real estate. The city claims that the tracks of the Baltimore Traction Company are assessable and taxable as real estate, and has increased the assessment from $3,500 to $53,800 per mile. The company disputes the claim and declares such method of taxation unjust and oppressive. The courts will decide.

$ $ $

AT the annual meeting of the Frankford & Southwark Railroad Company, of Philadelphia, a brief report was submitted, in which it was stated that from January 1 to July 1, 1893, the last date being the time the road was leased to the Electric Traction Company, 20,882,896 passengers were carried by the lines of the system. There was an increase in receipts from passengers of $31,589.93, and $36,159.63 was added to the construction and equipment account. In regard to the trolley, the report stated that it was believed that this year will see the new system nearly, if not entirely, finished.

$ $ $

THE annual meeting of the Wilkesbarre (Pa.) & Wyoming Valley Traction Company was held last month. Reports of officers show that during 1893 the gross receipts from passenger traffic were $310,927 and other receipts swell the total to $312,190. The operating expenses were $149,240. The total mileage is forty-three and a half miles, of which eleven and an eighth miles were built during the year, and six and a quarter miles reconstructed. The rolling stock consists of eighty-eight car bodies and sixty-six equipments. The average daily receipts for the year were $851.85.

$ $ $

THE annual report of the Toronto (Ont.) Railway Company for the year ending December 31, 1893, shows: Passengers carried in 1892, 19,122,022; passengers carried in 1893, 21,215.010; transfers in 1892, 5,592,708; transfers in 1893, 8.477,147; passengers increased in 1893, 2,092,988; transfers increased in 1893, 2,884,439. The earnings were as follows: Gross in 1892, $820,098.48; net, $229,765.23; gross in 1893, $900,232 59; net, $362,635.44.

The gross earnings of 1893 show an increase of 9 .7 per cent. over 1892, and the net earnings show an increase of 57 .8 per cent. over 1892. Instead of declaring dividends, the company will put the surplus into increasing the number of cars, shops, extension of service and an increase of power.

$ $ $

HORACE E. ANDREWS has been elected president of the Cleveland Electric Railway Company, vice Henry A. Everett, whose increasing duties in connection with his Canadian street railway interests have prevented his giving the time to the Cleveland road which he desired. Mr. Everett was elected vice-president of the Cleveland Electric Railway Company. The other officers elected were: Treasurer, James Parmalee; secretary, R. A. Harman; assistant secretary, L. E. Beilstein; adjuster, H. J. Davies; electrical engineer and purchasing agent, C. W. Wason; general superintendent, John J. Stanley; chairman of board of directors, Tom L. Johnson; chairman executive committee, A. L. Johnson; executive committee, A. L. Johnson, H. A. Everett, H. E. Andrews, C. W. Wason, R. A. Harman.

$ $ $

THE annual meeting of the Portland (Me.) Horse Railroad Company was held January 15. The annual report, which is for the year ending December 31, 1893, includes the following items: Gross passenger earnings $200,016.32; earnings from other sources, $760.50; total gross earnings, $200,777.82. Operating expenses, $169,274.36; taxes, $4,855,32; total, $174,129.68. Net earnings from business, $26,647.14; rents (less additions and repairs), $748,29; total, $27,395.43. Less interest paid, $10,372.81; total, $17,022.62. Dividends, $15,000.00; surplus, $2,022.62.

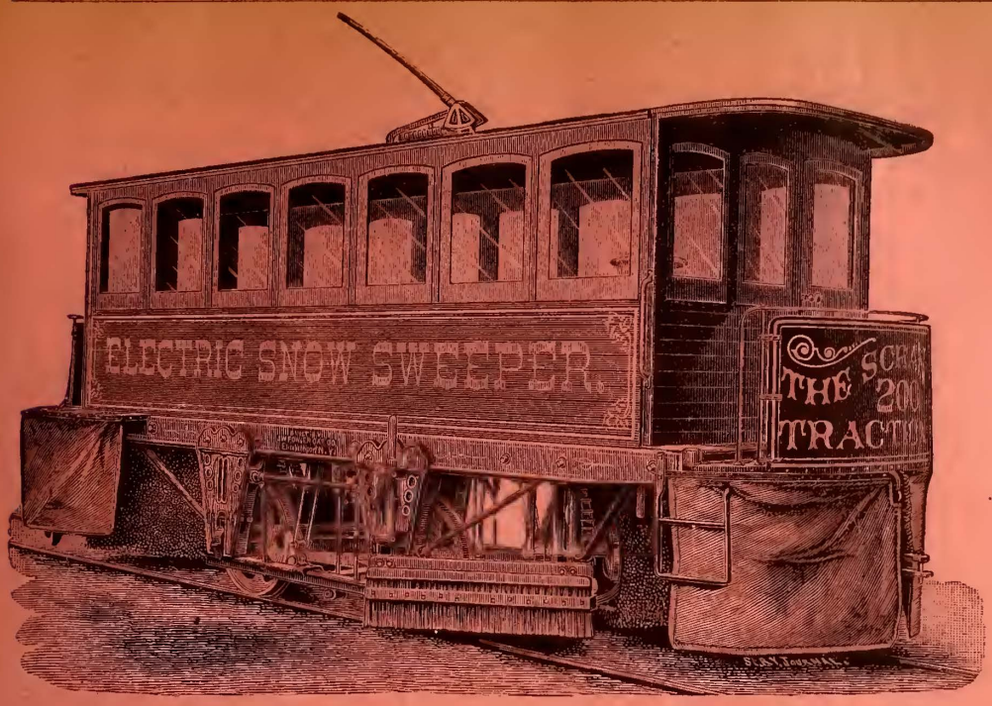
The total number of passengers carried during the year was 3,659,-126, the traffic for the last six months showing a decrease of 53,234 from a corresponding six months of last year. 676,247 miles have been run, 378,078 by horse and 298,169 by electric cars.

$ $ $

THE annual meeting of the Hestonville, Mantua & Fairmount Railway Company was held January 8. The annual report stated that 6,546,437 passengers were carried during the past year, an increase of 58,000 over the preceding year. The receipts for the past year were $325,126, showing a net increase of $9,000. During the year $42,000 were expended for betterments. The report stated that the company will have arranged its financial plans for trolleying the road within a short time, but it is probable that no outside work will begin before the first of April, except, perhaps, in the construction of the power house on the site of the Race and Vine Streets depot at the Callowhill Street bridge It is thought that the entire system will be trolleyed and in operation by the close of this year. The cost, including the cars, will not, it is estimated, exceed $1,500,000, and about seventy-five cars will be run over the route.

$ $ $

THE Atlanta (Ga.) *Journal* says: "The Atlanta Consolidated Street Railway Company has defaulted in the payment of the interest on its bonded indebtedness. The bonded indebtedness, $1,833,000, is held mostly in Eastern cities. The Old Colony Trust Company, of Boston, is the trustee for the bondholders. The bonds bear interest at the rate of 6 per cent. per annum, payable in January and July. The January coupons were payable January 1. In November last a large number of the bondholders met in Boston to examine a statement of



Snow Sweeper with full length cab, the motorman operating same on the inside. Same as built by us for Scranton Traction Co.

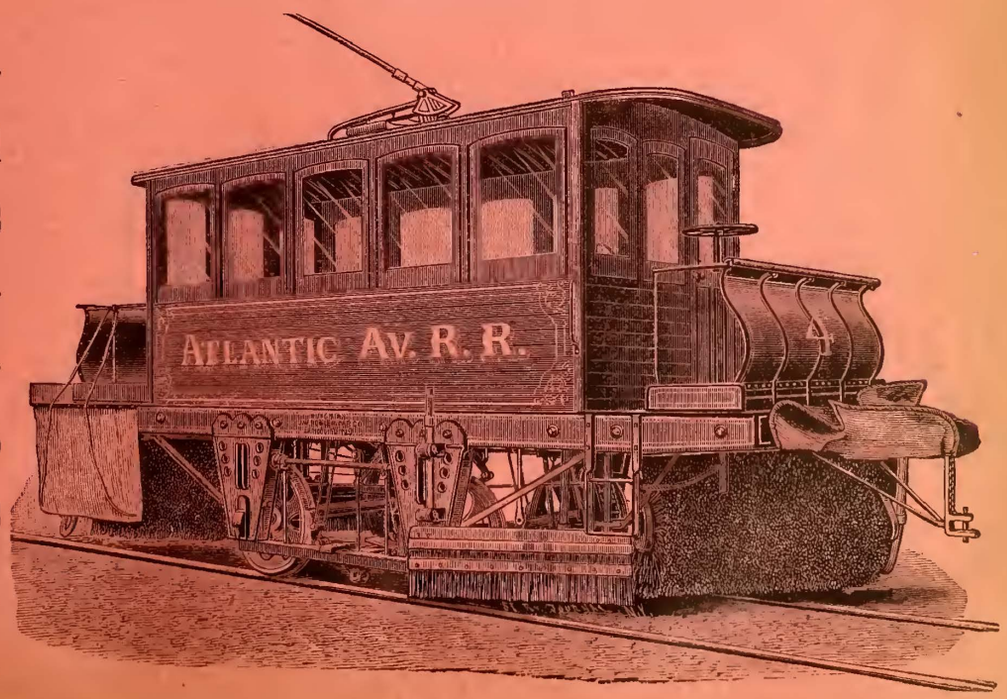
ELECTRIC SNOW SWEEPERS

BUILT BY THE

J. W. FOWLER CAR CO.

WORKS AND GENERAL OFFICE,
ELIZABETHPORT, N. J.

Electric Snow Sweeper to be operated with the motorman on the platform, motor operating the brooms inside cab. Same as built by us for the Atlantic Ave. R. R. Co., Brooklyn, N. Y.



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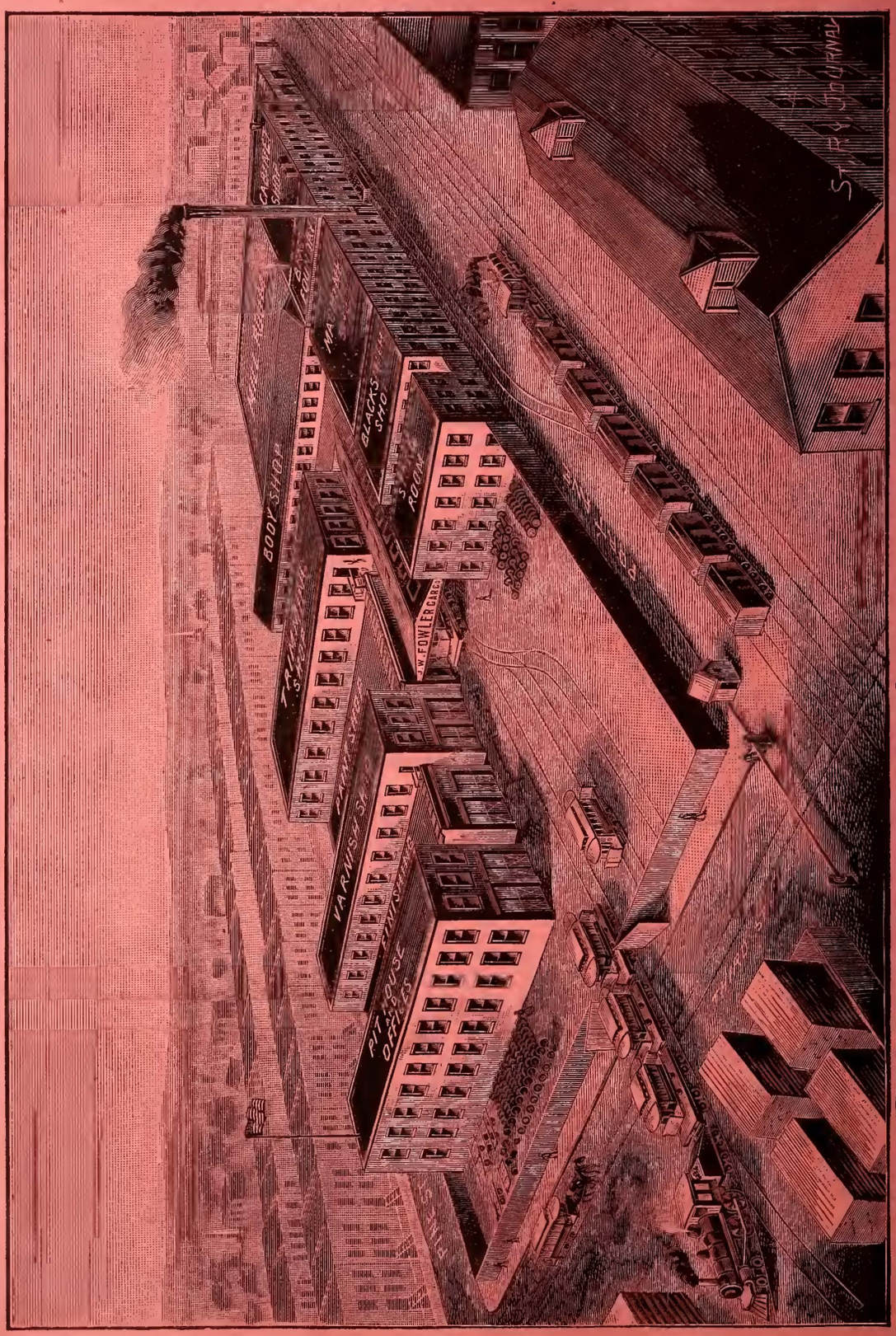

WORKS AND GENERAL OFFICE,

ELIZABETHPORT, N. J.

NEW YORK OFFICE, HAVEMEYER BUILDING.

the financial condition of the company presented by President Hurt. The bondholders prepared an agreement, to be signed by 90 per cent. of the bondholders and shareholders, providing for the cancellation of the entire floating debt, and a reduction of the rate of interest on the bonds. If the shareholders raise money to pay off the floating indebtedness, the bondholders agree to accept 3 per cent. interest on their bonds during 1894 and 1895, and during the balance of the life of the bonds they will accept 5 per cent. The shareholders are to be assessed for the purpose of raising money to liquidate the floating indebtedness, and are to receive for the assessment income bonds. It is said that the holders of about 80 per cent. of the outstanding bonds have agreed to accept this proposition.

$ $ $

THE Scranton (Pa.) Traction Company submits the following statement of its operations for the months of November and December during the last two years:

NOVEMBER.

	1893.	1892.		
Gross Earnings.....	$20,783.15	$16,087.80	Increase	$4,695.35
Operating Expenses..	10,938.31	10,308.80	"	629.51
Net Earnings.....	$9,844.84	$5,779.00	"	$4,065.84

DECEMBER.

	1893.	1892.		
Gross Earnings.....	$22,142.79	$17,491.05	Increase	$4,651.74
Operating Expenses..	11,450.30	11,203.05	"	247.25
Net Earnings.....	$10,692.49	$6,288.00	"	$4,404.49

$ $ $

A COMPARATIVE statement of the net earnings of the City & Suburban Railway, of Baltimore, Md., ended October 31, 1893, and for the corresponding period last year shows an increase this year of $22,147. The statement by months is as follows;

	1892	1893
May.....	$16,564	$14,718
June.....	12,555	15,882
July.....	11,833	15,164
August.....	12,389	14,234
September.....	11,848	16,732
October.....	9,448	20,054

$ $ $

THE annual meeting of the Chicago & South Side Rapid Transit Railroad Company, familiarly known as the Alley L road, was held January 4. W. W. Gurley and Vice-President Hopkins, representing the Chicago City Railway holdings, and Edward L. Lobdell were elected directors. The general manager's report stated that it would be necessary for the company to make extensive repairs of its rolling stock at a cost of $27,750, and eventually it would need more cars, The report said that, after paying interest due January 1 on the $3,000,000 of second section bonds, there would be left in the treasury about $400,000. These bonds were negotiated at about seventy-five cents on the dollar. The general manager's experience as to the cost of operating trains was summed up as follows: The cost of running a five-car train for eight hours is $25; a four-car train, $21.65; a three-car train, $18.30; a two-car train, $12.45; a one-car train, $11. The report concluded with the statement that further extensions of the road were positively essential to its well being.

In the following statement is shown the operations of the road since the company took possession December 16, 1892. The returns are given for fifteen days of December, 1892, and for each month of 1893. The number of passengers carried, income and expenses were as follows:

	Receipts.	*Expenses.*	*Passengers.*
December 16, 1892....	$ 32,684	$ 29,863	653,000
January, 1893.....	52,556	49.705	1,051,000
February.....	52,822	48,810	1.056,000
March.....	63,716	53,969	1,274,000
April	78,049	53,393	1,560,000
May.....	165,224	90,814	3,306,000
June.....	171,733	84,964	3,474,000
July.....	152,130	77,524	3,042,000
August.....	162,047	67,327	3,241,000
September.....	196,592	82,004	3,931,000
October.....	268,811	93,961	5,376,000
November.....	72,883	56,509	1,457,000
December.....	64,168	57,647	1,283,000
	$1,535,471	$846,495	30,709,000

The following table shows the percentage of earnings to operating expenses each month, and the actual cost of carrying passengers each month:

	Percentage.	*Cost per Passenger.*
December 16, 1892.....	91.2	.0457
January, 1893.....	94.5	.0473
February.....	92.5	.0462
March.....	85.0	.0424
April.....	68.5	.0349
May.....	54.5	.0274
June.....	48.5	.0242
July.....	50.9	.0255
August.....	41.6	.0208
September.....	41.7	.0209
October.....	35.0	.0175
November.....	77.6	.0388
December.....	89.9	.0443
Average.....	55.9	.0276

Mileage Table.

In the comparative tables of cars and miles of road for the years 1892 and 1893 published in our January issue, we find that several typographical errors have crept in, in the 1893 table.

The important ones are as follows: The number of electric cars in Delaware should be 50 instead of 56. Cable cars in Maryland should be 209 instead of 809. Total miles of road in Missouri should be 497 instead of 482, and in Nebraska 218 instead of 208.

The totals need changing in a few instances The corrected totals should read as follows: Miles of horse road, 3,497; horse cars, 16,845; miles of electric road, 7,466; electric cars, 18,233; miles of cable road, 657; cable cars, 4,805; total miles of all roads, 12,187; total number of all cars, 39,499.

Annual Meeting of the Swan Lamp Company.

The annual meeting of the stockholders of the Swan Lamp Manufacturing Company was held at its offices in Cleveland, O., on January 16. The following officers and directors were elected: S. M. Hamill, president and general manager; B. F. Miles, vice-president and treasurer; S. E. Cox, secretary and superintendent; E. P. Roberts, electrician. The directors elected were: W. H. Lawrence, B. F. Miles, L. H. Rogers, Webb C. Hayes, S. M. Hamill.

Florida Winters.

The "Clyde Line" is the only line making the trip between New York and Jacksonville without change. Six beautiful, fast steamships, the "Algonquin," "Iroquois," "Cherokee," "Seminole," "Yemassee" and "Delaware" are assigned to this service, and they leave Pier 29, East River, Mondays, Wednesdays and Fridays at 3 P. M. By this line all the dust and annoyances incidental to railroad travel are avoided. A pleasant feature of the trip is the stopping at Charleston, S. C., for half a day. The visit to this "Venice of America" is certain to be amply repaid. The steamships have the most complete modern fittings and accommodations, including elctric light, call bells and elaborate aloons and cabins.

Write the "Clyde Line" for one of their "Facts About Florida," as they take pleasure in furnishing them free of charge.

Of Interest to Travelers.

The Baltimore & Ohio Railroad announces that it has placed on sale round trip tickets at reduced rates to the winter resorts in Florida and the South, and also to such points of interest as Luray, Natural Bridge and Gettysburg. This company has also arranged to place on sale excursion tickets to San Francisco and other points in California, on account of the Mid-Winter Fair, at unusually low rates. Excursion tickets are now on sale to Baltimore and Washington via the famous Royal Blue line.

With its vestibuled train service, via Washington, to Cincinnati, St. Louis and Chicago, the Baltimore & Ohio is in the best of condition to handle Western and Southern travel. That the line is a popular one, is attested by the immense World's Fair business handled this summer.

Those contemplating a trip West or South this winter should write to C. P. Craig, general Eastern passenger agent, 415 Broadway, New York, for rates and other information.