Tension Apparatus for Cotton Rope Drives.

The accompanying illustration is an enlarged view of the tension apparatus employed in the power plant of the Los Angeles Consolidated Railway Co., and which was briefly mentioned in the description of the plant given in the December issue of the Street Railway Journal. The illustration shows a direct belting of a 500 H. P. Westinghouse multipolar generator, and it will be noted that the power is transmitted by an endless cotton rope, one loop of which is led around a tension carriage mounted in position as shown. The ropes for supporting the tail weight of the carriage are attached to horizontal sheaves shown under the base of the frame. While this is not a novel scheme in rope drives, it is the only one, so far as we know, employed in an electric railway plant, and its success in this field will be watched with interest.

The use of electric cars on trunk lines may soon become an assured fact. The Edison General Electric Co. have submitted estimates to the Illinois Central Railroad Co. for the necessary apparatus for such a service, and the installation, if made, will probably be first for a suburban traffic at Chicago. A number of the Chicago directors of the Illinois Central Co. are said to be enthusiastic over the proposition.

McMahon Ammonia Motor at the World’s Fair Grounds.

At Jackson Park, Chicago, a railway system of fourteen miles has already been constructed. The system affords excellent facilities for testing severely new motors which inventors desire to operate on the grounds when the Exposition is opened. As the authorities of the Fair are constantly at the grounds they have abundant opportunities to inspect the apparatus. The illustration on next page shows the new ammonia street car motor which is now being tested at the grounds. The photograph was taken when the car was in front of the Woman’s Building, the construction of which has advanced more rapidly than any structure in the enclosure. The inventor of the system is P. J. McMahon, and it is exploited by the Standard Fireless Engine Co., of Chicago.

The motor is operated by anhydrous ammonia, and it consists of a double engine of the same form and appearance as those used in small locomotives. The anhydrous ammonia as a liquid is carried in a drum contained in an iron tank under a pressure ranging from 150 to 185 lbs. This drum connects with a similar drum which serves the same purpose as the dry pipe of a steam engine; that is, to give dry gas. In a part of the iron tank separated from the ammonia is a certain amount of water into which the exhaust is discharged and absorbed. As the
affinity between water and ammonia is great, the absorption is produced with great rapidity, and no back pressure, or practically none, takes place. The cylinders of the engine are enclosed in a tank so that the gas escaping from leaks is at once absorbed. This arrangement also prevents freezing of the cylinders. From the escape or expansion of the gas, the absorption of heat is so great as to produce an extreme lowering of temperature, but as the water absorbs the ammonia, heat is produced in the solution which serves to equalize the temperature and prevent freezing. In fact, the heat produced is greater than could be utilized, and for this reason the exhaust gas and the solution pass through a number of small tubes which serve to return the surplus heat to the anhydrous solution.

When the gas has been used to such an extent that the pressure is insufficient to operate the motor the car is run into the generating station, the spent liquor is withdrawn, and the gas tank is filled again. The spent liquor is then pumped from the receiving tank to the generator where the application of heat serves to separate the gas from the water, the gas passing into a separator where it is freed from the small amount of water carried over as steam and then passes on to the condenser which consists of a number of pipes where a constant stream of water flowing over the pipes cools and condenses the gas to a liquid which then passes into the supply tank. The heat in the generator serves to expel the greater portion of the gas so that nearly pure water is left and this is withdrawn from the generator and stored in a tank until used to supply the absorption tank on the motor. The charging and discharging is accomplished in about two minutes.

It is asserted that the cost of operating the motor is quite small and improvements are being made which will make the machine still more economical.

McMAHON'S AMMONIA MOTOR CAR.

Meeting of the National Electric Light Association.

The fifteenth convention of the National Electric Light Association will be held at the Iroquois Hotel Buffalo, N. Y., February 23, 24 and 25, 1892. Mr. C. O. Baker, Jr., has been appointed general master of transportation with headquarters at 136 Liberty Street, New York.

The proceedings of the Association, owing to the intimate relations growing between the electric light and street railway interests, are of more importance to street railway managers each year. At the last convention of the Association, which was held in Montreal during the past summer, a large number of gentlemen prominent in street railway lines were present, and undoubtedly many will take the occasion to go to Buffalo next month to attend the sessions of the Association there.

Chicago Street Railway Commission.

The commission appointed by Mayor Washburne of Chicago to consider the matter of improving the street railway facilities of the city, has already held several meetings. Alderman Sexton, the chairman, in calling the committee to order for the first time, stated the problem in these terms:

"Chicago is growing at the rate of 1,000 a week. The World's Fair will be here this summer. How are we going to do in a few years or when the Exposition opens? Our deliberations require haste. Whatever we do, let us do it at once. Let us have continued and earnest work. I believe any action will be accepted by the Council and sanctioned by the people."

It was voted to divide the work into four sections and to appoint committees as follows:

Cause — Biegler, Ream, Stauber.
Immediate Relief — Stone, Kerr, Yerkes.
Permanent Relief — Hesing, Collerton, Wheeler.
Steam and Elevated Roads — Burton, Gorton, Corbin.

At the second meeting of the commission Alderman Goldzier presented a suggestion for relieving the North Side road. His idea is to make the downtown loop underground. Mr. Goldzier's remarks explain his plans:

"The main cause of the trouble is the congestion in the centre of the city. Suppose the La Salle Street tunnel be continued for a loop with no other opening afforded on the side except one on La Salle Street just north of Randolph Street. Have an open space at this point 200 ft. long and almost the width of the street for unloading and loading passengers. The open space would afford an opportunity for preventing the overcrowding of cars, and all persons wanting to go to the North Side could take the cars at this point. I think the loop should be much shorter than the present one. There would be no delay, and it would not be necessary to have so large a loop. This would greatly relieve the congested condition of the street and would take away the cumbersome car trains. Horse cars could be operated to connect with the cable at La Salle and Randolph Streets. Under the present conditions suppose Mr. Yerkes would put on twice as many cars, the streets would be more blocked and the transportation would be worse than it is now. If my scheme is feasible it is no limit to the number of cars except the strength of the cable."

This suggestion of Mr. Goldzier, while novel and interesting, has been seriously criticised and been declared entirely impracticable. It would be unsafe, on account of the great crowds, to attempt to load all passengers at one point. The city engineer, however, has stated that there are no unsurmountable engineering difficulties.

At this session J. M. Hannnahs described his well known elevated system.

At the third meeting of the commission it was decided to send the following list of questions to the cable company, with the request that they answer the queries as soon as possible:

To the South Side company:
1. How much time it consumed in making the circuit of the loop
2. How many cars can be accommodated on the loop?
3. What is the average number of passengers carried by each car during "rush" hours?
4. What is the maximum number of cars on Wabash Avenue during rush hours?
5. Ditto on State Street?
6. What is the running time from the southern terminus of the cable to State Street to the corner of State and Madison Streets?
7. Ditto on Cottage Grove Avenue?
8. To the North Side company:
   First three questions same as for South Side.
9. Maximum number of cars on Clark Street during the rush hours?
10. Ditto Lincoln Avenue?
11. Ditto Clybourn Avenue?
12. Ditto Sedgwick Street?
13. Ditto Larrabee Street?
14. Running time from central terminus on Clark Street to Illinois Street and La Salle Avenue?
15. Ditto on Wrightwood and Lincoln Avenues?
16. To the West Side company:
   First three questions same as above.
17. Maximum number of cars on Madison Street during rush hours?
18. Same on Milwaukee Avenue?
19. Running time from western terminus on Madison Street to corner Washington Street and Fifth Avenue?
20. Ditto on Armitage Avenue?

Alexander Clark presented to the commission the claims of the Chicago & Evanston Electric Railway, a brief description of whose system is given elsewhere in this issue. Coming to the question of motive power he said:

"The motive power will be electricity. Motors weighing 30,000 lbs. will be used, having a capacity to haul 200 tons on the level. These motors will be capable of hauling the heaviest trams up or down a five per cent. grade, and will run through on the surface road after leaving the elevated portion. The speed on the elevated portion of the road will be thirty miles an hour, and on the surface in the thicker settled portions of the city the same as the cable, twelve miles an hour, and in the outlying districts fifteen to twenty miles an hour, thus putting people down in the heart of the city from Evanston and the surrounding territory in from thirty to thirty-five minutes."

A communication was read from R. H. Keithley, in which a comprehensive plan for providing rapid transit, was outlined. Chicago, he said, would have to adopt some such plan as had been recommended by the rapid transit commission in New York. The city needed a system, in his opinion. He suggested first that the South Side Rapid Transit Co. be compelled to build at once its line from Van Buren Street to Jackson Park. This road he thought, should connect with an underground electric road at Fourteenth Street, which would extend north under State Street, below sewers and under the river to the Southwest corner of Lincoln Park. He thought the tunnel should be built a double iron tubular construction. He proposed an elevated track from the point extending over the sidewalk along the west line of the park to North Park Ave., Fullerton Avenue, and then in a direct line to Diversey Street and Clark Street to connect with the horse cars. Stations were provided at intervals for the underground portion.

An elevated road operated by electricity on Wabash Avenue was suggested.

Cable Crossing and Switch.

The accompanying engravings, Figs. 1 and 2, illustrate a crossing and switch recently made by the Indianapolis Frog & Switch Co. for the Broadway & Seventh Avenue, New York, cable line. The switch illustrated in Fig. 1 is the ordinary switch construction, of which there are quite a number placed at suitable intervals in the Broadway line to facilitate the transfer of cars from one track to the other, in case the line should be blockaded from any cause, Fig. 2, being the crossing at the intersection of Twenty-third Street. The very substantial manner in which the crossing and switch are constructed is fully shown in the illustration and reflects credit upon the manufacturers.

The United States produces 9,202,000 tons of pig iron per year, or over 1,100,000 tons more than Great Britain her greatest competitor.
Stomach Stones.

In "Notes from the Field" printed in our last issue, we mentioned the fact that a horse belonging to the Frankford & Southwark, Philadelphia City, Passenger Railway Co. fell dead after coming in from a trip, and on opening the stomach to determine the cause of death five stones were found which had been formed by a deposit in layers of calcareous matter, the weight of which had produced a rupture of the diaphragm. Three of these stones are illustrated in the accompanying engraving, the largest one of which we gaged fifty-seven ounces and measured sixteen inches in circumference. It is represented as cut in half, showing the rings or layers quite distinctly indicated by the various tints of the stone. The animal is said to have looked like a perfect railroad horse, was medium sized, had a smooth coat, good action and had given no symptoms of the disease which caused his death.

The disease known as stone in the stomach is not a very common one with street car horses, but is most frequently found in horses employed by millers and which are fed from the sweepings of grist mills, and is supposed to originate from small pieces of millstone or other foreign body which the animals may have swallowed with their food, and which form the nucleus around which the deposit is made. The usual symptoms of such formation are a depraved and capricious appetite and a disposition to eat the woodwork of the stable, earth or, in fact, almost any substance within their reach. Occasional colics may also result from stomach stones, and when these lodge at the outlet of the stomach they usually prove fatal. The position that seems to afford the most relief to an animal afflicted in this way is sitting upon the haunches. During the fatal attack the symptoms are those of obstruction followed by inflammation and gangrene. There is no treatment ordinarily that will prove effective.

Privileges Accorted to Police and Fire Departments.

The following is a consensus of the regulations adopted by street railway companies in a number of cities in regard to free transportation of policemen and firemen:

Boston—Policemen in full uniform, ride free when standing on the platform, but not more than two are allowed to ride free on any one car.

Chicago—Policemen, in uniform, ride free, and some in citizen's clothes ride on complimentary tickets.

Pittsburgh—Police and firemen ride free all over the lines.

Detroit—Books of 100 tickets are issued to policemen for twenty-five cents.

New York—With one or two exceptions the surface nature of an experiment. Nothing of the kind had ever been practically used there, and it was regarded as doubtful whether the public and management would approve of the decided innovation. It was also thought by some that in the narrow and crooked streets for which Boston is noted, and through some of which the car had to pass, it would not give such good service as a shorter car might.

The performance of the car, however, during the month of December, when it has been in operation on the West End street railway, has proved the falsity of these fears and the wisdom of the management in making the test. Mr. Whitney says in regard to the car: "It gives excellent satisfaction to the public and carries more passengers than the other cars, and to that extent helps to solve the transit question for large cities." From reports taken of the actual work done by the car, the interesting fact is brought out, among other points, that more passengers are carried on the upper than on the lower deck, and this too in winter weather. The following is a statement of the actual number of passengers carried during four round trips between Harvard Square and Bowdoin Square on December 13, the mileage made being fifty-four:

<table>
<thead>
<tr>
<th>TRIPS</th>
<th>TIME</th>
<th>Lower Deck Passengers</th>
<th>Upper Deck Passengers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>First trip</td>
<td>12:05 p. m.</td>
<td>88</td>
<td>85</td>
<td>173</td>
</tr>
<tr>
<td>Second trip</td>
<td>1:20</td>
<td>58</td>
<td>109</td>
<td>177</td>
</tr>
<tr>
<td>Third</td>
<td>2:35</td>
<td>153</td>
<td>154</td>
<td>290</td>
</tr>
<tr>
<td>Fourth</td>
<td>3:30</td>
<td>153</td>
<td>154</td>
<td>290</td>
</tr>
<tr>
<td>Fifth</td>
<td>4:05</td>
<td>73</td>
<td>106</td>
<td>183</td>
</tr>
<tr>
<td>Sixth</td>
<td>5:00</td>
<td>92</td>
<td>88</td>
<td>180</td>
</tr>
<tr>
<td>Seventh</td>
<td>6:00</td>
<td>57</td>
<td>102</td>
<td>159</td>
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<tr>
<td>Eighth</td>
<td>9:10</td>
<td>73</td>
<td>135</td>
<td>208</td>
</tr>
<tr>
<td></td>
<td></td>
<td>710</td>
<td>908</td>
<td>1,618</td>
</tr>
</tbody>
</table>
The Munsie-Coles Electric Conduit System.

In order to provide for an efficient system of electric traction in locations where the use of the overhead wire is prohibited, and at the same time overcome the difficulties inherent in the ordinary conduit system, the method herewith presented has been devised, and although somewhat more costly in the first construction than the overhead system, it can be built for very much less money than any of the cable systems. As will be seen from the accompanying illustrations, the main conductors are placed in a blind conduit between the tracks, as shown at $e$, in Figs. 1 and 2, and each track is provided with a shallow conduit, $c$, located between the rails and constructed with slot rails in the ordinary manner. The track conduits are intersected at suitable intervals with handholes, $d$, which are placed directly opposite the manhole, $e$, over the main conductor. In the handholes are placed two contact posts, one directly under and one at the side of each conduit. To the inner one of these posts, which is hollow, loops from the main conductor are led through insulating ducts, and connected with the contact point or spring on the top of the post, Fig. 3. The post directly under the slot supports a friction roller or circuit closing device which is operated by means of a traveling closing bar or long flexible trolley, suspended within the conduit from the car, in such a manner that in passing the friction roller is pressed down, making a spring connection with the positive wire contact point and conducting the current to the motors, the return being through the rails. The traveling closing bar which may be attached to one or more cars is of sufficient length to reach from one friction roller to the next as it is necessary to make contact with the one in advance before the other is left, so that the distance between the handholes is regulated to suit the length of the trolley, Fig. 6.

The closing bar or trolley is flexible and jointed as shown at $G$, and is rigidly attached to the first support at $f$, but is provided with slots in which the other supports make an adjustable connection which admits of the cars being operated on curves without the bar coming in contact with the rails of the conduit. The joints are also so arranged that vertical flexure is provided when running on uneven surfaces. Switches and crossings offer no obstacles to the operation of this system, as contact points can be placed in any situation and the trolley will adapt itself to all conditions. The handholes and manholes are provided with suitable drainpipes which are connected at intervals with the

FIGS. 1 AND 3—MUNSIE COLES ELECTRIC RAILWAY CONDUIT SYSTEM.

FIG. 2—MUNSIE-COLES ELECTRIC RAILWAY CONDUIT SYSTEM.
sewer, and the handholes are made a little lower than the drain pipe to provide for the accumulation of solid matter which can be removed by the linemen.

From the description it will be seen that the contact points on top of the inner posts are the only exposed bare points in the whole length of the circuit, and to protect these from leaking a special insulating device is employed. This consists of a cup or outer shell of glass, Fig. 3, or other insulating material having a stem through the centre extending higher than the cup which supports an overhanging cover which is designed to prevent dirt of moisture from falling into the cup, while at the same time it gives the necessary break between the cover and cup. The space between the outer shell and stem is filled by an absorbent which is designed to keep the stem and under side of the cover dry in all conditions of atmosphere. The friction rollers, it will be noted, are not charged except when the trolley is passing, and hence, will not form a ground should a piece of wire or any other conductor fall on to it through the slot.

A cross section of the hanger or supporting arm of the traveling contact bar is shown in Fig. 4, and is so constructed as to prevent the conductor from coming into contact with the slot rails. As will be seen, the shank is composed of a conductor, a, forming the centre and covered by an insulating material, b, which is enclosed in a metallic shield, c, which protects the insulation from wear on the slot rails. A glass cup, d, is fitted to the conductor having a triple perforated cover designed to enclose an absorbent to protect the conductor from moisture; e is a detachable metallic shield which fits over the glass cup, d, and prevents rain or mud falling on the latter, and at the same time prevents any rapid change of atmosphere about the absorbent, so that there would seem to be little chance for the current to escape while being conducted to the motor.

The method of attaching the trolley hanger to the truck is shown in Fig. 5, and consists of a hollow ball, a, firmly attached to the truck to which the hanger proper, c, is attached by means of metallic fingers, b, which grip the ball with sufficient hold to support the weight of the contact bar, but so arranged that in case the car should become derailed they will spring loose from the rigid ball and prevent injury to contact bar and connections. It will be observed that the yokes and conduit are so constructed that the paving blocks may be laid firmly against them, and the conduit being shallow the cost of construction will be much less than the conduits heretofore constructed. The device is controlled by the Munsie-Coles Electric Railway Equipment Co., of New York City, from whom further particulars may be obtained.

Electric Postal and Express Cars in St. Louis.

St. Louis is the first city in the United States, and thus in the world, to put into operation special cars devoted to an electric postal and express service. Negotiations have been progressing for some time past between the street railway companies of St. Louis and Major Harlow, postmaster of the city, for adopting an extensive postal system on the existing lines which are most in need of such an innovation. Major Harlow has had several interviews with Postmaster General Wanamaker in regard to the scheme, and the latter gentleman has been heartily in favor of it since the subject was first broached to him. The Major is also enthusiastically in favor of it, which is evidenced not only by what he has to say on the subject, but by his untiring efforts to make some arrangement with the street railway companies.

The reasons for wanting postal street cars to do service are apparent to all, and to St. Louisans especially. The city of St. Louis occupies a territory of sixty-two square miles, or more than the area of the District of Columbia. Within these limits are the central post-office and five sub-stations, or, there is one post office to every ten square miles. It is very evident that the number is not sufficient to accommodate the public. In consequence, there are many complaints about the time required by a letter to get from one part of the city to the other, and to do away with all trouble the adoption of postal railway cars on the street railway lines of the city has been suggested.

Major Harlow's plan in running these cars is as follows: Along the proposed route there are to be established at least forty sub-stations. A whole car, or an apartment in a car is to be fitted up in the same man-
The car on the southern railway running to Carondelet does an express business only. It is a temporary affair, but has been running for some time past. It will be replaced very soon by a fine car, somewhat similar to the one on the St. Louis & Suburban. It is different from the latter car in one detail, that is, the narrow door at each end is done away with, and in its place are substituted two swinging doors placed a little to one side, for accommodating long pipes or lumber in case long material of this nature should be expressed to anybody. The car has no dasher, but the ordinary iron grab handles and posts are used as on a railroad car. The car makes two trips a day, at eleven A.M. and five P.M. The St. Louis & Suburban car is divided up, one part being provided with the ordinary facilities for handling mail matter, such as pouches, pigeon holes, etc. and the other for the express and baggage. Express matter to be sent to Carondelet or intermediate points is delivered at the 'South St. Louis Electric Express Office,' corner 6th and Market Streets, the downtown terminus of the line, and is put on the car, which delivers to all the sub-stations between the termini of the line. At these sub-stations packages are delivered to their owners by the express agent.

An Adjustable Step for Trail Cars.

In the accompanying illustration is presented a device to provide for easy communication between motor and trail cars. As will be seen from the illustration, the device consists of a platform of cast iron or other material so hung from two hinged arms that it is maintained on nearly the same level as the steps of the adjacent cars. The supports are made of gas pipe and provided with brass handles near the top on the same level with the hand rails which serve as a firm and convenient support for the hand of the passenger or conductor while crossing. The step is prevented from swinging by means of two small links, not shown in the engraving, which are connected with a bolt designed to move in a vertical slot back of the step. The bridge is supported in such a manner as not to
be affected by the side sway of the car and readily adjusts itself to the varying distance between the cars. It is claimed that the position of the bridge between the platform steps is safer and more convenient than if it were on a line with the centre of the car, as in this case it would require an opening in the dashboard, which might become a source of danger in case the gate should be left open. The use of the bridge does away with one of the chief objections to operating trail cars, for it is often the case that one car will be overloaded when there are plenty of vacant seats in the other car, but cannot be utilized on account of the difficulty and danger in passing from one car to the other, an exasperating condition that often faces the tired man of business. This step seems to obviate many of the difficulties, and will materially assist the conductor in collecting fares, while it relieves him of the great risk incurred in attempting to pass between cars as ordinarily operated. Further particulars regarding the device may be had by addressing the inventor, Arthur Cobb, Louisville, Ky.

**Electric Car Snow Plow.**

A snow plow for electric cars, designed to be readily attached to and detached from the motor car, has recently been placed upon the market by the Wales Manufacturing Co. of Syracuse, N. Y., and is shown in the accompanying engravings. A number were in use on different electric railways last winter, and proved eminently satisfactory. There are no wheels on the plow to jump the track, but, instead, the fore part of the plow rests upon the rail by means of a heavy half round shoe of boiler plate which slides along the rails and allows the plow to pass over frogs, crossings, etc., without difficulty, as shown in Fig. 2. The plow is provided with an iron nose which can be raised or lowered and can be easily handled and moved from end to end of car by two men. The method of attaching to car is shown clearly in both of the engravings.

The Pelton Water Wheel Co. have installed at Laxa, Isle of Man, an overshot wheel 110 ft. in diameter.

**Device for Economizing Power on Grades.**

It is a well known electrical principle that in order to obtain the greatest efficiency from an electric motor the armature must be run to its maximum speed, and hence, since motors in climbing steep grades slow down about fifty per cent. an enormous amount of current is consumed without an equivalent in motive power. It cannot be ex-pected that an electric car will climb a steep grade at the same speed at which it will run on a comparatively level track, but while the speed of the car is necessarily reduced it is desirable to run the armature to its maximum speed.

The accompanying illustration shows a method of connecting armature with wheels in such a manner that the speed of the armature can be made uniform on level tracks or grades. A single motor is shown, mounted on a 2emis truck, and, as will be noticed, the armature shaft is provided with two pinions of different diameters which mesh into gears of correspondingly different diameters on the countershaft which in turn communicates power to the axle by means of beveled gears. The gears of the countershaft are provided with clutches to be operated by a lever from either platform, by means of which the driver can use either the large or small gear, or throw them both out of mesh so that the motor can run without moving the car. By employing the small pinion on heavy grades great power is obtained, while only a comparatively small quantity of current is required. When running on a level track where high speed is required the large pinion is employed. With this device it is claimed that no more current is required to run four miles an hour on grades than to run at sixteen miles on a level track. This device has been operated experimentally for about a year, and its claims are said to be sustained. In
a comparative test on an eleven per cent. grade with two other cars, one equipped with two fifteen h. p. motors and the other with two twenty h. p. motors of the double re-
duction type, the truck above described, with tow cars,
consumed only fifty-nine amperes, while the other cars
took seventy-eight and eighty-four amperes respectively.
On a five mile road where the above tests were made it
requires an eighty h. p. generator to operate two cars.
With the new equipment it is thought three or four cars
could be operated with the same amount of current. 
Further particulars may be obtained by addressing the in-
ventor, E. W. Goss, Amesbury, Mass.

The Hathaway Belt Power, Hydraulic Wheel
Press.

A wheel press is always a desirable and very often a
necessary part of the equipment of every street railway.
One of the most convenient machines of this kind which
has been brought to our attention is one which is illustra-
ted in the accompanying engraving, and is manufactured
by Alfred G. Hathaway of Cleveland, whose transfer and
turntables and other articles of car house equipment are
well known among street railway managers. As will be
seen, the pump is attached to the framework of the press
and can be set longitudinally, as shown, or transversely
with the ram so as to suit the condition of the shop shaft-
ing, enabling the user to locate his press at any desired
place.

The pump is of the duplex pattern with single acting
plungers, the gearing being five to one. The plungers are
packed with compressive fibrous packing with bolted
flange which is tight and works with no undue friction.
The pump barrel is made in one piece from hammered
steel. The suction and delivery pipes are large, per-
pendicular and of easy access for separate bonnets situa-
ted on top of the pump barrel. The movable beam runs
on rollers upon the top bar, and is recessed so that blocks
may be placed in each of sufficient thickness as to act as
a template in forcing on car wheels. A swing chuck
placed against the ram acts as a template for the other
end of the axle. The block can also be used when forcing
shafts into wheels. Return weight, water tank, safety
valve and pressure gauge are also furnished.

These hydraulic presses are manufactured of suf-
cient size to take wheels of thirty-six inches in diameter,
and they have a distance between bars of forty-one inches.
The tight and loose pulleys are fifteen inches in diameter
and turn at 150 revolutions per minute, and have each a

three and one-half inch face. The press can exert a pres-
sure of fifty tons.

Rapid Transit Plans in Boston.

The subject of underground rapid transit in Boston
has been the topic of several interesting addresses recently
by Henry M. Whitney, president of the West End Street
Railway Co. in that city.

In an address made before the Rapid Transit Com-
mision December 7, in connection with this subject,
Mr. Whitney showed by a series of figures the rapid
increase during the last ten years of the number of
passengers brought in and carried away from the city by
the steam railways, as well as those transported by the
surface lines within the city. In 1880 the aggregate num-
ber of passengers carried per day by the street railway
lines on the north side from Cambridge, East Middles-
sex and East Boston was 51,000, and the number carried
by the steam roads was 30,000. On the south side the num-
ers were respectively 114,000 people by the street rail-
ways and 30,000 by the steam roads, making for 1880 a
total of 225,000 people brought into and carried from the
city each day. Mr. Whitney showed that in 1890 the traffic
had absolutely doubled over every line then running, in-
cluding the steam roads.

The growth of the street railway business is shown by
the fact that in 1880 the roads now under the West End
system carried 59,000,000 passengers. The following
year they carried 63,000,000, the next year they carried
69,000,000 the next year 71,000,000, the next year 76,000-
000, the next year 80,000,000, the next year 86,000,000, the
next year 91,000,000, the next year 97,000,000, the next
104,000,000, the next year 114,000,000.

Mr. Whitney then, after referring to the advantages
to the city of having a transit system which could effi-
ciently and cheaply care for this immense and growing
traffic, detailed his plan for facilitating the work of trans-
portation. This plan provides, in addition to the present
surface lines, for a tunnel under the Common, commen-
cing on the south at the junction of Tremont and Warren-
ton Streets and emerging at Adams Square. This pre-
serves the line of travel as it present exists, and when
public necessity and convenience may require the develop-
ment of an elevated railroad, provides a system which
can be readily adapted to the new conditions. While
confident of the desirability to the city of the execution
of the plan as outlined, Mr. Whitney stated that he desired it
thoroughly understood by the Commission that the West
End Street Railway Co. could not undertake to work unless the State were willing to strengthen its hands by the removal of the danger of hostile legislation. The knowledge of the reasonable security of their investments would be the only condition, Mr. Whitney thought, upon which money could be enlisted from capitalists for the enterprise, and he urged upon the commission the desirability of some measures by the legislature by which the result would be obtained.

**Forms for Keeping Street Railway Accounts.**

We are frequently asked to give simple and convenient forms for keeping street railway accounts, and in the accompanying blanks we present the first and second pages of a cash book as copied direct from one in use by a prominent street railway company operating in the State of New York. From these pages the posting may be done directly to the ledger without journalizing, and the forms will be found to give a very satisfactory classification of accounts for horse railways, and can be easily modified to be used on lines employing mechanical traction. The pay roll account is shown as follows:

**HARRISON STREET RAILWAY CO.**

<table>
<thead>
<tr>
<th>PAY ROLL NO.</th>
<th>1892</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WAGES—Conductors and Drivers</strong></td>
<td></td>
</tr>
<tr>
<td>Clerks</td>
<td></td>
</tr>
<tr>
<td>Starters, Inspectors</td>
<td></td>
</tr>
<tr>
<td>Watchmen, Switchmen, &amp;c.</td>
<td></td>
</tr>
<tr>
<td>Repairs, Cars</td>
<td></td>
</tr>
<tr>
<td>Harness</td>
<td></td>
</tr>
<tr>
<td>Shoeing</td>
<td></td>
</tr>
<tr>
<td>Feed</td>
<td></td>
</tr>
<tr>
<td>Light and Fuel</td>
<td></td>
</tr>
<tr>
<td><strong>REPAIRS—Building and Fixtures</strong></td>
<td></td>
</tr>
<tr>
<td>Track and Roadbed</td>
<td></td>
</tr>
</tbody>
</table>

In this connection we present on the following page the blank prescribed by the railway commissioners for the State of New York, on which the quarterly reports of all street railway companies in the State are required to be made. This blank will also help in the classification of accounts. The subject of the standard method of keeping accounts received special attention in a paper read at the last meeting of the American Street Railway Association, and a committee was appointed to recommend to the Association, at its next meeting, forms that may be adopted as standards by railroad companies in all parts of the country.

Spanish cedar is becoming a very popular finishing wood on the Pacific coast, largely taking the place of redwood, to which it is superior because of its hardness and susceptibility to a high polish. The wood is expensive, however. It comes from Mexico and Central America, the finest from the last named country. The cedar grows on mountain sides and along streams and creeks. The primitive methods employed in logging makes the cost of the cedar from $75 to $80 per thousand landed in San Francisco in the log. Spanish cedar, it is believed, will take the place of mahogany.—The Mississippi Valley Lumberman.

A serious accident occurred December 7 on the cable road at Belleville, a suburb of Paris. The grip slipped, and as the brakes would not work properly the car descended the hill, upon which it was, at a high rate of speed and collided with a car which was ascending at that time. All the passengers in both cars were more or less hurt, and twelve of them received injuries which were very serious.
### Statement of the Earnings, Operating Expenses, Deductions from Income and Net Income for the Quarters ending 18\_\_ and 18\_\_

<table>
<thead>
<tr>
<th>Gross Earnings from Operations</th>
<th>Operating Expenses (including all Taxes)</th>
<th>Net Earnings from Operations</th>
<th>Income from other sources than Operations</th>
</tr>
</thead>
</table>

### Net Income from All Sources

**Deductions from Income as follows:**
- Interest on Funded Debt
- Taxes on earnings and capital stock
- Other than above
- \*Remains

### General Balance Sheet

#### Assets
- Cost of Road and Equipment
- Stocks and Bonds of other Companies
- Other Permanent Investments
- Supplies on hand
- Accrued Interest
- Due by Agents of this Co. on account of Traffic
- Due by others (not Agents of this Company) on account of Traffic
- Due by Companies & Individuals (on open account)
- Cash on hand
- Profit and Loss (Deficiency)
- \*\*\*\*<br>

#### Liabilities
- Capital Stock, Common
- Capital Stock, Preferred
- Funded Debt
- Loans and Bills Payable
- Interest on Funded Debt Due and Acreed
- Dividends Unpaid
- Due for Wages and Supplies
- Due Companies and Individuals (on open account)
- Profit and Loss (surplus)
- \*\*\*\*<br>

---

*Enter proportion for this quarter, of the annual amount, whether paid or not.*

Fill in all dates and cost of operating as called for above, and where there is nothing to enter under any item, so designate by a cipher.

On the above quarterly statement enter figures for the current quarter on the right side, and for corresponding quarter of previous year on the left side of this sheet.

Where no separation is made in Assessments between "Property used in Operation" and property not so used, all Taxes as Assessed may be returned as upon "Property used in Operation."

The General Balance Sheet is to be a condensed transcript of the General Ledger as it stands on March 31, June 30, September 30 and December 31 of each year, and must show the exact financial condition of the Company on those dates.

Interest on Funded Debt which has accrued, but may not be due, as well as that which is due and unpaid at the close of the Quarter, must appear on the Balance Sheet as a Liability.
The Street Railway Situation in Chicago.

If a Chigcgoan were asked what question is exciting the greatest interest in his city at the present time, he doubtless would reply, “the street car problem.” The topic certainly seems to take precedence over all local matters. It is the subject of a greater number of editorials usually vehement in character; it occupies the most prominent position in the news columns; it comes before the City Council in a variety of forms, and it has formed the subject matter for innumerable interviews with Mayor Washburne, who has dealt with it in at least one special message addressed to the aldermen.

Chicago unquestionably needs additional transportation facilities. The public realizing this fact must of necessity find an object for attack, and the surface roads naturally come forward practically all the abuse and criticism distributed largely by the public representatives. The general charge laid at the doors of the local companies is inadequacy of facilities. The other accusations, urged with bitterness, need but a brief reference. They are of the general character always brought against corporations which deal with the public.

An extract from Mayor Washburne’s message will throw some light on the situation. He says:

“It having come to your knowledge and to the knowledge of the administration that the present facilities rendered the public for passenger transportation within the city are wholly inadequate, and in view of the fact that the World’s Columbian Exposition will soon add very greatly to the demands of traffic in all parts of the city, it is desirable that radical and immediate steps be taken to remedy the evil.”

The question naturally arises, in what way was the present state of things brought about? The liberal policy of Chicago roads in extending their lines and in increasing their facilities, has been recognized throughout the country. Millions have been expended in cable construction, and in the purchase of rolling stock; yet at the present time they cannot handle comfortably the enormous traffic which demands accommodation.

It is not necessary to search long for the chief cause. The street car interest, like many another interest, has been overtaken by an increase of population entirely beyond expectation. But are the companies doing all that can be expected of them? The press of the city answers by an emphatic negative, but its opinions are expressed in such bitter, uncompromising terms that one cannot be impressed by the impartiality of its decisions. The Street Railway Journal has taken considerable trouble to investigate the question, and the results are given hereewith.

Any one who will visit the downtown loops of the several companies will find that during the “rush” hours at night and in the morning they are crowded by cable trains almost touching each other all around the circuit. The Chicago City Railway Co. which operates the roads on the south side of the city is so crowded on its downtown loop that its cars form almost a blockade each evening. Cars from its two main lines use the same loop. The demand for transportation has been increasing so enormously that at the present time the single loop is wholly inadequate. As a result, a solid line of cars, each waiting for its turn to enter the loop, may be seen each evening extending on both State Street and Wabash Avenue for four or five blocks.

No one realizes better than the company itself, its need for additional loop facilities, but the City Council refuses to accede to its request for a new loop. The aldermen wish either to force the company to use an inconvenient loop or to impose impossible conditions. Should the permission for a new loop be granted, the South Side company states that it can afford the public all the surface facilities needed. This statement was made by General Manager Wheeler to a representative of the Street Railway Journal. “Grant us the loop,” he said, “and we can comply with all the demands made upon us in the next few years. At present we can do no more. We are now sending around the loop all the cars that can run on it. We are now sending out so many cars at night that they fairly blockade Wabash Avenue and State Street. Under such circumstances no good is accomplished by adding cars. They would simply wait their turn to pass around the loop. If we are granted the permission we will begin work at once.”

“When do you expect the petition will be granted?” was asked.

“I can’t tell that. It will be granted some time, I think. Meanwhile we must do the best we can. Of course I do not mean to assert that with a new loop we could give every one a seat at six o’clock at night, but we could meet all reasonable demands.”

What has been stated explains the situation very completely so far as the South Side is concerned. Perhaps the bitterest complaint has been made of this company of late; yet it is prevented by the City Council from taking any steps to improve its service.

The West Side road has come in for its full share of abuse, yet officers of the company say it can handle all the traffic which comes to it. During the last four years it has increased its facilities so it can handle twice or three times the number of passengers which could be carried at the beginning of that period. For example, the cars on the Milwaukee Avenue line were making 45,000 miles a month when the present company assumed control four years ago. At the present time the mileage is 90,000 each month. The mileage run on the Madison Street line, the most largely patronized route, has been more than doubled during the last four years and increases are constantly making.

To provide for the demands of the people of the West Side, the company has built twenty miles of road during the last four years. It wished to build considerably more but the hostility of the last city administration prevented the company from beginning work. There are now pending in the City Council ordinances providing for the construction of forty miles of line. This includes extensions of existing lines and the construction of crosstown lines of which the West Side has none worth mentioning. Whether these ordinances will be passed or loaded down with such conditions that they cannot be accepted remains to be seen. What the attitude of the present city government is has not yet been ascertained. Citizens...
The delays and breakdowns on the North Side can be explained, as Mr. Parsons explains them, in the case of the West Side. They have been exaggerated by the local papers as much in one case as in the other. One of the officers of the road, in speaking of the charges made by the press, said to the writer recently, "You realize the falsity of the charges as well as I do. They are all included in the word 'bunching.'"

Mr. Yerkes' attention was called to the question of inadequacy by a representative of the Street Railway Journal. He said: "We are abundantly able to handle the traffic. We have power enough to meet all demands for the next five years, but we shall have to increase the rolling stock."

The situation, as it exists to-day in Chicago, can be judged from what has been written. It may be summed up in a sentence: The street railway companies are doing everything in their power to serve the public, but a sufficient number of cars cannot be run on the tracks to accommodate the vast number of people who wish to ride at certain hours of the day.

It is not the purpose of this article to show where the remedy lies. A public commission has that matter under consideration. It may be well to quote again from Mayor Washburn's message, to show that his opinion is not entirely different from that which has been expressed here. He says:

"It is plain that the facilities of the present surface roads, even if they were improved to the point of perfection, are insufficient to care for the rapidly growing population, and their inadequacy will become more marked each year. Your honorable body has granted ordinances to two elevated railroad corporations in this city, both of whom have partially constructed their roads. For many months both these companies have remained apparently idle, and appear to be taking no steps to perfect their roads and grant to the public a service which they are in duty bound to provide as soon as practicable."

In view of all these facts Mayor Washburn determined to appoint a commission "with the view of having a comprehensive report upon this, to-day, all important problem, and which will lay before the administration and the public the difficulties to be met and the obstacles to be overcome them."

The commission, which includes aldermen and citizens of the several divisions of the city, and representatives of the street car companies, is as follows: On the part of the City Council from the South Division, William R. Kerr and Anson Gordon; for the West Division of the city, Robert L. Martin and Edward F. Cullerton; for the North Division of the city, Austin O. Sexton and Peter J. Biegler. The citizens appointed upon this committee for the South Division are D. V. Purington and N. B. Ream; for the North Division, C. K. Corbin and Washington Hesing; and for the West Division, Frank Stauber. The North and West Division street railway represented by Charles T. Yerkes and the South Side Cable lines by G. H. Wheeler. The chairman is Austin O. Sexton.

What is said to be the largest girder in the world was placed in position, December 29, over the Mattabesset River at East Berlin, Conn. It is 102 ft. six inches long, six feet deep, and weighs over fifty tons. It was manufactured by the Berlin Iron Bridge Co.

The record of steam railroad accidents in the United States during September, upon which information could be obtained, included 139 collisions, 92 derailments, and six other accidents, a total of 237 accidents, in which 65 persons were killed and 138 injured.

SCENE AT CORNER OF MADISON AND STATE STREETS, CHICAGO.

was not over three minutes. It happened right out there," he continued, pointing out of his window, "and the wagon with the man who look after that sort of thing was on the spot at once."

"How about the statement of the newspapers that inadequate accommodations are provided?" was asked.

"This is another instance of gross exaggeration. I have in my hand a sworn statement showing the cars in which persons were standing. It shows that of the total number of cars operated not over one-seventh of them contained passengers who were standing. One count, for example, showed that of 2,200 cars passing around the loop in a day only 315 had standing passengers."

"This was measured all the traffic with the natural increase for the next five years?"

"Why certainly, although we can't provide seats for everyone when there are gathered at a street corner more people than a train will hold."

Now, as to the North Side road. During the last five years the North Side company has increased its system from thirty-five miles to eighty. During that time it has built twenty miles of cable road, and there is a great demand for more. The demands on the lines are enormous, and Mr. Yerkes speaks of the cause in this way:

"Here we have a great city growing faster than we can realize. In the heart of the city there are buildings in which 3,000 persons do business. I do not criticize this, but it shows the number of people that congregate in the business centre every day. It is a big business centre which everything pours into and out of in an exceedingly short space of time."
The Shaw Radial Car Truck.

A number of interesting trials have recently been made on the line of the Merrimac Valley Street Railway Co. and other roads in that neighborhood, with a new car truck, the invention of Henry S. Shaw of Boston, Mass. The construction of the truck is simple, as will be seen from the accompanying engravings, which give its plan and elevation. It has two pairs of driving wheels, with one small pair of wheels, which act as guides and which are attached to one set of the driving wheels. The wheels at the forward end of the car follow automatically the line of track whether it be straight or curved, and the radial bars by which both sets of wheels are connected give the second pair of wheels the same direction, by means of the movement of the body of the car. The radial bars also hold the wheels in place and aid them in passing over obstruction on the track.

The truck is so arranged that ninety per cent. of the load of the car comes upon the driving wheels, to which, of course, the motors are connected, only ten per cent. of the weight being supported by the small wheels. Further information in regard to the working of this truck can be obtained from Samuel A. Randall, 143 Federal Street, Boston.

Two Underground Electric Railway Projects in Chicago.

Although there are electric railways in Chicago they are located at a considerable distance from the centre of the city. The fact that no electric road has been built nearer the business section is due to the fact that Prof. J. P. Barrett, the city electrician, is an uncompromising opponent of overhead wires. No company contemplating the use of conductors above ground can expect any encouragement from him. The development of a conduit electrical system is therefore of particular interest to Chicago.

At the present time there is a prospect that a thorough test will be made, of two of these systems. It has already been stated that the Fullerton Avenue loop on the North Side will be equipped with the Love system. This section is about a mile and a half in length.

To equip this line with the Love system will involve a heavy expense, but the company which is exploiting it believes that the test will demonstrate the practicability of the plan. The car which will be used will be a small one, only ten feet in length; it will be equipped with an Eickemeyer motor. It will be built, in all probability, by the Pullman company. It is true beyond question that the electrical features of the Love system have been well worked out, and the construction is such that many of the difficulties attending the operation of conduit schemes will be avoided. The company hopes to have the road in operation within ninety days.

The electric railway at Buda-Pesth has attracted an extraordinary amount of attention during the last year, and it has been described as the only successful conduit electric railway in the world. It is not improbable that the success of the road has been somewhat exaggerated, for little has, apparently, been written of the natural difficulties to be expected in the operation of a road of this kind. The owners of the system, Siemens & Halske, have great faith in it and believe it will solve the problem. Mr. Mysenburg, of Chicago, became interested in the road when in Buda-Pesth last summer, and called Mr. Verkes’ attention to it. The latter thought it advisable to make a trial of it in Chicago. The test will be made on one of the West Side roads. General Manager Parsons, of the West Side company, is authority for this statement. It has erroneously been stated that a contract has been awarded to O. W. Mysenburg & Co. for the installation. No contract has been made, but it is not unlikely that the firm will build the road. Mr. Wright, of the firm, left for Buda-Pesth on December 8, to make a thorough study of the system. The matter will probably be definitely settled within two months.

The Star Power Saw.

In street railway power houses and repair shops a power saw for cutting iron and steel bars and pipe often proves a great convenience, if not, in many cases, a positive necessity. To furnish a convenient and inexpensive machine of this character has been the aim of the Millers Falls Co., of Millers Falls, Mass., the saw being shown herewith.

By this machine metal can be cut much more rapidly than by a lathe, planer, or blacksmith’s hack. By its use also a good percentage of metal is saved, as the pieces cut are left smooth and no labor or metal is lost in squaring up, as in the case after cutting with the hack.

No attention is required by the machine while in operation until the piece is cut off. The expense of the blades is small, since one blade will cut a steel shaft four and a half inches in diameter several times.
Electric Plant of the Missouri R. R. Co. of St. Louis.

The Missouri Railroad Co. has under its control a cable division, commonly called the Olive Street line, and an electrical division, the Market Street line. The former is one of the best cable roads in the country. For economical working it has very few equals. There are about 200 cars operated by cable power, of which forty-five are grip cars, and of the 155 trailers half are summer and half winter cars. There are in operation at the present time by cable about eleven miles of road extending from Fourth Street on the east to Forest Park on the west.

The electrical division, with which we are more intimately concerned in this article, runs from Fourth Street to Tower Grove Park, a distance of five and a half miles, double track. The cars of the Forest Park, Laclede Avenue & Fourth Street railway use the tracks of the Market Street line from Fourth Street to Twenty-seventh street, then branch off to Laclede Avenue, and run along this street to Forest Park, a distance of about one and three-fourths miles. Our reason for mentioning this road is that it is operated by the Missouri company, deriving its power from the latter’s power station, housing its cars in the latter’s car house, etc. Both lines have been in operation for eleven months, and their performances in handling the traffic have been most satisfactory. They parallel the cable road belonging to the same company, and in consequence have relieved it of some of its passengers, but the receipts of both lines belong to the same stockholders.

The power station (see Fig. 1) is situated on Clayton Road and the Wabash Railroad tracks, and thus its coal facilities are of the very best. No attempt has been made at architectural beauty in putting up this structure, but it was designed to be a substantial building for practical uses, such as all buildings of like nature should be. It is of stock brick laid on a heavy limestone foundation, and is one story in height. The high windows on the south and east sides provide ample light, and are large enough to do away with the necessity of any extensive skylight arrangements. Sufficient ground lies between Clayton Road and the structure itself for a large addition, should any such ever be needed. A switch from the main line of the Wabash Road runs along the north side of the building, and here the coal cars deliver bituminous coal through the large doors opening into the boiler room. The entire building is square in form, and measures 142 × 135 ft.

The engine room (see Fig. 2) which occupies the south and east sides of the building, and is in the form of an L, measures 135 × 106 ft. The present engine equipment consists of one 1,000 h. p. engine of the Hamilton-Corliss type, and built in Dayton, O.; two of 600 h. p. of the Harris-Corliss type, built in Providence, R. I.; one of 100 h. p. built by Porter & Allen, and one of sixty h. p. built by the Fulton Iron Works Co. of St. Louis, an aggregate of 2,360 h. p. This is the ultimate capacity of the plant, as there is no more space left for additional equipment. The cylinder dimensions of the 1,000 h. p. engine are 36 × 50 ins.; of the two of 600 h. p. each, 30 × 60 ins.; of the one of 100 h. p. engine, 12 × 20 ins.; of the sixty h. p. engine, 10 × 20 ins. The diameter of the 1,000 h. p. engine’s flywheel is twenty-eight feet, face six feet three inches, weight sixty-eight tons; of 600 h. p. engine’s, twenty feet, fifty-four inches, twenty tons, respectively, diameter of 100 h. p. engine’s flywheel five feet six inches, face fifteen inches; same of sixty h. p. engine, seven feet eight inches. All engine bearings are equipped with self oilers; and all engines are so arranged that they are in communication with the shafting and pulleys. The latter are arranged in one long line, 120 ft. in length. The shafting is divided into two sections, one of which has a diameter of eight inches and the other of nine inches. The latter half has recently been put in, and it is to be operated in connection with the 1,000 h. p. Hamilton-Corliss engine. All the pulleys are provided with the Hill clutch device, made by the Hill Clutch Works of Cleveland, O., and thus the direct coupling of the engines and dynamos is not permanent, but they may be interchanged at will. All shafting bearings are supplied with self oilers, and a speed of 192 revolutions per minute is maintained.

The required tension on the belts is regulated by means of the dog and screw arrangement made by the Hill Clutch Works. This not only tightens or loosens the belt, but gives to it a certain side or lateral play, which greatly increases its efficiency. The belts are all solid and were made by the Charles Munson Belting Co.
Chicago. The width of the belt used with the 1,000 H. P. engine is seventy-two inches; with the 600 H. P. engines, fifty-three inches; with that of 100 H. P., thirty-five inches; with the sixty H. P. engine, sixteen inches.

The boiler room is 100 x 36 ft., and is at present equipped with six boilers, in batteries of three each. The boilers are of the ordinary tubular type, and were made by Rohan Bros., of St. Louis. They have a six inch shell, are twenty-two feet in length, and have a diameter of sixty inches. Each boiler has eighteen flues of six inches diameter each. One battery is used at a time, but as soon as the 1,000 H. P. engine is put into operation an additional battery will no doubt be required. The boilers are supplied with water from the city mains. There are two Hooker No. 10 pumps in use, manufactured by the Hooker Co. of St. Louis, and a vertical pump of the type that steamboat men call a “doctor.” A Rohan heater, they can be self or separately exciting, a small exciter being operated by the sixty H. P. engine. Each generator is equipped with the latest type of Thomson-Houston lightning arrester, and the automatic circuit breaker of the same company.

The switchboard is very neatly fitted up in cherry. There are fourteen feed wires centering at the board, and each one is marked with the name of the street at which it connects with the trolley wire. The switches are insulated from the switchboard by means of square slate slabs, while in the case of the resistance coils, rheostats etc., the insulating material employed is porcelain. Very much to the credit of the Thomson-Houston company and the scrupulous care of the railway company’s electrical engineer, but one generator has been taken apart since the road started operations eleven months ago, and this machine, which is one of those first installed, is apart at

is used to heat the water to the required temperature, 212 degs., before its entrance into the boilers. Combined with the heater is a patent settler for clearing the water of all mud and impurities.

The steam piping outfit is about as complete as it could be. The main steam pipe runs from the boiler room to the north side of the engine room. It is here divided, one part branching off towards the 1,000 H. P. engine, and the other towards the four other engines. All pipes are covered with a good thickness of asbestos bound to them by means of brass strips.

There are at present in use three steel smokestacks. (See Fig.1.) They are ninety-five feet in height, and have a diameter of forty-four inches. They are given a good appearance by a capping of ornamental fluting. The steam engineering was done by Rohan Bros., and the Kupperle Co., both of St. Louis, and a great deal of credit is due them for the admirable manner in which they have equipped the plant.

The generator equipment consists of seven Thomson-Houston machines. Two of these are of the “M. P. 250” four pole type, of 275 H. P. each, and make 400 revolutions per minute. The five smaller dynamos are also of the multipolar type, of 100 H. P. each, and make 750 revolutions per minute. All the machines are so arranged that the present time, simply for renewing the binding strips on the armature.

There are in operation at the present time thirty motor cars and fifteen trailers, one half on the Market Street line and one half on the Laclede Avenue line. All the rolling stock was built by the J. G. Brill Co., of Philadelphia, and is representative of the fine work turned out by that company. The car bodies are sixteen feet long, while the length over all is twenty-four feet. The trailers are of the same dimensions as the motor cars, are equipped with Brill’s patent equalizing gear and two of Smith’s patent double centre lamps. The motor cars are lighted by electricity, and are equipped with Brill’s patent No. 7, independent, rigid motor truck. On each truck are mounted two fifteen H. P. Thomson Houston double reduction motors. Comment on the workings of the motors is almost unnecessary, as motors of this class have already established an enviable reputation for themselves. A thirty inch wheel is used with the motors, while the trailers are equipped with wheels of twenty-two inches diameter, and thus afford greater convenience for passengers boarding the cars. The cars are run at an average speed of ten miles an hour. This means about eight miles an hour downtown, and twelve miles an hour in the outlying districts.
The track construction is the very best that could be desired. From Fourth Street to Twelfth Street the stringer construction, laid while the road was operated by horses, is still in use and is quite as smooth as the girder construction. The wooden stringers seem to act very much like a cushion. This is most noticeable when the transition from the stringer to the girder construction takes place, the latter having a smooth but hard sensation. The remainder of the road, from Twelfth Street to Forest Park, the terminus of the Laclede Avenue line, and to Tower Grove Park, the terminus of the Market Street line, is laid with seventy-eight pound Johnson girder rail. This portion of the road, especially where the street is paved, is most substantial. The ties are planed squares and placed quite as near together as in steam railroad construction. Carefully tamped, they make the road as rigid as possible, and all joints are well guarded by an additional tie. There are no suspended joints, but each joint is supported by a chair and the latter by a tie. All curves, where the street is not paved, are laid with orange wood blocks, and where the Market Street line crosses the Missouri Pacific and St. Louis & San Francisco tracks smooth but heavy crossings are pro-
vided for both steam and electric cars.

The company's car house is situated at Compton Avenue and Dexter Street. It consists of one large building a block in length. One end is but one story in height, and here are accommodations for the Laclede Avenue cars, and at the other end, of the same height and dimensions, are accommodations for the Market Street cars. The centre of the building is of two stories, and here are situated the general offices as well as the car repair shops of the company.

At the Forest Park terminus of the Laclede Avenue line the management intends erecting an extensive pa-

tilion to accommodate next summer's crowds.

In conclusion, we wish to thank Mr. P. C. Maffit, President of the Missouri Railroad Co., Mr. Hill and Mr. Thompson, respectively, steam and electrical engineers of the power plant, for their courtesy in giving us the above information.

G.

The Practical Side of the Electric Railway.

Chapter II.—Overhead Construction.

By J. H. Bickford

There are two methods of line construction, known as the direct and indirect. The term "direct" is applied to that method of construction in which the trolley wire or working conductor is of large area and of high con-
ductivity and carries the current its entire length, being

supported only by one or two towers with the feed wires which lead out direct from the station.

The second or "indirect" method is that in which the trolley wire or working conductor is of smaller area and of low conductivity, and is divided into sections of 500 or 600 ft., each of which is connected to a parallel wire of high conductivity, called a main, which is run on the poles at the side of the street, and which is fed at intervals, so that the current is maintained at a nearly uniform potential throughout the entire line.

The first method has some advantages over the second on short lines two miles or less in length and on which only a few cars are operated. In this case the No. 0 copper wire which is usually used is of sufficient capacity to carry the current, but on long roads where it becomes necessary to reinforce the working conductor by feed wires the large wire has no advantage, and being heavy enters more easily through the street. On long roads where the direct method is em-
ployed the potential at the points most distant from the station is usually very low; not more than 300 volts on a certain five mile road with which I am acquainted, this condition being due to the absence of feed wires.

Some of the disadvantages attending the use of a heavy 0 wire where it is possible to reinforce it, are that it requires very large poles to support it in order to keep it in proper position; it is unwieldy and difficult to splice, and if made of copper has a low tensile strength compared with wires of other material; being soft it wears more readily and offers a large surface for the accumula-
tion of snow and sleet; from its tendency to stretch it is difficult to maintain it in position on curves or hold it to a proper adjustment on the tangents.

From the above it will be seen that hard drawn copper wire has few advantages to recommend its use on either long or short roads. On the other hand, the indirect method has several advantages, and it is the disadvantages of the direct method either on short or long roads. The working conductor employed with the indirect method is usually a No. 4 silicon bronze wire which is extremely light in comparison with copper wire of the same size and has a greater tensile strength; it is more readily and offers a much smaller surface for the accumu-
lation of dust; it is more easily held by poles and wire, it is not easily broken by accidental contact, and its better wearing qualities; its greater tensile strength en-

sures it from accidental breaking, and its small area offers little surface for the accumulation of sleet and snow; it is easily held in position on curves and can be readily spliced. Another great advantage attending the use of small wire is the fact that being light the trolley wires do not tend to lift it, causing it to bend at every point, which, in case it is covered with snow or sleet, tends to crack the incrustation so that it falls off in showers as the wheels roll along, while the large wire being virtually a rod is not raised perceptibly by the trolley, and when covered with sleet the trolley wire is not liable to pass over it with-

out making a contact. It is not claimed that with the smaller wire the trolley will clear of snow and ice in all cases, for it sometimes becomes so thick that it is neces-

sary to clear it off with poles and scrapers. But in any event it can be removed from the smaller wire more readily than from the larger one.

I am confident, from personal observation, that most of the electric roads that have been built within three years will necessarily be reconstructed within five years from the date of building, many having already been reconstructed. Of course, the fact must be recognized that the business being new, many blunders were made from inexperience; all had gradually to feel their way up to a proper standard, and it is not surprising that cheap work and cheap material played an important part in early constructions. The question has been heretofore not how good but how cheaply can a mile of electric line be built. Will its cost be $1,500 per mile? Had the answer been "Yes, it will cost twice that amount for a good line," many roads would have more dollars in their treasury to-day than they now have. In order to make the construction inex-

pensive, small poles were employed, and in many cases were not set more than four feet in the ground. In fact, the poles are frequently cut off at the ground, and the top of setting their poles with top short a section under-

ground. Poles that are small and insecurely set will bend and cut their way through the soil and will soon appear to have a decided attraction for the other across the street, while the trolley wire shows a like attraction for the rails. Although thousands of wooden poles have been employed that are not more than eight inches in di-

ameter at the ground line and four or five inches at the top, we do not hesitate to say that it is a waste of money to follow such a practice, as such poles will not hold the wire in position more than three years. With their use span wire cannot be kept kaut, and if the trolley wire is particularly heavy the sag will be correspondingly great, and when the attempt is made to take up the sag such poles will either break or bend, depending on the wood, whether chestnut or cedar.

Cement poles are said to be employed they should not be less than thirty feet in length nor less than inches in diameter at the ground line and not less than eight inches at the top. Chestnut poles should be of the same length and not less than inches at the ground line and seven inches at the top. Where round steel poles are employed the sections of tubing should not be less than six inches, five inches and four inches. The six inch section should be about eighteen feet long, the five inch
section about eight feet and the four inch section four feet; this will make a total length of thirty feet. We are aware that most steel poles are made from twenty-six feet to twenty-eight feet in length, but this not enough. If guard wires are to be employed thirty feet is the least length that ought to be employed, and where feed wires are employed the poles should even be higher than thirty feet. It is not a good practice to attach a number of feed wires to a single pole, and a thirty foot pole should not be required to carry more than a two pin arm. Wooden poles of the dimensions above named, except as to length, are large enough for streets of ordinary width, but steel poles of the above dimensions should be confined to streets not exceeding fifty feet in width. On the contrary, where heavy strains occur larger poles, whether of wood or metal, should be employed in order to maintain the trolley wire at the required height.

In case wooden poles are to be employed I would recommend a hard pine pole not less than ten inches square at the base and tapered to not less than eight inches at the top. The first twelve feet at the base should be left square and the remaining length sawed octagonal. The poles should be set not less than six feet in the ground, and after setting, the corner, from twelve inches above the ground up, may be chamfered leaving the surface one inch wide. This will make a strong, neat pole that will cost about six dollars. The top should be coned, and painted to prevent decay from the effect of moisture. The pole being in position, a piece of timber or plank should be placed next the curb about fifteen inches below the surface of the ground and stones should be tamped in at the back of the pole near its foot. Steel poles should in all cases be set in a concrete foundation, and it is also better to set wooden poles in the same material. Wooden poles should be set to rake away from the street at least twenty-four inches as they will pull up straight in time and will look much better looking outward than inward. Poles with brackets, however, may be set straight or nearly so. Both wooden, and steel poles should be painted with some neutral color except at the base which may be in some dark colors.

(To be continued.)

Foreign Street Railway Notes.

By Our Special Correspondent.

STREET RAILWAYS IN HOLLAND.

During the last few years the system of street railways in Holland has developed upon a remarkable scale. This may be caused by the Dutch laws which contain very favorable stipulations for the construction and working of street railways. The gauges employed are various, 2 ft. 5½ ins., 3 ft. 3½ ins., 3 ft. 6 ins., 4 ft. 8½ ins., being the most common. The track construction is of many different patterns, but after ten years' experience the Vignol rail on timber or steel ties, has been adopted generally, except at cross streets where grooved rails on stringers are still used. The lines are almost always of single track and have no special stopping stations.

In the street railways are operated mostly by horses, but in the country, nearly without exception, by locomotives. If the locomotives are used inside the towns all the moving parts of the machinery are covered by an iron case and they are also furnished with a smoke consumer. In some towns and villages a law is in force that in narrow streets a man with a bell must go before the train; this is made necessary because the train passes sometimes very close to the houses of the street; there are, in fact, places where the space between the train and the house is only four inches. On several lines only one man is employed on the locomotive; but in most of the provinces of the kingdom the authorities have ordered that two men, viz., an engineer and a fireman, must be on each locomotive.

Since the first of January, 1890, the highest allowable speed has been fixed at twelve and a half miles per hour; but while passing through towns and villages and while crossing bridges and important roads in many provinces only 4.6 miles per hour are allowed by provincial law.

In many cities in Holland a special tax is levied per car for the use of the street railways. A single line car pays the same tax as a long car, the street railway companies prefer to use the latter. In consequence, a train is composed very often of the locomotive, baggage car and one passenger car containing first and second class compartments with thirty-six seats inside and room for sixteen passengers on the platform.

In the year 1890 there were forty-seven companies operating 556 miles of street railways in Holland. Of these 522 miles were of double track and thirty-four miles of single track. Thirty companies used only horse power and twenty-two companies only steam power, while five companies used both steam and horse power. Of the above mileage one-half was of the standard 4 ft. 8½ ins. gauge. There were owned by these companies 213 locomotive engines, 1,023 horses, 802 passenger cars and 467 baggage cars.

UNDERGROUND RAILWAYS IN GLASGOW.

The construction of an underground railway in the important city of Glasgow was approved by Parliament in the year 1888, but the contracts for the different portions of the work have only recently been let.

This railway will cross the city of Glasgow from the east to the west and will have a total length of about six and a half miles. It starts from the Botanic Railway in the south-east part of the city close to the north bank of the river Clyde, then crosses the oldest city park of Glasgow, going along a nearly straight series of streets to the Queen's Dock, with which railway lines it will be joined by sidings. From the Queen's Dock it turns to the north and goes through a hill on which the West End park is situated, crosses the Kelvin River and the Botanical garden and comes out on the open ground where an extension may ultimately be made.

The greater part of the line will be entirely underground, but at several points the road will be carried above the surface of the streets.

At each of the thirteen stations proposed the ticket offices will be placed on the street level and staircases will lead to the railway platform. The steepest gradient on the line will be one in eighty.

The total cost of this railway is estimated at £4,700,000 out of which £220,000 must be paid for real estate.

ELEVATED RAILROADS IN BERLIN.

The well-known electrical firm of Siemens & Halske in Berlin has prepared plans for the construction of a network of elevated railways in the city of Berlin which will use electricity as a motive power. All cars will be equipped with motors and will be run separately under a headway of from two to three minutes. In cases, however, of great traffic, trains are to be formed of two to four of these motor cars. A service of eighteen hours a day is proposed. It has been estimated that each car on each run between the terminal points of the line will carry forty passengers, and that 15,000 to 17,000 passengers will be carried in each year.

The cost for constructing these elevated railways of double track has been calculated to be $605,000 per mile. Taking this figure as a basis the total cost of the proposed elevated railways will be $22,000,000. The present plan is to construct only the south line of only five and a half miles in length, provided, of course, that governmental sanction can be obtained, which is considered doubtful.

ELECTRICAL STREET RAILWAYS IN RUSSIA.

The first electrical street railway in Russia will be constructed in Kiev, a city of about 130,000 inhabitants and situated on the river Dnieper. This street railway will use the overhead system and will be ready for operation in the summer of 1892.
Conditions of Maximum Motor Efficiency.

In the operation of electric motors there are three principal factors to be considered, the speed, the torque and the efficiency. Under any variations in power the efficiency should remain as nearly constant as possible. For one class of work it is desirable to keep the speed constant; for another it is desirable to have a range of speeds with which to keep the torque constant at one particular amount when the speed varies. For a third class it is desirable to operate at many different speeds, and among the particular speed desired regardless of the torque. For a fourth class it is desirable to operate at many different torques, and yet automatically at any desired torque regardless of the speed; and for a fifth kind it is desirable to keep the amount of power supplied constant, regardless of a change in torque, that is, so that if the torque changes by the requirements of practice, the speed would automatically change so that the power consumed would remain constant.

Of the above five principal classes of work there is only one, namely, constant speed and variable torque, which can be had with reasonable efficiency and from our existing supply circuits.

It is well known that when a street car is first started and is speeding up there is a large current, and at this the breaker is cut out, or, for that matter, if the pounds pull is large, the feet per minute is extremely small; consequently the power required must be exceedingly small. With this in mind it appears evident that in order to develop the same amount of power, but a fraction of a horsepower we must, on account of the slow speed demanded, develop about 30 H. P., and then waste about ninety-eight per cent. Or, in other words, to utilize the remaining two per cent. in the way it is desired. The efficiency of the modern electric street car is not probably more than two per cent. when just starting from dead rest and moving at the rate of one-half foot per second. We are certainly compelled to conclude that the explanation is that in order to get the necessary large torque with freedom from excessive sparking we must have a very large current in a nearly constant field. For the E. M. F. must be used by a generator which will carry a large current, and the power which will vary almost directly with the torque, and will be regardless of the speed. Or, in other words, the efficiency of the motor will vary inversely as the speed, with an efficiency of perhaps eighty per cent. at full speed.

As a result of my investigation of this subject I have concluded that the most economical electric motors are those of the type that are manufactured by Mr. Mailloux, and that the type of which the present single motor is greater than the combined capacity of the apparatus this system would require, and the capacity of the prime motor very much reduced.

In order to reduce the first cost to a minimum and yet secure the advantages of different automatic speeds and high efficiency, I have devised two modifications of the arrangement described above, so that first is adapted to power in which a smooth, efficient acceleration of a load from rest is required, as in the case of passenger locomotives and electric trams. The second case is intended for an application, not so unusual, but no special importance attaches to the starting of the load from rest, as it is the case in machinery in general.

The first case is that of two motors, one being the motor of electric street cars as the most important. Let us suppose we have two motors of 15 H. P. each for the car. We find that for full speed upon a level we require, perhaps, 150 amperes at 700 volts, therefore upon thirty-five of such we get a speed of about fifteen miles an hour. This motor is adapted to operate upon my system let us place upon the car a motor generator, the motor part of which is wound for 500 volts and twelve and a half amperes, and the generator part of which is wound for 125 volts and fifty amperes. The fields of the motor and generator part are distinct and are wound for 500 volts, as are the fields of the two propelling motors under the car. All these fields are supplied from the trolley circuit. In the field of the auxiliary generator is placed a rheostat.

Now, suppose the car rests upon a grade. The motor generator is running; it is the generator. The two propelling motors are running, but connected by a controlling switch to the propelling motors. We now gradually cut resistance from the generator field circuit and finally get the two motors running at no load, and with this C. M. F. we get sufficient current to produce fifty amperes through the armatures of the propelling motors in a saturated field. This gives us the full torque of the motors. If we perhaps want the car to get up to full speed, the speed can be maintained constantly and indefinitely, and the consumption of energy will be less than two H. P. This is less than three amperes per horse power. The car, however, increases in speed, but gradually accelerated until we have 125 volts upon the terminals of the propelling motors. We will now be running at one-quarter of the full speed, and the car, therefore, will consume fifty amperes, that is, 25 K. W. instead of 25 K. W. to get the same result with existing motors. To put it another way, we will not be using as much energy as is represented by the 500 volts and 15 amperes necessary for full speed on a level surface.

The next step on the controlling switch will disconnect the armatures of the auxiliary motor from the trolley, and connect the armatures in series across the trolley line direct. We will now get a speed represented by 250 volts, that is, one-half full speed. The next step of our switch will place the two armatures in multiple across 250 volts, and the next and last step will place the 120 volt auxiliary generator in series with the main central station generators and give us 625 volts on our armatures and a correspondingly increased speed. We will be able to go up a grade of six to eight per cent. at full speed, with fifty amperes and 500 volts, which, with the present motors, gives us only about one-quarter of that speed.

We are now practically at the finished point. We have to notice that the apparatus which could be called additional is the small motor of 500 volts for the generator part of our motor generator, which is useful not only for starting, but for full speed. We are now making the action delivering back energy to the line at full efficiency and not through a rheostat, as at present.

We have a train of three cars, so that we have six motors, we can start from rest with sufficient smoothness by placing all six armatures in series, which will give us something less than one-sixth speed on first step. Then we may superpose the three multiples, which gives us one-third speed. Next, two in series with three multiples, which gives us one-half speed; and finally, all in multiple, which gives us full speed. Under such conditions, we can dispense with the small converting plant altogether.

THE LAW OF MAXIMUM EFFICIENCY OF ELECTRIC MOTORS.

BY C. O. MAILLOUX.

In the very interesting article on his new method of operating motors Mr. H. Ward Leonard has introduced a new law of efficiency which is, unfortunately, not free from objections. Mr. Leonard states his "law" as follows:

"Vary the voltage as the speed desired."

"Vary the amperes as the torque required."

The new classical researches and historic experiments of Marcel Deprez have long since consacrated these two statements, which are to be found, more or less amplified and elaborated, in the writings of Du Bois, Froelich, Du Bois and Froelich, Arnot and others. The claim to novelty rests upon the term combination, or, rather, upon the opposition of the two statements to make a law. It so happens, however, that one can arrive at the same result more simply and directly by the use of the term "law," as worded, obtains in the now common practice of regulating street car motors by means of a variable resistance in the circuit. The modification of this resistance at the time of starting, or afterwards, causes the amperes to vary as the torque required. It also causes the voltage (available at motor terminals) to be varied as the speed desired.
THE STREET RAILWAY JOURNAL

January, 1892.

Report of the Trustees of the New York and Brooklyn Bridge for the Year Ending December 1, 1891.

In the past twelve months the receipts from tolls have been $1,176,447.05, divided as follows: Promenade, $8,221.02; carriageways, $1,732,280.88; railroad, $1,088,971.34. This is $49,355.45 in excess of the twelve months ending November 30, 1890, notwithstanding the fact of the abolishment of tolls on the promenade since May 31. Passenger cars were run by railroad numbered 59,766,043 and the income derived from this department shows an increase of $10,057.21 over that of the previous year.

The whole number of foot and railway passengers was 41,265,379, showing an excess of 300,880 over the number reported last year.

The comparison of receipts is as follows:

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<tr>
<th>Description</th>
<th>Promenade</th>
<th>Carriageways</th>
<th>Railroad</th>
<th>Total</th>
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</thead>
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<tr>
<td>For 12 months ending Dec. 1, 1890</td>
<td>$18,064.68</td>
<td>$76,465.10</td>
<td>$1,088,971.34</td>
<td>$1,176,447.05</td>
</tr>
<tr>
<td>For 12 months ending Dec. 1, 1891</td>
<td>$18,211.02</td>
<td>$9,265.30</td>
<td>$1,098,571.34</td>
<td>$1,176,447.05</td>
</tr>
</tbody>
</table>

*Six months only* on the Promenade.

The comparison of traffic is as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Promenade</th>
<th>Railroad</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passengers for 12 months ending Dec. 1, 1890</td>
<td>3,322,073</td>
<td>37,667,11</td>
<td>40,989,48</td>
</tr>
<tr>
<td>Passengers for 12 months ending Dec. 1, 1891</td>
<td>3,501,327</td>
<td>39,868,04</td>
<td>43,369,37</td>
</tr>
</tbody>
</table>

*Six months only on Promenade.*

The receipts from all sources for the year ending December 1, 1891, are as follows:

- City of Brooklyn construction account: $9,260,000.00
- City of New York: $1,800,000.00
- Receipts from tolls: $1,732,280.88
- Material sold, etc.: $35,675.50

Interest: $7,045.53
Rent, real estate and telephone wires: $105,284.86
Balance on hand as per last report: $255,076.32
Receipts from all sources for 12 months to November 30, 1891: $1,289,789.43

EXPENDITURES:

- Construction account: $1,175,923.34
- Pay rolls for 12 months: $70,516.15
- Salaries for 12 months: $37,570.50
- Real estate, rolling stock, supplies, etc.: $105,284.86
- City of Brooklyn: $100,000.00
- City of New York: $50,000.00

Balance on hand December 1, 1891: $353,186.87

Total amount received from rentals for twelve months, $185,254.86, of which $75,250.12 was received from real estate, and $95,001.74 from telegraph and telephone wires.

The Bridge police force comprises one captain, two sergeants, three roundsmen and ninety-six policemen.

Eighty-nine persons were accidentally injured on the Bridge by falling on the stairs and from other causes. Forty-four persons were taken ill upon the Bridge, one person died suddenly; there were three fatal accidents; one person committed suicide; there were eight lost children; two vessels were deprived of their top-masts while passing under the Bridge; there were forty-two runaways, eight causing slight damage, ten serious damage, and four causing serious damage. Two persons were injured while passing under the Bridge; there were forty-two runaways, eight causing slight damage, ten serious damage, and four causing serious damage.

The history of the increase of the demands upon the facilities afforded by the Bridge is one of steady growth, whose succeeding chapters are detailed in the annual reports submitted each year by the Board of Trustees to the Mayors of New York and Brooklyn.

At page 13 of the report for the year ending December 15, 1890, that history was brought down to the point of the appointment of the Board of Experts, which board was at that time engaged in deliberation upon the problem of how best to increase the terminal facilities of the Bridge. Since that report was submitted, that board reached a conclusion and made its report to the Special Committee of Trustees having the matter in charge.

Upon due consideration the Special Committee decided to accept the report and plan of the Board of Experts, and reported the same to the full Board of Trustees, with a recommendation for its adoption, which recommendation was favorably received and the plan adopted.

The full report of the Board of Experts embodying their plans, was printed and widely circulated.

The enabling Act provides that for the purpose of making the terminal improvements embraced in the Washington Street section, the City of Brooklyn shall pay two-thirds of the cost and the City of New York one-third.

A rather humorous question asked by an old lady passenger on the Los Angeles cable line one day, illustrates in a general way the idea entertained about cable roads by unthinking people. The cable had stopped for a few minutes when she turned to the conductor and asked if the machinery and rope didn't stop every time a car stopped.

—Exchange.
The trustees have received for this purpose up to this time, from the City of Brooklyn, $350,000.00; from the City of New York, $180,000.00; and $50,000.00.

The Act of 1891 provides that the funds to meet the cost of the improvement shall be secured by the comtrollers of the two cities, borrowing upon the respective credit of each city the sum required, interest on which is to be paid. It further provides that the bonds to be issued for such loans shall be thirty year bonds, and shall bear interest at three per cent, and shall not be sold at less than par. This Act was passed at a time when in the light of previous experience it was assumed that such bonds could be readily disposed of. Upon attempting to market the bonds as directed by the Act, the comtroller of Brooklyn found it impossible to reach the money market with any assurance that only 300 of the bonds could be sold. The trustees are advised that the financial condition of the community is such that money-seeking investors will find it more profitable to invest in marketable bonds than municipal bonds of the kind, bearing three per cent, interest, and that so long as this condition of the business community continues, it will be practically impossible not only to complete the work on the Washington Street improvement, but to make progress upon any other portion of the improvements authorized by the legislature.

It is now thought necessary to spur the contractor to commence its operations as soon as the order was placed with the result that the entire material is ready for the contractors ready for immediate shipment, but the trustees are unable to accept it for lack of funds. This presents the complication that for such material the contractors may have to pay not only the contract price, but the excess interest upon the deferred payment, and yet by way of damages for their inability to perform their part of the contract, by accepting and paying for the material ordered by them, and by way of damages for their own contract.

Travel during the year, over the Bridge railway, has continued to increase, but at a diminished ratio as compared with that of previous years. At the rate of increase for the first six months of 1891 it diminished; since it has rapidly increased. In the aggregate, however, for the whole year, the increase has been marked. In October, the year, the number of passengers carried was 120,767, a number greater than that carried during any other month since the railroad was first operated; the nearest being in October, 1890, when 3,431,053 passengers were carried, an average per day of 110,693.

On November 21 151,554 passengers were carried, the greatest number on any day during the year. On that day 522 trains were run, and 1,413 single car round trip trains were made.

From the opening of the Bridge railway, September 22, 1883, to November 30, 1891, inclusive, 220,487,253 passengers were carried. During the year the trains have run with great regularity and few interruptions. The total time lost by delays from all causes was seven hours and thirty-six minutes, and a half a minute, an average of one minute and sixty seconds per day. Out of this total of 87,111 passengers. Of these delays during the year, fifty-four per cent. was occasioned by a failure of or a defect in some of the seven engines, 49 of the cable hauling machinery, and the remainder, forty-six per cent., by causes common to ordinary railroad transportation.

Contrary to what appears to be a general impression, but little time has been lost on the railway in consequence of the grip mechanism failing to act; thus during the past year from this cause there were in all thirty delays, amounting altogether to two hours and fifty-seven and a half minutes, of the 7,300 hours the cable was run.

The previous excellent record of the railway, as being pre-eminently a safe one for passengers, remains unimpaired. Of the large number carried since its opening to public use no one has been killed, and during the past year none have been seriously injured. The principal accidents to trains have been in the form of rear collisions at the stations, caused by an incoming train bringing up against a preceding one, not hauled out from the platform. As the passenger cars are constructed, when such an accident occurs there is little or no damage done to the cars themselves; and the passengers are entirely safe from these "coupes with the tail", if they are not too late.

To effectively provide against the possibility of a train, from any remote cause, becoming uncontrollable when going down or up the steep grades on the line, safety brakes have been fitted, each car having four brake bars, operated by air and a hydraulic brake, and in no instance have both of these systems failed to act in an emergency.

The past year has been the best year so far as the increasing number of passengers transported on the railway during the evening and early morning hours, trains are now run from 7 o'clock P. M. to 12.40 o'clock A. M. on three nights, and from 12 o'clock A. M. to 12.40 A. M. on other three nights. The effect of this has been to bring down the number of cars, at the danger of headways, from 8.40 to 7.40 A. M., in a period of five and a half hours, instead of on four minutes and fifteen minutes' headway respectively, as was formerly the case. The effect of this has been that the cars have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated, six and a half hours, and only in the morning and evening, they have been operated, six and a half hours has been operated.
The following figures are taken from the annual reports of several of the largest street railway companies in Massachusetts to the railroad commissioners of the State. The period covered is the year ended September 30, 1891.

### West End Street Railway

<table>
<thead>
<tr>
<th>Item</th>
<th>1890</th>
<th>1891</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital stock authorized by charter</td>
<td>$16,400,000</td>
<td>$11,900,000</td>
</tr>
<tr>
<td>Capital stock authorized by vote</td>
<td>$10,300,000</td>
<td>$7,000,000</td>
</tr>
<tr>
<td>Capital stock paid in</td>
<td>$13,349,350</td>
<td>$9,850,480</td>
</tr>
<tr>
<td>Funded debt</td>
<td>$4,272,000</td>
<td>$4,034,442</td>
</tr>
<tr>
<td>Unfunded debt</td>
<td>$1,102,000</td>
<td>$1,097,000</td>
</tr>
<tr>
<td>Total debt</td>
<td>$5,374,000</td>
<td>$5,131,442</td>
</tr>
<tr>
<td>Cash assets</td>
<td>$2,704,052</td>
<td>$1,537,103</td>
</tr>
<tr>
<td>Net debt</td>
<td>$2,650,374</td>
<td>$1,994,339</td>
</tr>
<tr>
<td>Cost of construction</td>
<td>$3,519,990</td>
<td>$4,435,990</td>
</tr>
<tr>
<td>Cost of horses</td>
<td>$90,664</td>
<td>$98,215</td>
</tr>
<tr>
<td>Feeder wire for miles of track</td>
<td>$2,565,742</td>
<td>$2,065,466</td>
</tr>
<tr>
<td>Other articles of equipment</td>
<td>$1,683,866</td>
<td>$1,488,080</td>
</tr>
<tr>
<td>Total cost of equipment</td>
<td>$5,110,281</td>
<td>$4,153,742</td>
</tr>
<tr>
<td>Total property and assets</td>
<td>$6,560,084</td>
<td>$5,796,546</td>
</tr>
<tr>
<td>Cost of extension of tracks</td>
<td>$193,052</td>
<td>$175,372</td>
</tr>
<tr>
<td>Total cost of equipment</td>
<td>$228,004</td>
<td>$53,437</td>
</tr>
</tbody>
</table>

### Newton Street Railway

<table>
<thead>
<tr>
<th>Item</th>
<th>1890</th>
<th>1891</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital stock authorized by charter</td>
<td>$16,400,000</td>
<td>$11,900,000</td>
</tr>
<tr>
<td>Capital stock authorized by vote</td>
<td>$10,300,000</td>
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<td>$13,349,350</td>
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<td>$4,272,000</td>
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</tr>
<tr>
<td>Total cost of equipment</td>
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<td>$5,796,546</td>
</tr>
<tr>
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<td>$193,052</td>
<td>$175,372</td>
</tr>
<tr>
<td>Total cost of equipment</td>
<td>$228,004</td>
<td>$53,437</td>
</tr>
</tbody>
</table>

### Lynn & Boston Street Railway

<table>
<thead>
<tr>
<th>Item</th>
<th>1890</th>
<th>1891</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital stock authorized by charter</td>
<td>$16,400,000</td>
<td>$11,900,000</td>
</tr>
<tr>
<td>Capital stock authorized by vote</td>
<td>$10,300,000</td>
<td>$7,000,000</td>
</tr>
<tr>
<td>Capital stock paid in</td>
<td>$13,349,350</td>
<td>$9,850,480</td>
</tr>
<tr>
<td>Funded debt</td>
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<td>$4,034,442</td>
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</tr>
<tr>
<td>Cash assets</td>
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<tr>
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<td>$1,994,339</td>
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<td>$98,215</td>
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<td>Other articles of equipment</td>
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<tr>
<td>Cost of extension of tracks</td>
<td>$193,052</td>
<td>$175,372</td>
</tr>
<tr>
<td>Total cost of equipment</td>
<td>$228,004</td>
<td>$53,437</td>
</tr>
</tbody>
</table>
### Helyoke Street Railway.

<table>
<thead>
<tr>
<th>Item</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital stock authorized by charter</td>
<td><strong>$150,000</strong></td>
</tr>
<tr>
<td>Cash assets</td>
<td>23,229</td>
</tr>
<tr>
<td>Net debt</td>
<td>8,216</td>
</tr>
<tr>
<td>Cost of construction</td>
<td>88,925</td>
</tr>
<tr>
<td>Total cost of equipment</td>
<td>186,356</td>
</tr>
<tr>
<td>Real estate</td>
<td>27,877</td>
</tr>
<tr>
<td>Total property and assets</td>
<td>102,750</td>
</tr>
<tr>
<td>Net addition to property</td>
<td>90,436</td>
</tr>
<tr>
<td>Passenger earnings</td>
<td>40,765</td>
</tr>
<tr>
<td>Total income from all sources</td>
<td>41,911</td>
</tr>
<tr>
<td>Total expense of operating</td>
<td>34,972</td>
</tr>
<tr>
<td>Net income above operating expenses</td>
<td>6,995</td>
</tr>
<tr>
<td>Interest accrued</td>
<td>4,510</td>
</tr>
<tr>
<td>Dividends declared</td>
<td>3,018</td>
</tr>
<tr>
<td>Surplus for the year</td>
<td>3,413</td>
</tr>
<tr>
<td>Total miles run during year of operation</td>
<td>13,130</td>
</tr>
<tr>
<td>Passenger carried</td>
<td>132,696</td>
</tr>
<tr>
<td>Persons regularly employed</td>
<td>25</td>
</tr>
</tbody>
</table>

### Fitchburg Street Railway.

<table>
<thead>
<tr>
<th>Item</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital stock authorized by charter</td>
<td><strong>$200,000</strong></td>
</tr>
<tr>
<td>Funded debt</td>
<td>30,000</td>
</tr>
<tr>
<td>Unfunded debt</td>
<td>150,000</td>
</tr>
<tr>
<td>Cash assets</td>
<td>2,030</td>
</tr>
<tr>
<td>Net debt</td>
<td>29,518</td>
</tr>
<tr>
<td>Cost of construction</td>
<td>67,737</td>
</tr>
<tr>
<td>Total cost of equipment</td>
<td>138,078</td>
</tr>
<tr>
<td>Real estate</td>
<td>5,347</td>
</tr>
<tr>
<td>Total revenue from all sources</td>
<td>40,265</td>
</tr>
<tr>
<td>Total expense of operating</td>
<td>27,271</td>
</tr>
<tr>
<td>Net income above operating expenses</td>
<td>5,544</td>
</tr>
<tr>
<td>Interest accrued</td>
<td>2,488</td>
</tr>
<tr>
<td>Dividends declared</td>
<td>3,000</td>
</tr>
<tr>
<td>Surplus for the year</td>
<td>1,649</td>
</tr>
<tr>
<td>Total miles run during year of operation</td>
<td>13,640</td>
</tr>
<tr>
<td>Passenger carried</td>
<td>22,531</td>
</tr>
<tr>
<td>Persons regularly employed</td>
<td>24</td>
</tr>
</tbody>
</table>

### Worcester Consolidated Street Railway.

<table>
<thead>
<tr>
<th>Item</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital stock authorized by charter</td>
<td><strong>$300,000</strong></td>
</tr>
<tr>
<td>Funded debt</td>
<td>120,000</td>
</tr>
<tr>
<td>Unfunded debt</td>
<td>210,000</td>
</tr>
<tr>
<td>Cash assets</td>
<td>2,506</td>
</tr>
<tr>
<td>Net debt</td>
<td>29,518</td>
</tr>
<tr>
<td>Cost of construction</td>
<td>67,737</td>
</tr>
<tr>
<td>Total cost of equipment</td>
<td>138,078</td>
</tr>
<tr>
<td>Real estate</td>
<td>5,347</td>
</tr>
<tr>
<td>Total revenue from all sources</td>
<td>40,265</td>
</tr>
<tr>
<td>Total expense of operating</td>
<td>27,271</td>
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<tr>
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<td>5,544</td>
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<tr>
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<td>2,488</td>
</tr>
<tr>
<td>Dividends declared</td>
<td>3,000</td>
</tr>
<tr>
<td>Surplus for the year</td>
<td>1,649</td>
</tr>
<tr>
<td>Total miles run during year of operation</td>
<td>13,640</td>
</tr>
<tr>
<td>Passenger carried</td>
<td>22,531</td>
</tr>
<tr>
<td>Persons regularly employed</td>
<td>24</td>
</tr>
</tbody>
</table>

### Boston & Revere Electric Street Railway.

<table>
<thead>
<tr>
<th>Item</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital stock authorized by charter</td>
<td><strong>$50,000</strong></td>
</tr>
<tr>
<td>Funded debt</td>
<td>25,000</td>
</tr>
<tr>
<td>Unfunded debt</td>
<td>25,000</td>
</tr>
<tr>
<td>Cash assets</td>
<td>4,712</td>
</tr>
<tr>
<td>Net debt</td>
<td>4,712</td>
</tr>
<tr>
<td>Cost of construction</td>
<td>70,534</td>
</tr>
</tbody>
</table>

### Natwick & Cochituate Street Railway.

<table>
<thead>
<tr>
<th>Item</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital stock authorized by charter</td>
<td><strong>$25,000</strong></td>
</tr>
<tr>
<td>Total debt</td>
<td>1,582</td>
</tr>
<tr>
<td>Cash assets</td>
<td>9,717</td>
</tr>
<tr>
<td>Net debt</td>
<td>9,717</td>
</tr>
<tr>
<td>Total cost of equipment</td>
<td>7,418</td>
</tr>
<tr>
<td>Real estate</td>
<td>4,000</td>
</tr>
<tr>
<td>Passenger earnings</td>
<td>3,000</td>
</tr>
<tr>
<td>Total income from all sources</td>
<td>10,170</td>
</tr>
<tr>
<td>Net income above operating expenses</td>
<td>4,000</td>
</tr>
<tr>
<td>Interest accrued</td>
<td>1,170</td>
</tr>
<tr>
<td>Surplus or deficit</td>
<td>3,000</td>
</tr>
<tr>
<td>Total surplus or deficit</td>
<td>3,000</td>
</tr>
<tr>
<td>Miles of railway (single track) operated</td>
<td>1,008,803</td>
</tr>
<tr>
<td>Persons regularly employed</td>
<td>10</td>
</tr>
</tbody>
</table>

### North Woburn Street Railway.

<table>
<thead>
<tr>
<th>Item</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital stock authorized by charter</td>
<td><strong>$200,000</strong></td>
</tr>
<tr>
<td>Funded debt</td>
<td>100,000</td>
</tr>
<tr>
<td>Unfunded debt</td>
<td>100,000</td>
</tr>
<tr>
<td>Cash assets</td>
<td>3,159</td>
</tr>
<tr>
<td>Net debt</td>
<td>4,642</td>
</tr>
<tr>
<td>Total cost of equipment</td>
<td>88,203</td>
</tr>
<tr>
<td>Real estate</td>
<td>21,460</td>
</tr>
<tr>
<td>Passenger earnings</td>
<td>4,626</td>
</tr>
<tr>
<td>Total income from all sources</td>
<td>129,429</td>
</tr>
<tr>
<td>Net addition to property</td>
<td>3,485</td>
</tr>
<tr>
<td>Total income below operating expenses</td>
<td>20,537</td>
</tr>
<tr>
<td>Total expense of operating</td>
<td>21,157</td>
</tr>
<tr>
<td>Interest accrued</td>
<td>1,526</td>
</tr>
<tr>
<td>Deficit for the year</td>
<td>2,096</td>
</tr>
<tr>
<td>Total surplus September 30</td>
<td>3,121</td>
</tr>
<tr>
<td>Miles of railway (single track) operated</td>
<td>166,534</td>
</tr>
<tr>
<td>Persons regularly employed</td>
<td>18</td>
</tr>
</tbody>
</table>

### Quincy & Boston Street Railway.

<table>
<thead>
<tr>
<th>Item</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital stock authorized by charter</td>
<td><strong>$50,000</strong></td>
</tr>
<tr>
<td>Funded debt</td>
<td>31,812</td>
</tr>
<tr>
<td>Cash assets</td>
<td>8,050</td>
</tr>
<tr>
<td>Net debt</td>
<td>23,262</td>
</tr>
<tr>
<td>Total cost of construction</td>
<td>32,582</td>
</tr>
<tr>
<td>Real estate</td>
<td>7,745</td>
</tr>
<tr>
<td>Total property and assets</td>
<td>37,527</td>
</tr>
<tr>
<td>Net addition to property</td>
<td>3,775</td>
</tr>
<tr>
<td>Passenger earnings</td>
<td>31,333</td>
</tr>
<tr>
<td>Total income from all sources</td>
<td>31,368</td>
</tr>
<tr>
<td>Total expense of operating</td>
<td>31,048</td>
</tr>
<tr>
<td>Net income above operating expenses</td>
<td>8,264</td>
</tr>
<tr>
<td>Interest accrued</td>
<td>1,609</td>
</tr>
<tr>
<td>Deficit for the year</td>
<td>195</td>
</tr>
<tr>
<td>Total surplus September 30</td>
<td>6,800</td>
</tr>
<tr>
<td>Miles of railway (single track) operated</td>
<td>146,470</td>
</tr>
<tr>
<td>Total miles run during year</td>
<td>115,806</td>
</tr>
<tr>
<td>Persons regularly employed</td>
<td>18</td>
</tr>
</tbody>
</table>

### East Middlesex Street Railway.

<table>
<thead>
<tr>
<th>Item</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital stock authorized by charter</td>
<td><strong>$300,000</strong></td>
</tr>
<tr>
<td>Funded debt</td>
<td>125,000</td>
</tr>
<tr>
<td>Unfunded debt</td>
<td>175,000</td>
</tr>
<tr>
<td>Cash assets</td>
<td>8,760</td>
</tr>
<tr>
<td>Net debt</td>
<td>154,301</td>
</tr>
<tr>
<td>Total cost of construction</td>
<td>241,301</td>
</tr>
<tr>
<td>Real estate</td>
<td>9,802</td>
</tr>
<tr>
<td>Total income from all sources</td>
<td>30,625</td>
</tr>
<tr>
<td>Net addition to property</td>
<td>17,951</td>
</tr>
<tr>
<td>Passenger earnings</td>
<td>80,421</td>
</tr>
<tr>
<td>Total income from all sources</td>
<td>99,552</td>
</tr>
<tr>
<td>Total expenses of operating</td>
<td>79,553</td>
</tr>
</tbody>
</table>
The development of street railways during the decade lying between the tenth and eleventh censuses—a development both as to facilities and amount of business done—may certainly be counted as one of the most remarkable features of the whole comprehensive business of transportation. Looking first to the question of length, it is found that in 1890 there were 2,059 miles of street railways in operation, while in 1890, this number had risen to 3,793 miles, an increase in the ten years of 3,734 miles. This increase, remarkable as it is for the whole ten years, is still more remarkable when the decade is divided into two periods of five years each, for then it is seen that the most astonishing development has been during the last half of the ten years and at a rate before unparalleled. The figures show that during the first five years the increase of mileage was 888 miles, while during the last half it was 2,845 miles. Looking for the cause of this extraordinary increase, it can readily be found in the introduction of electric roads. Of these roads, which on June 30, 1890 constituted nearly one-fifth of the total number of street railways, none in operation previous to the year 1885. In that year two electric railways commenced operations; in 1887 the number had increased to six; in 1888 to thirty; and in 1890 to fifty-seven. In the first three months of 1890 no fewer than forty-nine new electric roads were reported. The development of cable roads has also largely assisted in this increased mileage, but not to such an extent as the electric railways, which, as has been shown, the year 1896 was the year of inception of the electric road, the first cable road began to run in 1897. The increase by years is shown in the following table:

<table>
<thead>
<tr>
<th>Ten years</th>
<th>1890-1895</th>
<th>1885-1890</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1880</td>
<td>2,000</td>
<td>2,000</td>
<td>0</td>
</tr>
<tr>
<td>1881</td>
<td>2,000</td>
<td>2,000</td>
<td>0</td>
</tr>
<tr>
<td>1882</td>
<td>2,000</td>
<td>2,000</td>
<td>0</td>
</tr>
<tr>
<td>1883</td>
<td>2,000</td>
<td>2,000</td>
<td>0</td>
</tr>
<tr>
<td>1884</td>
<td>2,000</td>
<td>2,000</td>
<td>0</td>
</tr>
<tr>
<td>1885</td>
<td>2,000</td>
<td>2,000</td>
<td>0</td>
</tr>
<tr>
<td>1886</td>
<td>2,000</td>
<td>2,000</td>
<td>0</td>
</tr>
<tr>
<td>1887</td>
<td>2,000</td>
<td>2,000</td>
<td>0</td>
</tr>
<tr>
<td>1888</td>
<td>2,000</td>
<td>2,000</td>
<td>0</td>
</tr>
<tr>
<td>1889</td>
<td>2,000</td>
<td>2,000</td>
<td>0</td>
</tr>
<tr>
<td>1890-1895</td>
<td>3,750</td>
<td>3,750</td>
<td>0</td>
</tr>
</tbody>
</table>

Looking to the urban locality of increase it is found that the most remarkable is in the smaller cities, a fact that is plainly illustrated in the subjoined table:

<table>
<thead>
<tr>
<th>Total Length</th>
<th>Increase</th>
<th>Per cent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miles (1890)</td>
<td>3,750</td>
<td>82.10</td>
</tr>
<tr>
<td>Miles (1895)</td>
<td>3,793</td>
<td>102.10</td>
</tr>
</tbody>
</table>

The Western cities again show the largest percentage of increase, but Boston and its neighborhood show the greatest absolute increase and Chicago is second. The reason for Philadelphia’s remarkable length of line lies in the fact that this is street length, it being a per-
cularity of that city, and, in some degree, of the Boston roads, that the
tracks usually occupy different streets in going to and from a terminus
instead of being laid upon the same street. The result is that roads in
these two cities traverse a greater length of street in proportion to track
length than in New York, Brooklyn and Chicago. The differ-
ence between the two calculations can be seen in the following table showing street length of line and track length of these five cities:

<table>
<thead>
<tr>
<th>Cities</th>
<th>Street Length of Line</th>
<th>Track Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philadelphia</td>
<td>378.94</td>
<td>300.35</td>
</tr>
<tr>
<td>Boston, Lynn &amp; Cambridge</td>
<td>326.35</td>
<td>292.87</td>
</tr>
<tr>
<td>Chicago</td>
<td>371.13</td>
<td>348.02</td>
</tr>
<tr>
<td>Brooklyn</td>
<td>375.24</td>
<td>375.24</td>
</tr>
<tr>
<td>St. Louis</td>
<td>232.57</td>
<td>232.57</td>
</tr>
</tbody>
</table>

Still keeping to the same twenty-six principal cities, the pre-
faching statistics of cars, employees, passengers and cost are to be
distributed as follows:

<table>
<thead>
<tr>
<th>Cities</th>
<th>No. of Cars</th>
<th>No. of Employees</th>
<th>No. of Passengers Carried in Unit Year</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baltimore</td>
<td>35,000</td>
<td>1,611,144</td>
<td>265,517,820</td>
<td>4,765,240</td>
</tr>
<tr>
<td>Boston, Lynn &amp; Cambridge</td>
<td>35,000</td>
<td>1,611,144</td>
<td>265,517,820</td>
<td>4,765,240</td>
</tr>
<tr>
<td>Buffalo</td>
<td>35,000</td>
<td>1,611,144</td>
<td>265,517,820</td>
<td>4,765,240</td>
</tr>
<tr>
<td>Chicago</td>
<td>35,000</td>
<td>1,611,144</td>
<td>265,517,820</td>
<td>4,765,240</td>
</tr>
<tr>
<td>Cleveland</td>
<td>35,000</td>
<td>1,611,144</td>
<td>265,517,820</td>
<td>4,765,240</td>
</tr>
<tr>
<td>Detroit</td>
<td>35,000</td>
<td>1,611,144</td>
<td>265,517,820</td>
<td>4,765,240</td>
</tr>
<tr>
<td>Hartford</td>
<td>35,000</td>
<td>1,611,144</td>
<td>265,517,820</td>
<td>4,765,240</td>
</tr>
<tr>
<td>Milwaukee</td>
<td>35,000</td>
<td>1,611,144</td>
<td>265,517,820</td>
<td>4,765,240</td>
</tr>
<tr>
<td>New York</td>
<td>35,000</td>
<td>1,611,144</td>
<td>265,517,820</td>
<td>4,765,240</td>
</tr>
</tbody>
</table>

United States carriers last year a number of passengers considerably
greater than the population of the globe, and when it is also stated

*From advance sheets.*
The "eighty-one per cent." of the street railroads referred to above is all that gave any satisfactory statement in the form of a balance sheet, but it includes most of the important companies, and calculations to fill out the 100 per cent. can easily be made.

### Legal Intelligence.

#### STREET RAILWAY CO.—MUNICIPAL POWER—ORDINANCE—HEATING OF STREET CARES—POLICE REGULATION.

This action sought the prosecution of the defendant street railway company for the violation of the following sections in the general ordinance, and subdivisions of certain sections of the City Charter, giving the City Council power to pass laws. "To limit the employment of local carriers, and all others pursuing like occupation, and to prescribe their compensation. 2. To regulate the police of the city or village, and pass and enforce all necessary police ordinances. 3. to do all acts, make all regulations which may be necessary or expedient for the promotion of health, or the suppression of disease."

Under these provisions the city authority claimed ample authority was given by the Legislature to the city to enforce against all street car companies this ordinance in question, requiring them to "cause their cars to be heated sufficiently to make them comfortable for the transportation of passengers at all times when in operation during the months of October, November, December, January, February, March and April of each year."

The company defended on the ground that the city had no power to pass the ordinance in question, because such exercise of power was an invasion of the contract existing between the State and the defendant railway company, made through the Common Council. The Court, (McConnell J.) construing the evidence.

1. Held, that the city of Chicago, under the General Incorporation Law, has no power by ordinance to require the defendant company to use cars heated sufficiently to make them comfortable for the transportation of passengers during the months of October, November, December, January, February, March, and April of each year.

In conclusion, the balance sheet of eighty-one per cent. of the operating roads will be found in the subjoined table:
2. That the ordinance cannot be justified as a police regulation; it is an attempt to burden the defendant company with the expense of certain comforts for the benefit of its patrons, and the power delegated to the city by the General Assembly is not broad enough to warrant the city in so far as it involves the exercise of a power never surrendered by the state. Hence, the ordinance must fail.

People ex rel. v. West Chicago Street Ry. Co., Cook Co. (Ills.) Criminal Court, June 27, 1891.

SPECIAL ASSESSMENT—RAILROAD RIGHT OF WAY—STREET RAILWAY PAYING STREET. Where the commissioners appointed to make a special assessment for a street improvement assessed a block belonging to a railroad company, and over which its road ran, in two parts, assessing one part higher than the other, and expressly accepting the right of way. The County Judge, upon application, for confirmation of the assessment modified the assessment, so as to make one assessment on the entire block in an amount equal to the sum of two partial assessments. Held, 1. That this did not constitute an assessment on the right of way. 2. That assessing separately two parts of an undivided block was an assessment not more than the benefits received by the entire block. (This case distinguishes the case of Warren v. Chicago, 118 Ill. 329). 3. That a street railway company, which is required to pave and keep in repair that part of the street which it uses, is not liable to special assessment for paving the rest of the street. (See case of Parmalee v. City of Chicago 60 Ill. 267) heretofore reported in the STREET RAILWAY JOURNAL.)


INJURY TO PASSENGER BOARDING MOVING CAR.—Where the plaintiff, a young man in good health and unincumbered, stepped on the side of defendant’s open street car as it was moving slowly, and had nearly stopped. And where in about a second, and before the car had reached a right line, and the plaintiff had got into the car he was struck by the hind wheels of a truck in the street. There was no evidence that either the driver or conductor saw the truck. Held, in an action for damages for the injuries sustained that plaintiff should have been non-suited, for the reason that the injuries sustained by plaintiff seem to have been the result of an accident. And, if it was due to any negligence, it was due more to his own negligence than that of the defendant.

Reversed and remanded.


Note: This is an important question. If negligence occasioned the injury, which of the two were the more negligent? It was not carelessness for the plaintiff to attempt to enter the car while it was slowly moving. Hundreds of young men get off and on cars daily in perfect safety while the cars are in motion. No negligence can be charged against the company merely because it did not stop the car for plaintiff. But for the wagon standing in the street he would have entered the car in safety. The question is, did the company have reason to believe that the plaintiff intended to enter the car while it was going? The answer is in the affirmative.

26
THE STREET RAILWAY JOURNAL. January, 1892.

INJURY TO TRAVELER—TRACK OUT OF REPAIR— DAMAGES—In an action for damages resulting to a traveler upon the street, upon appeal the court

Held, 1. That a municipal corporation, vested by law with control over its streets, is bound to keep the same in good order and condition, sufficiently safe to prevent injury to travelers thereon. And it may grant to a street railway company the privilege of building its tracks and running its cars thereon, with the obligation of keeping them in proper order and condition. 2. A street railway company which neglects to keep its tracks and rails in good condition is liable to a party injured by a fall on a loose rail and protruding spike, in consequence of which his skull is fractured or perforated, and death ensues. 3. A party using due care and diligence when using such track has a right to recover from a railway company for injury inflicted by its gross fault and negligence, when the cause is proximate. Cline v. Crescent City Ry. Co. et al. La. D. C., May 9, 1891.

Note: Here the plaintiff sued both the city and the company for damages, but the court held that the company alone is the responsible respondent.

STREET RAILWAY COMPANIES—THE RIGHT TO USE EACH OTHER'S TRACKS—COMPENSATION—HOW DETERMINED. 1. Where a city charter (St. Louis, Mo.) provides that “any street railroad company shall have the right to run its cars over the track of another street railroad company on payment of just compensation for the use thereof, under such rules and regulations, as may be prescribed by ordinance; and it shall be the duty of the municipal assembly to immediately pass such ordinances as may be necessary to carry this provision into effect.” Held, that an ordinance having been passed giving the right to use tracks, the only thing necessary to perfect the right was to have the “just compensation” ascertained, as provided by ordinance.

2. Where proceedings under an ordinance provided that when the right to use the tracks of one company has been granted to another company, and the two cannot agree as to compensation, it shall be determined by commissioners appointed by the Mayor, and such act does not involve the exercise of the right of eminent domain.

3. That the charter (Art. 10 Sec. 6) gives the city power to make rules and regulations, not only for running the cars of one company over the tracks of another, but also for ascertaining the compensation to be paid therefor. Hence, an injunction the Mayor restraining him from acting in such matter will not lie. Union Depot Ry. Co. v. Southern Ry. Co. et al., Mo. S. C., July 29, 1891.

INJURY TO PASSENGER RIDING ON PLATFORM—NEGLECT. The plaintiff, on account of the number of passengers in the car and upon the rear platform, was compelled to stand upon the platform of defendant’s car, from which he was thrown and received very severe injuries, by his leg being run over and crushed by one of the car wheels. The court took the case from the jury, and directed a verdict for the defendant. Plaintiff appealed, alleging the violation of the following duties by the defendant: 1. To provide and furnish plaintiff a safe and convenient seat or place to ride while being conveyed as a passenger; and to provide prudent, safe, and com-
petent agents to manage said car and to provide for his safety as such passenger; not to drive such car at such a rate of speed as to be dangerous to such passenger; to have a chain or guard across the passage way of the steps of the front platform extending across the passage way for the safety of passengers, etc.

2. That the driver and conductor wrongfully, recklessly and carelessly, mismanaged said car, by going at a high rate of speed, and also by such regulations or management to cause the horses a blowing causing them to jump forward, thereby throwing the complainant from the platform, and while clinging and struggling to recover himself and calling to the driver to stop the car, he fell across the rail and suffered a crushed leg at the ankle.

The plaintiff introduced evidence sections 4 and 5 of the revised ordinances, viz.: Sec. 4. "Every street railway company in the city (Detroit) shall so inclose and guard the front platform of each car operated and run by any such company within the limits of the city, as to prevent passengers from getting on and off such platform."

Sec. 5. "No conductor or driver on any street railway car, while such car is in use shall permit any person to enter or leave the same by way of the front platform or forward platform; and no person, when the front platform of any street railway car in actual use is inclosed or guarded, as required in the preceding section, shall enter or leave, or attempt to enter or leave, such car by the forward platform, and no person under the age of sixteen years shall ride on the rear platform of any street railway car, or get on or off in the same while said car is in motion."

Testimony showed that no guard or chain was used to protect passengers while on the front platform; that plaintiff was suffered to ride on the forward platform, and that he was thrown off and injured in the manner set out in his petition.

Hold. 1. That whether it is negligence in a street railway company not to guard its horse cars so as to prevent passengers from getting on and off the front platform is a question of fact for the jury, notwithstanding that the city ordinances require such cars to be so guarded.

2. Whether a passenger on a crowded horse car is guilty of negligence in riding on the front platform is a question of fact for the jury, and it was error to withdraw the cause, for which error the cause must be reversed and new trial granted.


Note: In the case of Upham v. Street Railway Co. (Mich. S. C., February 27, 1891) it is held that it is not negligence per se to ride on the platform of a street car, though there is room within; and an instruction that this fact will prevent a recovery for an injury to a passenger resulting from the negligence of the street car company is error. In this case the injured party, after finding seats for his companions, returned to the front platform through which they entered, and while standing with his back against this door was thrown to the pavement by reason of the driver striking his horses and going over and around a curve, and at such high rate of speed.

It is within the power of street railway companies to prohibit passengers from riding upon the platforms of cars or to give notice that those who ride there must do so at their own risk, or to limit the number of passengers which each car shall carry, and to require them to ride inside cars, until such regulation they adopt some such saving devices and notify the public, it is but reasonable for courts to hold them liable for injuries resulting from their own negligent acts, to their patrons who are themselves in the exercise of reasonable care, whether riding upon the platform or within the cars.

The largest passenger elevators in the world have just been completed at Weehawken, N. J. They carry passengers to the top of the Palisades, 150 ft. above high tide.

The Stillman Light Track Construction.

A short section of the main line of the Wood River Railroad at Hope Valley, R. I., was laid early in November with the Stillman construction, which was illustrated in the November issue of World's Fair. The track was laid by twenty-four pounds per yard, and is laid upon split stringers formed by sawing 6 x 6 in. timbers diagonally. The ties are placed nine feet apart, and the rails are arranged to break joints alternately with the stringers. This construction is said to be standing up well under the traffic, which consists of sixteen trains a day, with locomotives weighing twenty-two tons. This system is essentially a stringer construction, the soil being tamped up thoroughly throughout the entire length of the stringer.

Notes on the Columbian Fair.

COMMISSIONER McCORMICK writes from London that Mr. Armstrong will soon arrive in Chicago, his purpose being to present to the authorities of the Exposition a project to reproduce the Tower of London.

The Council of the Society of Arts, which is the Royal British World's Fair Commission, have decided to appoint committees on finance, engineering, manufactures, electricity, agriculture, mines and metallurgy, textile industries and transportation, to promote the interests of British exhibitors.

The Bureau of Construction of the World's Columbian Exposition have contracted for a 100 H. P. Armington & Sims engine for use in connection with their temporary light and power plant. The sale was concluded by the Penn Engineering Co., general Western agents for the Armington & Sims engine.

The great dome of the Administration building, which will be the most conspicuous architectural feature of the Exposition, and the four smaller domes, will be covered with aluminum bronze, a newly discovered amalgam, which is said to glister brighter than gold. The contract for gilding the domes has been let for $34,000.

The "moving sidewalk" at Jackson Park was tested a short time ago and is said to have worked satisfactorily. It is the invention of J. S. Slsbee of Chicago. To satisfy the Exposition people of its practical value, the company put up an experimental loop of the platform on the grounds. The loop is 300 ft. long and is arranged to seat 900 people.

At a recent meeting of the Western Society of Engineers a paper was read by Mr. A. Gottlieb, defending his work in putting in foundations for the World's Fair buildings at Jackson Park. A disagreement with Chief of Construction Burnham and other World's Fair authorities led to Mr. Gottlieb's resignation as chief engineer of the Columbian Exposition. Mr. Gottlieb claims that his work was in line with the best American practice.

THE LONDON TIMES has completed the publication of a series of four articles, aggregating nine columns, about the Exposition, from the pen of their chief American correspondent, Joel Cook of Philadelphia. The articles are exceedingly favorable in their tone toward the Exposition. Mr. James Dredge, of London, has also begun the publication of a series of Exposition articles in his paper, Engineering, which are technical in style and are accompanied by numerous plans, drawings, etc.

The managers of the Exposition have decided that transportation within the grounds, except by boat on the lagoon and the movable sidewalk, shall preferably be by electric railways. Bids will be asked about January 1 for the construction of five and a half miles of standard gauge track, elevated from twelve to twenty-five feet above the ground, for two stations, including a sort of central station, or union depot at the Transportation Building, and for about thirty electric motor cars and 100 passenger cars.
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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 cooperation of all interested to furnish us particulars that the directory may be correct and of the greatest possible value.

Address all communications to
Street Railway Publishing Co.,
World Building, New York.

If Chicago is to Have Electric Railways they must it is claimed, be operated by an underground system. The city authorities will listen to no project which involves the use of overhead wires. The city electrician believes he has solved the problem of operating electric lights by varied conductors, and he stoutly maintains that electric railway wires should be disposed of as effectually. For these reasons conduit systems are of special interest in the metropolis of the West as the electrical fraternity has sometimes felt it was almost a reproach that Chicago was practically without an electric railway. In the near future two underground systems are to be tested on an extensive scale in the city, and the promoters of the enterprise feel confident they will meet with entire success. The particulars are given elsewhere in this issue. The results of the experiments will be awaited with no little interest by street railway men generally.

A Plan for a Model Power House with the best arrangement of machinery to make it convenient and insure economical practice, is one of the things for which the street railway companies are calling with the advent of the new year. We know of no one branch of electric traction that should receive more careful attention on the part of inventors and engineers than this, and we are sure that a good design will be readily adopted, and result in ample compensation to any one who shall solve the problem. The committee appointed by the American Street Railway Association at its last meeting to report on this subject, will doubtless be able to make valuable suggestions when the report is finished, but in the meantime there is a good opportunity for those who are studying the subject to present their views, and receive whatever credit their design may merit. In this connection it would be well for architects and engineers to work in harmony. Frequently the architect designs the building out of proportion to the requirements of the machinery, and when the latter is in position its efficiency may be curtailed by some oversight on the part of the architect.

Drivers on Late Night Cars are apt to become very lax in the performance of their duties, and frequently ignore the rules and regulations of the manager, owing, we suppose, to the fact that they are not watched as carefully as the day hands. We recently had occasion to take a long ride late at night over a line on which electric power was employed a greater part of the time, but the all night cars were run on long headway by horses. On this occasion the driver took a boon companion on the platform; then, with a cigar in his mouth he sat on the dash rail and chatted with his friend, apparently indifferent to his duties, while his team was allowed to proceed at a slow walk over the entire route. Such a disregard for the rules reflects not only upon the management, but has a demoralizing effect upon other employees, for an evil of this kind soon spreads to a greater or less extent, and is likely to contaminate the entire force unless promptly corrected. It will be found to be a good practice to overlook the night hands occasionally, but if the superintendent is too much occupied with other duties, he should delegate one of his inspectors or other subordinates to look after this matter. Careful inspection at all hours is the secret of good discipline.

Insurance Against Accident Claims is receiving more careful attention from Street Railway managers than formerly, and we find that those who have taken out policies with reliable insurance companies speak in the highest terms of the results obtained, and of the satisfactory manner in which the latter conduct their business. A policy which protects against all liability for any accident that may occur in the operation of a road enables the company to set apart each year a definite sum for this purpose, which assists in giving a definite basis on which to forecast the year's business. The practice relieves the management of a great deal of time and energy usually spent in investigating and settling claims, and provides that the energies of the company may be spent in the direction of improved service that will result in advantage to the company. In a few instances insurance companies have issued policies to large corporations at too small a premium, resulting in loss to the insuring company, but as the business is developed, more equitable rates will be established, and the plan is generally operating to the mutual satisfaction of both parties. The system, however, is not in high favor with the "contingent fee" lawyers, who are making a practice of trumping up claims against street railway companies.

The Trolley in Brooklyn, N. Y., will doubtless be one of the most important events marking the development of electric traction which we shall have the pleasure of noting during the year 1892, as the Board of Aldermen of that city recently, by a vote of thirteen to four, passed a resolution, in answer to the united application of the different street railway companies, granting them permission to erect poles and equip for electric power. This result of the combined efforts of the companies proves the old adage that "in union there is strength," and also marks the inevitable march of electricity, notwithstanding the strong opposition offered by ignorant and pre
judged parties. We know of no city in which application for electric traction has been made where the opposition has been so strong, and where the arguments for and against have been so thorough, nor where the defeat of the opposition has been so overwhelming. Of course, now that the action has been taken, a few cry "Boggle" and "Fraud," and fail to see that the justice of the cause has triumphed, as must always follow when people become thoroughly informed regarding the merits and advantages of electric traction. The history of the Brooklyn contest will doubtless serve a good purpose in assisting roads in smaller cities and towns to obtain similar concessions from the authorities. We venture the assertion that neither the Brooklyn companies nor the public will regret the change to electrical traction, and we congratulate the companies that they make the change at this time, when they can benefit by the experience of the pioneer roads, and reap the additional advantages of improvements in motors and reduction in prices of electrical appliances.

The Street Railway Problem in Chicago has assumed such importance that the mayor of the city has found it necessary to appoint a commission to consider the question and to report on the best means of providing additional facilities for the public. We do not think it will be denied by candid observers that at the present time the surface lines in the city are unable to meet the enormous demands made upon them at certain hours of the day. While this statement is generally true, we do not think that the companies deserve the harsh criticism which the local press heaps upon them. The enterprise of the Chicago corporations has been marvelous; they have been lavish in their expenditures for cable construction, and rolling stock; they have been untrusting in their efforts to meet the extraordinary demands made upon them. Chicago has had a phenomenal increase in population, and already the World’s Fair is beginning to attract vast numbers to the City. The business section of the city is small, and multitudes enter and leave it at practically the same hour. The increase has been so great within the last few months that the surface companies have been fairly overwhelmed. The number of cars on the downtown loops has become so great that the trains almost touch each other in running around the circuit; the capacity of tracks has been taxed almost to the utmost limit. The elevated roads are not completed and the surface companies have become the objects of unmerited abuse. The commission is searching for a remedy, and we trust they may be successful. If they attack the problem in the proper spirit they may accomplish good; but inventive and unjust complaint will not aid in the solution. Elsewhere a summary of the situation is presented, and we also give a synopsis of the deliberations of the transit commission.

Street Railway Securities in general are at present attracting the attention of capitalists, and it is highly probable that in the near future street railway stocks and bonds will become the favorite security with investors. Considerable change in feeling among capitalists as a class is highly likely to develop in the early future over the question of investing in street railway stocks and bonds. It is being noted here and on the foreign exchanges that there is an insufficient quantity of good investments on the market to consume the capital seeking them. Quite a change has been taking place within the past year in investors’ minds as to the merit in the securities which have heretofore been most active on our exchanges, and the opinion prevails, that had our crops been moderate or small this year, there would have been a large falling off in investment in steam railway stocks, etc. This is mainly on account of aggressive legislation, and the constant reduction of tariff charges due to the effects of our interstate commerce law, which, strange as it may seem, is throwing the cream of our transcontinental traffic into the hands of the Canadian Pacific Railroad, a matter which is fully explained in the Report of the Internal Commerce of the United States for 1890. Added to the growing discontent in England over our steam railway profits, are the troubles with South American and other foreign securities, which altogether tend to turn European and home capital toward our industrial stocks. Between these and the steam roads stand our street railway securities, which investors as a class have heretofore known too little about. But the striking agitation which extends pretty well all over this country regarding improved methods of rapid transit, is attracting attention to this class of securities, and they seem to promise better returns than the best of industrial stocks.

The Desirability, and consequently, the market value of any class of security, depends in part upon its convertibility. A stock or bond paying regularly six per cent. to its holder if sold in the open market, may not bring so much as a five per cent. stock or bond of equal reliability or intrinsic worth, simply because the latter is issued by a company whose standing is better known by the general public. And just here comes in the difference between the true value and the market value of any stock or bond. The former is based upon the present and future prospects of return on the money invested as well as the security of the capital itself. The latter is dependent upon a number of factors, but primarily, except in the case of inflated securities, upon the appreciation of the true value by the investing public. The more widely the real value of a security is known, the more nearly, generally speaking, will it be convertible, that is, will its true value be obtainable in the market. For this reason, the article in another column on methods of floating stocks and bonds, and the plea toward listing active street railway securities on exchange are worthy of attention. That street railway securities are a popular form of investment when the reliability of the company is well known is shown by the demand for the recent issue of $2,000,000 Baltimore Passenger Railway five, where the application at the price named, above par, amounted to $3,000,000 before the time for subscription had expired. A similar result was experienced a few months ago at the sale of the $3,000,000 of Brooklyn City Railway five per cent. bonds. Other street railway securities ought to form a popular object of investment. There are many reasons which commend them, in preference to any other type of security. The surest way to keep them before the attention of the public is to put them on the list on the exchanges of some of our large cities. Then purchases and sales can be made easily and a market value will be found, depending upon the worth of the security.

The Underground Rapid Transit Scheme for New York, as proposed, is receiving a good deal of attention from capitalists in the vicinity of Wall Street, and
the weight of opinion seems to be that there is no money in it. People don't want tunnels, say others; the elevated roads are unsatisfactory, but the commissioners suggest nothing better, claim other investors. Note is taken of Mr. A. B. Hewitt's change of opinion after he visited the tunnel system of London. Before that, and when he was Mayor of this city, he favored the tunnel project; now he entirely disapproves of it, saying the bad ventilation of the underground roads and the general discomfort in many other ways is an experience that should not be repeated here. Mayor Grant returns from London with similar ideas and endorses Mr. Hewitt's language against the discomforts of the underground roads of England's metropolis. Other travelers returning say they prefer to go uptown in the open air. These, and many like opinions, which are strengthened somewhat by the fight of property owners along the proposed routes against digging through abutting streets, cause these investors to shake their heads. At the same time they all confess something must be done at once; the values of uptown realty are dependent upon greater rapid transit facilities for getting there. Not alone is New York anxious in this particular, but Chicago is in just as bad a plight, and proposes an extensive system of elevated roads for relief. Philadelphia, too, is crying out loudly for elevated roads, as the only solution of the vexed question of rapid transit for that city. These investors note the success, safety, and advantages of our elevated system, and their opinions lead them to confess it is the most meritorious plan devised. While it has drawbacks enough, nothing better is shown, therefore they say greater facilities for extensions and improvements, and for additional elevated structures should be encouraged without delay.

The World's Fair is to be the greatest of all the year's fairs that the world has ever known, but the public are only just waking up to the full significance of the undertaking. The grounds which have been set apart for the Exposition are located about seven miles from Chicago, on the shores of Lake Michigan, and embrace an area of more than 600 acres, of which 117 acres will be covered with buildings, some of them of enormous dimensions. The grounds have a frontage of two miles on the lake, besides two and a half miles of interior water course suitable for pleasure craft. The largest building will be about a mile in circumference, with a centre aisle having a clear span of 365 ft. and 206 ft. in height. Within the aisle could be placed the machinery hall of the Paris Exposition, with fifty feet to spare above the roof. The buildings are to be constructed of iron and steel, and will have a total floor space of upwards of 6,320,000 ft. What is being done to provide for a proper representation of the street railway interests at the Columbian Exposition, is a question we are frequently asked, but which we are not able to answer in any satisfactory manner. We hear it rumored that application has been made by the American Street Railway Association for 50,000 sq. ft. of space, but we are of the opinion that three or four times that amount will be required. In fact, two or three manufacturers of street railway supplies have informed us that their exhibit will require more than one-half of 50,000 ft. The attention of those interested in the street railway business is called to the fact that this interest should form no inconsiderable part in the exhibition. A committee to look after the street railway exhibits at the Fair was appointed by the American Street Railway Association, at its meeting in Minneapolis, in 1889, and consisted of the following named gentlemen: George W. Pearson, Washington, D. C.; G. Hilton Scribner, New York; Charles B. Holmes, Chicago, Ill.; E. B. Edwards, Philadelphia, Pa.; Henry M. Whitney, Boston, Mass.; Thomas Lowry, Minneapolis, Minn.; Charles Green, St. Louis, Mo.; Edward Lusher, Montreal, Can.; William H. Martin, San Francisco, Cal. Two of the above committee, Charles B. Holmes, Chicago, and Henry M. Whitney, Boston, have resigned, and their places have been filled by the appointment of Mr. John B. Parsons, of Chicago, Ill.; and Mr. Amos F. Breed, Lynn, Mass. Although the committee would seem to be late in taking hold of this work, they will not doubt make up for any tardiness by unusual zeal and energy from now onward. Probably the entire committee are not so situated that they can give any amount of time to this work, hence we suggest that a sub-committee of two or three be chosen who will be able to take up the work and give it the attention it deserves.

"I Feel Out of Place," said an official of a street railway company recently, while addressing an association of street railway men: "having come up from the old days of horse power, I feel that my days as a street railroader are numbered, unless I learn what I have learned and begin again." This position is partly right, but a good deal wrong. Once in the business a person should never allow himself to feel that he is out of place among any class of street railway men. It is well to forget some things relating to former practice, but it is never necessary to unlearn what one has acquired in practice with animal power in order to adapt himself to the requirements of mechanical traction. Neither is it necessary to begin again, for progress is the prime quality that is needed in the development of any system of traction, be it animal or mechanical. Hence, it is necessary to be learning all the time. When one ceases to learn he ceases to be useful, and the study required to become proficient in the use of mechanical power is no more difficult, but, on the other hand, is much more agreeable and fascinating than the study necessary along the old lines. Only recently we took occasion to congratulate the street railway fraternity on the fact that only in a few instances had it been found necessary to make a change in management with the introduction of improved methods of traction. We stated that, in almost every instance, superintendents and managers had broadened out and filled the new positions admirably. In fact, many of them had become experts in their line. No man in the work should allow that he cannot do what others have done. We have in mind certain men who may be said to be pioneers in the service, but who stand in the very front of skillful managers, and are to-day doing the very best work of their lives. It is not safe, however, for any to rest contented with past experience and judgment gained in an extended practice. These are useful only as they are made to conform to progressive methods. Experience and judgment are good foundations on which to base new acquisitions, but if they are one's only stock in trade, sooner later young men, or men who keep up with the development of the times must succeed to the other's place.

** The science of street railway traffic (for it is indeed a science) is new, and just now is subjected to rapidly changing conditions, owing to improved methods of trac-
tion. What was legitimate and judicious a few years ago in the conduct of street railway traffic is now regarded as obsolete, so that the chief requirement in the personnel of the urban traffic lines of the country is men who are alive, men who will readily change their methods and practices and conform to the correct principles of rapid transit as they may from time to time be developed.

The Rapid Transit Problem upon which so much attention is concentrated in some of our Eastern cities is also a topic of live interest at present in Chicago. The situation confronting those seeking a solution is given fully in another column, but may be briefly outlined by the statement that the needs of the city have grown faster than the transportation facilities. A special emphasis, however, is given to the problem, in Chicago, by the approaching World's Columbia Fair which will bring a large number of strangers to the city, and which makes it absolutely necessary that some decided steps be taken to secure relief. For its rapid transit Chicago at present depends upon surface lines which are either cable or horse, the two elevated railroads which have been partially constructed on the south and west sides not having yet been opened for traffic. The existing cable lines upon which the greater part of the burden of furnishing transportation devolves are admirably managed and equipped and daily carry large numbers of passengers within the city and to the suburban districts, but during the day, and especially the hours of greatest traffic in the morning and evening, seem insufficient to meet the demands for passenger traffic. The managers of these railways have for a long time recognized the present growing needs as well as the extra demands which will be made upon them at the time of the Exposition and have installed many improvements, and at the same time have made application for permission to carry out others, but nothing important of this character has been permitted by the authorities under conditions which would justify the investment by the railway company. In the meantime the present condition of affairs in that city has formed the basis of a number of vigorous attacks in the daily papers and technical press upon the management of the cable railway companies and the cable system of car propulsion. In the city of Chicago several so-called indignation meetings have been held at which denunciations have been freely indulged in and hostile legislation of various kinds threatened, but at which no remedy of a practical nature has been advocated. The claims brought forward by the Railroad Gazette and other papers in commenting upon the situation that the cable system per se is accountable for the delays, that the system is a failure under the conditions presented in Chicago, and that it is useful only within narrow limits are untenable and absurd. The situation is very similar to that in New York where the elevated roads afford the only rapid transit at present, or in Boston where the electric cars often find themselves blocked; but neither of these facts proves the failure of steam or electric power in those cities. The needs of the city have grown faster than the roads. Capital has been unwilling to open new lines of travel without satisfactory guarantees that it will not be disturbed, and the greed of the municipality in trying to overreach the transportation companies, and not the avarice of the companies themselves, is the true cause of any lack of transit facilities.

Some Methods of Floating Street Railway Bonds and Stocks.

The basis of all street railway construction is the obtaining of the necessary capital. While bonds and stocks issued for such purpose in distant cities, are usually taken up by local capitalists, those who are most interested in the development of the real estate of their locality, it frequently happens, particularly in the rapidly growing towns, that capital can ill be spared for such purposes, owing to the innumerable demands made for its use. Especially is this the case in the South and West, where, in consequence, ready money becomes stringent and high rates of interest are demanded for cash loans. The chief relief in such cases is to seek aid from the large centres, like New York for instance, because there money averages in interest rates less than in any other locality. This is the distinguishing feature which makes New York the financial centre of the country; and the only change in this particular which may be reasonably expected, is when other large centres offer as good or better inducements of the same kind.

It is often a problem to investors who are not strictly intimate with Wall Street methods, why money rates in New York should be so much less than in the newer districts, like, for instance, in the more flourishing part of Texas. There it is a common thing for the National banks to ask from ten to fifteen per cent. to merchants in the giving of regular discount, and the same banks charge farmers from twelve to twenty per cent. for well secured loans. Of course such rates are against the laws of Texas, and National banks who practice this business run great risks. But the profits make these bankers shut their eyes and depend upon intimidation if anybody "kicks." The truth is, the merchants of that locality are glad to get money at any price, because nobody offers it on better terms, and the banks hold well together with their purpose in view. And the officers of these banks say that the borrower who would try and make trouble for them through the courts, would be ostracised at once, and fairly run out of his town, such being the force of established usage in spite of the law.

The problem alluded to then is, why does not the money of the large centres where no such interest rates are obtainable, flow to this district where more National banks have sprung into existence on account of profits than in any other part of the country during each of our recent twelve month periods? The main answer is, that capitalists prefer to loan their money where they can keep their eyes upon it. A New York capitalist learns of the high prevailing rates for the use of money in Texas, but as he is unacquainted with the people and local surroundings of that territory, he prefers to lend by the same banks a half or a quarter of the Texas rates; consequently, he refuses to send his money to that state to restore an equilibrium between the two districts.

The result of this state of affairs, which undoubtedly will be remedied before the country gets much older, renders it difficult for many distant cities to build street railways, which, under lower rates for the use of money, would be quickly stimulated into existence. This means, of course, that it is for the immediate interest of all who sell to street railway corporations to aid any practical plan by which these old and distant districts can be relieved of their money pressure, and it is in behalf of general prosperity to bring this about as soon as possible. Again, it is not commonly expected that street car companies should earn over ten per cent. a year dividends; which percentage, from the New York investor's point of view, is thought to be exceedingly good. Such railways can compete with Texas bank loans at higher figures. While some roads pay more than ten per cent. a good many pay less, and it has been observed if the earnings much exceed that figure the populace of such a place are apt to rise up and demand legislative restrictions, through reduction in some way or other, the investor will not reap too large profit—from the people's point of view.

—on the capital employed.

After a street railway corporation is formed, it often
becomes a subject for discussion among the directors, particularly if they desire an increase of capital for extension, improvements or to change over their system to electric or cable methods of operation, to learn how more money may be obtained with the least cost and trouble. While this is a vast subject requiring extended treatment, which from time to time we may describe in all details, for the moment we will speak of one point only, in relation to placing such stocks and bonds on the public exchanges.

There are no active street railway stocks or bonds on the New York Stock Exchange except those of the elevated road. What purchases and sales of such securities take place, are done privately or by means of what are called street brokers. It costs $500 to "list" a new stock on the New York Stock Exchange; and $250 on the New York Consolidated Exchange. The brokers on the larger board charge one-eighth of one per cent. each for either buying or selling; while the Consolidated brokers ask one-half that rate or one-sixteenth each way. The advantage to a street railway company in "listing" its securities, is the advertising it affords, and, what is more important, the ready cash market thus afforded for selling more securities or for borrowing purposes. Besides this, many stocks are increased in value by legitimate manipulation; about this particular we may speak at another time.

Street brokers buy and sell outside of the Exchanges, by means of verbal, written and printed communications, with investors in all parts of the country. These street brokers are all brokers, not members of the Exchanges, or who, being members, additionally deal in outside business. Commonly street brokers ask $100 to introduce a stock through their correspondents, in addition to the brokerage for selling or buying, which may be either of the above rates, according to who the broker is. The street brokers say that a street railway stock should never be listed on the Exchanges, if a company desires to find an active market, and the Exchange brokers say, the only way it can be done is by means of the Exchanges. The street broker claims that a street railroad stock put on the Exchange sinks it out of sight, and prevents him from doing any business in it; and that the Exchanges are so wrapped up in the steam roads that the street road stock is lost in the maelstrom. In support of some Exchanges say that "washed" sales, which are no sales, but only pretend to be such, must be resorted to; but they usually want their one-eighth per cent. brokerage each way, just the same as for real sales; unless some private agreement can be made to the contrary. Such sales systematically continued, they claim, will so advertise a stock into activity that eventually a good market may be found for it to any reasonable limit.

"Wash" sales are illegitimate and against the rules of all Exchanges, with penalties attached, nevertheless many Exchange brokers say it is the only way to make an unknown stock active. Street brokers claim it costs about ten per cent. of the stock's capitalization to "wash" it properly. That is, if the corporation is capitalized at $1,000,000, it costs $100,000 of that through the Exchange to get it before public attention.

There is not much advantage in having a stock listed which is not active, but if it is active and pays regular dividends there are many advantages, not the least being loans can readily be obtained upon it. The trust companies rarely lend money upon inactive stocks, and it is said they know the difference between a stock "washed" into activity and one that is normally active. The secret of placing stock profitably is the same as in every industry; it must be advertised until people are familiar with its sound. Stocks which nobody has heard of nobody wants at any price. There are stocks and bonds offered in Wall Street every day which possess double the intrinsic value of many of the active stocks on the Exchange, yet they will not bring as much money at auction. This is not right, of course, but it is one of those things that exist, and which all who operate in Wall Street are obliged to recognize. If a stock is active and is fair in quality any trust company will loan money upon it, because they can quickly realize the cash in case of foreclosure, but offer them bonds which may be three times as valuable intrinsically, and if there be no active market for them on the Exchange these assets will not advance a cent on them in the shape of a loan. The big banks reason the same way on the subject. J. M. B.

**The First New York Electric Road.**

Work on the electric railway which is being installed in New York City, the Hariem Bridge, Morrisiana & Fordham, is being pushed rapidly under the management of the engineer, Mr. L. H. McIntire. In the accompanying illustration is shown a view of a section of the track in process of construction. As will be seen, ties, stringers, and tie rods are used, and they are 2 ft. 2 in. apart. The rails weigh 65 lbs. to the yard, are side bearing, and were furnished by William Wharton & Co. Copper rail bonds riveted through the web of the rail, and without any supplementary centre wire, are used for the return circuit.

A portion of the line extends under the elevated railway of the Suburban Rapid Transit Co., and it is the intention of the managers of the road to carry the trolley wires upon special tie rods attached to the lower portion of this structure. Elsewhere iron lattice poles supplied by Miliken Brothers will be employed to support the overhead wires.

The power house will be located on the Bronx River, West Farms, and will have a dock with a frontage of 350 ft. The building will be of brick with sandstone trim-
A Promising Rail.

The section of track on lower Fourth Avenue, New York, which was recently relaid with the Duplex rail, offers a remarkably smooth way for the passage of cars which cross this section, and is so free from the usual jolting at the joints that the feature is frequently noted by the passen-
gers. Having had the pleasure of a ride over this line recently, we are pleased to add our personal testimony to the popular verdict. This track has not been long enough in service, however, to prove all the claims made for it (a limit of time not less than a year being necessary for any rail to develop its weak points), but it has many promising features. From what we have said in our columns the almost universal failure of the ordinary rail joint, it will be seen that the call for the railway joint that will stand up under electric service is a pressing one.

The chairs of the Duplex rail are designed to rest on a concrete block 12 x 12 x 4 ins., which are made of the best material and fully seasoned before put in place. The tie rods are placed three feet eight inches apart, and between the chair, so there is little chance for the rails to spread.

Since the Fourth Avenue track was laid, the Duplex Track Co. have contracted to equip a section of road with their rail in the city of Richmond, Va., and have also made a contract to deliver several tons of rails to the North Chicago Railway Co. These will be put in service at once should the weather permit; if not they will be laid in the early spring.

Among other advantages, it is claimed for this rail that it will not be necessary to bond the rail for electric traction, nor will it be necessary to provide a supplemental wire return, the lap joint and keys making virtually a continuous return. In proof of this claim we quote the following communication from an expert to the editor of the Electrical Engineer:

New York, Dec. 24, 93.

SIR: I have examined, according to your request, the section of track furnished to the Atlantic Avenue Railway Co., Atlantic and Third Avenues, Brooklyn, by the Duplex Street Railway Track Co.

The track is so keyed together for the purpose of securing mechanical continuity, and the strength that electrical continuity is at the same time secured, thus rendering the track a good electrical return for trolley or conduit roads, without any other bonding than that which is a part of the system and which does not involve extra expense, as do the ordinary methods of bonding.

I made a bridge test of the above mentioned section and found the resistance too small to give an indication on the bridge, although the latter showed .005 ohms very plainly. The test current had to pass through two keys and around one complete joint.

I think this track, when properly laid, will be found practically equal to a continuous rail both mechanically and electrically.

Yours sincerely,

TOWNSEND WOLCOTT.

Each of the 600 employees of the Rochester (N. Y.) Railway Co. was remembered by John N. Beckley, the president of the company, who presented each with a Thanksgiving gift.

Two Hundred Kilo-Watt Edison Generator.

In the accompanying illustration is shown the latest form of Edison railway generator of 200 kilo-watt capacity. As will be seen, it is of standard bi-polar type, the general features of which are so well known as to need no further description. To adapt this generator to the demands of electric railway service, its field has been supplied with a compound winding, easily adjustable to meet the necessary requirements by means of a shunt coil, which is conveniently placed in the back board of the keeper. The close adjustment obtained by this arrangement greatly facilitates the operation of generators in parallel, and forms one of the characteristic features of this particular type. The series field is composed of sections wound on spools, which are slipped separately over the cores, and then properly connected. In the event of a fault occurring, the spool in which it develops can be removed and another substituted at once; this not only prevents delay, but makes any repairs necessary a matter of comparatively small expense. The centre of gravity of the armature being low, due to the bearings being located close to the base frame, great stability is secured. Self oiling bearings and carbon brushes help to reduce to a minimum the attention necessary to the operation of the dynamo.

On November 1, the records of the Edison General Electric Co., showed installations of these railway generators the total capacity of which amounted to 52,822 H. P.

It is stated that the steam power of the world is equal to the strength of 1,500,000,000 men, or twice the number of working men that exist. The horse power of England, as regards engines, is estimated at 7,000,000; of the United States, 7,500,000; Germany, 4,500,000; France, 3,000,000; and Austria, 1,500,000. These figures do not include the horse power of locomotive engines, of which it is estimated that last year there were in the whole world 105,000, representing horse power from 5,500,000 to 7,000,000.
The Walker Manufacturing Co's Works and Products, Cleveland, O.

The accompanying engravings illustrate samples of products and interior view of the machine shop of the above works, the latter showing the equipment which enables the firm to turn out the ponderous machinery which has given the works a world wide reputation. The rope drive wheel, which is illustrated in Fig. 1, is one of four of equal size which the firm have recently manufactured under a sub-contract from the Pennsylvania Iron Works Co., for the power plant of the Third Avenue, N. Y., cable railway. These wheels are thirty-two feet in diameter, with a six foot one inch face, and are provided with thirty-two grooves for driving two and a quarter inch cotton ropes, the entire weight being over seventy-five tons. A large number of pinion wheels, being a part of the same order, are shown in different positions on the floor of the machine shop, and the large drum is also shown in position in the pit lathe in the rear of the shop. Although this firm have made a specialty for some years of cable railway machinery, including the Walker differential drums, which have made the name of the company a familiar one in street railway circles, 116 of which have already been put in operation, this line of work is by no means the exclusive product of the shops. They also manufacture hydraulic machinery of every description and large pulleys and gears for factory equipment.

Our readers are already acquainted with the fact that extensive new shops have been erected by the company during the past year, a partial description having been given in the April issue of the Street Railway Journal, and an account of the formal opening in the July issue; but in order to form a correct idea of the vast extent of the works one must necessarily make a journey to Cleveland and visit the plant.

The new buildings cover about nine acres of ground and are fire-proof, being constructed entirely of brick, iron and glass. The works are situated in the west suburbs of Cleveland and face on Waverly Avenue, near the shore of Lake Erie. The walls present a continuous front of about 432 ft. The machine shop proper is about 170 ft. wide and is divided into three bays, one of which is illustrated in Fig. 2, each having a separate roof, supported by iron columns, placed twenty-four feet apart longitudinally. Two of the bays are 280 ft. long and the third is 430 ft. long; but it is the intention ultimately to extend them all to 500 ft. Each bay is equipped with an improved thirty ton traveling crane, which was manufactured by the company, and with modern tools, together with an enormous pit lathe capable of swinging a pulley thirty-two feet in diameter and eight feet face. Between the machine shop and foundry buildings is an open yard, having an ornamental wall and arched gate connecting the buildings and making the front a continuous wall along the avenue.

FIG. 1.—SEVENTY-FIVE TON, THIRTY-TWO FOOT ROPE WHEEL FOR THIRD AVENUE (N. Y.) CABLE POWER STATION.
FIG. 2.—INTERIOR OF MACHINE SHOP—WALKER MANUFACTURING CO.
No. 1 foundry is 118 ft wide and 300 ft deep, divided into three bays, the centre one being fifty-seven feet wide and the side bays twenty-six feet wide. The height of the centre bay is forty-one feet to the tie beams and sixty-two feet to the top of the skylight. Twenty three, ten, rope driven traveling cranes are each track above, and the main crane and in the side bays are twelve seven traveler cranes. The second foundry has five six ton cranes, and between it and No. 1 foundry is a second building thirty-four feet wide. Besides the cranes, the foundry equipment consists of the means for handling and storing the clay and sand for the molding process. This knowledge and equipment show the extent of the foundry, and the products it turns out. There are four cupolas, three of them being, respectively, fifty, sixty and seventy inches inside diameter, and having an aggregate output of forty tons of iron per hour. The cupolas are equipped with the Walker patent doors. The mechanism for supplying the air blast of the cupolas is of peculiar design, and is the same as has been in successful operation for years in the old foundry. The blast is generated by three cylinder, vertical blowing engines, the air cylinders being 48 × 30 ins., and the cylinder of the steam engine for driving the compressor is 14 × 30 ins. The engine and machinery were built by the company. A very elaborate system of hydraulic elevators is provided for elevating the material to the cupolas, and is automatic in operation. The accumulator is fourteen inches in diameter, with fourteen foot stroke. The casing is loaded to secure a pressure of 1,000 lbs. to the square inch. The cupolas are the pumps, water being supplied according to requirement, and will work to a speed of 150 revolutions per minute, without pounding, when necessary. The elevator cages and guides are of iron, and the cage is capable of sustaining a load of 12,000 lbs. The entire hydraulic machinery employed was built by the company under the direction of Mr. W. Naylor. The manufacture of hydraulic machinery is an important part of the output of the works. The foundries are supplied with an elaborate system of water pipes and tanks, with suitable hose connection for sprinkling the moulding sand and for other purposes.

There are five permanent casting pits, four of them being, respectively, twelve, sixteen, twenty and twenty-four feet in diameter and four feet deep, in which large pelotons, drums and gear wheels are cast. The fifth is twelve feet in diameter and twenty-five feet deep, for casting cylinders and other end work, the traveling cranes being of sufficient strength to handle the passage. The casting pit is located and place it in any portion of the foundry. There are two core ovens, one 24 × 30 ft. and the other 20 × 30 ft. These are connected by a passageway with the ovens of the old foundry. The ovens have double tracks, arranged for the trucks on each side. In each of them all of that can be combined together and operated simultaneously, each being provided with a crank and gearing, so that they are readily moved by one man. The ovens are fired from the back and have covered fireplaces inside to shield the cores nearest the fire. Flues are provided under the oven floor, with openings near the top, the openings being larger as they approach the top, in order to equalize the heat at both ends of the oven. The usual smoke and damp chimneys are used, and an additional damper is placed at the top of the oven to let off the smoke and heat before the doors are opened, thus cooling the oven more readily and preventing the smoke and heat from entering the foundry when the doors are open.

The gearing and moulding machinery with which the foundry is equipped is complete in every detail, including both fixed and portable machines, also striking machines of sufficiency. The frames which were installed by Mr. John Walker, general manager of the company. The crane ladles are very substantial, and range in capacity from three to twenty-five tons, and are so arranged that the metal can be poured from either side and from any position that may be necessary. The sand pits, of which there are fourteen, for storing the various kinds of sand, consist of brick arches built under the yard, but opening into the side of No. 1 foundry. The sand pits are drained by a six inch pipe, thus keeping the sand always in good condition. A narrow gauge railway is constructed in the yard, and by means of turntables leads to the elevators and other points where material is to be delivered.

The general offices for the accommodation of the officers and their assistants are situated at one corner of the machine shop, on the ground floor, front, and rear, and are divided into four distinct parts. The walls are fire-proof, and the interior is finished in antique oak. The windows are of orange colored cathedral glass, giving a rich tint to the interior. In the rear of the general office are the fire-proof vaults for storing valuable records. The building is divided into two large rooms, and these are divided into twenty-four offices, each office and is divided by a passageway twelve feet wide. On each side of the passageway are sixteen foot brick vaults, with massive iron doors, the doors being 5 × 6 × 14 ft.

The draughting room is located over the office, and is reached by a stairway, the steps of which are of iron, with a wall of polished oak. The draughting room, which is of the same size as the general office, is lighted both from the sides and roof, and is provided with gas and electric lamps. The furniture of the draughting room consists of twenty-four tables, and the interior is finished in the same style as the office below, and the floors are covered with the best quality of Linooleum cloth, which serves to deaden the sound of footsteps. Adjoining the draughting room is the blue print room, which is well appointed and equipped with all the necessary appliances for reproducing the tracings. In the rear of the draughting room are the blue print vaults, where the blue prints and tracings of the same size and number as the blue prints are stored. Below the draughting room is the office dining room and library. There is also a coat room and lavatory for the use of the employees.

**Electric Street Car Heating.**

By W. R. B. Willcox

During the past three seasons nearly 100 electric roads in this country and Canada have tried electric heating, and found them in every way satisfactory. In certain cases the heaters have been reported inefficient, but examination has revealed the fact that in each of these cases the trouble lay with the traction company. Generally one case to which we refer, the heaters had been set up within the panned car seats, with a small opening above the seat. In the interest of efficiency it is required the greatest amount of heat being confined beneath the seats. A less apparent but surer cause for inefficiency was discovered in another case. Heaters were ordered to be operated upon the so-called railway or 500 volt circuit, when, in fact, the men worked on the low voltage. Since a proper relation between the resistance of the heaters and the voltage of the circuit upon which they are to be used is the principle of the heaters' operation, the importance of having the one correctly adapted to the other is evident. It is perfectly practicable to construct a heater for a circuit of any voltage, but, if made for 500, it is furnished with only 420 volts, it is like feeding a stove with a spoon—a lapse at a time. The heater customarily used consists of two corrugated iron castings, holding in the intervening space resistance wire so protected as to prevent its oxidation. Four such heaters, placed in the corners of the car, are four inches wide, mounted upon iron legs raising them four inches above the floor, comprise the equipment for an ordinary street car. They are placed two at each end of a car, under opposite seats. The group is so wired that, with the addition of a transfer switch, they can be operated either in parallel series of two or in direct series of four. Provision for such an alteration in circuits is made in order that a car may be heated rapidly before starting on a trip, while during the time it is out a continuous current of lesser amperage may sustain a comfortable temperature. No. 10 or No. 12 triple braid, weather-proof wire should be used in connection with the heaters. Leaving the main circuit on the line side of the motor switch, it should pass from the heater to the heater and make its ground connection at the regular ground binding post on the car truck. Best results, furthermore, are
obtained when the heaters are set within tin cases, so constructed as to reflect the heat into the car and prevent, as far as possible, any distribution beneath the car seats. In cases where the seats are paneled, the panel directly in front of each heater should be removed, and the reflectors so arranged that all the heat from the heaters will be reflected through their respective openings. While not necessary, an improved appearance is obtained by having screens fitted to the openings. The electric heater is a perfectly clean device, the dirt and smell of the regulation car stove being wholly absent. There is no combustion whatever inside the car. Therefore the accidental firing of a car from its heating apparatus, and the consequent loss of equipment, is an absolute impossibility. While an electric heater combines all the desirable points of an ideal heating contrivance, giving abundant and evenly distributed warmth and at the same time being absolutely safe, its one grand feature is economy. Stoves last on an average about three seasons, and frequently during that time their consumed parts must be replaced. They require the purchase and cartage of a particular kind of fuel, and in addition considerable attention of conductors. They shorten the life of cars by frequently burning and scorching the car ceilings. The electric heater, on the other hand, will last longer than the car in which it is placed; it cannot injure the car in any way; and with the least care it will never need refitting. If, when heating rapidly, the heaters remain in parallel circuit for more than thirty minutes at a time, there is danger of oxidation of the resistance wire, when, of course, new wire would be necessary. Such loss, however, would only result from pure carelessness. With the electric heater the same fuel which furnishes light and motive power for a car also warms it. Indeed, since it can be so, why for the sake of either light, heat or motive power, shovel coal in two places? All the work attendant upon the use of electric heaters is the movement of a simple switch, conveniently placed upon the hood of the car, which requires not three minutes per day.

It may be added that not only does a direct benefit accrue to a street line by the use of electric heaters, because of their unquestionable merits, but also an important, indirect benefit, due to the honest appreciation of the patrons of the road of such a desirable and convenient system of heating.

Proposed Suspension Bridge at Chicago.

Among the proposed means of promoting rapid transit in Chicago is one which contemplates the connection of the north and south side boulevards of the city by a system of bridges. To fulfill the conditions demanded by such a system, the Day method of bridge construction has been devised.

As will be seen, this is a new departure in the suspension principle for bridges, its characteristic feature being a second pair of cables curved upward and connected with the upper cables by vertical or oblique tension members. By this means a complete tension frame is formed with rigidity sufficient to resist flexure in any direction and avoiding the so-called elasticity which is the characteristic of most suspended structures.

From some figures on the weight of structures by Prof. Fleeming Jenkins, a 400 ft. single span, such as is proposed for this bridge, would, neglecting the roadway, weigh as a simple suspension bridge eighty-three tons; as a girder bridge, 475 tons. With the addition of the lower cables, as in the Day system, there will be, of course, an increase in the weight of the structure, but there will still be a large margin in its favor as compared with the girder type of bridge.

The present plan provides in connection with the 400 ft. span for a pair of handsome towers 400 ft. high, to stand on either side of the river, the one surmounted by a lighthouse and the other by a colossal statue of Columbus. Elevators at cross streets give access to these bridges, whose aggregate length will be more than a mile, and the elevator shaft will be placed in the supports of the span.

The height of the bridges will prevent any interference with shipping, and the grade be so arranged that it can easily be ascended by horses drawing a heavy load.

A company has been formed with an aggregate capital of $19,000,000, and it is to be hoped that construction will be begun in the near future.
Means of Transportation in the World's Fair Grounds.

The principal means for transportation in the World's Fair grounds will be an elevated railroad. This has been generally agreed since the Fair project took definite shape. The authorities are opposed to tracks upon the grounds. There are to be found persons who do not entirely agree with the Exposition authorities in this matter. They contend that visitors at the Fair would prefer to walk from one building to another rather than to climb a stairway to reach an L station.

The proposed route of the road is shown in the accompanying diagram. This has not been decided upon definitely, but in all probability no radical change will be made.

The specifications call for a road five and one-quarter miles in length. There will be a double track with a loop at each end, as shown in the drawing. Standard gauge has been specified. Twenty-four stations have been provided, with a Union depot at the Transportation Building. An equipment of thirty motors and ninety coaches is called for. It is estimated that with this rolling stock a train can be dispatched every minute, making the circuit in about thirty minutes.

It has generally been assumed that electricity would be adopted as the motive power; in fact a number of statements to this effect have been published. It is true, undoubtedly, that the Fair officials are in favor of electricity as an agent for furnishing power for all purposes practicable within the grounds, but they have not committed themselves in the case of the elevated railway.

In all probability the construction department will soon issue a circular calling upon those interested to submit propositions of this elevated railway. Propositions from all companies explaining transportation systems are desired. The construction department only specifies the general conditions that the systems shall be safe and not unsightly. The propositions will be passed upon by the construction department, which will recommend that a certain system be adopted. The road will either be purchased by the Fair company and give the bidding company a certain percentage of the receipts, or it will allow the bidder to construct the road, taking a certain percentage of the receipts as consideration for the franchise.

While the elevated road will be the principal means of transportation, a number of companies are seeking for privileges. P. J. McMahon is anxious to operate his ammonia engine on the grounds. Mr. McMahon is alternate Fair Commissioner from Louisiana. The International Railway Co., which is exploiting the Applegate under-ground electric railway system, is desirous of illustrating the scheme on an extensive scale within the enclosure. The Movable Sidewalk Co. wishes to install several miles of its interesting system on the grounds. The company has now in operation a small exhibition plant at the Fair grounds. The system has been frequently described. It consists of a walk built in parallel sections, each of which moves at a different speed. The outside one may move at two miles an hour, the next at four miles, and the third at six miles. One can step from the ground to the first section or from one section to another without receiving any perceptible jar. If a system of walks of this kind were built the company thinks it would greatly facilitate the movement of visitors. The plant at the Fair grounds at the present time consists of two sections, one moving at two and a half and the other at three miles per hour.

During the Fair visitors may go from one part of the
The "No Seat No Fare" Business.

A Very Sensible Article From the Chicago Evening Journal, December 6, 1891.

Evidently the proposed street car measure, which is called "no seat no fare," is the most impracticable of any that has been suggested as a cure for over crowded and too few cars.

Instead of remedying the evil, if it could be applied, it would make the evil greater. To prohibit the companies from carrying more than twenty-four passengers in a car would leave thousands and thousands without any means of transportation, if the cars should run less than a rod apart.

To establish a rule that street car doors should be closed when the seats are full and that no further stop-

The present is 1891. Proposed 39 PITTSBURGH, to people has at full gate and company grounds overhead way Inclined will in being of the degree the curve 2,640 is 1891, passengers January, located its the railypay, at the inclided track. which the number is railroad. The the terminus. planes, which differs from that of most inclines, is that the tracks make an eighteen degree curve for 350 ft. at a point about 1,000 ft. from the lower terminus. The driving ropes are carried around the curve on thirty-six inch pulleys which are located in each track. The cars are 16 X 47 ft. on a triangular truck and are designed to carry fifty tons or more. The fare is only one cent, and there is a very heavy travel both of foot passengers and wagons.

The number of passengers carried on the Buffalo, (N. Y.) Street Railway during the year ending June 30, 1891, was 17,768,570.

pages should be made to receive passengers, would create a riot at every street corner afterwards reached.

Uncomfortable and exasperating as it is to be compelled to stand up and hang on to a strap for a ride of two or three miles or more, it would create greater discomfort and exasperation if people should be prohibited from entering cars.

Men and women by thousands must get downtown by certain hours, and if there are no seats in the cars they must "stand it," so to speak, and make the best of it. They cannot wait, and must ride, seat or no seat.

There is another thing. Under such a regulation, if enforced, the cars would be crowded with standing passengers who would get on board for the mere purpose of securing a free ride. The "beats" would be in a majority of the passengers. They would more than overload the cars, and would make it more uncomfortable for paying passengers on the seats than it is at present with the greatest crowds.

No, this would be no cure. The only cure is for the...
street car corporations to use all the facilities that they have or can add to the present equipment of the lines, and then must come, or rather immediately should come, elevated roads.

Even then this vast surging mass of the population of Chicago, after all shall have been done that shall be possible, will find the discomforts of the "rush" hours too much for any but the most even tempers and the most patiently disposed.

There is one other source of relief that might be added. Let women who come downtown only for shopping purposes do so early in the day, and go home before the "rush" hours. They will find the stores less crowded as well as the street cars.

**Favorable Testimony.**

In conversation with Mr. H. A. Everett, formerly of Cleveland, now general manager of the street railway lines of Toronto, Can., he stated that the great importance of electric traction lay in its possibilities, but no one could estimate these, for when a system was once established it required a constant outlay to keep up with the inevitable growth of the city and the increased traffic incident thereto, and that he knew of no electric lines in this country that had been operated long enough to determine when a halt could be called in the line of development. "When we first introduced electricity on our lines in Cleveland," said Mr. Everett, "we were operating sixteen cars, and it was estimated that the cost of changing to electric traction would be about $40,000. We have already expended over $450,000 and are now operating ninety cars. Notwithstanding the enormous sum that we have spent in experimenting with electricity on the East Cleveland lines, we would gladly do it all over again, if it were necessary, to secure the advantage of this method of traction. We have not decided what system we will adopt in Toronto; in fact, we think there is very little difference in the systems. Each of the prominent motors has some points that are better than others, and if it were possible we would be glad to employ a system embodying the good points of all the systems. In the meantime we are experimenting with a number of the more recently improved motors on the Cleveland lines for the purpose of satisfying ourselves as to their relative merits before deciding what system to employ on the Toronto lines.

Among the motors which we shall try will be one of the Short single reduction motors, also one of the Westinghouse single reduction, and the Edison single reduction, the Wightman motor, and the motor manufactured by the Detroit Electrical Works."

**Brooklyn Bridge Cable Power Plant.**

The accompanying engraving illustrates the ground plan of the new power plant designed for operating the cables on the Brooklyn Bridge railway. The engine and boiler rooms have recently been enlarged, and the power equipment will be increased by the addition of one new engine and the erection of two sets of winding drums.

The new drums will be mounted on an extension of the main shaft of the present equipment which consists of the two drums, shown to the right of the plan. The drums will be driven by means of differential gearing, the same as the original drums, the device being the invention of Mr. G. Leverich, associate engineer of the Brooklyn Bridge. The tracks of the bridge railway are to be in duplicate, not, however, far enough apart for trains to pass, but the new rails will be laid about six inches from the rails of the present track. When completed with the new approaches, it is intended to operate two of the cables at the same time, while two are kept in reserve. Additional particulars of the new construction will be found in the annual report of the trustees printed in another column.

The Short Electric Railway Co. have just closed a large contract with the Atlanta & Chattahoochee Railway of Atlanta, Ga., and the plant will be installed immediately. The contract calls for the new Short single reduction motors, and the Short slow speed multipolar generators of 250 H. P. each.
New Track Switch.

The accompanying illustrations show a device for operating a tongue track switch from the car, the invention of Jeremiah Young of Boston. For electric lines where there are no horses in advance of the car to move the tongue the advantages of a simple and effective method of switching which shall be under the control of the drivers, is apparent.

Fig. 1 shows a vertical longitudinal section of a portion of a car equipped with the device. A bracket is secured centrally to the bottom of the car directly in front of the wheel truck. Two laterally projecting rods, one of which only is shown, are swiveled at their ends in the bracket, in such position that their outer ends are in position to be directed into engagement with the track. These rods are provided on their outer ends with a roller having an annular flange or disk, which rests against the outer edge of the track when the rods are lowered.

Each roller is connected by a system of levers with a button on the front platform, so that each can be lowered into position at the will of the operator. Its appearance when in this position is shown in Fig. 2.

The use of the device is then easily understood. For directing the car to a turnout on the left, the left hand button on the front platform is pressed down by the driver or motorman. This lowers the roller which engages the outer edge of the rail, as described, as near as possible to the point of contact between the car and rail. Thus the ordinary flange of the wheel is held closely against the inner face of the rail, and as it reaches the branch track it is caused to be directed therein instead of running straight on the main track.

As soon as the foot piece is freed it is forced upward by a spring and the roller is taken out of connection with the track.

An Electric Railway Conduit.

A new type of electric railway conduit, using an open slot, has been devised by S. D. Nesmith of Cleveland, O., a cross section of the device being shown in the accompanying engraving. As will be seen, the conducting wire is supported upon a short bracket, protected by and supported upon a metal plate extending longitudinally in the conduit and fixed at an angle of about forty-five degrees from the horizontal. The trolley arm or plow is of a peculiar shape, adapted to the conditions of the conduit, the main portion being curved so that it clears the metal plate, and at the same time, at its lower end, makes contact with the trolley wire by means of an ordinary trolley wheel. To this trolley arm is affixed a depending branch arm to which a brush may be attached for sweeping out the bottom of the conduit. At suitable intervals along the bottom of the conduit are provided sluiceways leading to the sewers for drainage. At crossings, curves and switches a slot is made crosswise through the protecting plate for the passage of the trolley arm.

Chicago & Evanston Electric Railway.

The residents of Evanston, a suburb twelve miles north of Chicago, are greatly interested in the Chicago & Evanston Electric Railway Co. They are at present obliged to depend upon two steam railroads whose suburban service is but by no means excellent. Should the electric railway connecting Chicago with Evanston be constructed it would greatly enhance the value of the former as a place of residence. The promoters of the road are energetic. It is stated that they have now secured the consents of property owners from Clyborne Avenue on the north side to Evanston, with the exception of about 1,500 ft. It is the intention of the company to build a surface road to Clyborne Avenue where an elevated structure will commence. This will pass over Hawthorne Avenue to Larrabee Street, a distance of about a mile and a half, and on Larrabee Street and Chicago Avenue to Kingsbury Street, and on the latter to Kinzie, thence to State and across the river, with the possibility of a loop through the courts between South Water and Randolph Streets. It is proposed to build the elevated structure on a single line of columns, which will be located in the space between the surface tracks. These supporting columns will be placed every thirty-five feet. As soon as the required frontage is obtained, the company will ask for a franchise, When this privilege is granted, the Edison company will take charge of the construction of the railway.

The Lindell Street Railway Co. of St. Louis are operating two Short gearless motors. The first trip was made November 25, and the electrical apparatus has been in constant use since that day, with the best possible results.
The Green Electric Railway Patents.

The Patent Office issued on December 15 two patents to George F. Green of Kalamazoo, Mich., covering inventions in electric railways, which, it is claimed, will have an important bearing on the electric railway interests of the country. The application for Mr. Green's first patent (No. 465,457) was filed September 15, 1879, but owing, it is said, to its being prepared by himself and to his unfamiliarity with patent matters, it did not meet all the requirements of the Patent Office in regard to technical description, though the invention was pronounced patentable from the start.

For these and other reasons the application was rejected. But Green's claims, covering the broad matter, were persistently prosecuted by way of an appeal to the Supreme Court of the District of Columbia, and the latter tribunal overruled the Patent Office, thus securing to Green the claims for which he had been so long contending.

An experimental railway, which is claimed to have been the first full sized electric railroad ever operated from a stationary source of electric energy and capable of carrying passengers, was built by Green in 1878. But his invention was made long prior to this date, as shown by a small model of an electric railroad built and operated by him about the winter of 1874-75 for the purpose of exhibiting his invention to capitalists and demonstrating its practicality.

Fig. 1 is a reproduction of the drawing illustrating Green's first patent. The object of the invention, as stated by the patentee, is to operate cars readily and easily without the annoyance of carrying the source of energy by which the cars are propelled. To accomplish this Green states that independent conductors can be used, but that he prefers the rails be insulated, one rail of the track being connected with the positive pole of the source of electrical supply, the other being connected with the negative pole. The motor is carried on the car and supplied with electricity by metallic connections with the track, either through the wheels or otherwise. The fourth claim awarded by the patent is as follows:

The combination of a railway track, one or more stationary means of electric supply, electrical conductors extending from said means of electric supply along the lines of said track, and consisting wholly or in part of the rails thereof, moving along said track, rotating electric dynamic motors fixed upon said vehicles for imparting motion thereto, and wheels supporting said vehicles upon the track, and also serving to maintain electrical connection between said means of electric supply and said rotating motors, substantially as described.

In the second patent (No. 465,432) the application for which was filed May 15, 1886, the object of the patentee is to secure, with the system described in the former patent, a method of motor control. To accomplish this he places a pole-changing switch in circuit with the motors, so that the current in the latter can be reversed in direction by one movement of a lever. The first claim made in this patent is as follows:

The combination of one or more stationary sources of electric current, a conducting circuit formed wholly or in part of an insulated line of rails of a railway track, a wheeled vehicle movable upon or along said line of rails, one or more rotating electric dynamic motors mounted upon said vehicle for propelling the same and included in said circuit of conductors, and a circuit controller placed on said vehicle and also included in said line of conductors, substantially as described.

Both of the patents described above have been assigned by the inventor to Oliver S. Kelly, of Springfield, O.

Wire Rope Dressing.

Cable railway managers who find it difficult to procure a satisfactory dressing for wire ropes will do well to follow the practice of the Third Avenue Railway Co., of New York. We are informed by Mr. F. L. Hart, mechanical engineer, that for the last six months they have been using for cable dressing on the Tenth Avenue and 125th Street cable lines a tar made by the Improved Pine Product Co., whose offices are at 5 and 7 White street, New York. This is distilled tar, free from moisture and acid and can be used pure without a mixture of lime or oil, and applied direct to the cable without being heated. The price per barrel is the same as for ordinary tar, and since the line began using it it requires about twelve barrels and two weeks' time to fill a cable, where formerly it required thirty barrels and an application during five or six weeks to get a rope in proper condition, and the action of the rope upon the driving drums is more satisfactory.

The Columbia Railway Incandescent Lamp.

An incandescent electric lamp is now being manufactured by the Columbia Incandescent Lamp Co., of St. Louis, Mo., which is especially constructed and adapted for use on electric railway circuits.

The filament is anchored at the bottom of the lamp with platinum hooks, and is so made that it will stand quite a fluctuation in voltage. By this method the filament is strengthened at the point where breakage is most apt to occur, and is also stiffened throughout its length, preventing the destruction of the lamp by the carbon coming in contact with the glass and cracking the globe through the vibration of the car.

A number of these lamps are already in use upon many of the electric railways throughout the country and are reported as giving excellent satisfaction. The lamps are made to fit all the standard sockets.

This company have had a large experience in lamp manufacture, and also supply commercial lamps for use in central stations and isolated plants. They claim for their lamp long life, high lumenary and full candle power, and that the lamp will maintain its candle power to the highest degree during its life, and that there is scarcely any discoloration of the bulb.
Return Circuit for Electric Street Railway Systems.

By George K. Wheeler.

The above subject is one which has not received the careful attention it should have from electrical engineers and contractors or railway companies who have in operation or are about to install an electric railway system. It is the purpose of this paper to bring to the notice of such the importance that this part of the installation bears upon the operation of any road commercially, satisfactorily and economically. The return circuit may be constructed so that the coal consumption will be largely in excess of that required to operate the road, and the writer regrets to say that a large number of roads are now operating with power house expenses frightfully in excess of what they should be, on account of unbalanced circuits.

The following are the different methods that have been and are now in use, with mention of their advantages and disadvantages: The first method, the oldest, is that of bonding the rails with a No. 4 bare, soft copper wire about thirty-six inches in length, having soldered on each end a copper rivet three-eighths of an inch in diameter. The manner of connecting is to drill a three-eighths inch hole in the rail about eighteen inches from the end, pass the rivet through the hole from the inside of the rail and head it down securely; in addition to this, the bond wires are connected together about every 500 ft. with a copper wire of same size as the bond wire, and all connections are carefully soldered.

The objection to this method is the great liability of poor connections, owing to the large number of soldered joints necessary to secure the rivets to the bond wires, and the liability of bond wires of this size: breaking by reason of poor joints in track, and by trains running on track where paving is not used, and the vibration of track causing the wire to break away from the rivet. Further, the carrying capacity in amperes of this circuit is only sufficient for small lines operating a limited number of cars.

The second method of construction only differs from the first by the use of iron instead of copper wire. This method has only one advantage over the others; that is, its low cost to install. It is, in the writer's opinion, the poorest kind of a return, and after it has been laid for a few months is but little better than the track itself, without bond wires. It is well known that the life of a No. 4 galvanized iron wire when suspended in the air, is about seven years, and its life when underground must be considerably less than this, on account of the great liability of corrosion. Bond wires of copper are used to obtain high conductivity at the joints of the rail, which cannot be obtained on iron, and for this reason the third method of connecting the rails, which is a modern invention together with the accompanying engraving, is recommended.

The third method, one which has been generally used and has given good results in a number of cases, is to construct the return circuit in a manner similar to the first method, but in addition to this, use a No. 6 soft drawn, bare copper supplementary wire which is laid between the rails in the centre or on the side, as may be desired, and connect each of the bond wires to this wire, soldering each connection. Of the same objection apply to this as in the first method, with the exception that it gives a much better return on account of the addition of the No. 6 wire. On some roads of great length, where a large number of cars are used, it has been found necessary to run out track feeders in addition to the supplementary wire since the conducting capacity of the rails has not been and could not be fully utilized when No. 4 bond wires were used. Railway companies have often objected to using the supplementary wire on account of the increased cost of track construction, which is about $300 per mile, and have preferred to put that amount of money into overhead feeder lines, so that in a great many cases this has been done, incurring a needless expenditure of money, though without benefiting the system one particle.

The writer has given considerable attention and study to this subject and has made a number of experiments on all forms of return circuits during the last few years, for the purpose of obtaining the most efficient method and one that could be more economically constructed than the third method, where the No. 6 supplementary wire is used, and for the past year has recommended the following form of construction, which may properly be called:

**The Ideal Return Circuit.**

This circuit is constructed in the following manner:

Drill in the rails, about eighteen inches from each end, a hole nine-sixteenths of an inch in diameter with a twist drill, and connect to each rail a No. 6 soft drawn, bare copper bond wire by means of a channel pin of either pattern, illustrated at the right in the accompanying engraving. Placing the bond wire in the hole from the inside of the track and driving the channel pin in from the outside, secures it firmly to the rail without the use of solder; this is a very decided advantage gained over other methods of bonding, as there is no possible chance of connections being corroded, as there is when solder is used. The cost of labor is also largely reduced as the connection can be made in a very short space of time. In addition to this, the rails are cross-connected every 300 ft., connection being made to the bond wires at these points by means of a copper wire, the same size as the bond wires. This method gives a large carrying capacity, the safe carrying capacity in copper being 160 amperes, in addition to the amount that must necessarily be carried by the rails. The cost of this, including all material and labor, is about $350.00 per mile of single track, and as compared with the third method where supplementary No. 6 wire is used and which costs $55.00 per mile of single track, a saving is made of $250.00 per mile, and a much better return is obtained with less liability of breaking of bond wires and corrosion through poor soldering.

In addition to this, on roads over five miles in length, the writer recommends the following:

**Earth Return.**

This is constructed in the following manner and can be used in connection with any form of return circuit: Place an old car wheel deep enough in the soil between the tracks to reach moist earth, connecting the car wheel by means of channel pins to two or three No. 6 copper wires, and connecting the same to the bond wires at that point, and at the power station sink several car wheels in moist earth, the number to be determined by the number of wheels placed in the soil between the tracks, and connect the same by means of wires of sufficient size to the
negative side of the generators. This will, in addition to the rails and bond wires, give an earth return which will largely assist in the economical operation of any road, providing the roadbed is not constructed upon ledge rock. This form of construction has been used on several large roads and excellent results have been derived, the motor cars moving very quickly when the current is applied, at all times using a small amount of current, and greatly reducing the coal consumption at the power station.

On roads where track feeders are required, it is advisable also to install supplementary wires placed in the centre of track and connected to each bond wire. This is much more economical than constructing track feeders overhead and there is less liability of short circuiting the system.

**RIVER RETURN.**

Good results have been obtained by use of river returns in addition to the rail and earth returns, and they should be employed wherever possible. If a river runs adjacent to any point of track and the power house, it would be well, in addition to the rail and earth returns, to sink in the river bed old car wheels or metal plates, copper preferred, of sufficient area, and connect the same to the bond wires of the rails by means of No. 0 copper wires. A similar connection should also be made with plates or wheels at the power house and the same be connected to the negative poles of the generators.

On a number of roads which have been constructed the negative poles of the generators have been connected to the overhead line, making the rails positive, and the current has passed from the supplementary wire (if used) and bond wires to rails, from rails to wheels, through wheels to motor, through motor to overhead line and back to the generators at the power station. This is bad practice and will invariably work great injury to any system in a very short time on account of electrolysis, which occurs by reason of the positive current passing from the copper supplementary or bond wires to the iron rails, causing the copper to be rapidly eaten away, making poor connections, obliging the generators at the station to work at all times under a heavy load and increasing the coal consumption and the liability of injury to the apparatus. The writer has some samples of No. 0 wire which were in the oil but a few months, with the positive poles of generators connected to the rails, which are in a very bad condition, being almost entirely eaten away. They were laid in soil that was not affected by any gases or salt water, and the action can only be due to electrolysis. All systems, in the writer's opinion, should be connected with the positive pole of the generator of the overhead line, and he believes that this is to-day the standard practice and conformed to by all engineers and contractors.

There is one thing more that is equally as important as the installation of the return circuit, and that is, the attention that bond wires should receive after a road has been put into operation. They should be carefully inspected by the trackmen whenever possible, and a broken or defective bond wire can be readily discovered at night, as there will always be a flash at the wheels when the motor car is passing that point. Defective or broken bond wires should always be repaired at once. There is always a marked decrease in the amount of current used in the operation of an electric railway during rainy weather; this is due to the fact that the moisture assists in making a perfect contact between the wheels and rails, and also allows the current to pass defective bond wires by way of the earth. A large number of the larger roads use a water tank car, which is arranged to allow a flow of water to run on both rails, this keeping the rails wet at all times. On these roads it has been found that considerably less power is required to operate, and that there is an entire absence of sparking at the wheels.

In conclusion, the writer would certainly advise all railway companies who equip electrically to be sure that they obtain the best possible return circuit, and one that will be ample and sufficient for their needs, and he would suggest to those who are at present operating electrically the adopted roads that they consider what improvements which they are now using by adding the earth return above referred to, and also the river return, whenever possible, and thus establish a marked reduction in expenses of operation and maintenance.

**Notes from the Field.**

**Albany, N. Y.**

For some time rumors have been industriously circulated, by parties hostile to electric traction, to the effect that the operation of electric railroads by the overhead system was not so successful as had been anticipated, owing to a greater depreciation in the appliances than had at first been anticipated, for which reason a number of roads had come to the conclusion that all that glitters is not gold, and were regretting that they had equipped their lines with this method of traction.

If there are still any skeptics in regard to the value of electric traction in situations that are favorable to this method they have but to visit Albany, N. Y., and study the operation of the lines of the Albany Railway Co., which are now all operated by the Thomson-Houston overhead system, when we are quite sure, all their doubts will be removed.

Having spent some time in Albany recently, we are able to give our readers reliable information in regard to the operation of these lines. Mr. John W. McNamara, general manager of the Albany Railway Co., in answer to our questions, replied that, had they to start over again, to change from horse power to electricity, in the light of experience gained after eighteen months of practical operation, they would do just as they have done, taking advantage, of course, of the improvements which have since been made in motors and electrical appliances; that the lines were being operated with better success and with far less annoyance from electrical failures than they anticipated when they decided to adopt electric traction; that the operations of the road improve with age, and that it requires less power to operate the same number of cars than when the lines were first equipped, and that the lines were being operated at sixty per cent. of the gross receipts, not a single passenger having been injured since the lines began to be operated with electric power and no serious injury having been done to pedestrians. There had, however, been a few more accidents to vehicles, with which the motors had come in contact, than formerly. Owing to the method employed of ground return, known as the Sabold system, there was no interference whatever with the telephone service; the service had proved acceptable to the patrons, and travel had increased to such an extent that it had become necessary to add ten new eighteen foot cars to the equipment.

There are so many interesting features connected with the operation of these lines that are worthy of imitation that we feel justified in mentioning them in detail,
although the power station and general equipment has been fully illustrated and described in the June, 1896, issue of the Railroad Journal.

Five separate lines are now operated from a central power station. These are known as the State Street line, which runs to West Albany, the Pearl Street line, Hamilton Street line, Clinton Avenue line, and Madison Avenue and Water Street lines, which are street cars which are to be electrically equipped, and was put in operation in April, 1890. Owing to the physical characteristics of the route, it is one of the most interesting in the country. The grade on State Street from Pearl Street to the Capitol, is eight per cent. From State Street to Washington Avenue at Twenty-six street, the grades are on the average about one per cent grade, and continues past the Capitol on Washington Street. A branch has recently been added to the State Street line, leaving the main line at the foot of Washington Avenue and passing through Steinbein Street to Broadway, terminating directly opposite the Union Depot. This is a single track line, with two turnouts. The whole route from Pearl Street to Eagle Street is on a uniform grade of eight per cent.

The speed of the cars over the grade on State Street is five miles per hour, and the speed on the remainder of the road varies from eight to twelve miles. It is interesting to note, however, that when the motors were tried on the State Street hill, and, when the track was in good condition, were able to ascend the grade, but were obliged to continue the ascent without stopping. Electric motors start readily from any point and make the ascent without difficulty when the cars are crowded with passengers. It is necessary, however, to keep the track thoroughly sanded, a requirement which is accomplished both by the use of sandboxes on the cars and by having a man stationed on the hill, whose duty it is to apply the sand to the rails at frequent intervals; this he does by means of an ordinary watering pot with a long spout. Sand is applied both to the rails of the down track, but to only one rail of the up track, the other being left clean to provide for proper electrical contact.

The trucks of the cars on the State Street line are equipped with the Flood car starter, or dog, which we have previously illustrated, and which is employed to prevent the cars from running backwards when it is necessary to stop on a steep grade. At a point just above Pearl Street where the regular stop is made to take on passengers, every other row of paving blocks between the track is left an inch or two higher than the ordinary level to provide a firm footing against which the dog may rest. The track is described as having a slope of one foot in ten when the grades are approached and lifted free from the track when passing over level portions. The use of this device is highly commended by the management. The trucks are also provided with slipper or track brakes, which are employed in connection with the wheel brakes when the rails are slippery. There are conditions of the track, however, when it is found impossible to stop the cars even with the slipper brakes, but by their use the speed is reduced below the danger limit.

The cars, which are the original equipment, were manufactured by the Gilbert Car Manufacturing Co. of Chicago. They are of very ample construction, and are so arranged as to be very strong and rigid, being well under the severe duty imposed upon them. They are kept scrupulously clean and are not disfigured by advertisements. The cars are mounted on the Manier non-oscillating truck, and the journals have the Meneely roller bearings. These bearings give excellent satisfaction and very materially reduce the power required for hauling the cars.

The ten new cars before mentioned were built by the same company, but are mounted on the Taylor truck, which was illustrated and described in the November, 1896, number of this paper. These trucks are equipped with the Meneely spring of a new design and will be equipped with the Lewis & Fowler sandboxes and with the Flood car starter. The electrical equipment consists of twenty-five h. p. Thompson-Houston single reduction water-proof motors. The driving peculiarities of the Taylor truck are that they are provided with elliptical springs in place of the spiral springs usually employed. On each journal box are four half-spring side bars supported by side bars, and at each corner of the frame full fourfoulid elliptical springs are placed which support the body of the car. The car is attached to the frame in such a manner as to positively prevent the body from tilting or rocking. The trucks, without the motors, weigh about 3,600 lbs.

The new cars have the appearance of being longer by two feet, are of the same style and finish as the former equipment, being painted in straw color or light buff, with the main panel of claret color. The window frames are of mahogany, and the headings are of quartered oak artistically decorated.

Of especial interest is the construction of the Albany lines, as we have before noted, was done in a thorough and substantial manner, the poles being of the Hilton type and the trolley of No. 0 copper wire.

The experience of the Albany Railway with its tracks has been an interesting one, and their experiments will prove valuable to the railway world generally. The metallic construction which was employed on a portion of their lines proved inadequate for electrical traction and, with the exception of two miles, has been replaced with the girder rail. About two miles of the metallic system has been relaid on cast-iron chairs. On State Street and one of the other avenues, the Fowler girder rail is employed, and so far this rail is standing up splendidly under the traffic and gives promise of very long life. On other portions the Johnson girder, with the standard joint, has been employed and is also giving excellent satisfaction.

The company will extend their Greenbush line in the spring, and will build about four miles of new track on which it is intended to place the girder rail upon stringer construction, after the method employed in Boston. In case, however, this construction does not prove to be durable, as there is strong probability that it will not, a different construction may be adopted.

In discussing with the general manager the question of rails and joints, he claimed that it would require at least a year of service to determine whether any rail or joint would be durable under electric traction; that several kinds of rails tried had given satisfaction for six or eight months, and after that time had broken down.

The power station of the Albany system is located on Pearl Street, near Third Avenue, about 300 ft. from the river and beside the railroad track, so that coal is delivered from a siding directly into the yard adjoining the power house. The power equipment, which we have previously described, consists of five steel box engines of 125 h. p. each, and three compound, McNamara & Seymour high speed engines of 250 h. p. each. Originally each engine was designed to drive two Thompson-Houston eighty h. p. generators, to which they were connected by direct belting; but two of them are now driving six generators, three being coupled to each engine, and the third engine is now arranged to drive four generators, the shaft being equipped with three flywheels. The engines make 200 revolutions per minute and the armatures of the generators 900 revolutions. It requires but eight and a half tons of ordinary buckwheat meal to gear the entire twenty-six cars which are now running.

The water which is drawn from the river is purified by a Hyatt filter and fed from a National heater. Half hour readings of the appliances in the power station are made, and a daily report is made to the general manager. Ordinarily the maximum power required to operate the twenty-six cars now employed is 400 h. p., or about 16 h. p. per car, while the average power required does not exceed 250 h. p. Owing to the increased speed of the electric cars four cars handle the traffic on some of the lines where formerly seven horse cars were required. On the State Street in the first year under electric traction was 365,693 passengers over the last year's operations with horse cars. The fare on the State Street and other hill lines is six cents or twenty tickets for $1. On Pearl street—a level line—the regular fare is five cents. No transfers are given.

In reply to our question, Mr. McNamara stated that
the cost for building one mile of straight double track similar to the Albany construction, including the paving and overhead equipment, would be about $18,500, not including the power equipment or rolling stock.

Troy, N. Y.

The electric lines of Troy, which now operate over eighteen miles of track (seven more to be put in operation in the spring) with thirty-five cars, have a somewhat earlier history than the Albany lines, having been running about two and a half years. Three of the cars are equipped with Thomson-Houston and the balance with Edison motors.

Mr. Charles Clemishaw, president of the company, in speaking of the success of electric traction, repeated substantially what we have quoted above from the remarks of the general manager of the Albany lines, to the effect that the Troy company would repeat their experience, were it necessary, and under no circumstances would they go back to horses, and further, that the patrons of the line would not submit to it were such a movement proposed.

The Troy company are still operating four and a half miles of road by horse power, and the operating expenses of the two methods of traction furnish a striking proof of the advantage of electric traction, the cost of operating expenses per car mile, being less with electricity than with horse power. In reply to our question as to the system he would recommend a new line to adopt, were his advice sought, Mr. Clemishaw stated he would not attempt to say, until he had made a more careful test of some of the new motors recently put upon the market, but that no system of electric traction would have a great advantage over the pioneers, owing to the reduction of price of electric appliances, and that the Troy equipment could now be duplicated for much less than the original cost. In view of increasing the equipment with new motors, a car equipped with the Edison single reduction motor is now being operated experimentally by the company.

While pleased with the success of electric traction, the most serious question connected with the operation of electric lines is that relating to a proper rail and joint. On being asked what type of rail and joint he would recommend, Mr. Clemishaw stated that he could not give any advice, that they had tried four kinds of construction, and with none of them were they satisfied, and that they were designing a rail and joint that would be different from anything now in the market, and with which they could experiment during the coming season. The best success so far had been had with the Johnson sixty-three pound girder rail and the new standard joint made by the same company. They were intending to equip an additional track with the same construction with ties only eighteen inches apart, from which they expected better results than from anything heretofore tried. Incidentally it was mentioned that on a single track where the motors run in both directions the joints stand up much better than when the cars run continuously in one direction. The grades on the Troy lines are not severe, the highest being an eight and a half per cent, grade 900 feet in length.

The poles employed for supporting the overhead equipment on the Troy lines were manufactured by the Syracuse Tube Works and are giving excellent satisfaction. The power equipment of these lines has recently been increased from a new power house on Front Street, near the river, diagonally across from the car house, in which has been installed a 425 H. P. Greene engine, manufactured by the Providence Steam Engine Co., which is belted direct to two 212 H. P. Edison generators of the latest improved type, which are illustrated on page 33. The bells, which are twenty-four inches wide and fifty feet long, from centre to centre, were manufactured by Barnum Bros., Co., of Troy, N. Y. The steam equipment consists of two batteries of Babcock & Wilcox boilers of 186 H. P. each, together with the usual equipment of pumps, filters and heaters. Foundations are laid beside those in use, for duplicating the entire equipment. The switchboard is of slate, and provided with the very latest electrical switches and appliances, sufficient for ten generators. Water is drawn from the Hudson River, and coal is hoisted from boats to coal sheds alongside the boiler house.

The original power equipment, situated in Lansingburgh, four miles from the city, consists of one 400 H. P. Greene condensing engine, which is belted direct to three No. 32 Edison dynamos, and two 150 H. P. Corliss condensing engines, which transmit power through a counter-shaft to three No. 32 Edison generators. There are also three 500 H. P. Babcock & Wilcox boilers.

The entire system of electric lines is divided into five sections, with such arrangement of independent feeders, cut-out boxes, etc., from both power stations, that not only can the entire system be operated from either power station, but any section can be instantly cut out without affecting any other section.

Correspondence.

Communications on all subjects of interest to street railway managers are solicited. Names of correspondents may be withheld upon publication if desired, but must be known to the editors. The correspondent alone is responsible for his statements and opinions, not the editors.

Advantages of Splicing Cars.

Lindell Railway Co.,
St. Louis, December 12, 1891.

Editors Street Railway Journal:

Replying to your communication of 6th inst. relative to the advantages which splicing cars, in which you ask the following questions:

1st. What is the economy of building long car from two short cars?

2d. What is the cost of new eight wheel car?

3d. What is the estimated value of long car built of two short cars?

4th. What is the cost of reconstructing one long car from two short cars?

5th. Under what condition would you favor selling old cars and buy new, rather than rebuild into long cars?

I hereby submit answers to each question, as follows:

1st. On all roads where travel justifies the operation of trail cars the long car is the most economical, and for such roads as have a full equipment of twelve, fourteen or sixteen foot cars, either trail or motor cars, the advantage of operating a long car, as compared with a motor car and trailer, as hereinafter mentioned, is certainly in favor of the former.

2d. New eight wheel cars, about forty feet in length, can be purchased at from $1,800 to $3,000, according to the design and finish.

3d. The estimated value of long cars built from two short ones depends largely on the estimated value of the two short ones, before such alteration is made, and the amount expended in finishing the same where said cars are joined. If properly constructed, framed and joined it would unquestionably increase the life of the two cars so rebuilt at least fifty per cent, beyond the incident to the operation of trail cars, which is alike injurious to framing of motor and trail car, not to mention damage to platforms and drawbars. The long car mounted on double trucks also eliminates that rolling, rocking motion noticeable on short cars with single truck, and which is damaging to the entire framework of car.

4th. The cost of reconstructing two short cars into one long car depends entirely on the length of the former and the length required for the latter, also on the general design and finish. The writer has just completed two long cars, such as were illustrated in the October issue of the Street Railway Journal, each forty-four feet long, rebuilt from sixteen foot cars, as follows:

From each sixteen foot car we took the hood and platform from one end and placed the said ends facing, allowing a space of four feet. We then connected the tops with an iron framing properly bolted to each car,
building an iron or wood transom at opposite ends for the pivotal truck, and connecting thereto iron or steel "I" beams, or long sills properly trussed. This completes the framing. The space between the two cars, known as a专利, is finished in accordance with the general appearance of the cars, and equipped with hinged doors and sliding vestibule seat, as well as a reversible step.

The estimated cost of the change is as follows:

Framing, including all iron and wood work, and labor of same .................................................. $125.00
Reversible vestibule, with door .............................................. 30.00
Doors, ceiling, roof, floor and seat of vestibule, including labor .............................................. 50.00
Painting and varnishing vestibule to match balance of car .................................................. 10.00

Total ........................................................................... $250.00

For each long car so built there are two platforms, two hoods, two draw-bars, two brake staffs two handles, two bells and one register not used, estimated at fifty dollars, all of which should be securely stored away for repairs and renewals at each end of long car, leaving the net cost of the above charge, exclusive of trucks, $200.

A car rebuilt in this manner, in operation by the Linedale Railway Co. of St. Louis, has been in constant service for upwards of four months, carrying on one load 158 passengers, besides motorman and conductor, and, being repainted, has the general appearance of a new car.

5th. No short car, twelve, fourteen or sixteen feet in length, having sound framing, should be disposed of by sale and replaced with new long cars when they can be readily and cheaply rebuilt into commodious long cars at a trifling cost and be made to give years of service.

Two twelve foot cars, with four foot vestibule, would make one long car thirty-six feet long, including platforms.

Two fourteen foot cars, with four foot vestibule, would make one long car forty-four feet long, including platforms.

Two sixteen foot cars, with four foot vestibule, would make one long car forty-four feet long, including platforms.

We do not find the latter too long, for it must be remembered two sixteen foot cars, coupled together with draw-bars, are forty-nine feet long.

The following are some of the many advantages in favor of the operation of long cars, as compared with short car and trailer attached.

1st. They dispense with one conductor.
2d. The load being on motor trucks, they give greater adhesion to the rail, and consequently require less power.
3d. The brake question is solved, for it has been a source of much annoyance to railway managers how to brake the trail car.
5th. From this cause, and the fact that passengers will insist on getting on and off the front platform of the trail car, over seventy-five per cent. of accidents are due to operation of trail cars.
6th. The car repair account is decreased very materially, incident to the decrease in cars and parts.
7th. When license is assessed on cars, this charge is reduced fifty per cent.
8th. One register only is required.
9th. Cars with double trucks ride much easier than single truck cars.
10th. With the vestibule and side entrance, experience shows that passengers are as readily discharged as though riding in two separate cars.
11th. The wheel base being much shorter, curves are more easily rounded.
12th. Long cars are better adapted for crowded thoroughfares and heavy travel than motor cars with trailers, because they require less room and are more easily controlled.
13th. Passengers like them better.
14th. One car may be made a smoking apartment without interfering with passengers in the other.

15th. One part may be built open, the other closed.
16th. Passengers may pass from car to car without danger.
17th. Absolute freedom from danger of being run over by rear trucks is secured to passengers.

Yours truly,
G. W. BAUMHOF.

WEST END STREET RAILWAY JOURNAL.

Yours of December 3 received, requesting that I give you my opinion regarding the economy and also practicability of splicing long cars from two short cars, and also the difference in cost of the new eight wheel cars, compared with the spliced cars.

To begin with, I would say it is a difficult matter to now dispose of any of our old sixteen foot horse cars. If they are ten or twelve years old people do not want them, but they are willing to buy a young car, say, three to five years old, and pay a good price for it. The best price we got for a sixteen foot horsecar, which was thrown out of service on a particular line by the introduction of electricity, was $800. These we consider our best cars, run only a few years, built by Jones and made up in the best style. We do not take a car of this kind for splicing, for the simple reason that the value of the two horse cars would be $1,600; cost of splicing, $650, making a total of $2,250 as the cost of the large car. What we do is to take our oldest cars, for which we can get but $500 for the body. The first cost of two bodies will then be $600; splicing, $450, or a total of $1,050.

The cost of the new cars, such as we have put on late, is about $1,600 or $1,750, according to style and finish of the car. This makes a saving in equipment of about $600. I wish to emphasize the fact that the cars are practically just as good for our business, earn as much money and ride as well, though they, perhaps, do not look as well; otherwise they fill the bill admirably. Our method of splicing is to take two sixteen foot cars and keep as near to twenty-five feet for length of body as may consistently be done, being guided by the number of windows. The cars, also, must be of the same pattern to an eighth of an inch, made from same templates when first built. We were unfortunate enough to build over a couple of cars, one of which was one-quarter inch wider in the dome and one-half inch higher than the other, and this made some trouble. These things have to be looked into very sharply before starting in to do any of this kind of work.

My advice to companies desiring to undertake this splicing is, that it depends entirely upon whether they can dispose of their cars. If they have only one, two, three, a half dozen or a dozen cars, I would say sell them, if possible, at almost any figure; but where a company has four or five hundred cars to dispose of, the question presents another aspect, and the most economical method is, do as we have done—splice.

Yours truly,
L. PEINGST,
Master Mechanic.

Street Railways and the World's Fair.

The main part of the strictly street railway exhibit at the World's Fair will be located in the Transportation Building. Here will be illustrated all means for conveying passengers and freight from one point to another. Of course many other buildings will contain displays of special interest to street railway men. In the Electricity Building, for example, will be located the exhibits of electrical apparatus for railways. The electric generating station in Machinery Hall will be a marvel in its way, as its capacity will be at least treble that of the similar department at the Paris exhibition. The work on the Transportation Building is proceeding rapidly. Mr. Willard A. Smith, chief of the Department of Transportation, says those interested in street railway work should now begin to consider how much space they desire, and how they wish to have it divided.
The Short Gearless Motor.

The Short Electric Railway Co. of Cleveland, O., is working on its second line, a thirty-thousand horsepower line, for gearless and single reduction motors. The first large road to be equipped with the single reduction motors will be the Trenton Passenger Railway Co. of Trenton, N. J., work upon which is now progressing very rapidly, with the expectation that the road will be in operation on about February 1st. The first gearless motor car, a final type, will go to Albany, Washington, Louis ville, Indianapolis, Rochester, St. Louis, Chicago, Cleveland, Denver, Houston, Brooklyn and elsewhere, in filling large contracts already secured by the Short company.

Although the Short company had a commercially successful type of motor car last July and could have made shipments in quantities at that time, it fore saw that the financial situation would be such that very few large contracts would be closed before fall, and therefore determined to complete all experiments upon its gearless motor before sending it out in large number. The wisdom of this course has been justified, and the "Perfected" gearless is now not only the simplest but the most economical motor on the market. The magnetic circuit has been greatly improved by imbedding the armature coils entirely in the armature core, and extending the pole pieces "right through" the top as well as at the sides of the armature. The armature has also been cross connected so that the brushes are both on top and extremely easy of access. The frame has been made rectangular instead of circular as before, so that it can now be easily placed on a thirty-thirty-inch wheel with four inches clearance over the track. The method of connection between the hollow armature shaft and the truck has also been simplified. It will be remembered that the original plan provided a spring connection between a disk keyed to the hollow shaft and the car wheels. The second method was to do away with the springs, keying a three legged spider to the hollow shaft and providing wheels with special lugs cast on their spokes. This, while an extremely simple arrangement, had the disadvantage of calling for special wheels. The final method now adopted is to key a disk directly to the car axle close to the end of the hollow armature shaft, upon the lathe in large places, to a two legged spider connecting with the disk through flexible rubber bushings, the car being driven both ways upon the same side.

It is interesting to note the development of great manual labor saving devices in the electric field. Two years ago the Short Electric Railway Company was hardly known outside of a limited circle of believing friends. Its past reputation for never failing success is high, and it may also be noted that it has rarely failed to start a road successfully and without a hitch.

The Jamestown Street Railway Co. of Jamestown, N. Y., although one of the most difficult roads in the country to operate, is still one of the most successful. Two years ago the company purchased from the Short Electric Railway Co. a large amount of additional apparatus for its spring system, which will include, by the way, one of the finest private cars yet built, which will be equipped with the Short single reduction motors. The July reduction to be largely increased, and the Short 200 H. P. multipolar generators to be used.

Notes on the Short System.

At Battle Creek, Mich., the Short Electric Railway Co. have installed an electric railway which is a model of completeness and careful workmanship. The line was opened for traffic late in November last and has an equipment of six electric cars, each equipped with two Short stand alone reduction motors. The cars were furnished by the St. Louis Car Co. At the powerhouse are two 100 H. P. dynamos of the standard Short pattern. Both rolling stock and generation station are doing excellent work.

Mr. S. S. Leonard of the Hill Clutch Works paid us a visit during December.

Mr. F. L. Hart, mechanical engineer of the Tenth Avenue, New York, Cable Railway, called at our office recently.

Mr. H. A. Everett, general manager of the Toronto (Can.) Street Railway Co., was a welcome visitor at our office one day last month.

Mr. Alexander von Babe, representing the firm of Siemens & Halske of Berlin, Germany, has opened an office in the Times Building, New York City.

Mr. E. J. Wessels has been appointed in charge of the New York office of the Short Electric Railway Co. of Cleveland, O. Mr. Wessels was formerly of E. J. Wessels & Co., who own and operate the Wessels line of steamers between Jamaica and New York. He has had a long business experience with them.

Mr. W. H. Eckert has been appointed general agent for the sale of Kettle insulated wires and cables, etc. Geo. B. Prescott, Jr., who has resigned on account of ill health, Mr. Eckert has for a number of years been connected with the Metropolitan Telegraph & Telephone Co. of New York, and is well known among the electrical fraternity.

Mr. Julius Meyer recently resigned his position as chief engineer of the Milwaukee Electric Railway Co., and will for the present be connected with the New York office of the Edison General Electric Co. Under Mr. Meyer's supervision over forty miles of track on the Milwaukee lines have been reconstructed for electric traction since July last. The new construction consists of seven inch girder rails spiked directly to the cross ties and connected at the joints with six bolt fish plates, the bolt holes in the plates being punched staggered.

Mr. C. D. Wyman, vice-president of the Central Park, North & East Electric Railway Co., Cleveland, O., and also with the Walker Manufacturing Co. of that city to represent their interests abroad, and act as agent for introducing their apparatus on the electric and cable roads. These gentlemen sailed on their return voyage on the 6th of December, but before sailing gave us the pleasure of making a call at our office.

Mr. J. S. Sloan and Mr. D. S.aylor of the J. S. Sloan Co., dealers in heavy machinery of 42 Rue du Louvre, Paris, France, have been spending some time in this country inspecting rapid transit systems and have made arrangements with the Short Electric Railway Co., of Cleveland, O., and also with the Walker Manufacturing Co. of that city to represent their interests abroad, and act as agent for introducing their apparatus on the electric and cable roads. These gentlemen sailed on their return voyage on the 6th of December, but before sailing gave us the pleasure of making a call at our office.

Mr. H. H. Littell, general manager of the Buffalo Railway Co., following his usual custom when in New York, paid the Journal a visit last month. In conversation Mr. Littell confirms what has been said in an interview in another column of the rapid development of the street railway business following the introduction of electric traction. On one of the Buffalo lines which was opened with twelve cars twenty-five years ago being only operated, and if they had them thirty-five could be filled during the rush hours of morning and evening. A good deal of controversy is going on in Buffalo between the railway company and the City Council over the power to change the franchise of the Crosstown Line which was originally started as an opposition line, but which is now under the management of the Buffalo Railway Co.

The original contract called for the payment of the treasurer eleven and three-quarters per cent. of the gross receipts, and the present company finding it impossible to operate advantageously under this requirement, has asked to have the rate reduced to three per cent.

Obituary.

Louis de Bebian, president of the Christopher & Tenth Street Railway Co., of New York, and one of the best known of New York's French residents, died of heart disease at his home, No. 165 West Fifty-seventh street last month. Mr. de Bebian was born at Guadaloupe in the West Indies, in 1831, and came to New York when fifteen years old. He was a man of exceptional energy and besides his connection with the Christopher & Tenth Street company, was a director in various banks, gas, insurance and trust companies, and a member of the Chamber of Commerce, as well as being identified with a number of charitable and social organizations. Mr. de Bebian was one of the most active workers for the success of the Centennial Exposition in 1876, and was treasurer of the American Committee on the Bartholdi Statue. He leaves one daughter.

A Testimonial.

At the last meeting of the executive committee of the National Electric Light Association, a very complimentary and deserved resolution was unanimously passed thanking Mr. John Carroll, of the Electro-Phillis Electrical Institution, for his long and eminently successful labors in connection with the reception of the Association during its convention at Montreal. These resolutions were ordered engraved and presented to the above mentioned gentleman.
Street Railway News.

General.

Austin, Tex.—The Austin City Railroad Co., have awarded a contract for the electrical equipment of their lines, consisting of 150 arc lamps and 2,750 miles of road, with motor cars to the Thomson-Houston Electric Co.

Baltimore, Md.—The Traction syndicate is said to be negotiating for a controlling interest in the York Road Railway, and the Union Ilion & Rockville Railroad. If the Traction company get possession both roads will probably be called.

The Baltimore & Western Railway Company have awarded the Ewthrop electric property to be utilized as the site of one of the cable power houses. The company have received several new open cars, canary colored and having a seating capacity for twenty-four persons, recently ordered by them from the Brownell Car Co., of St. Louis.

Tilt contract for cable cars for the Baltimore City Passenger Railway has been awarded to Reed, Stickney & Co., agents for the Davis & Thomas, of Catsauqua, Pa., for twenty-eight dollars per ton. This contract includes such material required, except a previous order given to the Pennsylvania Steel Co.

Boston, Mass.—A municipal ordinance has been introduced prohibiting a speed of electric cars of more than seven miles an hour, unless the car be provided with proper candles.

Brooklyn, N. Y.—The General Term of the Superior Court last month confirmed the report of the Commissioners in favor of the application of the Coney Island & Brooklyn Railway Co., for permission to operate their road between Coney Island and Prospect Park, and the change in the power will probably soon be made since the consent of the State Board of Railroad Commissioners has been secured. The provision of 60 persons opposing the road has been purchased by the company. Active work upon the electric equipment will now probably be begun in the spring. The condition of the road in the report of the engineers has been improved. All the street railway companies will comply are that the wires shall be attached to iron or steel poles, not less than twenty feet in height; the poles are to be of the specified material, and have a diameter of one and one-half inches, on one side and a low pressure cylinder, twenty inches diameter, on the other. The engine is reported as giving general satisfaction.

Canton, O.—Superintendent A. G. Davis has resigned his position with the Canton Street Railway Co., Mr. Catlin, the assistant superintendent, will succeed in his position.

Chicago, Ill.—At a conference held last month between General Counsel Winfield of the Chicago City Railway Co., and the Council sub-committee on streets and alleys, south, the company agreed to build new lines on Thirty-third and Thirty-fourth streets, to begin this winter, to be followed by two more cross lines in the spring. In return for these concessions the sub-committee will probably report favorably on an ordinance to relieve the company from further taxes, as requested by the company. In order to relieve the crowded condition of the cars on the main line the company will make a trial of the Pullman double decked cars.

John A. Hez, was appointed a receiver of the Russell Street Carriage Co., December 22, in place of Dr. Frederick Pond. The change was made at the request of stockholders who thought a different appointment should be made because Dr. Pond is interested in Senator Evans in a $20,000 mortgage on the property of the company.

At a recent meeting of the City Council a preamble and resolution were introduced setting forth that the street road companies had issued an order directing that passes should not be issued to police officers not in uniform, and providing that a committee of three be appointed by the Chair to wait upon three street railroad companies and, if possible, arrange for the issuance of transportation to such members of the Police Department, whether in uniform or otherwise, as the Superintendent of Police may designate. The resolution was not adopted.

Enlargement of the plant of the Cicerio & Provio Street Railway Co. is well under way. The Pond Engineering Co., through their Chicago office, are constructing the pipe work and are furnishing an $80,000 Hoppes exhaust feed water heater, two Pond separators to insure dry steam and a large boiler feed pump of improved construction.

Denver, Colo.—The Denver Tramway Co. will build a large brick car house and repair shop at Twenty-first and Gilpin Streets, to cost in the neighborhood of $275,000. The dimensions are 206 x 250 feet, and will be six stories high, and will accommodate 300 cars, practically all for storage purposes. The space underneath is excavated for repairing the motors. The completion of this building will result in the abandoning of the old car house. It is 50 by 75 feet, has three stories, and has a red brick exterior.

The Board of Supervisors have passed a bill regulating the size of street cars. The length of cars is not to be over thirty-seven and a half feet, including platform, and the width not over seven feet ten inches; only one trailer will be allowed.

January, 1892. The Street Railway Journal. 49

English Electric Railways.

The outlook for electric railways in England at present seems to be very bright. The Brush company are reported to have some very important and valuable contracts on hand, among which is the application for the passage of the Liverpool and Manchester or South Staffordshire Tramway Co. This corporation and its affiliated company, the Electric Traction Co., seem to be taking a leading position in the manufacture and installation of some of the most important provincial trams, notably the Glasgow Tramway, and in close negotiation for the application to their systems.

A Reorganized Car Company.

The Northern Car Co. of Minneapolis have recently been reorganized under the name of the Catholic Car Co., and a capital stock of $250,000 is in process of establishment to accommodate the many orders of which the company are constantly receiving. The new officers of the company are: President, C. J. Jones; vice-president, W. A. Biddle; treasurer and general manager, D. M. Gilmore, who was with the Gilmore Furniture Co. of Minneapolis for seventeen years, and secretary, George F. Starnes. The superintendent is C. F. Manier, who was for three years with the Gilbert car company of Troy, N. Y., as workman, general foreman and superintendent.

At the location of the factory at Robbinsdale there are at present three buildings, each 60 x 150 ft., to which will be added immediately a paint shop 75 x 100 ft. On the pay rolls of the works are 200 names, and the capacity of the works at present is one car per day.

The impetus given to the car manufacturing trade by the wide adoption of electric power throughout the country has greatly increased by the Northern Car Co., and the manufacture of electric cars constitutes a most important part of their business. They have built a large number of special cars for cities in the Northern part of the Mississippi River, and number many other prominent street railway companies in the West and Northwest, especially, among their customers.

The R. D. Nuttall Company.

These well known manufacturers present as their report for the past year a vast display of business in all lines of electrical supplies manufactured by them.

The popularity of the Nuttall trolley is self evident, from the large amount of orders on the curb list, and the marked preference of the public, as well as the large order being 65%. Among the street railway companies which have recently adopted the Nuttall trolley upon all of their cars are the Sundsvall & Central Railroad Co., of Pittsburg, Pa., and the Wheeling Railway Co. The Nuttall company have made extensive improvements in their patterns of trolley during the past few months, and it, at present, is so improved over the original pattern that the pressure has been greatly reduced.

They have lately brought out a steel railway pole made of spring steel drawn in one solid piece without brazing, and tapering from end to end. This pole is practically indestructible, and when bent can be straightened cold without injury to the metal. Orders have been booked during the past month for 1,005 poles, fitted with improved trolleys and contact heads.

The Nuttall company expect soon to place on the market a new departure in railway motor geared made of rawhide throughout, under patent and under the control of Mr. L. P. Flett, manager of the principal street railway company at Erie, Pa. Mr. Betch in Erie, Pa., one car now equipped with this gearing, which has been operating for the past two months, the company say that the car has not been laid up for repairs to gearing, the original wheels being still in place and doing good service.

The gear train in general has been growing very rapidly with the Nuttall company during the past year. Since they went into this business upon an extensive way they have added much improved machinery and patents, which have given them the place a superior article on the market at almost ten percent less cost than the same could be had two years ago. The Nuttall gears have, therefore, become the standard for themselves, which indicates that the company attribute to the extensive experience had by them in the manufacture of these articles, and the improvements they have been making from time to time, and the result is that the company can place a superior article on the market at the same cost that could be had two years ago.

The Nuttall rawhide pinions are in such demand by street railway companies, that though the number produced at their factory at present is fifty per day, the company finds themselves unable to get a stock of these pinions for the next year and a half. The company have been very rapidly, in the past six months, and was too much to handle from the home office. They expect to have their new catalogue ready for distribution in the near future. The company have already given their car manufacturers descriptions of all the articles of their manufacture, giving prices, numbers of articles, and a telegraphic code for the facilitating of their manufacture. H. H. 66 also give new in, with which we have not had time, but we will turn the care of the motors, and electrical railway machinery generally.
Dubuque, la.—Dr. W. L. Allen has announced his intention to retire from the presidency of the Dubuque Electric Street Railway, Light & Power Co.

Mass.—Mr. A. Martin has resigned the superintendency of the Gloucester Street Railway.

Heiiena, Mont.—The Denver & Heiiena Investment Co. have sold the line of the Union Electric Railway to New York capitalists, represented by Mr. A. B. Lawrence. The price paid was the purchase for the purpose of consolidating with the Steam Motor Co.'s property in this city. The consideration in the deal was said to be $89,000, being less than what the parties took stock to the amount of $60,000 in the new concern.

Houston, Tex.—The Houston Street Railway Co. will at once commence to build a large car house and car shops on Commerce Street.

Ishpeming, Mich.—It was expected that cars would be running over the Ishpeming-Negaunee electric line not later than Christmas.

Ithaca, N. Y.—A majority of the stock of the Ithaca Street Railway is said to have been recently purchased by A. C. Robinson & Co., of Wilkes-Barre, Pa. The road will probably be extended and improved.

Kalamazoo, Mich.—The Klinkerbocker Trust Co. filed a petition in the United States Court last month for a receiver to be appointed for the street railway company here. The petition was granted. W. R. Adams, of New York, was appointed. By the arrangement Mr. Adams is authorized to issue $10,000 of receiver's certificate and there are all the stock in the company. Kearney, Neb.—It is said that the Kearney Electric Co. will sell $1 per month ticket good for any number of rides. Burton heaters have been adopted on the road.

Lightning deal has taken place here by which the Continental Trust Co. of New York have taken an interest in the City Railway. The stock of the company is increased from $50,000 to $175,000 and the company is owned entirely by the trust company. A. M. Skinner retaining an interest and Messrs. Nelson Brady and O. M. Barnes each taking $1,000 of the stock. The road, from one end to the other, will be relaid with new forty-five pound T rails. A new power house will be built immediately on a site yet to be selected, and the company will furnish their own power for the entire line.

Laramie, Wyo.—The Laramie City Tramway Co. have issued these bonds and will build six miles of road, receiving subsidies to the amount of about $30,000. They have two miles more of road under consideration. The franchise of the company is exclusive, and runs the road for a period of time.

Lebanon, Pa.—Two new and handsome cars have recently been received by the Lebanon & Annville Railway Co. from the works of the Lewis & Fowler Manufacturing Co., of Brooklyn, N. Y.

Logansport, Ind.—The electric road put in operation during the last week of November has been running very successfully. The Edison system is in use.

Los Angeles, Cal.—The electric line on Maple Street has been put in operation.

Lynn, Mass.—President A. F. Breed of the Lynn & Boston Railroad Co. has announced that the electric work on this line of track in the city will be equipped with electrical apparatus within another year.

Milwaukee, Wis.—The Milwaukee & Wauwatosa Rapid Transit Co. have purchased the electric light plant at Wauwatosa. It will be operated on the right of way from Milwaukee only. The road will be extended to the city, and the plant will be equipped for the electric lights on the Milwaukee and Wauwatosa Railway system. The plant is equipped with two 250 light incandescent dynamos and the necessary engines for their operation. It is probable that the building will be remodeled so as to adapt it to the needs of the railroad company, but the electric lighting of the streets in Wauwatosa will also be continued.

Minneapolis, Minn.—A number of changes have been made during the past month preparatory for the winter. A number of cars have been equipped with Burton electric heaters, and several snow plows have been purchased.

Mr. W. F. Carr has resigned his position of chief engineer of construction of the Minneapolis Street Railway Co. He will spend the winter in the South.

The company have placed an order with the Northern Car Co., for four double ended interurban 'cars for use in local use, the same size as those now running. They will be numbered from 533 to 536, painted yellow and finished in cherry.

Montreal, Can.—Mr. R. A. Maingrul of 147 St. James Street, Montreal, purchased the electric street railroad in Montreal, the contemplated length of single track as about twenty miles. The gauge will be 4 ft. 8½ ins., and about fifty cars will be used. The rails will be a girder rail, outside the city a T rail of fifty-six pounds. Electricity will be the motive power used, but whose system is not definitely settled. As soon as the franchise is obtained, a company will be organized under the charter of the Montreal Elevated Railroad Co., with a capital of $1,000,000. If the franchise is awarded building will commence about next April.

Nashville, Tenn.—Stoves have been installed in the cars of the Cudahy & South Nashville Rapid Transit Co.

Natick, Mass.—The Natick Electric Street Railway Co. have voted to issue subscribers' tickets. These tickets will be sold in packages of thirty-three for $1.

New Haven, Conn.—Work on the new Winchester Avenue line is being pushed. When this is completed through cars will be run from Newhallville to the depot.

New Jersey State Street people are laying double tracks upon a considerable portion of their route.

New Orleans, La.—The city will offer at public auction on February 10, 1892, at the City Hall, right of way over a number of streets.

On December 1, the Mayor sent a lengthy communication to the Common Council stating that, in his opinion, the best interests of the city and the company can be preserved by the adoption of the overhead system for its street railways. As New Orleans has heretofore expressed a desire that the head wires vigorously, the communication was received with more than ordinary interest.

It is thought that the New Orleans & Carrollton Railroad will be granted permission to use the overhead system.

New Rochelle, N. Y.—The New Rochelle Railway & Transit Co. have completed a new piece of track on Hugenot Street and laid the first track on Bridge Street, the company being about to arrange a large Business.

A sixty pound centre bearing rail with Johnson switches and curves was used on this extension. Patrons along the line of the route can now ride directly from the railroad station to their homes in New Rochelle without leaving shelter on stormy days.

Newburyport, Mass.—James F. Shaw, superintendent of the Black Rocks & Salisbury Beach Street Railway Co., has temporarily resigned for the winter, in order to give his time to the introduction of his new patent trolley wheel.

The new brick car house of the Newburyport & Amesbury Electric Railway Co. has just been completed, and it is said to be one of the most convenient and handsome in the State. A company is being formed by Lowell and Haverhill capitalists to build a new road from Lowell through Groveland, to Newburyport, via Merrimac and Amesbury. Capital $600,000.

Hon. E. F. Shaw, president of the Black Rocks & Salisbury Beach Street Railway Co. of this city, and connected with many other lines in New England, has been elected Senator in the Fourth Senatorial District of Massachusetts.

New York, N. Y.—John McBride, sub-contractor with Willard & Wharton Jr., & Co., on the Third Avenue Cable Railway, has brought suit against the Philadelphia firm for work done on the cable road.

The New York & Queens County Tunnel Railroad Co. have been organized with a capital stock of $1,500,000 to be used for the construction of a tunnel three and one half miles under the waters of the North and East rivers, and to be operated by steam, electricity or other modes of power. The directors are Frank Carey and Joseph Tasker Lowery of Brooklyn; Jason W. Broadhead and Joseph H. Jones of New York City, and Robert Morris, of Greenvillle, N. J.

A protest has been made by a number of Madison Avenue residents against the proposed tunnel of the Rapid Transit system under that avenue.

Commissioner Gilroy, who in the early part of December announced that on the tenth and work on the Third Avenue Cable Road, which would have to be stopped, reconsidered his decision, and allowed it to go on as long as the weather permitted. The contractors are using everything in their power to hurry the work, and gangs of men are working night and day on the road.

A complicated railway suit was brought last month to the Superior Court, special term, before Judge O'Brien. The case is one involving the right of a short line railroad to the right of way in the Flower Street, between Ninth and Fourth Avenues, over the road, owned or leased by the Christopher & Tenth Street Rail Road Co., and the Central Towtown Railroad Co. The defendants say it plain that, according to a lease made in 1854 between defendants and themselves, the right to run their cars over the Fourth Street tracks as far east as Fourth Avenue was established. Their present action is to enjoin the defendants from interfering with their use of the Fourth Street road. Defendants say that they do not so understand the terms of the lease.

Experiments are being tried on the Broadway road with the Quints gas system for illuminating the street cars. Some very satisfactory results have been obtained.

Northampton, Mass.—E. C. Clark has been appointed superintendent of the Horse Railroad Co. The number of passengers during the year ending December 1 was 372,290, Number of miles, 15,154. Number of miles snow plowed, 9.

Norwich, Conn.—The Norwich Street Railway Co. have fitted their closed cars with the Lewis & Fowler stoves.

Oakland, Cal.—Track laying on the Mountain View cemetery branch of the electric street railroad in Mountain View is being put in rapidly. In accordance with a petition of the property owners on booth Street, which is macadamized, the Board of Supervisors inserted a clause in the franchise of the company to macadamize the road seven feet on each side of the track.

It is stated that the Oakland Consolidated Co. will not build an electric power house at Seventeenth and Wood Streets, where they bought land, but will obtain it for their cross town road from the present power house at Temescal.

The road of the East Oakland Railroad Co. will probably be in operation in a month. The tracks are completed to Fifth Avenue and East Eighteenth Street. The roadbed will be completed before many weeks.
The Haywards road is being built and a power house is being constructed at the Warner tract.

Ogden, Utah.—Col. R. M. Spivey has been appointed General manager of the Ogden Electric Street Railway system to succeed H. C. Gilbert, resigned. Colonel Spivey has had wide experience in railway and street railway management and the street railway may be congratulated on his acquisition.

Oswego, N. Y.—At a meeting of the directors of the Oswego Street Railway Co., held lately by E. A. Van Horne was elected general manager, an increase of a thousand. Mr. Spivey is the new general manager.

Ottumwa, la.—The Steam Heat & Electric Light Co. and the Electric Railway Co. were consolidated last month into one, called the Ottumwa Electric Railway Co., which will have a capital stock issued of $200,000 to $600,000. Three members of the old street railway company, Messrs. Merrill,Mahon and Garnet have retired.

Paterson, N. J.—The electric system in Paterson began running regular service on December 14, on a line between headway Capitola and the corner of Main and Market Streets. There is now complete electric connection between the centres of Paterson and Passaic. This important line has been constructed by the Field Engineering Co. of New York.

Philadelphia, Pa.—It is virtually settled that the Thirteenth and Fifteenth Streets Railway is to become a part of the Traction company's system. The terms are said to include a rising scale of guaranteed dividends, beginning at ten dollars per share per year and increasing until the maximum of twelve dollars per share per year has been reached, after which they will remain.

The Traction company's declaration of their intention to parallel the lines of the People's Passenger Railway by running omnibuses on Broad Street and Gizard Avenue has taken tangible form in the application of the Chief Electric Railway Officer of the Bureau of the City to the Board of Street Railway Commissioners for licenses to run "buses" to be controlled by the Philadelphia Traction Co. The proposed route is on Broad Street from Germantown Avenue to the Avenue of the Goddess, and on Gizard Avenue from Belmont Avenue to East Norris Street. This action is regarded as a move to enable the Traction company to more easily secure control of the People's Line, on which it is said, the Traction company are trying to accomplish.

Pittsburgh, Pa.—The Pittsburgh & Birmingham Traction Co. have assumed control of the Pittsburgh & Knoxville Incline Pleasure Railway Co. The old electric and will at once commence the construction of the system of hill top street railways contemplated by the Knoxville company.

At Pittsburgh, Knoxville & St. Clair Electric Railway were lately sold at the suit of the receiver, to Murray, Vernon; for $2,500, subject to a mortgage of $60,000 and receiver's certificates amounting to $35,000. The terms of sale, besides the price of the road, $86,500, this was the first electric road built in Pittsburgh. It is said that it is the intention of the Birmingham Traction Co. to make use of a portion of these lines in completing the system of railways proposed for Allen-town, Knoxville and vicinity. That portion of the old road below Washington Avenue will be abandoned.

Rumors of a consolidation between the Duquesnes Traction Co. and the Pittsburgh & Birmingham Traction Co. have for a long time been current, but on December 17 the subject was submitted to the stockholders of both companies. The basis of the adjustment is said to be that the carrying of both systems in the same line and the bonded indebtedness paid from the common fund and the balance of the earnings divided on a ratio of fifty-five for the Pittsburgh company to forty-five for the Duquesne company. The agreement will be known as the E. W. Davis Traction Co. on the Fifth Avenue traction line, has tendered his resignation, to go into effect on January 1. It is understood that William Elinick, son of the president of the company, will take the place of Mr. Davis.

T-ins all night cars put on last month by the Duquesne company have been doing far more business than was expected of them. Nearly 200 passengers have been hauled every night thus far, but the officials think this will not continue, and as soon as the weather permits the patronage will settle down a little, but an average of even 100 passengers per night will pay all expenses.

At the recent fire which occurred at the barns of the Second Avenue Passenger Railway Co., of Pittsburgh, it was discovered, in making an investigation of the wreck, that the Westinghouse electric motors in the fire car were the fire engine and could have been used to save the injury and could have doubtless be put into service. The railway company since the fire have purchased from the Westinghouse company additional equipments to the value of $30,000, which were destroyed in the fire. The small horse cars belonging to this line, which at present are used on the Tenth Street bridge division, will be abandoned, and the line will be equipped electrically. Mr. J. C. Riley has recently been elected secretary of the Traction Co. by thestockholders.

The Citizens Traction Co., at the annual meeting of the stockholders, elected the following officers of directors: James Verner, John G. A. Stewart and John W. Johnson, president; John G. A. Stewart and John Gripp. The board re-elected the old officers. The comparative exhibit of passenger business of the road for the year ending December 14, on 40,000,000 miles is as follows: 1891, 12,408,969; 1890, 11,040,532; gain, 595,437.

Portland, Me.—It looks now as if Westbrook would be connected with Portland by an electric railway next summer. A proposition to this effect is before the city government.

Providence, R. I.—Several car bodies for the electric street railway have arrived from Newburyport, Mass. The cars are thirty-five feet long and of the standard width. The loss frames are of hard pine, the cross beams of ash every third. The opening of the road will occur January 1, if possible.

Rochester, N. Y.—Another $150,000 p. f. generator was received at the power house of the street railway company last month and is now in operation. At present there are in operation six electric cars running on all the lines of the city by the middle of the winter.

General Manager C. K. Minard has resigned.

The Charlotte Electric Railway Co. have voted to double the capacity of the track. The present plant located just this side of Charlotte, consists of one $250,000 engine and two eighty H. P. generators.

St. John, N. B.—Charles D. Jones, manager for the Eastern Electric Company, in this city, is now a general manager and a managing director of the St. John City Railway Co.

St. Joseph, Mo.—The barn of the Union Railway Co. was burned on November 30. Thirty cars equipped with electric motors were lost; the loss is $800,000, fully incurred.

St. Louis, Mo.—A new cable rope has been installed on the Broadway cable line from Pine Street north. The length is about nine miles. The cable taken out rendered good service, running 63,000 miles in little less than a year.

St. Paul, Minn.—The cars of the street railway company on West 7th Street burned to the ground last month. The barn had recently been used as a storehouse, and twenty-three disused cars stood in it. The loss is $25,000 on the building and $5,000 on contents fully insured.

St. Paul, Minn.—The Nautilus street railway has arrived the Essex electric road of Salem and Peabody. The roads will be continued as nominally separate corporations, but practically as one, and there will, no doubt, be important changes.

The managers of the two companies have appointed J. F. Hickey general manager of the two roads; James Learay, traffic manager (a new office) and John H. Bickford electrical engineer. The present division superintendents will be retained.

San Francisco, Cal.—At the annual meeting of the San Francisco & San Mateo Electric Railroad Co., Behrend Joost, C. C. Butler, Fabian Joost, J. W. Hartzell and W. F. Thomas were re-elected directors. The old officers were chosen. The secretary reported that twenty-one miles of single track had been constructed, beside power and car houses. He reported, also, that the road would probably be completed to the Holy Cross & Alcatraz. The monthly report, further, that the officers had filed the required notice that $50,000 had been expended on work within the time set by law, and the board accepted the report.

San Jose, Cal.—F. Chappellet states that the Patent moter may be used on the line between Haywards and San Jose.

Santa Cruz, Cal.—The Santa Cruz, Garfield Park & Capitola Electric Railway was opened November 25.

Spokane Falls, Wash.—The public is greatly divided over the question of whether it is to the best interests of Spokane to grant to the Spokane Street Railway Co. authority to haul freight cars over their various lines in this city. The franchise asked for simply gives the company the right to move freight cars during the night between 12 o'clock, midnight, and 6 a.m.

Springfield, Mass.—The Springfield Street Railway Co.'s stables were lately damaged by a fire which originated from a furnace which heated the flue of the engine house. The fire was reported on December 16 and extinguished on the following day. The flames spread rapidly, but all the electric cars on the ground were removed without loss. The damage to the building is estimated at $10,000, fire department.

Superior, Wis.—Three additional motor cars have been received by the street railway company. These make nine new cars in all received recently.

Toronto, Ont.—Engineer Cunningham has presented a very large and elaborate report on the system of electric street cars to be adopted in the city. He visited Buffalo, Cleveland, Pittsburgh, Allegheny, Washington, New York, Newark, Albany, Boston, Springfield, and other American cities and inspected the traction systems there. He reported a mass of information is given in the report, and the engineer concludes by recommending the adoption of the overhead trolley system to Toronto.

Vancouver, B. C.—The electric tramway to connect Vancouver and Westminster has been completed and the traffic is even greater than was expected. The electric tramway systems of Victoria and Vancouver have been very successful and considerably extended, and a third is finished in West End. Vancouver.

F. L. Damp, superintendent of the Vancouver Electric Railway, Light & Power Co. has resigned, and has taken a position with the Houston Electric Co. as district engineer, with headquarters at Portland, Ore.

Vicksburg, Miss.—The long fight between the city and the street railway has finally culminated in the execution of the former's plans to destroy the road's trolley system. The railroad company made no effort to stop the work by injunction, but, it is understood, will sue for damages in the United States Court.

Washington, D. C.—In a recent interview Senator McMillan of Michigan, chairman of the Senate Committee of the District of Columbia, expressed himself as opposed to the further extension of the overhead system in the City of Washington.
Windsor, Ont.—When the electric railway was being built in Windsor there was some friction between the Council and the company about the latter's paving, sidewalks, and pending a settlement the Mayor ordered work to be stopped, and arrested four men who were subsequently released on bail. These men now propose to have redress, and they have furnished the Mayor and the police force with the names of other officers that they will at once begin suit for false imprisonment. They want $5,000 damages.

Worcester, Mass.—The annual report of the Consolidated Street Railway of Worcester contains the following figures: Passengers carried, 657,100; round trips run, 17,000; receipts, $273,000; expenditures, $222,000; horses owned, 157; rolling stock forty-five box and forty-six open cars. T. Fairbrother has been appointed superintendent in place of J. B. Chapin, resigned.

Extensions and Improvements.

Atlanta, Ga.—The Atlanta Consolidated Street Railway Co. recently voted to build a two mile extension.

Boston, Mass.—The West End Street Railway Co. have been granted permission to extend the overhead system and lay double tracks on Mt. Auburn Street in Cambridge.

Chicago, Ill.—The Calumet Electric Street Railroad Co. propose to extend their lines on Michigan Avenue from Kensington Avenue 10th Street on 9th Street, thence north on Wentworth to 11th Street and east on 11th Street to Michigan Avenue. The company, it is stated, has secured contain the line of 90,000 ft. out of a total of 15,000 ft. The present line of the company is on Ninety-third Street.

Columbia, S. C. — A bill has been introduced to authorize the conversion of the Columbia, Electric Street & Suburban Railway Co. into Electric Power Co., and the Congaree Gas & Electric Co., under the name of "The Columbia Electric Street Railway Light & Power Co."

Columbus, O.—The Columbus Consolidated Street Railroad Co. have been making arrangements to largely increase their steam plant in the near future.

Corsicana, Tex.—The Corsicana Street Railway will probably be electrified.

Dallas, Tex.—It is reported that the entire property of the Dallas Cable Railway has been purchased by a syndicate which will immediately commence work with the object of placing it in operation.

Tig Dallas & Oak Cliff Dummy Co. propose equipping their lines with electric traction.

Detroit, Mich.—An application has been made by Capt. W. H. Stevens and Frank E. Snow for a street railway franchise over Atwater, Griswold and Shelby Streets and Michigan, Woodward, and other avenues to Pallister Road.

Du Bois, Pa.—The street railway company intent to extend their line to Falls Creek next year and equip with electricity.

Dubuque, la.—It is reported that storage batteries will be abandoned on the Rhombert line in the spring, and that overhead wires will be adopted.

Gadsden, Ala.—The Gadsden & Attalla dummy line will probably be electrified.

Harrisburgh, Pa.—The East Harrisburgh Passenger Railway Co. are pushing their road to Steetlton.

Hartford, Conn.—The Hartford & Wethersfield Horse Railroad Co., according to reports of the Connecticut Co., will run trolley cars they are the City Hall and the East Hartford bridge. The road bed and overhead system are all ready for the new cars.

Malden, Mass.—The East Middles Street Railway Co. have petitioned for location of double track on Main, Salem, Ferry and other streets.

Marlboro, Mass.—The Marlboro Street Railway Co. have asked for permission to extend their road to Hudson and Westboro.

Milwaukee, Wis.—A number of important extensions of the street railway system here are proposed.

Muskegon, Mich.—Great improvements are to be made by the Muskegon as they are to increase their line by the addition of a 250 H. P. engine, and a new dynamo. They contemplate extending the line to North Muskegon and making a loop line on the Lake Street. They will probably extend to Muskegon Heights to Mona Lake, providing the owners of the property there will convert it into a park.

New Berne, N. C.—It is said that the Electric Street Railway Co. have been granted permission from both ends of the Company's road to run trolley cars they are to lay tracks in South Fourteenth Street, connecting the lines of the Rapid Transit and Orange systems. It was stipulated that the poles should be ornamental iron ones, and that temporary wooden poles may be used between Central and Ninth Avenues until the latter thoroughfare is graded.

The extension of the Rapid Transit railroad's electric power house is nearly completed, under the direction of Architect Albert Phillips, and 1,000 H. P. will soon be available for electric railroad service. This will double the capacity. The Orange extension of the line is about completed.

Norwich, Conn.—At a recent meeting of the stockholders and directors of the Norwich Street Railway Co. it was voted to introduce electric rapid transit on their lines immediately after obtaining the consent of the Common Council. The company intend to lease the Norwich Electric Light Co., if possible, or failing in that to set up their own plant.

Oakland, Cal.—The work of changing the Telegraph Avenue horse line into an electric road will probably be begun by the first of this year. The Oakland & Berkeley Rapid Transit Co. are now building a branch from Fortieth and Garcia Streets to Mountain View. They will be two miles long, with a double track. They also are building the road across the Sixteenth Street marsh. They will build from Wood Street across Fifth to Grove and from Grove to Fourteenth Street as soon as they get a franchise from the City Council, which has been applied for, will extend the road from Second and Broadway along Second Street to the Market.

Petersboro, Ont.—The charter for the new electric road in this city, for which there are two companies applying, includes a stipulation that the company applying and obtaining it shall provide and keep in repair eighteen inches of roadway on either side of the track with stone pavement.

Ottawa, Ont.—Messrs. Asnen and Soper, managers and principal owners of the railway, have recently purchased the controlling interest in the old horse car company, will make application for an amendment to the charter to enable them to equip the line with electricity.

Portland, Ore.—The Portland & Fairview Railway Co. have been granted a franchise to lay down and operate a street railway on the road forming a portion of the eastern boundary of the city.

Tin, City & Suburban Railway Co. have been authorized to construct and operate a double track road on Morrison Street from Front to Fifteenth.

A contract has been made between the City & Suburban Railway Co. and the promoters of the Portland & Fairhaven system, by which the former company have bound themselves to build a line on G Street, from Fifth to Twenty-eighth, thence to Rosenthal's place, northeast of Multnomah.

Richmond, Va.—A petition from the Richmond Railway & Electric Co. asking permission to extend their road from Twenty-first and Broad Streets along Broad to Twenty-fourth Street to connect at both ends with the present track, has been presented to the Council.

Sacramento, Cal.—The Central Railway Co., which has purchased the lines of the City Railway Co., propose to commence immediately to equip all the lines with the electric system.

Saginaw, Mich.—The Saginaw Union Street Railway Co., are having prepared plans for a new power house to be erected this winter at some convenient point on the river front and which, with engines, boilers and buildings, will cost about $24,000. It will be provided with four 150 H. P. engines, three Babcock boilers, and an additional 150 H. P. dynamo.

St. Cloud, Minn.—The Board of County Commissioners has granted the right of way to the street railway company for laying a track along the county road to the Great Northern shops. Work will be commenced at once.

St. Joseph, Mo.—The Board of Street Railway Co. are making some important improvements in their rolling stock.

Seattle, Wash.—The Board of Trustees of the South Seattle Electric Railway Co. have let the contract for the furnishing of electric cars and other fittings to the Northwest Thomson-Houston Electric Railway Co. The present line down Commercial Street from King Street to South Seattle, a distance of two and a half miles, is to be changed from a steam motor into an electric line, and is to be extended up Commercial to Main Street. It was proposed to have the work completed by the beginning of this month (January).

Tacoma, Wash.—Three largely signed petitions have been circulated in the Fourth ward asking the Tacoma Street Railway & Motor Co. to extend their line to Wright Avenue.

New Roads.

Alexandria, Va.—The officers of the newly organized Alexandria & Fairfax Passenger Railway are D. E. Leech, president, W. S. Speer, secretary and treasurer. The president is a New York capital stockholder. J. E. Swartz, of Philadelphia, president of the Red Star steamship line, is also interested.

Aspen, Colo.—J. R. Pemberton of Detroit and T. J. Flynn of this place, are organizing a street railway company.

Baltimore, N. Y.—The New York street railway company have been incorporated. The road is to run from the foot of Fulton Street, East river, to the town of Newtown, to be two miles long and have a double track. The capital stock is $500,000. The directors include Edward M. Tyrrell of Brooklyn, Michael E. Conway, James Robinson and James E. Williams of Long Island City, and John J. Delaney of College Point.

Benton Harbor, Mich.—F. S. Hopkins has presented an ordinance asking for a franchise for the Benton Harbor Street Railway Co.
January 1892.

The Street Railway Journal.

Brantford, Ont.—A proposition entailing an outlay of $60,000 has been submitted to the Brantford Council for the establishment of a system of electric trams. The estimated cost of equipping the city for electric taxation for ten years and a franchise for thirty years, with the option of purchase by the city at the end of that time.

Brooklyn, Md.—Curtis Bay will have an electric road in operation on April 1. Power and car building are nearly completed, and a 300 horse gas plant will be in the power house, which will be 500x50 ft. while the car house will be built of iron 60x60 ft. The road is to be built near Acton's Park.

Brooklyn, N. Y.—Consents are being secured from property owners in Bedford Avenue by Henry B. Buckhout and Frederick R. Conomson for the extension of the street railway under the name of the Bedford Avenue & Flatbush Railroad Co.

Bucyrus, O.—The Crawford County Commissioners have granted a franchise to a company to construct an electric railway between Bucyrus and Galion. The work is to begin at once. C. W. Fisher is president.

Burlington, Vt.—The Vermont Electric Co. propose to construct an electric railway through the city from Winsocki to the Old Logging Road. The company will use the water power at the "gorge" near the twin bridges, and will furnish electric power to stationary electric motors. Four cars will be installed at first.

Chicago, Ill.—The Chicago and West Ridge & Waukegan Electric Railway Co. have been incorporated to operate an electric street railway from Chicago to Waukegan and the section line, capital stock $15,000; incorporators Louis, Pomeroy, and Gallon. The work is to begin at once.

Columbus, Miss.—The City Council have granted a charter to a stock company to build a street railway. The latter agree to have everything in working order by April 1.

Columbus, O.—The directors of the new Worthington, Clintonville & Columbus Street Railway Co. have elected O. W. Aldrich, president; P. F. Teller, vice-president; R. M. Weaver, secretary; H. C. Cooke, treasurer. The capital stock is $50,000.

Council Bluffs, Ia.—The Council Bluffs Transit Co. have been granted permission to install an electric line to the Chataqua grounds.

Delaware, O.—The council have awarded the bid for an electric railway to link up the villages of this city to J. K. Newcomer, and have authorized the construction of a street railway.

Des Moines, Ia.—The Des Moines Water & Electric Co. have been incorporated with a capital stock of $2,500,000, and the incorporators Lowry W. Goode, Fred D. Goode, and C. K. Mead.

East St. Louis, Ill.—The Venice Transportation Co., East St. Louis, with a capital of $100,000, have been incorporated.

Florence, Neb.—The Omaha & Florence Street Railway Co. have filed articles of incorporation. Authorized capital $200,000. The incorporators are H. G. Clark, E. H. Walker, R. H. Olmstead, Frank E. McCarty, and F. M. Smith.

Fort Wayne, Ind.—The Indiana & Fort Wayne Street Railway Co. have filed articles of incorporation. Authorized capital $200,000. The incorporators are H. G. Clark, E. H. Walker, R. H. Olmstead, Frank E. McCarty, and F. M. Smith.

Fort Worth, Ind.—The Indiana & Fort Wayne Street Railway Co. have filed articles of incorporation. Authorized capital $200,000. The incorporators are H. G. Clark, E. H. Walker, R. H. Olmstead, Frank E. McCarty, and F. M. Smith.

Fosteria, O.—Certain portions in Findlay and Fosteria are quietly pushing a scheme to connect the villages by an electric street railway. The distance is only sixteen miles and the idea is feasible.

Galveston, Tex.—The South Texas Construction Co. propose the electrification of the street railway.

Grand Rapids, Mich.—The Grand Rapids Electric Street Railway Co. have asked for permission to construct an electric railway in Spring, Louis, Campau, Fulton and Waterloo Streets, and Godfrey, City, Tupper & Butler Avenues.

Hamilton, Ont.—C. J. Myer, one of the lessees of the Hamilton & Dundas Street Railway, is forming a company to build an electric railway outside of the city limits. The road will be twenty-two miles in length and will cost $75,000—$85,000 has already been subscribed, and as soon as a charter is obtained the road will be constructed.

Haverhill, Mass.—Charles Goss, L. J. Marston, N. Y. Ellis and others have incorporated the Haverhill & Amesbury Street Railway Co., with authority to construct and maintain a surface railway with electricity or other approved motive power.

Jacksonville, Ill.—The Jacksonville & Suburban Street Railway Co., with a capital stock of $15,000 have been incorporated to operate a railway by animal, steam or electric power; incorporators, William S. Hook, Marcus Hook, Francis Hook.

Lancaster, Mass.—The incorporation of the Lancaster & Warren Electric Railway Co., with authority to construct and operate a surface railway between said cities.

Lynchburg, Va.—A charter for an electric road has been requested by Peter J. Otey, C. M. Blackford, W. H. Dulaney and others.

Marion, Ind.—D. Babat, Jr., has accepted the street railway franchise granted by the City Council. This assures the building of Marion's street railway.

Niagara Falls, Ont.—The commissioners of the Queen Victoria Street Railway Co., have accepted the franchise, and with the syndicate who propose building the electric railway along the bank of the Niagara River, this line will in time run from Niagara, on the lake, to Fort Erie, but for the present work will be done only on the section between Chippewa and Queenstown. The syndicate, it is said, gives a bonus of $10,000 and agrees to pay a rental of $10,000 a year. Surveyors are now mapping and staking out the route.

Ottumwa, Iowa.—The directors of the Ottumwa Electric Railway Co. have been elected W. H. K. Butler, J. R. Oller, and H. M. Reimann. The latter agrees to have everything in working order by April 1.

Ourai, Cal.—Articles of incorporation have been filed with the Secretary of State for the Ouray & Frankton Electric Railroad, Light & Power Co., and the directors have elected Mr. N. W. Wilson, of Denver, Charles Munn of Ouray, J. H. Casson of Phillip Smith, and W. A. Wallace of Clearfield, Pa. The capital is $500,000. It is said that the construction of the road will be pushed at once. Should the incorporation be made, it will be one of the most marvelous pieces of railroad building in the country.

Philadelphia, Pa.—The Quaker City Elevated Railroad Co. have been incorporated to construct an electric railway on the line of the Lehigh and Leland Avenue. Length of line, twelve miles; capital stock, $150,000. Among the directors are Edwin Mechever, J. W. Kucker and William B. Stout, all of Philadelphia.

Pittsburgh, Pa.—The stockholders of the proposed Grandview Electric Railway on Mt. Washington & Duquesne Highlands lately elected directors, who chose the following officers of the road: President, W. B. Lupton; secretary, F. W. Gordon; treasurer, W. W. Bowen. About $20,000 of stock has been subscribed for and steps will be taken at once to get a charter.

Portsmouth, Va.—The Portsmouth Electric Railway Co. have applied for a charter, with Virginia Butt, A. J. Phillips, Edward Mahoney and others as incorporators. The capital stock is to be not less than $50,000 nor more than $500,000. The Petersburg Street Railway Co., with a capital of $100,000, has been incorporated by George Beadle, Alexander Hamilton, Augustus Wright, and Walter S. Phillips.

San Augustine, Fla.—The bond to guarantee the construction of the street railway here will be filed with the mayor of Ridge Avenue, near the Board of Trade, and the Mayor of (?). The bond will be $75,000.

San Francisco, Cal.—At the meeting of the Board of Supervisors lately an order was finally passed granting Irwin C. Stump, P. N. Lillienthal, Abner Doble, W. R. Hest, William Hollis and others a franchise to build and maintain a street railway from Mission and Sixth Streets, down Sixth to Brannan, along Brannan to Eighth, along
Eighty to and across Channel and Townsend, and so on along various thoroughfares to Railroad Avenue and Sixteenth Street in South San Francisco.

Electric Railway Development Co., of San Francisco have been incorporated with a capital stock of $50,000. Directors: Dr. De Witt, Clinton Moore, George Dunlap, J. W. Dunlap, William M. Fitzmaurice and Ira V. Hitchcock.

The San Francisco & Eastern Railway Co. have been incorporated for the purpose of operating a steam or electric railway from Alameda through San Jose to San Diego, a distance of 350 miles. The capital stock is $14,000,000. J. R. Howell is the principal stockholder.

Stanodsky, O.—An application for permission to build an electric street railroad from Soldiers’ Home in Stanodsky to Milan was presented to the Erie County Commissioners last month. The application is of the same character as that of Mr. George Barney, W. H. Gilcher, J. C. Gilchrist, G. D. DeWitt and others.

Shanandoah, Pa.—The work of building the Mahanoy City, Shanandoah, Girranville & Ashland Electric Railway has been commenced. This line will be about eighteen miles in length and will connect the four towns. The contract for the building of the power house foundation has been awarded to August Kuding of Mahanoy City.

Staten Island, N. Y.—The Port Richmond & prohibition Park Electric Railroad Co., have been incorporated, with a capital of $60,000, for constructing a surface road about two miles in length. The largest stockholders are E. D. Clark of New Brighton and Isaac K. Ketchum of New York.

Steelton, Pa.—An electric street railway from Steelton to Middletown is now an assured thing. All the necessary stock has been subscribed for and the legislation closed for the second hour of way over the line. Application for a charter will be made at once, and the work of constructing the road commenced as soon as possible. The road is expected to be completed by April 1, 1892.

Velasco, Tex.—An electric railroad will be built here by the Velasco & Surf Side Railway Co....

Equipment Notes.

J. F. Barry & Co., of New York, have recently been appointed constructing engineers of the Atlantic Avenue Street Railway Co., Brooklyn, N. Y.

S. A. Day of New York has issued a circular to the public stating that Mr. W. H. Eckert has been appointed general agent for the sale of the insulating cables.

The Newburyport Car Manufacturing Co., of Newburyport, Mass., have just finished five electric snow plows for Worcester, Mass., and three for Lawrence, Mass. Mr. James F. Shaw of this company has invented a self-lubricating trolley wheel, which is said to have a great many desirable features.

Chas. A. Schieren & Co., of New York, have recently shipped to the Franklin Electric Co., of Franklin, Pa., a twenty inch, perforated, electric, double ply leather belt. This order is a strong endorsement of the results attainable by the Schieren belts since the Franklin company have already a number of perforated electric belts in their works.

The Lewis & Fowler Manufacturing Co., of Brooklyn, have moved into their new building at 23 Walworth Street. The offices of the company are on the second floor and the building is admirably commodious as well as very inviting. Arrangements seem to have been made for every department of this extensive company, and each person has been provided for. A view of the works of the Lewis & Fowler Company can be obtained from the rear windows of the new building.

The American Electrical Works of Providence, have sent to their many customers and friends a memento of the holiday season, consisting of an illuminated card, to which is attached a fine twig and minute cornucopia. Upon the card is printed the following message, "Xmas '91. We deeply regret that it is impossible for our many customers to be present with us at our Christmas festivities, but remembering that they are only being held on our Christmastree." The Lee Composite Manufacturing Co. of New York are doing an excellent business in the sale of their products for railway use. The requirements for the street railway and the second and third class buildings and embankments of railway buildings, have long been the aim of roofing experts. Acids and gases are constantly at work from the undersides, while the atmosphere is constantly changing with the difficulties and accidents of the construction, however, seem to be fully met in the permanent brand of the composite manufactured by the Lee Composite Co. for this special purpose.

The Jewel Belt Co., of Hartford, Conn., have received the order for a sixty inch double belt and four sixteen inch double dynamo belts for the new 500 horse power Rapid Transit Co. of New York. N. Y. also ordered for forty eight inch, three ply belts for electric work. Their factory is very busy in the department for driving belts, and the following is a list of belting in process of construction:

- 310 ft. of twenty-four inch double, 620 ft. of thirty inch double, 395 ft. of thirty-two inch double, 110 ft. of forty-three inch, and seventy feet of twenty-six inch triple.

The Perfection Oil Purifier Co., of New York, have a purifier which is pushing to the front and they are consequently doing a thriving business. The simplicity of their device is attracting the attention of users of oil and commending itself as a most practical solution of the problem of purifying and storing oil. They say that they will not convince any doubts. Among their latest sales are purifiers to the Richmond Railway & Electric Co., Richmond, Va.; Allegheny County Electric Light Co., Pittsburg, Pa.; and the Schenectady, N. Y.; New York Life Insurance Co., New York; Post-office, Chicago, and others.

Joe Stephenson Co., Ltd., have in their extensive factory cars for all parts of the world. Among the shipments soon to be made are some cars for Mexico and Venezuela. The electric cars which this company are at work upon are a number for the Second Avenue Electric of Pittsburgh, for which there was awarded November 21, and the first installment of five cars is scheduled for the second following month. Among the cable cars in the works of the Stephenson company are those for the Washington & Georgetown Railway Co. This order is for seventy grip cars, and one partly built shows that it will contain six benches, and will present a handsome and substantial appearance.

The Watts-Campbell Co., of Newark, N. J., have recently closed a contract with the William Clark Co., spool thread manufacturers of Pawtucket, Conn., for a pair of twin, tandem, compound engines with cylinders 22½ by 100. These engines are capable of developing 1,200 h. p. The fly-wheel is twenty-six inches in diameter, 101 ft. in. face, and is faced for four belts. The Watts-Campbell engines are also building three tandem compound engines of 300 h. p. each for the Lynn & Boston Railway Co., and three tandem of the same dimensions for the A. & E. Sugarloaf Railway Co., Knightsbridge, Mass., and two for the Trenton Electric Railway Co., of Trenton, N. J. The engines of this company are attracting much attention in the street railway line.

The Reliable Manufacturing Co., 33 State Street, Boston, have completed their large factory in Everett, Mass., and are now ready to fill all orders promptly for their celebrated Reliable sand box, which is claimed to be superior in quality as well as price on the market. It has been adopted by many of the leading car builders and street railway companies in the country, and is rightly named, for it is reliable and can be depended upon to do the work required speedily and well.

The Wightman Electric Co. of Scranton, Pa., have made a most satisfactory record in electric railway work during the past year, and report from the railroadmen that the electric railways have a very flattering character. During 1891 the Wightman Company have taken contracts for a large number of car equipments for roads in Scranton, Wilkes-Barre, Scranton, and Altoona, Pa., and also contracts for the use of electric equipment in Seattle, Wash., Y., and two for the Trenton Electric Railway Co., of Trenton, N. J. The engines of this company are attracting much attention in the street railway line.

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The Stillman Light Railway Development Co., of Providence, has paid the whole of its bond interest for the present year and some twothirds of the bond principal. We understand that the stillman company is in the immediate preparation of a large additional stock offering. The Stillman Light Railway Development Co., of Providence, has paid the whole of its bond interest for the present year and some twothirds of the bond principal. We understand that the stillman company is in the immediate preparation of a large additional stock offering.

H. W. Leonard & Co. are licensing various manufacturing and construction concerns under Mr. Leonard’s recently patented system of motor regulation. The basis of the license is a charge of $2.50 per horse power (roughly per horse power) in the motor. The license is not an annual charge, but is paid once for all in each case. Wm. Sellers & Co. have taken license under Mr. Leonard’s patent on this basis, agreeing to use the method upon all electric cars they build in the future, during the life of the patent. The royalty is so small that the method will, no doubt, be rapidly introduced wherever it is applied. H. W. Leonard & Co. have secured the contract for wiring the Mail & Express building for 5,000 incandescent lamps, acting as sub-contractors under the Wadell-East Electric Co. They have also received an order from the United States government for forty ii. p. motors for use upon traveling cars. The motors are to be supplied under rigid specifications, as to dimensions and performances.

The Ball Engine Co. of Erie, Pa., include the following in a list of their late shipments: Lawrence Gas & Electric Light Co., New Castle, Pa., one 150 h. p. single cylinder and one fifty h. p.; Citizens Electric Light Co., Braddock, Pa., one 150 h. p. single cylinder; Huntington Electric Light Co., New London, Conn., two 300 h. p. compound, Pittsburgh & Birmingham Traction Co., Pittsburgh, Pa., one fifty h. p. single cylinder; Calif. Electric Light Co., San Francisco,
January 1892.

The Street Railway Journal

55

The Union New West, Xenia, the r. H. W. Johnhs Manufacturing Co.'s new factory. South Brooklyn, two 125 ft. horizontal, steel single-return tubular boilers; Phillip Daly's Power Plant, New York, a complete plant of sixty-five ft. Duncil Electric Light Co., Bound Brook, N. J., complete plant of thirty-five ft. Mr. Luther C. White, Waterbury, Conn., one 80 ft. single-return boiler; New York, W. & H. Ideal engine; Mr. Jacob Rothchild, New York, one 35 ft. Ideal; Hotel "Endicott," New York, two 100 ft. Ideal engines. All of these contracts for engines were made with most rigid guarantees that the engines would run noislessly and without vibrations. These people are making a specialty of this class of work, appreciating how important it is, and they should be no more or vibration whatever in plants for hotel and apartment house service.

The Page Belting Co. of Concord, N. H., with stores in New York, Boston, Chicago and San Francisco, are moving on with their business. We understand from a recent communication that among the large belts which they have recently shipped is one to Richmond, one to Madison, Me., and one to the nail electric light company in Minnesota. Among the several companies to which they have shipped during the past month, have been the following; the Chattanooga Electric Railway Co., Chattanooga, Tenn., 100 ft. Duncil Electric Light Co., South Dayton, Ohio; People's Street Railway Co., Scranton, Pa. In the export business they have shipped to Havana, Russia, Brazil and Caraccas. Of their Eureka dynamos we will mention one recently shipped to the Belting Co. of Chicago, which they have shipped among others to the following electric companies: Austin Water, Light & Power Co., Austin, Tex.; Xenia Electric Light Co., Xenia, O. D.; Monroe Electric Light Co., Monroe, Mich.; End Street Car Co., San Antonio, Tex.; Home Electric Light & Steam Heating Co., Tyrone, Pa.; Shamokin Street Railway Co., Shamokin, Pa.; Buffalo Electric Light Co., Buffalo, N. Y.

The Thomson-Houston Electric Co. of Boston, have a business which never seems to grow old, but is constantly increasing. Their railway supply department is now thoroughly established and meeting with great success, and is prepared to furnish supplies of every description for electric line, street car, engine and power stations. A number of railway companies have already manifested their appreciation of this new department, and express themselves as highly gratified at being able to obtain any particular device promptly forwarded upon receipt of an order. The company have ample facilities for manufacturing the supplies they furnish, and many of the devices they furnish to railway workshops in railway workshops in the United States and Canada, present the latest inventions and improvements in their particular line. The large stock room which was secured for the supply department a few years ago, is found to be completely too small. Among the latest additons to the line of supplies is a steel gong or bell for cars, which the company guarantee to replace whenever and wherever it is to be found. This addition to the line of supplies is a combination with electrical work, and whose experience in street railway construction and operation renders him eminently fitted for the position, is a manufacturer, and is surrounded by a force of energetic and competent assistants.

The Berlin Iron Bridge Co., of East Berlin, Conn., have recently closed a contract with the Dry Dock Engine Co., of Detroit, Mich., for a new fire-proof modern machine shop to enable them to build the largest engines with the least expense and the quickest possible time. The machine shop when complete will be one of the finest on the great lakes and will compare favorably with any in the country. The plant will have modern appliances, such as electric cranes, two of twenty tons capacity running the whole length of the building, new machinery, electric cranes, engine, all of which will be set up on the site and overlapping the present quarters which will be torn down. The main portion of the building will be 200 ft. long, thirty-seven feet wide and five in height, and electric cranes running the whole length with thirty-eight feet of clearance. The upper windows will be placed along the sides giving abundance of light, and skylights with foot of clear glass will run along the roof. Three galleries, twenty-eight feet wide, with the opposite side of glass, extending its entire length. The first two will be occupied by light machinery benches, and the top gallery will be arranged for the storage of smaller tools and machinery. There will be a total of 280 horse power. Two-thirds of it will be erected in eight weeks and completed in ten. The remaining will be completed as soon thereafter as the old shop can be torn down.

The Engineering Equipment Co., of New York, report some recent sales of Habirah wire aggregating 59,000 ft. showing that their sales are catching up with that of the manufacturers. This is probably due to the fact that they are selling at manufacturer's prices. In the line of span and guard wire they have sold up to December 18, the enormous quantity of 310,520 ft. to important railways now being constructed. They have also recently shipped nearly 60,000 ft. of hard fife pipe, the sale of which they control, to points in New York, Pennsylvania and Tennessee. There are over 350,000 ft. of this pipe laid in Philadelphia, Buffalo and Detroit.

Among their customers in this line they number the New York Central & Hudson River Railroad Co. who use it to carry their signal wires.

The Electric Equipment Co., of Philadelphia, announce that they have sold conclusively that every foot of the pipe now laid is giving full satisfaction. Some of this pipe has been down three years. Recent shipments from this company are some 150 ft. of "Atma" insulators; 120 "Boston" trolleys, complete; of Anderson pull-offs, 530; terminals, 405; tree insulators, 925; kanges, 1,935; also 1,000 of various kinds of insulators, most of which are specialties. All of the above were additional to direct factory orders. Besides these shipments the Engineering Equipment Co. report the acceptance of orders for 350 111 clippers, 1,900 50 ft. trolley poles, 500 bond clamps, 625 trolley cars, 150 curve insulators, 420 trolley belts, etc. The electric railway specialties of this company are peculiarly valuable and they will not knowingly commend nor sell cheap materials.

Western Notes.

The Knapp Electrical Works of Chicago, are receiving substantial orders from railway companies for feeder wire and general supplies.

The Illinois Steel Co., at their South Chicago works, produced during December, one ton of steel rails, which is stated to be the largest output for a month in the history of the plant.

The Electrical Supply Co., of Chicago, are now making their own baked pintoins and 120 ft. of this wire, the operation has been made in the price of the Boston trolley and its parts, so that it does not now cost materially more than other trolleys.

The Paton Motor Car is operating successfully at Pullman, Ill. Thousands, hundreds, general orders are on hand for the three new cars will soon be built. They will be differnt in design from that of the present car, but no changes in mechanism will be made.

The Western Electric Co. of Chicago, have orders for 200 line for the Toledo Consolidated Electric Railway, amounting to several thousand dollars for electrical equipment for two cars now being operated upon the lines in Toledo. The motor is gearless and of the Eckeemeyer type. The armature is a drum with seventy-four coils. The cars will be thoroughly tested on the Toledo system before additional motors are made by the Western Electric Co.

A. G. Hathaway, of Cleveland, O., manufacturer of the Hathaway patent transfer table, turn-table, etc., sends us word that among his latest contracts is one with the Riverside Worsted Mills, of Olney, Pa., for 220 ft. of rails, which is the largest order of this kind he has received. His wheel press, described in another column of this issue is also being with a wide demand. The Hathaway appliances are now generally recognized as standard and essential parts of most street railway equipments.

The Shults Belting Co., of St. Louis, number among their recent sales two woven leather link belts to the Citizens' Electric Railway Co., of Decatur, Ill., one forty-eight inch, double belt to the Municipal Electric Light & Power Co., of St. Louis, who installed a similar belt nineteen months ago, and two double belts, one thirty-five and 175 ft. long, and one of 12 ft. and 210 ft. long, at Clinton, Mass. They have also supplied a number of other prominent manufacturing companies with belting recently.

The Columbia Incandescent Lamp Co., of St. Louis, seem certain that their manufacture of incandescent lamps for railway use, if the many orders which they have on hand is any indication of the satisfaction which it gives in practice. This company are at their factory now engaged in working thirty days in order to supply the large demand for the lamp, although they have not a single traveling agent engaged in soliciting orders.

The special claims made by this lamp company for their lamp are long life, combined with high efficiency and full candle power.

The Detroit Electrical Works of Detroit, Mich., have closed a contract for five additional thirty ft. t. p. equipments with the People's Electric Railway Co. of Springfield, Ill. This road was equipped by them in the spring of 1891 with ten 30 t. p. motors; two additional equipments being purchased later. The present order makes a total of fifteen motors for this road alone. The additional orders for the Detroit Electrical Works is with the Kokomo Electric Railway Co., and is for five cars and one 50 Kilo-watt generator of the type which has been furnished them service at Nashville, Tenn.; Gloucester, Mass., and South Chicago, Ill.

The American Car Co. of St. Louis, only recently established, is already making rapid progress. Their works, which are very large and complete, are thoroughly equipped with the most improved machinery and all modern appliances for handling a large business. This American company is at present busy on an order of 180 cable car bodies for the Washington Street line in Washington, D. C., and their second order of thirty cars for the West Division Street Railway, of Chicago. This company report the outlook for the present year very promising, and are already in receipt of orders from their railway friends. Mr. Wm. Sutton is president and Mr. Emil Alexander secretary. We wish them every success.

The Electric Bell Wire Co., of Chicago, is as usual, busy with their many orders. Good words spoken for a number of their specialties are coming in from many roads. Brand's steel wire track broum holders, Wardell's track broum holders, Pratt's portable fare registers, and Burton electric heaters, are meeting with large sales. The latter have been placed upon electric roads in the following places the past month: Ottumwa, Iowa; Reading, Pa.; McKeesport,
THE WARRENSBURG J., secretary, very thoroughly requesting tube. Orders Newburyport orders be office, will tus. Rock has ordinary line in vestibule proved as improving requested well inside Sioux of installation Baltimore are their coaches. These cars are owned equipment. The Conduit Street, Conduit service, by Mr. W. R. Mason, president of the company, in the management of its affairs.

A Company Goes Into Liquidation.

The Astoria Electrical Manufacturing Co., of Chicago, has now completed the arrangements of their new offices at 14 Adams Street, which is pleasantly in every respect than the old quarters, having more room, and better ventilation. The old location is still habitually utilized for the storage and shipping of the light stock. A full line also of all their well known electric railway supplies is exhibited upon the ground floor. This company has received a letter from the Allentown & Bethlehem Rapid Transit Co., of Allentown, P.A., requesting the shipment of eight more heaters with switches, and stating the heating company has been very popular with their light stock. Orders have also been received from the Benson & Haegar Co., of Chicago, for six sets of Electric Railway Engines, for the Louisville & Nashville Electric Railway Co., of Louisville, Ky.; the company improving their work and adding to their facilities, adding an unusually large amount of work during 1892, which are in the highest grade of quality.

The Pullman Palace Car Co., of Pullman, Ill., one of their street railway orders is for twenty cars for the City & Suburban Railway Co. of Portland, Ore. These cars will be delivered in sixty or seventy days. The Pullman company are now finishing one of their new double deck, centre vestibule cars for the City Traction Co. of Philadelphia. This style of cars has become very popular with street car companies. The one tried on the West End Railway of Boston has proved in every respect satisfactorily that the railway company are things. A large number of these cars have been received from the Pullman company for the supply of 100 of these cars. The Pullman company will also furnish six more identical car engines for the Electric Railway Co., of Boston, which will be finished in mahogany. The car which was built for the Judson Pneumatic Co. is now in operation at Pullman. The works are turning out the greatest number of cars of any type in the East. The annual demand was 4,000 freight cars and 100 passenger coaches for the Philadelphia & Reading road. When these are completed the Pullman company will furnish the remainder of the cars for the company, the remaining coach cars are to be built for the C., B., & Q., and the same number for the Rock Island road. For the Chicago & Eastern Illinois twenty-five coaches, they are built as follows:

The Central Electric Co., of Chicago, have just taken orders for Illinois, Missouri, Nebraska and Indiana for the Interior Conduit & Insulation Co., and will carry in stock at Chicago, the Ste. Louis, Kansas City, St. Paul, Kansas, and Pittsburg, with sufficient capacity to meet the business. This is a very important agency, and the Central Electric Co. can be congratulated in securing it. Since taking the agency the company have secured an order for 50,000 ft. of one size of tube. Since undertaking the handling of electrical supplies, the Central Electric Co. report a very considerable increase in this department of their very large general electrical supply business. Electric railway men are coming to understand that they cannot get good articles, and that it is important to have a stock, enabling them to make shipments promptly. The Central Electric Co. are headquarters for a number of first-class specialties, among which are the best of all milling machines, high-quality insulators, special Canoe feed wire, trolley bangers, etc., etc. Occupying a building of some 20,000 sq. ft. area, not one foot of which can be spared on the ground floor for Stock, these are designed for both high and low tension systems. They give long life and are perfectly straight and uniform. Shipments will be made from the Central Electric Co.'s stock, until the factory opens.

A New Company.

The Wheeler Condenser & Engineering Co. have recently filed articles of incorporation with the Secretary of State, at Trenton, N. J. The company have bought out the entire plant and business of the Colwell Iron Works, at Catert, N. J., which is one of the largest concerns in this country manufacturing vacuum pans, and special machinery for sugar refineries, salt works, condensed milk factories, etc.

Annual Meeting of The Burton Electric Co.

At a meeting of the Board of Directors of the Burton Electric Co. held December 15, at Richmond, Va., it was stated that W. R. Mason of Chicago had become president of the company over 1,000 men and 15,000 heaters had been shipped for the season. These, it is conceded, were at that time using the heater, though at present the number is over 1,000. The resolution was unanimously adopted expressing their entire appreciation and satisfaction of the zeal manifested by Mr. W. R. Mason, president of the company, in the management of its affairs.

The Astoria Electrical Manufacturing Co.

The Astoria Electrical Manufacturing Co., has been organized with a capital of $500,000 for the manufacture of electrical machinery and apparatus. It is capitalized for the sale of steam engines and boilers. The company have secured the ownership of the various patents upon improvements in electrical railway motors which have been granted to Mr. W. M. McDougall, and Mr. W. M. McDougall of Chicago, has the franchise for the present to his interests in Bristol, Tenn., which consists of the Bristol Belt Line Railway, and the Bristol & East Tennessee Railroad, in both of which he owns a controlling interest. The company advise us they that retire from business with every debt and a good balance to be distributed as a dividend to the stockholders.

A Chapter on Raw Hide.

It is a fair presumption that since gearing was first employed a desire has existed and efforts have been made to secure for it the important combination of noiselessness and durability. That this has at last been accomplished by the raw hide gearing is shown by the testimony published by the New York Evening Journal. Many witnesses, including eminent engineers, machinists and many street railway companies.

The term rattle and ratchet of metal gearing used on many electric motor cars is accountable for a great part of the hostility to the extension of old and the building of new lines, and was one of the points on which the most vigorous opposition rested. These rails, Raw Hide Co. claim to have, and that their gears and pinions have been doing active service on motor cars and in machine shops for the past three years. This is a fact, and confirms what the company have been saying, that “the conditions are all favorable.” On the Federal Street & Pleasant Valley Passenger Railway, Allegheny, Pa., on the People’s Railway of Scranton, the grades are remarkably heavy and frequent, the curves sharp, traffic heavy. Yet on these lines the gears in question
have been doing efficient service for the past two years and more; and
on many others where the conditions are similar, the results are
essentially favorable.

The following claims are made for them: They have the strength
and endurance of steel; they are noiseless; they do not require lubri-
cation, hence a saving of oil and labor; cleanliness is an accom-
paniment of their not being oilous; they greatly reduce vibration, preserving
the life of the armature wires; they do not wear the gears with which they
mesh—cannot possibly strip or otherwise injure them; are free from flaw

New Publications.

New Stories Boiled Down for Busy Men. This is the title of a
small circular issued by the Eureka Tempered Copper Co. of North
East Pa., which contains, besides a few remarks about the tempered
copper wire, a comphrehensive array of flattering testimonials from
former and present customers.

A Few Testimonials: issued by the Burton Electric Co., and
their selling agents, the Electric Merchandise Co. This circular gives
a few of the many testimonials received by those two concerns from
street railway companies, recommending the well known Burton elec-
tric heaters. The names of many prominent street railway companies
appear as users of this appliance.

Combined Snow Sweeper issued by the Thomson-Houston Co.;
this handsome publication which terms No. 1,001 of the bulletin
of information issued by the Thomson-Houston Electric Co., is descrip-
tive of the new Thomson-Houston Electric Snow and Ice Sweeper, as
used at the Pittsburgh Convention and already illustrated in these columns. Three
handsome engravings besides small cuts are given in the pamphlet, as
well as a complete list of the different types manufactured and the net
prices to the customer.

Catalogue of Street Railway Cars issued by the St. Louis Car
Co., of St. Louis, Mo. This very handsome and carefully edited cata-
logue presents types of the many cars for cable, electric, horse and steam
operation, manufactured by the St. Louis Car Co., the dimensions of each style of car are given with the illustration. The catalogue also includes a view of the St. Louis Car Co.'s electric snow and ice sweepers, and a complete description of the products of this company are widely recognized as models of small
construction and intelligent workmanship.

Eighth Annual Report of the Bureau of Statistics of Labor in
New York City for the year 1891, issued by the bureau's super-
intendent, Charles F. Peck. In this volume of nearly 1,200 pages a great
deal of space is occupied with the discussion of many "labor questions." Among the many questions are the condition of wages of workers and the variety of opinions, more or less logical, are quoted in favor of it by
the commissioner. But four pages are devoted to the condition of street
railway wages of drivers and conductors for a day of twelve hours seems to vary from $1.50 to $2.00. A more complete
statement on the question of wages was given in the Sixth An-
nual Report.

The Monthly Record of Facts and Figures about Electric Rail-
way Work; published by the Edison General Electric Co., Edison
Building, New York. This publication, issued by the railway department of
the General Electric Co., is intended to contain information concerning the improvements which are from time to time made in the Edison system for electric railways, as well as important facts relating to the numerous electric railways which are being operated
in this country. The first number of this periodical, which has been
issued present much interesting matter, and show that the railway de-
partment of that company is enterprise, pushing and bound to get
its just deserts.

Report of the Board of Railroad Commissioners of the State of
New York on Strains on Railroad Bridges of the State for 1891.
Issued by the commissioners. Within a year from the establishment of
the Board of Railroad Commissioners of the State of New York in
1889, it became evident that some measures should be taken to secure a
more accurate report on the strains brought to bear on the members of
the different railroad bridges. For this reason a special department was organized and details are now obtainable of each railroad bridge in the state. The total number thus examined is about 5,000, not quite the number of the struts of the St. Louis elevated railroad, the strains of which have also been calculated. 669 bridges have been criticised by the board, of which 535 have been repaired by the companies and 134 entirely rebuilt.

Annual Report of the Postmaster General of the United States
for the Fiscal Year Ending June 30, 1891. This exhaustivereport sent to the President under date of November 30, 1891, covers 181 pages and contains much useful information as well as a number of valuable suggestions and recommendations for the improvement
of the service. Under the title Utilizing Street Cars in Cities, Mr.
Warnack describes the actual conditions in St. Louis which will
give more fully in another column. He also makes mention of the use of the inter-urban electric line at St. Paul and Minneapolis for carry-
ing the mails, and recommends the use of electric cars in other towns
of the same service. As an example of a point where, he thinks, the
electric cars could be utilized to advantage, the city of Wheeling, W. Va., is cited, from which place the tans of Benwood, Bellaire, Mar-
lin's Summit, and others, could be served easily by a small line. Authorities are also proposing to install electric postal cars between the cities of Davenport, la., and Rock Island, Milin, and Moline, Ill. Among other recommendations made by the Postmaster Gen-
eral is one for a postal telegraph.

List of Street Railway Patents

Issued by the U. S. Patent Office, December 1, 1891, to
December 22, 1891, inclusive.

December 1.

Carriage, William S. Ridsger, Buffalo, N. Y., 46,182
Car Starter and Brake, Frank J. Stafford, Cleveland, 0., 465,111
Car Truck, James T. Robinson, Altoona, Pa., 464,014
Car Truck, Edgar Peckham, North West Rock, Ark., 465,114
Crossing for Trolley Wires, Robert J. M. Sloan Lake City, Utah, 465,120
Electric Wire Support, Richard Edison, Cincinnati, 0., 464,928
Electrical Wire Trolley, Thomas J. Hainsworth, Cleveland, 0., 465,128
Railroad Switch, Samuel J. Petrouse, Portland, N. H., 465,130
Railway, Henry J. Fairway, N. J., 464,015
Street Car, Geo. T. Chapman, White Plains, N. Y., 464,430
Trolley Wood for Electric Railways, G. H. Yoe, 465,270
Trolley Wire Hanger, Smith W. Kimble, Denver, Colo., 465,371

December 5.

Cable Grip, Louis Kamenstine, St. Louis, Mo., 465,973
Car Truck, Edward J. Brown, Denison, Tex., 465,984
Car Brake, John Trendley, St. Louis, Mo., 466,536
Conduit Conductor for Electric Railways, Walter H. Knight, New York, 465,565
Droll for Electric Railways, John F. Bailey, Farmington, Conn., 465,573
Electric Free Recording System, Barton S. Mygdenes, Minneapolis, Minn., 465,418
Electric Railway System, Louis 0. Don, Natick, Mass., 465,567
Rail Joint, Milton C. Niles, Chicago, Ill., 465,593
Rail Joint, Milton C. Niles, Chicago, Ill., 465,606
Railway Joint, Alphonso C. Edmonds, and Benham and Stratton, Calif., 465,607
Renewable Shoe for Cable Car Grips, Charles Fitzgerald, Pittsburgh, Pa., 465,824
Street Railway, Whitcomb L. Judson, New York, N. Y., 465,614
Street Railway, Whitcomb L. Judson, New York, N. Y., 464,610
Street Railway, Whitcomb L. Judson, New York, N. Y., 465,615
Transmitting Mechanism, for motor cars, Charles W. Thomas, Jersey City, 465,610
Trolley for Electric Railways, John W. Schiesser, Washington, D. C., 465,740

December 10.

Bracket for Supporting Electric Conductors, John A. Dugan, Quincy,
Mass., 465,826
Car Brake, James T. Robinson, Altoona, Pa., 466,350
Converter System for Electric Railways, Mark W. Dewey, Syracuse, N. Y., 465,350
Corset, a, for Electric Railway, Mark W. Dewey, Syracuse, N. Y., 465,350
Electric Railway, George F. Green, Kalama, 10. Mich., 466,417
Electric Railway, George F. Green, Kalama, 10. Mich., 465,422
Pender for Street Railway Cars, Robert H. Marsh, Boston, Mass., 465,350
Momentum Reservoir Motor, Martin M. Bailey, Denver, Colo., 465,122
Pick-up and Throw-off Mechanism for Cables, George Mulier, Holbrook,
Mass., 465,191
Rail Chain, George K. Wells, Philadelphia, Pa., 465,193
Sliding Railway, Charles A. Barre, Paris, France, 465,151

December 23.

Cable Grip Car Truck, Ernest R. Esmond, New York, 465,658
Car Truck, Ernest R. Esmond, New York, N. Y., 465,658
Car Truck, Ernest R. Esmond, New York, N. Y., 465,666
Electric Railway, William H. Applegate, Atlantic, 10., 465,622
Electric Wire Trolley, a, Colman & Co., 465,685
Electric Railway Trolley, Frank J. Sprague and Patrick F. O'baugh, 465,806
Gearing for Electric Motor Cars, Owen F. Evans, Columbus, Ohio, 465,592
Guard for Trolley Wire Insulators, Francis O. Blackwell, Lynn, Mass., 465,447
System of Street Car Propulsion, Frederick G. Wheeler, New York, N. Y. (reissue), 463,211

Steam Generator for Street Cars, Frederick G. Wheeler, New York, N. Y. (reissue), 463,222

We will send copies of specifications and drawings complete of any
of the above patents to any address upon receipt of twenty-five cents.
Give date and number of patent desired. STREET RAILWAY PUBLISH-
ING COMPANY, WORLD BUILDING, NEW YORK.

Caution.

to whom it may concern:

We beg to call your attention to our Patent No. 257,861, dated November 6th, 1883, under which we manufacture "our noise-
less" railway gears of steel, bored and cured by our patented process.

As the owners of this Patent, we claim the sole right to manufacture and sell railway gears "composed of several layers of rail wen,
which are incorporated in the first layer, and held together," and in order that all may be aware of our rights and not feel aggrieved if sued for infringement upon our rights, we hereby notify all interested parties that we shall prosecute all infringers whether they be manufacturers, dealers or others, and any action that any infringer brings against the present owners of this patent is an infringement.
# QUOTATIONS OF STREET RAILWAY STOCKS.

## BOSTON STOCKS.
- **Company**: West End Pte.
  - **Par.**: 50
  - **Capital**: 4,900,000
  - **Period**: J. & J.
  - **Date of Issue**: 1892
  - **Bid**: 28
  - **Ask**: 29

- **Company**: West End Co.
  - **Par.**: 50
  - **Capital**: 13,000,000
  - **Period**: J. & J.
  - **Date of Issue**: 1892
  - **Bid**: 47
  - **Ask**: 52

## PROVIDENCE STOCKS.
- **Company**: Providence Cable Tramway
  - **Par.**: 100
  - **Capital**: 275,000
  - **Period**: New, Oct., 1892–1913
  - **Date of Issue**: Oct., 1892
  - **Bid**: 91
  - **Ask**: 95

- **Company**: Providence, R. I. & R. Co.
  - **Par.**: 300,000
  - **Capital**: 300,000
  - **Period**: Owned by Union Railroad Co.
  - **Date of Issue**: Nov., 1892
  - **Bid**: 95
  - **Ask**: 100

## HOLYOKE STOCKS.
- **Company**: Holyoke Street R. R.
  - **Par.**: 100
  - **Capital**: 100,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 225
  - **Ask**: 225

- **Company**: Northampton Street R. R.
  - **Par.**: 100
  - **Capital**: 50,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 15
  - **Ask**: 15

## CHARLESTON STOCKS AND BONDS.
- **Company**: Charleston City U. C. Co.
  - **Par.**: 25
  - **Capital**: 100,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 65
  - **Ask**: 7

## NEW ORLEANS STOCKS AND BONDS.
- **Company**: Crescent City Co.
  - **Par.**: 100
  - **Capital**: 1,500,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 86
  - **Ask**: 89

- **Company**: Canal & Chicora Sta., R. R.
  - **Par.**: 100
  - **Capital**: 250,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 80
  - **Ask**: 85

- **Company**: New Orleans & Lake Co.
  - **Par.**: 100
  - **Capital**: 1,000,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 80
  - **Ask**: 85

- **Company**: St. Charles R. R. Co.
  - **Par.**: 50
  - **Capital**: 400,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 80
  - **Ask**: 85

## NEW HAVEN STOCKS AND BONDS.
- **Company**: F. Haven & Wantville R. Co.
  - **Par.**: 25
  - **Capital**: 200,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 40
  - **Ask**: 40

- **Company**: New Haven & New Haven R. R.
  - **Par.**: 25
  - **Capital**: 200,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 35
  - **Ask**: 35

- **Company**: Whitney Ave. Ry.
  - **Par.**: 25
  - **Capital**: 25,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 140
  - **Ask**: 140

- **Company**: Hartford & Westfield R. R. Co.
  - **Par.**: 100
  - **Capital**: 100,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 100
  - **Ask**: 100

## BROOKLYN STOCKS AND BONDS.
- **Company**: Brooklyn City R. R. Co.
  - **Par.**: 50
  - **Capital**: 1,000,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 100
  - **Ask**: 100

- **Company**: Brooklyn R. I. R. Co.
  - **Par.**: 100
  - **Capital**: 500,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 121

## ALBANY STOCKS AND BONDS.
- **Company**: Albany R. R. Co.
  - **Par.**: 100
  - **Capital**: 750,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 107
  - **Ask**: 110

## NEW YORK STOCKS AND BONDS.
- **Company**: St. Louis & Fulton Ferry.
  - **Par.**: 100
  - **Capital**: 1,000,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 40
  - **Ask**: 40

- **Company**: Brooklyn Turnpike & R. R. Co.
  - **Par.**: 100
  - **Capital**: 150,000
  - **Period**: J. & J.
  - **Date of Issue**: Jan., 1892
  - **Bid**: 95
  - **Ask**: 98

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**Notes:**
- In bond buyers pay accrued interest.

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<th>Par.</th>
<th>Capital</th>
<th>Period</th>
<th>Date of Issue</th>
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<td>60,000</td>
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Bonds.

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<th>Principal Paid</th>
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<td>1871</td>
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LOUISVILLE STOCKS AND BONDS.—Corrected by Albeet Bros, Stock and Bond Brokers, 416 West Main Street, Louisville, Ky., Dec. 18.

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<td>50,000</td>
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<th>Bid</th>
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<tr>
<td>Louisville &amp; Ry. Co.</td>
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<td>Chicago Cen.</td>
<td>50,000</td>
<td>A &amp; O</td>
<td>1890</td>
<td>Sept 1891</td>
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Bonds.

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<td>Allegheny &amp; Monongahela R. R. Co.</td>
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SAN FRANCISCO STOCKS AND BONDS.—Corrected by Paul Harnin, Broker, 140 California Street, San Francisco, Dec. 18.

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<td>California St. Cable Co.</td>
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<td>A &amp; O</td>
<td>1890</td>
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Bonds.

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ST. LOUIS STOCKS AND BONDS.—Corrected by James Campeau, Banker & Broker, 30 Pine St., St. Louis, Mo., Dec. 18.

<table>
<thead>
<tr>
<th>Company</th>
<th>Par.</th>
<th>Capital Period</th>
<th>Date of Issue</th>
<th>Bid</th>
<th>Ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>St. Louis &amp; Suburban</td>
<td>10,000</td>
<td>A. &amp; O</td>
<td>1891</td>
<td>1891</td>
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</thead>
<tbody>
<tr>
<td>Philadelphia &amp; Reading R. R. Co.</td>
<td>50,000</td>
<td>A. &amp; O</td>
<td>1891</td>
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Bonds.

<table>
<thead>
<tr>
<th>Company</th>
<th>Amount Outstanding</th>
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<th>Interest Paid</th>
<th>Principal Paid</th>
<th>Date</th>
<th>Bid</th>
<th>Ask</th>
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<td>1895</td>
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STOCKS.

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<th>Bid</th>
<th>Ask</th>
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<tr>
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<td>50,000</td>
<td>A &amp; O</td>
<td>1887</td>
<td>Mar 1891</td>
<td>1891</td>
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Bonds.

<table>
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BONOS.

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<th>Bid</th>
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<td>1895</td>
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<td>1895</td>
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Rennert & Hettich, 416 North Broad Street, Philadelphia, Dec. 18.
### CLEVELAND STOCKS

<table>
<thead>
<tr>
<th>Company</th>
<th>Par.</th>
<th>Capital Period</th>
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<th>Bid.</th>
<th>Ask.</th>
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</thead>
<tbody>
<tr>
<td>Broadway &amp; Newburgh R.</td>
<td>100</td>
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<tr>
<td>Union Passenger</td>
<td>100</td>
<td>1,000,000</td>
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<td>115</td>
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<tr>
<td>City Electric &amp; Cable</td>
<td>100</td>
<td>4,000,000</td>
<td>250</td>
<td>235</td>
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</tr>
<tr>
<td>East Cleveland R.</td>
<td>200</td>
<td>2,000,000</td>
<td>95</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Woodlawn Ave. &amp; West Side</td>
<td>100</td>
<td>1,100,000</td>
<td>119</td>
<td>150</td>
<td></td>
</tr>
</tbody>
</table>

### Financial

- **The Altoona (Pa.) City Passenger Railway Co. will issue $50,000 of bonds.**
- **The Cincinnati (O.) Street Railway Co. have voted to increase their capital stock from $60,000,000 to $6,750,000.**
- **The Denver (Col.) Lake & Golden Railway Co. have decided to increase the capital of the road from $600,000 to $1,000,000.**
- **The earnings of the Atlanta Consolidated Street Railway Co. for October were reported to be $3,737,022, against $3,57,125 last year.**
- **The net earnings of the West End railway, of Boston, in October, are reported as $173,000, an increase, it is said, of $36,000 over 1890.**
- **The Oshkosh (Wis.) Street Railroad Co. have filed an amendment to their articles of incorporation increasing their capital stock from $60,000 to $100,000.**
- **The stockholders of the Columbus (O.) Consolidated Railway Co. have decided to increase the capital stock of the company from $350,000 to $1,250,000.**
- **The Rutland (Vt.) Street Railway Co. on December 1 retired bonds numbering 15 to 20 inclusive. There still remain unpaid bonds to the amount of $23,700.**
- **The managers of the Rome (Ga.) Street Railway Co. have decided to make a new issue of bonds. The amount is $100,000 bearing interest at six per cent.**
- **The report to the State Commission of the Cottage City (Mass.) Street Railway Co.: Total earnings, $2,666,15; running expenses, $2,261,08; net earnings, $405,07.**
- **At a meeting of the Board of Directors of the Lebanon (Pa.) & Annville Street Railway Co. the capital stock of the company was increased from $60,000 to $600,000.**
- **The International Trust Co. of Boston have made application in the Superior Court for the appointment of a receiver for the Keokuk Electric Railway & Power Co.**
- **The stockholders of the Redlands (Cal.) Street Railway Co. will vote January 23, 1892, on the question of increasing the capital stock of the company from $50,000 to $75,000.**
- **The St. Louis (Mo.), Collinsville & Carondelet Railway Co. have filed for record a resolution of the bondholders authorizing the directors to issue 1,000 bonds of $1,000 each, payable July 1, 1931.**
- **The Laramie City (Wyo.) Tramway Co., of which F. M. McHale, of Denver, is president, has just issued $60,000 in bonds, secured by a first mortgage upon their property. The Title Guarantee & Loan Co. are named as the trustee.**
- **The Dubuque (Ia.) Electric Railway, Light & Power Co. have given a second mortgage for $20,000 on their plant to cover the floating indebtedness caused by the building of the South Dodge Street and other branch lines. The first mortgage is for $200,000.**
- **The $100,000 deposited by the Lake Street L Co., of Chicago, with the city treasurer as a guarantee that the road will be built, is to be returned to the company, and the city gets a bond in the penal sum of $200,000 on condition that the road is completed according to the ordinance.**
- **This total receipts for 1891 of the Citizens' Traction Co., of Pittsburgh, including $300,000 from new stock were $952,223.31. The total expenditures, including Shaplesgurl electric construction and equipment and dividends, were $895,241.71. Cash balance November 1, 1891, $65,481.57.
At the last annual meeting of the Philadelphia Traction Co. it was voted to divide the remaining stock, sold the $3,000,000, to $800,000,000 by authorizing the issue of 600,000 additional shares from time to time as the directors may determine. It is understood that $1,000,000 of stock, or 20,000 shares, will be issued during the next six months, at a price of $40 per share paid on the existing stock. During the past year the Traction company carried 68,675,451 passengers, and had $5,352,904 earnings, or $2,571,712 expenses, leaving $2,781,314 in earnings.

The applications to the bankers for the $2,000,000 issue of bonds of the City Passenger Railway Co., offered at 102 and the interest, was largely in excess of the amount for sale. The bonds are dated November 2, 1891, having a par value of $100,000, payable March 1 and November 1 in gold, and run twenty years. The average net earnings for the company for the past ten years, as stated in the bond circular, are $337,775.10 for the year 1891, the bonds being $337,775.10 in excess of the amount required to pay the interest on the bonds for a corresponding period. The company during the last ten years, besides spending large amounts for plants, property, and extensions, have paid dividends of from ten to thirteen per cent on annuities.

The directors of the West End Street Railway Co., Boston, last month declared dividends of four per cent, upon the preferred stock and five per cent upon the common stock, payable January 1, 1892, to stockholders of record December 19, 1891. The full board of directors at the last annual meeting, held November 1, as follows: G. C. W. Brigham, Isaac T. Barr, T. Jefferson Coolidge, Joseph S. Fay, Jr., Eastace C. Fitz, Henry D. Hyde, Walter Hunnewell, E. D. Jordan, Samuel W. Knowles, Mary M. Parsons, Daniel W. Richards, Nathaniel Thayer, Walter S. Swan, Henry W. Whitney. The new members are Messrs. Mason, Coolidge, Parsons, Hunnewell and Knowles. The company has been very prosperous, and has paid a dividend for each of the four months ending December 31, 1891, after paying all fixed charges and dividends upon both preferred and common stocks, it has been estimated, will be only $120,000.

The Westinghouse Reorganization.

The plan of reorganization adopted by the Board of Directors April 13, 1891, and by the stockholders July 15, 1891, has been completely consummated. The stockholders have subscribed their nominal amount to the call for the surrender of forty per cent of their holdings for the use of the company. Of the stock at the disposal of the company, approximately $1,000,000 has been converted into common, in the form of a cumulative stock and the balance into "assenting stock," entitled after the preferred stock, to a seven per cent annual preference. Provision has been made for the company's debt and working capital by the sale at par of $3,000,000 of the preferred stock, for which payment in full has been received.

The company has acquired almost all of the stock of the United States Electric Lighting Co. and the Consolidated Electric Light Co. (commonly referred to as the "leased companies"), so that the fixed charges on the whole will be little if any less than the present, and the lessened debt on the newer companies are now substantially obliterated, and the consolidation of interest in the new company has rendered possible a great reduction in general expenses. The saving in interest upon debt, rentals and other fixed charges, thus effected by the new plan, has been increased to more than $1,000,000. All this has been accomplished without increasing the company's capital stock ($10,000,000), of which over $1,000,000, common and preferred, is being increased to fully meet the increased working capital requirements. The consolidation has been effected without litigation and without interruption to the business, the three factories having been kept in continuous operation. The company has never been so favorably situated for work as now, and they have every prospect for a large and profitable business.

A Large Ammeter.

The Weston Electrical Instrument Co., of Newark, N. J., have taken a contract to build a 5,000 ammeter ammeter for the Wilson Aluminum Co., of Leaville, N. C. This instrument is to be a very large form of the well known Western type of ammeter, with some important modifications to meet the peculiar requirements of the case. It will have a scale about fourteen inches long, which will be divided into 250 parts. Each division will equal twenty amperes and the divisions will be large enough to be easily read to tens or two amperes, and care to one amper. The scale will be laid by actual calibration to the full current to be measured by the instrument in practical work, namely, 5,000 amperes.

This may seem a somewhat astonishing thing for the Weston company to do, especially when we consider the work which is commonly done by them in this special line. Nevertheless it is beyond the facilities of the Weston Electrical Instrument Co. to construct such an instrument in the regular course of their work, without a special plant for the purpose. The Weston company has therefore prepared a special plant for the purpose, and have made and installed appliances of the Weston company for standardizing work are generally known to be excellent, and some idea of the perfection of the company can be given in which we state that the copper conductors in the laboratory for handling ammeter work, weigh about four tons, and that some of the mains have a sectional area of five square inches, and are capable of carrying a current of 10,000 amperes without inconvenient heating.

A New Engineering Firm.

A corporation known as Sprague, Duncan & Hutchinson (Limited) has been formed in New York, with offices at 15 Wall Street, to carry on the work of consulting electrical engineers. The gentlemen comprising this company are well known in both the street railway and electrical fields.

The senior member is Mr. Frank J. Sprague, inventor of the Sprague system, and one of the foremost pioneers in the electric street railroad and a well-known authority on rapid transit by electricity. Dr. Louis Duncan has for a long time been head of the electrical department of the Johns Hopkins University at Baltimore, and his authority as an expert on electrical matters has been widely recognized. Dr. C. T. Hutchinson was Mr. Sprague's assistant in the Sprague Electric Railway Company, and he is therefore assistant to the chief engineer of the Edison General Electric Company.

We wish the new corporation all the success in their line of work which they deserve.

What the Papers Say About It.

This road has long been noted for the beauty of its scenery, the elegance and comfort of its equipment, and as the greatest through car line on the American continent.

The main line is 450 miles in length and connects the cities of Chicago and Buffalo, with branch lines to the oil regions of Pennsylvania, Fort Wayne, Ind., and to the flourishing cities of Detroit, Jackson, Lansing, Kalamazoo, and Grand Rapids in Michigan. The main line passes through such important cities as Dunkirk, N. Y., Erie, Pa., Cleveland, Sandusky and Toledo, O., Ashtabula, Hillsdale, Mich.; and Goshen, Elkhart, South Bend and La Porte, Ind.

The roadbed is unsurpassed by any line in the country, and under their continuous improvements made during the past two years, the reduction of curves and grades, the Lake Shore is to-day a line practically without a grade or a curve, a thoroughly constructed double-track railway, facts which give it an added attraction for our readers. The favorite passenger line between the East and West, standing in the front rank among the great transportation companies of the world, a sample of the care and executive policy in its management, the double tracks permitting of a high rate of speed with entire safety, the perfect roadway giving ease and comfort to its passengers.

The equipment of the trains is, indeed, of a very high order of excellence. The sleeping, drawing-room and dining cars are of Wagner build, and noticed which those who may say of the comfort and welfare of passengers is omitted in their make-up.

The Lake Shore enjoys the distinction of being the line selected by the United States Government as the route of the fast mail trains—three daily trains being devoted almost exclusively to this branch of business—and forms in connection with the New York Central & Hudson River Railroad the greatest through mail line in the world, the line between New York and Chicago. No higher compliment could be paid to its management, and the road certainly merits the trade-mark it has adopted—the mail pouch.

The country traversed by it represents the richest portion of the Middle States. Its connections with other railways being made in almost every case in Union passenger stations of necessity calls to its attention the great influx of people frequenting these cities and their immediate neighborhood. Its universally recognized excellent through train service between the cities of New York, Boston and Chicago, which has been greatly increased by the addition of two new trains making thirteen through trains between the cities mentioned, ten of which are daily, has attracted the attention of people throughout the Eastern and Midland States.

The magnificent passenger station on Van Buren Street, occupies a central position in the city of Chicago, convenient to all hotels, banks, post-office and street railway lines, and secures to travelers immunity from the annoyance of of a long transfer across the city.

Another cause of the Lake Shore's popularity is the fact that it is the only line conveying passengers over the four track New York Central in the city of New York without a ferry transfer.

WE PURCHASE

Total Issues of Street Railway Bonds.

CORRESPONDENCE INVITED.

N. W. HARRIS & CO.,

Bankers.

163 Dearborn Street Chicago,
15 Wall St., New York. 70 State St., Boston.
SPECIAL NOTICES.

FOR SALE.

FOR SALE.—30 twelve-foot cars, one-end type, with one fare box; in first order. Gauge 4 ft. 8½ in. For all particulars apply to Metropolitan Railroad Co., Washington, D. C.

FOR SALE.—Street Railway, (4 miles), operated with horses, in a growing manufacturing city of 20,000, East of the Alleghenies. For particulars write to "Berlin," care Street Railway Journal.

FOR SALE.—STREET CARS.—On account of increase of business calling for larger cars, we have for sale 9 twelve-foot double-end, box cars, with fare box in each end. Gauge 4 feet 8½ inches. Apply to Union Street Railway Co., New Bedford, Mass.


POSITIONS WANTED.

WANTED.—By an electrical engineer familiar with all branches of the profession and expert in experimental work, particularly telegraphic and telephonic. In desire of engaging with parties who have new invention or system to develop and introduce. Has had extensive practice in Europe, both with apparatus and with patents. Practical operator, long experience, best references, modest expectations. Address "Multiplex," care Street Railway Journal.

WANTED.—By a thoroughly practical mechanical and electrical engineer, a position as superintendent or manager of an electric road. To any company about changing from horse to electric power, I will guarantee a great saving. Am competent to purchase and install both steam or electric plants of the best for the least money. Can furnish 25 years' references, which will include my record as an occasion manager and a reliable man whose whole time is given to the interest of any company by whom I am employed. Address "Economical Manager," care Street Railway Journal.

FOR SALE.

125 tons second-hand 35 by 7 ft. steam rails, in excellent condition. 300 tons second-hand 2½ by 7 ft. rails, but little used.

D. E. GARRISON & CO., - - 219 N. 4th St. Louis, Mo.

FOR SALE CHEAP.

FARE BOXES.

G. L. M. Slawson Fare Boxes, 4 Wales Manufacturing Co., Fare Boxes Will be Sold Very Cheap by the

OSWEGO STREET RAILWAY CO.,

OSWEGO, N. Y.

CAR AND CARRIAGE MANUFACTURERS

Should write for

SAMPLE BOX OF NATURAL RUBBING STONE.

SENT FREE OF CHARGE. CHARGES PREPAID.

A. L. SIMMONS, - - Geneseo, N. Y.

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Interior Conduit & Insulation Co.

FILLS A LONG FELT WANT, ESPECIALLY FOR STREET RAILWAY WORK.

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Contract for Road-bed Construction and all Materials, also for Entire Equipment.

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ARE MADE BY

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