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The Van Depoele Electric Railway System.

The Van Depoele Electric Railway system, now in successful operation at so many places in the United States, is the invention of Mr. Charles J. Van Depoele, the electrician of the Van Depoele Electric Manufacturing Co., of Chicago, Ill.; and is the result of constant experiment in generators, motors, and the transmission of power, commencing in 1874 and running down to the present time.

The Van Depoele generator is a model of simplicity. Several changes have been made from the ordinary Van Depoele dynamo to adapt it to the work of transmission of power.

The Van Depoele motors are of various sizes and styles, from a motor weighing one pound to an eighty horse power motor weighing eight thousand pounds. The cut illustrates the largest sized motors for running railway trains.

The first railway operated under the Van Depoele system was in Chicago in the winter of 1882-3; and the current was conveyed

by a wire. In the fall of the same year a car was run at the Industrial Exposition at Chicago from an overhead wire. In 1884 a train was run at Toronto, Ontario, by the Van Depoele system. Using an under-

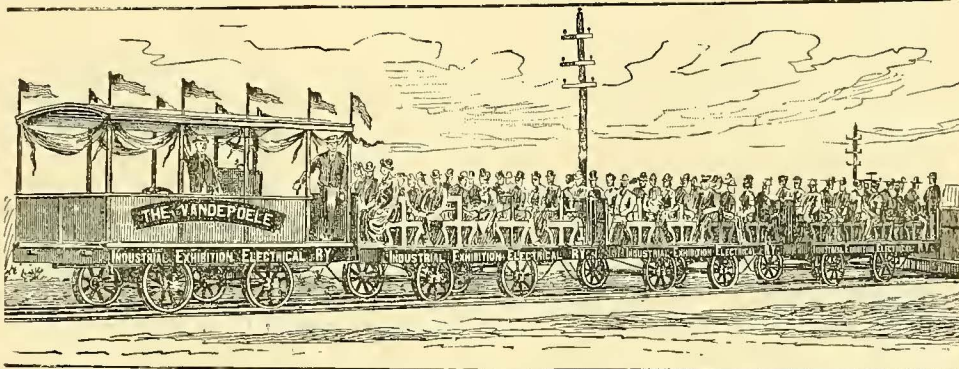
This train averaged 200 passengers per trip, at a speed of about thirty miles per hour.

In the fall of 1885, at Toronto, the road connecting the Exposition grounds with the

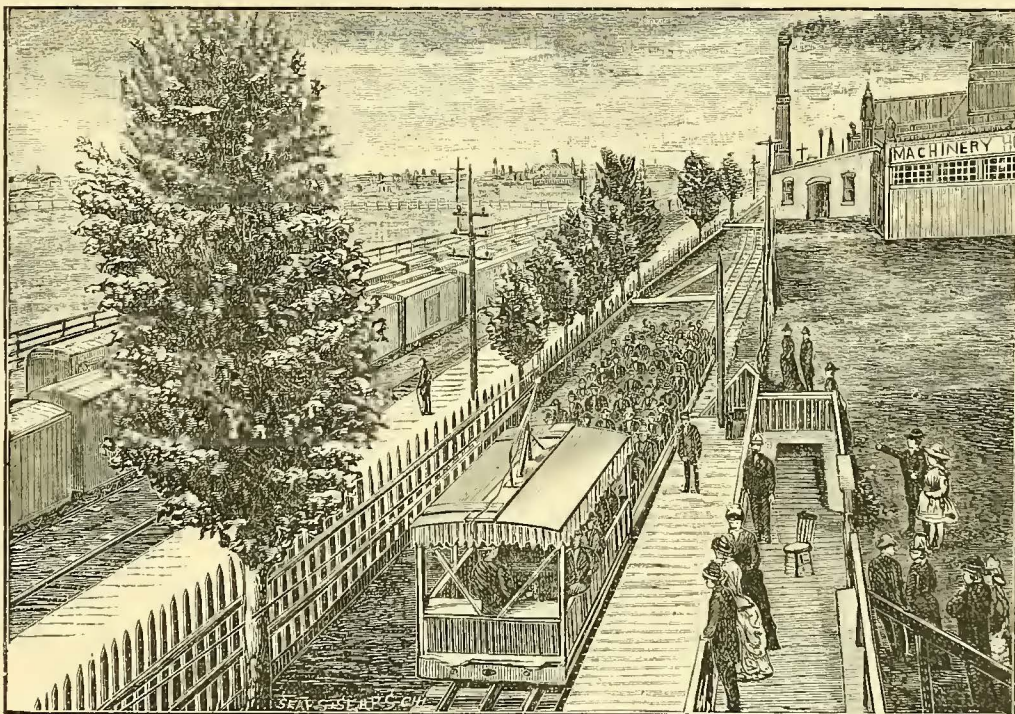
street railway, a distance of one mile, was equipped with a Van Depoele motor. This train consisted of three cars and a motor car. As there was only one track it was necessary to run at a high rate of speed. An overhead wire was used as a conductor, it requiring but a few days to put it in operation. An ordinary forty-eight dynamo was used, and was driven by a Doty 10 x 16 inch engine.

The average speed of trains was about thirty miles per hour, and from 225 to 250 people were carried at a time, the average number carried per day being over 10,000, with a coal consumption of 1,000 pounds per day.

At South Bend, Ind., for the purpose of conducting experiments, a portion of the South Bend Railway line was equipped in the fall of 1885, and several independent cars were run with small motors, the generator being driven by water power, the cars traveling in different direc-



ELECTRIC RAILWAY AT TORONTO, 1884.



ELECTRIC RAILWAY AT TORONTO, 1885

ground conduit, this road was operated successfully, and carried passengers from the street car line to the Exposition grounds, running as long as the Exposition lasted.

The cut illustrates the train in use at that time.

tions from the same conductor. This road, however, has not been equipped, owing to change in management.

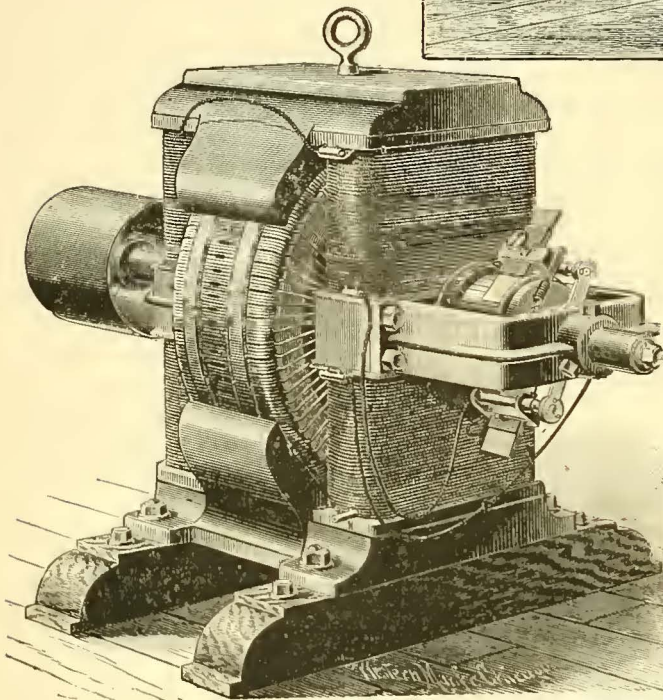
At New Orleans a train, consisting of three large cars, was run successfully until the collapse of the Exposition.

The Minneapolis, Syndale & Minnetonka Railway, of Minneapolis, have been obliged to discontinue the running of their locomotives in the more thickly settled portions of the city of Minneapolis, and an arrangement was made to bring the cars into the city and deliver them back to the steam locomotives.

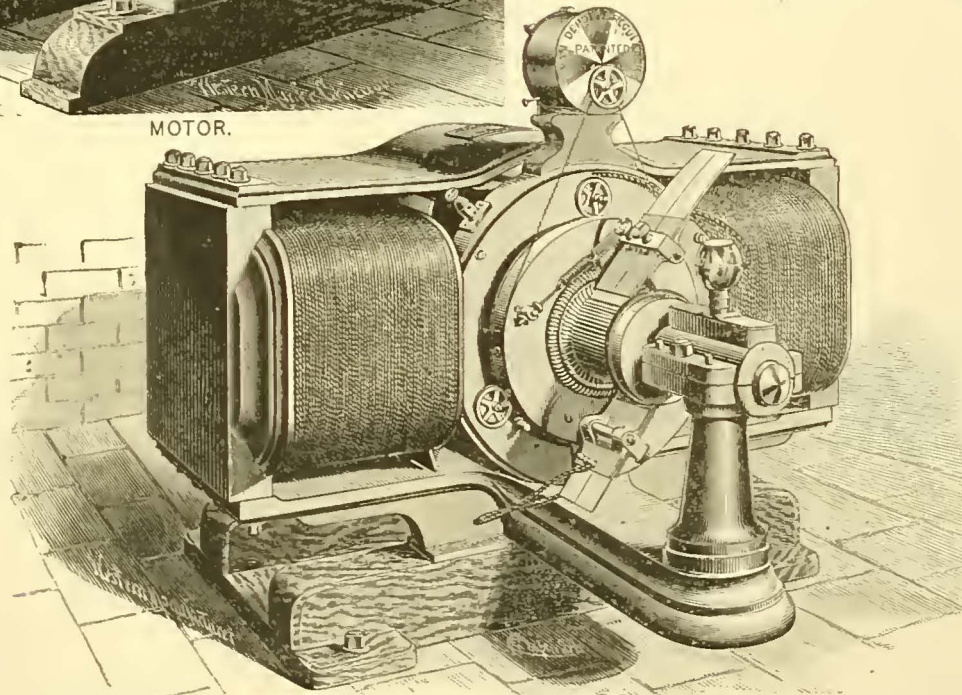
This is being done successfully. The motor is located upon a cheaply constructed motor car, and takes the current from an overhead copper wire. The generator is located quite a distance from the track, and



ELECTRIC RAILWAY AT MONTGOMERY, ALA.



MOTOR.



GENERATOR.

Commenting on the successful inauguration of this system the St. Paul Pioneer Press said: "The car was run up to Washington Avenue with only a few slight detentions caused by the partial disarrangement of some of the overhead wires. In the mean time the crowd of spectators increased until the

and forth several times between Washington Avenue and First Street, the platform of the car being covered with spectators and with enterprising curiosity hunters banging to every available projection. Here the electric motor remained, until the four o'clock train arrived from the lake. The latter went out on its regular time, and after it had reached Third Street, Mr. Van Depoele crossed Washington Avenue and started in pursuit. The rate of speed on the outgoing trip was about equal to that made by the regular train, the electric machinery passing the switch above Fourth Street without detention, and making the ascent at that point without apparent difficulty. As it passed out of sight toward the

lake, the crowd of spectators dispersed, each having seen a car driven by electricity; a feat, which would have been considered utterly impracticable only a few years ago. That the electric motor will run at a fair rate of speed was satisfactorily demonstrated yesterday, and the Van Depoele Electric Manufacturing Company will now undertake to show that their motor can also overcome another obstacle in the shape of heavily laden passenger cars, and it is hoped that this important experiment will be fully as successful as that made yesterday afternoon. If the lighter grade of passenger cars

is driven by an old slide-valve engine, 12 x 18 cylinder, making 125 revolutions per minute. The consumption of coal is about 3,000 pounds for seventeen hours' run.

sidewalks were literally filled from First to Fourth Street, while an open air mass meeting was held at the corner of Washington Avenue. This motor was moved back

can be (pulled) moved by electricity and in such a manner as to meet all reasonable demands, it is safe to predict that great changes will be witnessed in Minneapolis

and St. Paul, Minn., within the next year."

Forty-eight trains are run each way daily between 6 A. M. and 11.30 P. M.

These trains are composed of from three to four closed steam railway cars or coaches, weighing about eleven tons each and of a smaller number of open cars, weighing six tons each.

As large a number as eight of these cars have been run at one time, and this up a grade of 3½ per cent. with the cars crowded to their utmost capacity. The total weight of train is ninety-one tons.

At Montgomery, Ala., the Capital City Street Railway have been running two cars for some time. The grades are over seven per cent. and the distance more than one and a half miles.

The motors are placed on the platform of each car, and do the work well. The speed over the grade is six miles per hour. The cars run sixteen hours per day and the generator is driven by an old-fashioned slide valve engine, stationed 250 feet from the boiler.

The amount of coal consumed per day is 3,000 pounds including getting upsteam from cold water.

As to the effectiveness and durability of this apparatus, there seems to be no question.

The company* claim that the work which they have performed with it

has most fully demonstrated its economy, and that their method, of doing work instead of selling stock, is now bearing fruit.

They are also making motors for transmission which are adapted to the Brush, Edison and other electric systems.

*Van Depoele Electric Mfg. Co., Chicago, Ill.

If you want supplies consult our advertiser's directory.

Veterinary Practice.

In the Ohio Farmer, Dr. Farr gives some practical directions for the care of stock that may be of interest to those of our readers who have the charge of small stables that will not warrant the regular employment of a surgeon.

borhood of the sore and applying acetate of lead in the proportions of one ounce to one quart of water three times a day. After the inflammation has subsided, it is well to apply iodine. In a case where the owner had applied hot vinegar, soft soap and caustic balsam, he condemns the practice,

as serving merely to irritate and excite the wound, and recommends the application of cold water to the shoulder, and that the callous parts should be cut out with a knife. In another instance, where there seemed to be a core to the wound, and the owner had applied castile soap and water, and also acetate of lead and water, without producing any beneficial results, he ordered an application of nitrate of silver for a few times, until the fibrous tissue was removed, and an avoidance of the use of the collar until the wound was healed.

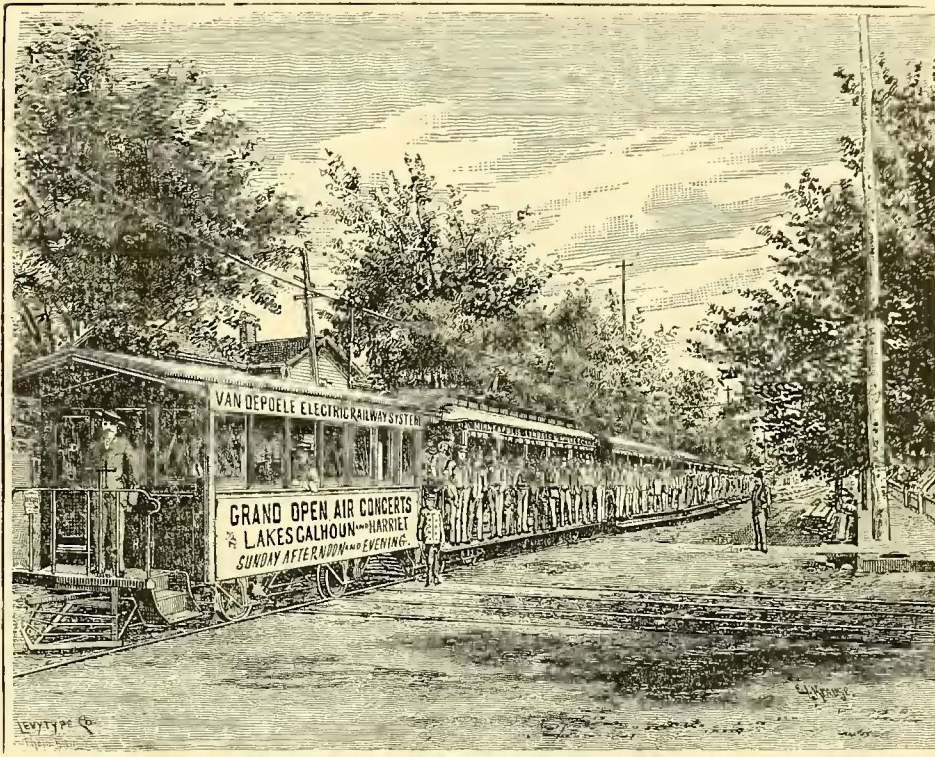
For shoulder strains, where the animal is lame, with a shrunken breast and an enlargement upon the outside of the shoulder, a blister of caustic balsam should be applied well down on the point of the shoulder, and the horse be given complete rest.

Where a horse has a severe cough with continued runnings at the nose, relief may be obtained by giving one table-spoonful of sulphate of iron and one of powdered digitalis twice each day in

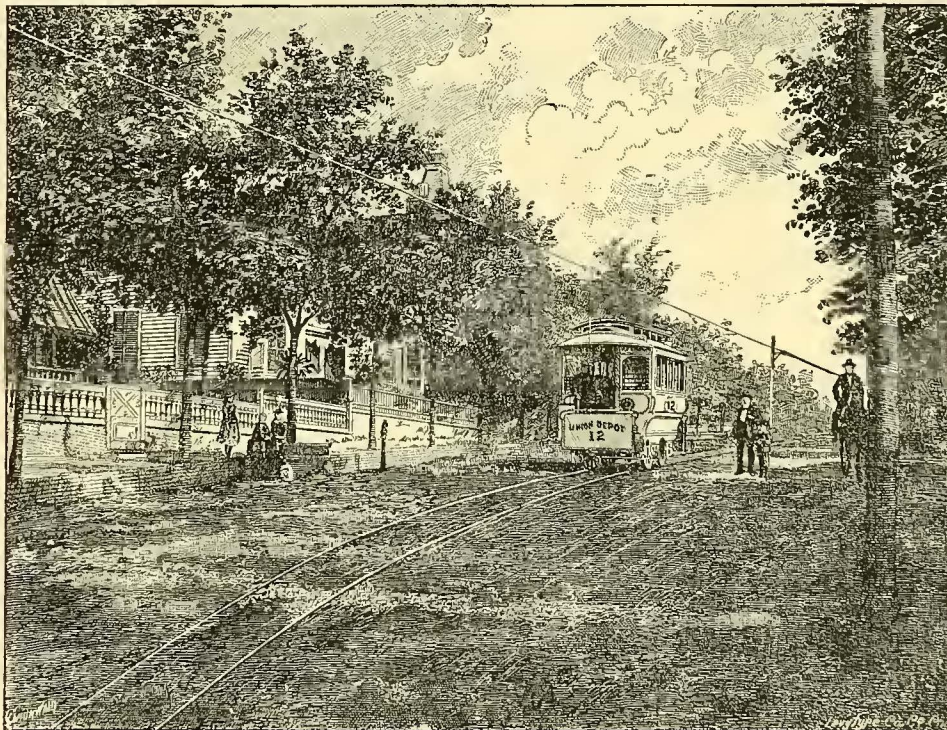
the feed, until the difficulty is relieved.

A Chicago newsboy was caught by the diamond shaped fender of a State street cable car and he was pushed along in front for a block before the train was stopped. Meanwhile the boy was calling lustily for help. When taken out it was found that he had not received a scratch.

This paper is only one dollar per year.



THE ELECTRIC RAILWAY AT MINNEAPOLIS, MINN.



RAILWAY AT MONTGOMERY, ALABAMA, SHOWING GRADE.

He says, that when horses are troubled with corns on the inside of the foot, care should be exercised in not allowing the smith to cut too much off from the sole of the foot as that will only aggravate the trouble. That the foot should be relieved from all pressure, as far as it is possible, and be kept in plenty of moisture.

For the treatment of an ordinary collar gall, he recommends cutting off the hair close to the skin in the immediate neigh-

Chaplin Roller Bearing.

These bearings* are made in combination with the housings or boxes. The boxes themselves are made of the best cast iron and contain an oil well below the bearing proper which it is claimed will hold oil sufficient for one year. They can, however, be filled with oil at any time through a hole in the top which is usually kept plugged with a tap screw. The interior of the box is so ribbed that the oil flows down around into the oil well.

As to the construction of bearing proper, a vulcanized washer one-eighth inch thick is placed in the end of the box nearest the

Where the two halves of the brass come together in the center, they are cut away, but not entirely through so as to render the touching of the rings that hold the rollers in place impossible.

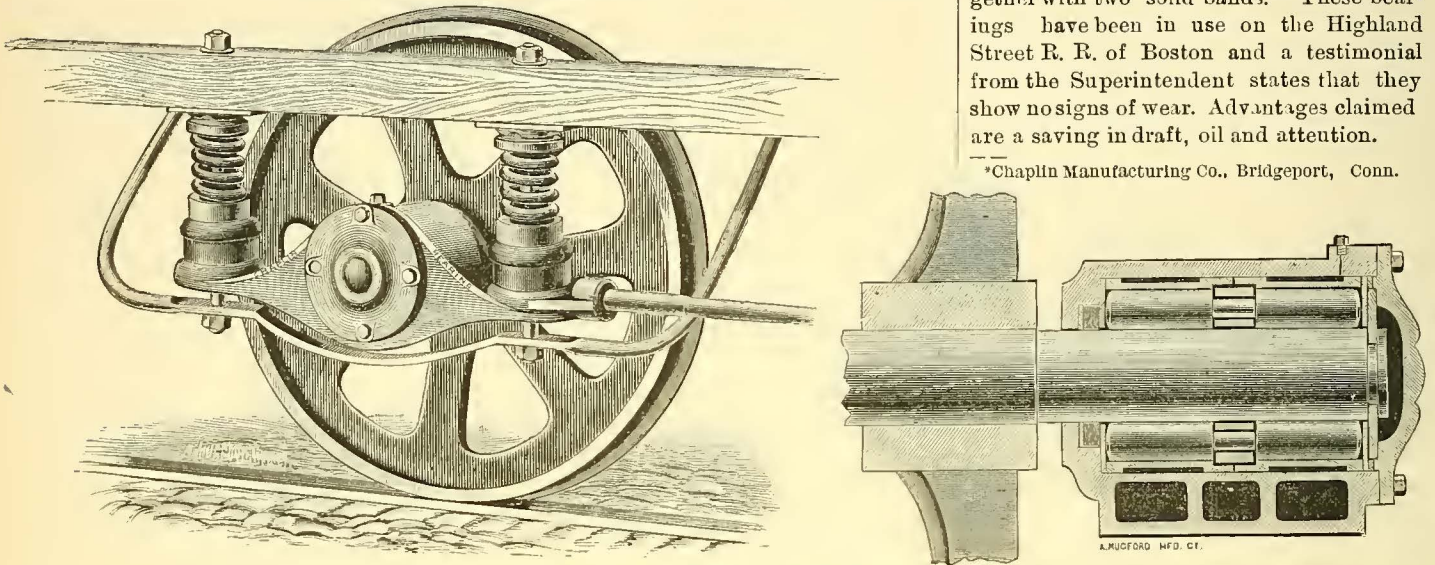
After the first half of the brass box is in place the rolls are put in. These are 1-16 inch in diameter for seven inch and one inch in diameter for six inch rolls, and are of steel finely fitted and case hardened, are necked at centers to admit of a series of intermediate rolls, which are also of steel and case hardened; these are put together and the intermediates are of such size that they do not admit of the large rolls touching each other under any cir-

work upon, before the whole is finally put together to stay.

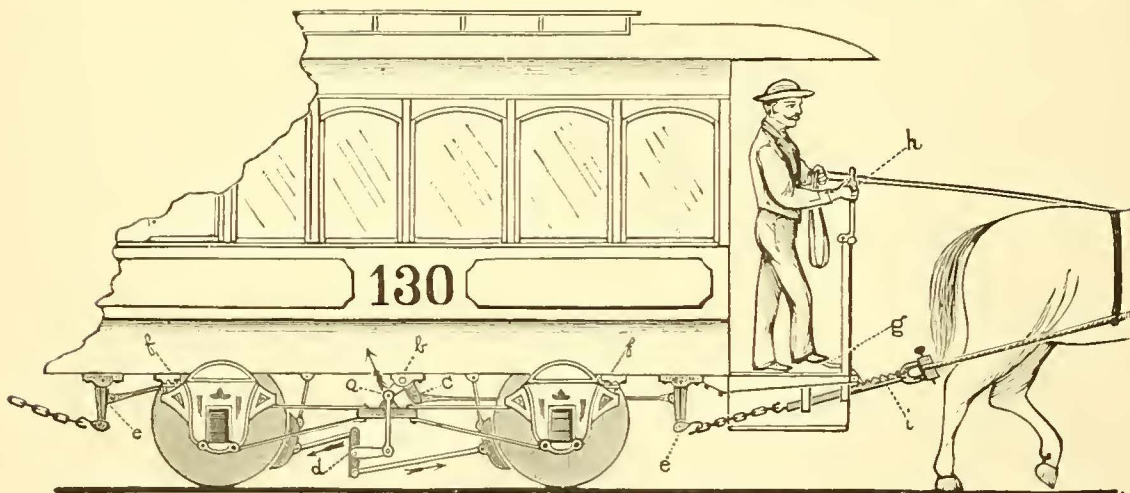
After these brasses are in, another steel washer 3-16 inch thick, that is cut out to admit the axle, is put in; then steel plates 3/4 inch thick, are set into a groove in the outer end of the journal to take the end thrust and hold the axle in place. Around these plates there is a small round of leather which is fitted to a small groove in the cap. And finally the cap is put on and fastened with bolts, thus making the housing dust proof and preventing escape of oil.

The rolls are put together by two of them being shelled, which explains the apparent puzzle of holding the grooved rolls together with two solid bands. These bearings have been in use on the Highland Street R. R. of Boston and a testimonial from the Superintendent states that they show no signs of wear. Advantages claimed are a saving in draft, oil and attention.

*Chaplin Manufacturing Co., Bridgeport, Conn.



THE CHAPLIN ROLLER BEARING.



THE MALLINCKRODT STREET CAR BRAKE.

wheel, and is so cut that it just clears the axle. Then a felt washer cut in the same way but making a close fit about the axle and 1/4 inch thick is solidly pressed into place, and finally a 3-16 inch steel washer that allows the axle to pass through it is placed against the felt. This last has a larger diameter than either the vulcanized or felt washer, and occupies the full size of the hole in the box and serves to hold the other two in position. When these three washers are in place the brass box is solidly pressed into the housing and against the steel washer. This brass box is 9-16 inch thick and is ribbed like the housing so that oil may be admitted from the oil hole, and allowed to circulate freely.

circumstances. They are held firmly together by two bands, which are of brass and are not welded. The inside ring is covered by the rolls so that it does not touch axle in revolving, as will be seen by a reference to the engraving.

The outside ring is 3/4 inch thick and extends above rolls, as shown, but does not strike the brass bushing, as that is as already remarked recessed, so that neither of the rings hit axle or brass. After putting in first part of brass as described, then comes the set of rolls which are always held firmly together when out of the box. And after the rolls are in place the other half of the box is pressed in. The brass boxes are bored true on the inside for the rolls to

The Mallinckrodt Street Car Brake.

We give an illustration of a new street car-brake* that is in use upon some of the street railways in St. Louis, Mo. The principle upon which it acts is that of utilizing the weight of the car body with its load of passengers to set the brakes, and the draft of the horses to release them.

The entire weight of the car body with its load rests upon the four points (ff.) These are the ends of the short arms of the main levers which pivot upon the axles, while the long arms work the brake.

In the cut, the brake is represented as being off, and the driver in the act of putting it on. The drawbar (i) is connect-

ed by chain, intermediate lever (c) and rod to the vertical lever (e) in the middle of the revolving shaft (b) which extends across the entire width of the car, and has a crank (a) at each end. The crank-pin bears upon the inner ends of the long arms of the main levers, which press upward with a force equal to one-fourth the weight of car body with its load. As soon as the pawl which holds the drawbar out is disengaged, the upward pressure of the side-arms revolves the shaft, pulling in the draw-bar and at the same time working the three armed lever (d) which presses the shoes against the wheels. It is evident, therefore, that the heavier the load, the greater will be the pressure upon the shoes, and the more positively the brake will be set; while with the ordinary brake, the heavier the load the more difficult it becomes to stop the car.

When the brakes are to be released, the team pulls the drawbar out for about eight inches with a force equal to one-sixteenth of the load, thus revolving the shaft, depressing the crank-pins and long arms of the main levers for about two inches, and raising the points which carry the load about one-half an inch, and turning the double bell-crank (d) so as to release the shoes. The various parts are then held in this position by the pawl (g), which works in with the ratchet teeth on the drawbar.

The action of pulling out the drawbar also tends to start the car. The strain upon the team is at first only one-sixteenth of the load, which, it is claimed, is in most instances sufficient to start the car.

Whenever it is necessary to make a quick stop to avoid, or in case of an accident, the disengagement of the pawl (g), allows the weight of the car to instantly set the brakes with full power. A clamp is provided, as shown at (h), whereby the drawbar may be kept from going back too suddenly, and a gradual stop be made; or the drawbar may be held at any point, when it is necessary that the brake should be only partially set. There are also two devices not shown in the cut, one for locking the brake, when so desired, to guard against the danger from runaway teams; and one for releasing the brake by hand when the team is not hitched to the car.

If, at any time, the chain, the rod, or the lever connecting the drawbar with the revolving shaft, be broken, the brake will be set automatically.

The pressure on the brake-shoes is regulated by the longest arm of the three-armed lever (d). The connecting stirrup between the main levers and this arm is attached to the latter 7 inches from its center of motion. The rods connecting the shoes to the lever (d) are attached to the two short arms 2 inches from the center of motion; thus giving a leverage of 7 to 2, or $3\frac{1}{2}$ to 1; and as the upward force exerted at the point (a) is $\frac{1}{4}$ of the load, the pressure upon the shoes is $3\frac{1}{2}$ times $\frac{1}{4}$, or $\frac{7}{8}$ of the load. This is always $\frac{1}{8}$ less than the full pressure upon the rail, consequently the friction at the shoe is always a little less than that on the rail.

The brake is of simple construction, con-

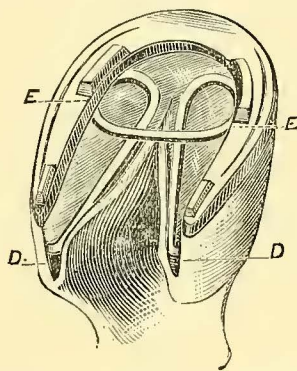
taining no delicate parts which easily get out of order, and every part is substantially made of the best material. It is claimed that no great amount of experience is needed in order to manipulate this brake, and that it will save the great fatigue which the drivers are now called upon to endure, besides giving the company the benefit of more effective work.

*Mallinckrodt Street Car Brake Co., St. Louis, Mo.

Roberge's Hoof Expander.

This hoof expander* is intended for the cure and prevention of contraction, quarter cracks, corns, etc., and consists of a peculiarly-formed spring contrivance, which is placed or introduced into the under portion of the hoof, and by exerting a constant and gentle pressure against the outer walls of the hoof, it prevents contraction and irregularity in form where there is a tendency in that direction, and assists in restoring the hoof to its natural shape where it has been caused by careless shoeing or malformation. From contraction, or wiring in of the quarters, we have shortness of gait, soreness, and generally accompanied with corns, and frequently quarter cracks.

To prepare the feet for the expander they should be carefully soaked and poulticed so



that the hoof will yield readily to the pressure of the expander. For simple contraction the inventor recommends that the foot be lowered and the toe shortened as much as possible. In paring, the foot should be well cut from the point of the frog to the quarters, and also the bars. Open the heels back of the bars and as close to the frog as possible. Cut or saw straight up so as to form a shoulder for the points of the expander to rest against, as shown in the cut. The expander is then introduced by placing one point in the open heel on one side, and then by pressing the opposite side of the expander about three-fourths to one inch. It can be easily introduced. This will give about twelve to fifteen pounds pressure outwards against each quarter.

It is claimed that this expander will cure a case of contraction in from two to four months.

The shoe should be nailed around the front of the foot, leaving the quarters free, and keeping the heels of the shoe or quarters a little fuller than ordinarily, to allow for the expansion of the hoof.

*F. P. Roberge, Veterinary Surgeon, 1741 Broadway, N. Y.

A Cable Splice.

Mr. Thomas C. Nash, of Chicago, Ill., has recently invented a method of splicing wire cables, which is of special value and interest at this time, when cable railways are acknowledged to be not only a success mechanically, but are admitted the most economical and advantageous of all the motive powers known and used, and the value of the invention will be apparent to the public, as well as the corporate bodies, when it is understood that a successful splice is vital to the operation of a cable railway.

At an annual meeting of the stockholders of the Chicago City Railway Co., Mr. C. B. Holmes, the President and Superintendent, says, after stating that all other splices known to the trade had proved a failure, "Mr. Nash, who has charge of our cables, introduced a method of his own and with anxious interest its operation was watched, until long continued use has determined its advantage and success. The difficulty was to secure a splice which would not increase the size of the cable and expose the splice to the abrasion by the grips, which would not draw out when a heavy strain was brought to bear, nor yet allow the ends to loosen when the action of the cars produced a slackness of the cable, one also which would not allow one strand to creep ahead of the others and project up for the grips to cut or tear it up.

"If nothing else had been done during the season in this department than to discover a successful method of treating this important part of the system, it would have been a season well spent, for it is vital to the operation of cable roads."

Though not generally known to the public, the Chicago system of cable roads with its costly and extensive plant, perfect in every other detail, would doubtless have proven a failure without the introduction of this splice, for prior to that time the cost of broken cables was so great as to consume a great portion of the profits of the company and not to speak of the great annoyance to the public.

The splices used heretofore lasted at the most only about four weeks, but with the introduction of the Nash splice all this was changed, for by it a spliced rope was really made as secure as any other portion of the cable, that is to say the splice in all cases lasted the full life of the cable, namely about 12 months.

Mr. E. A. Hovey, of Chicago and latterly of San Francisco, one of the most successful of engineers in the construction of cable railways, says, "that while with this invention cable railways are a perfect success, no cable road can be operated successfully without this splice."

Briefly the splice is as follows: A cable consists of six strands, (in some cables there are 16 wires to the strand and in others 31 wires) wound about a core of some fibrous or flexible material, and when a splice is to be made both ends of the cable are unlaid a distance of 17 feet, the strands are then interwoven one with the other, and then brought as close together as the laid por-

tions will permit, with the unlaidd strands of each end of the cable laid between the opposing ends of the other portion of the cable, which operation so far is the usual method employed in splicing wire cables.

Mr. Nash's invention, however, begins from this point and has to do only with the disposition of the meeting ends of the strands, in which all of the difficulties of splicing are encountered.

Each individual strand is composed of say 31 wires, 19 forming a core and the remaining 12 the outside wires, and when the ends of two strands are brought together the outside wires are in turn unlaidd and the inside wires tied together, and the terminals or ends of both the inside and outside wires of the two opposing strands are tucked in an untwisted condition in the body of the cable between the strands thereof, thus making at this point sixty-two (62) wires knotted and tucked or thirty-one more than belongs in the cable at this point, a complete strand in fact tucked away without any perceptible increase of diameter in the size of the cable at that point.

The Chicago City Railway Co. have purchased the right to use this splice on all of their lines.

This splice is also in use and endorsed by the Cincinnati, St. Louis, Kansas City, Hoboken, Philadelphia, and New York cable railways.

This splice will also be of considerable interest to mine and mill owners, particularly where wire cables are used for the transmission of power, with whom the breaking of a cable generally means the end of its usefulness for that purpose, and on whom a considerable and unnecessary expense is thus imposed annually.

The La Salle Street Tunnel of the North Chicago Street Railroad.

We are indebted to the Industrial World for the following description of the old La Salle street tunnel which has recently passed under the control of the North Chicago Street Railroad, and will be used by them.

The transformation of the La Salle street tunnel, with its present dingy aspect, and humid atmosphere hovering like dank vapors within its walls, into a transit route where these obnoxious features will all disappear and a pleasant highway of travel be permanently established, cannot but be regarded in the light of a great desideratum. The change will be as radical as effective, and the rather repulsive condition of the tunnel as it now exists will be so improved as to render it both inviting and attractive. Passengers by the Fourth Avenue Line in New York enjoy with grateful satisfaction their ride through the cool and shaded archways of the great tunnel that ends at the Grand Central depot, and pedestrians rather seek than shrink from, a walk through this convenient passage way, that is proof against the summer's heats or winter's storms, yet letting in the cheerful light of day through its systematically distributed apertures and illuminated at night by the bright, incandescent glow of the

best appointed electric burners. The La Salle street tunnel, as it stands, seems a sort of useless hiatus, a dreary yawn, or sleepy gap, in the very heart of a populous locality, and in the center of active business operations, simply because it is unpatronized and neglected. Converted into a cleanly thoroughfare, ventilated by the most approved sanitary methods, with a carefully constructed sidewalk for foot passengers, and brilliant at night with electric lights, the public will eagerly seek the cable cars that will transport them uninterruptedly to their destination.

Irrespective of the increase of the value of property, which is a natural sequence of the very transit lines that annihilate distances and make remote points readily accessible, and naturally augmenting the amount of taxes, thereby adding materially to the city's revenues, this proposed cable line will insure to residents safe and reliable transit to the business portion of the city. It will also effect a great saving of time to parties forced to adopt the slow measures of pedestrianism as their only alternative, by conducting them by easy and rapid approaches to different localities. But what is paramount to all other considerations is that it will enable persons taking the Northwestern trains to make sure connections, "a consummation devoutly to be wished," in the face of the obstacles that now leave the matter involved in extreme doubt and uncertainty. The bridges, which may be an absolute necessity, spanning as they do the river which courses through certain portions of the city, are nevertheless "stumbling-blocks" in the way of suburban dwellers, and must be a serious obstruction to the general transportation of merchandise. The bridges are open for three hours between 8 o'clock in the morning and 5 o'clock in the afternoon, and it does not require any arithmetical calculation to determine the fact that here is an irretrievable loss of three hours to the actual transaction of business, to say nothing of the delays, annoyances, and vexations to the traveling public and the denizens along the lines of the different roads. All these difficulties are obviated by this proposed route, which is nothing more or less than the cable extension of the whole line of the North Chicago Street Railroad Co., running on La Salle street from Jackson to Illinois street, thence branching east and west and connecting with the road at Wells and Clark street's.

The enterprise is one in the regular order of the progress and development of the times, and if the projectors are to be peculiarly benefited it will offer the most salient advantages to the public, compensating property owners in the higher appraisal and value of their property, rendering remote points easy of access, accommodating suburban residents, affording the people comfortable and more rapid transit, enabling the bridges to conform to their requirements and purposes, without an infringement of individual rights or a trespass upon personal convenience, and securing the pedestrian, who is either constrained to adopt or else elects this method of lo-

comotion, a by-way at once inviting in its aspect and agreeable in its general accessories and surroundings. The illustration which we present will convey an adequate idea of its general appearance when occupied by the North Chicago Street Railroad Company.

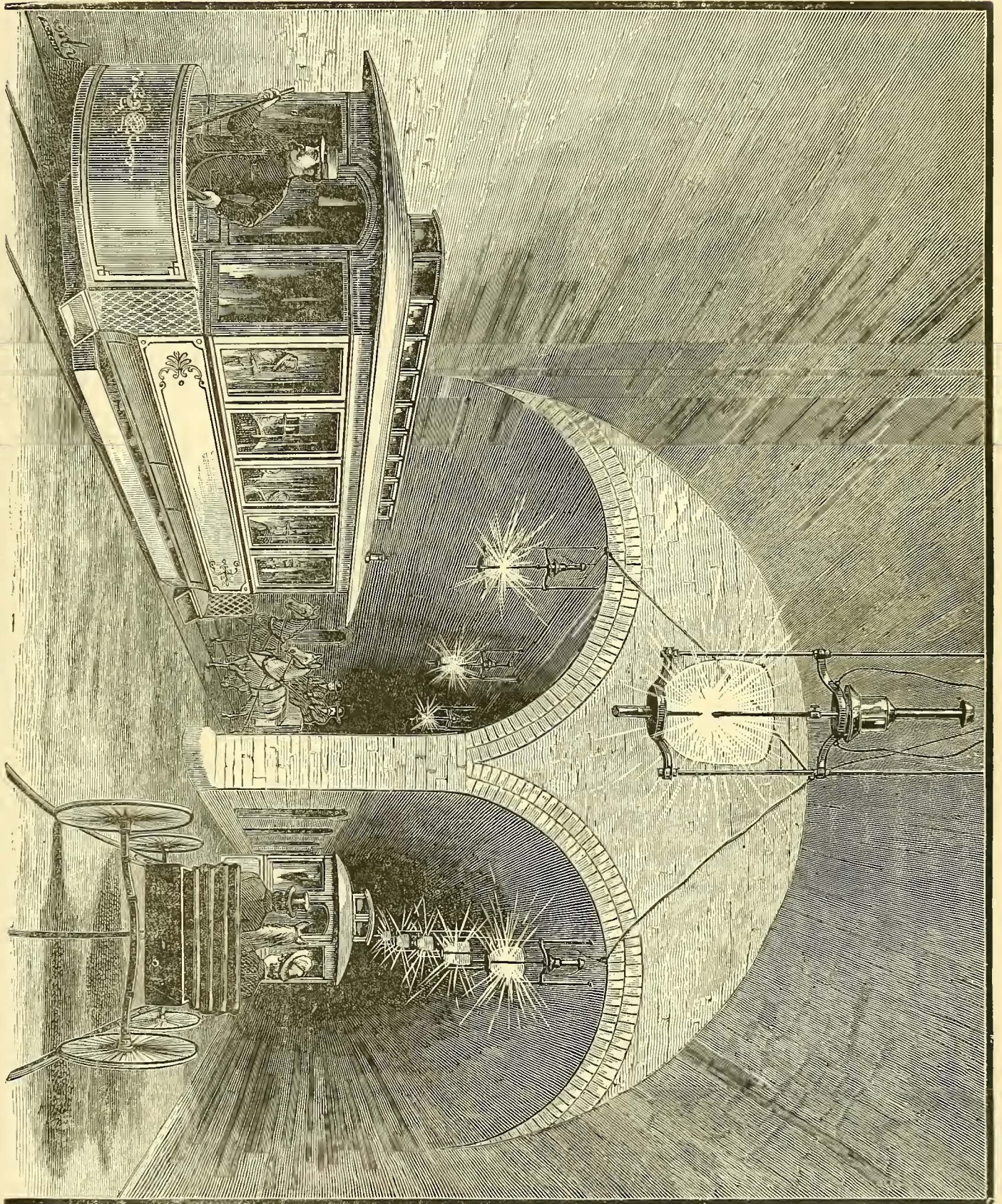
The First American Tramway.

At the last meeting of the Engineers' Club of Philadelphia, Dr. R. P. Robins read a paper on the First Permanent Tramway in America, a summary of which is given by the secretary of the club as follows:

The tramway was projected by Thomas Leiper, of Delaware county, Pa, in 1809, for the transportation of stone. After experimenting in the yard of the Old Bull's Head Tavern, Second street, above Poplar Lane, Philadelphia, as to the feasibility of such a roadway, he advertised in the Aurora of September 28, 1809, as follows: "I wish to contract for the digging part of a railway, from my quarries on Crum creek to my landing on Ridley; the distance and level has been accurately ascertained by Mr. Reading Howell. The distance is exactly three-fourths of a mile, and an accurate statement of the quantity of digging required may be seen from the plot in my possession, calculated by Mr. Howell. I also wish to contract for making and laying the rail part of the same, consisting of wood, a specimen of which, as furnished by Messrs. Large & Winpenny, may be seen by applying to them at their manufactory, adjoining the Bull's Head on Second street, in the Northern Liberties. The scantling for the above will be furnished on the ground. I wish to progress in this work immediately."

The work of grading and building was immediately begun, the draft of the road being made by John Thompson; and the railroad was completed early in 1810. The ascents were graded inclined planes, and the superstructure was made of white oak, with cross-ties and string pieces. The cars or trucks were very similar to those now in use, the wheels being made of cast iron, with flanges. The road continued in active use until 1828, when it was superseded by a canal after the plan made by Mr. Leiper, but not carried into effect until three years after his death, when his son, the Hon. George Gray Leiper, concluded the work which had always been nearest to his father's heart. The site of the old road can still be seen, though it is in ruins, nothing remaining except the deep cuts made by the cross-ties.

There has been a great deal of discussion of late years with regard to the claim of priority for this road, it having been claimed by various New England writers that an earlier tramway had been built in or near Boston. But, as nearly as I can arrive at any conclusion upon the subject, the only road constructed before the building of Mr. Leiper's tramway in Delaware county, was that on the western slope of Beacon Hill, which was designed and executed by Silas Whitney, in 1807, and which was about a quarter of a mile in length. It was used for the transporting of gravel from the top of the hill down to Charles street, which



THE LA SALLE STREET TUNNEL OF THE NORTH CHICAGO RAILWAY CO.

was being filled up and graded. There were two trains of cars on the railway, so arranged that one train being loaded with gravel would in its descent pull up the empty train. While the full cars were being emptied the unloaded cars were being filled, and in their descent would haul up the first train, thus doing the work without horses. This road was, however, only temporary, and as the work of grading progressed was gradually removed. It is, however, entitled to mention as the first work of the kind in America, having been put into active operation at least two years before Mr. Leiper's preliminary and experimental railway in the yard of the Bull's Head Tavern. Mr. Leiper's road in Delaware county was, however, the first permanent tramway constructed in this country; the next in point of date was that laid in Nashua, N. H., in 1825; the third was laid down at the Quincy granite quarries, in Massachusetts, in 1826-27; and the fourth, the great enterprise at Mauch Chunk, Pa., nine miles long.

◆◆◆ Making a Cable.

A San Francisco paper gives the following account of the manufacture of a cable as carried on in the engine house of the Market Street Railway. For contrary to the usual custom of cable roads this line manufactures its own cables.

This cable-making machine is a purely Californian invention, the inventor and patentee being Mr. Henry Root, who, in fact, has invented about everything which has made the Market street system so nearly perfect.

The machine is situated in the extreme rear of the engine house, and runs from the basement clear up among the rafters of the building.

This machine takes a piece of manilla rope and one hundred and fourteen wires, and in a few minutes places on the reel, ready for use, a cable of the most approved kind. As the work commences at the basement, or lower deck, a description of the machine properly begins there. An iron column runs up from the foundation to the top of the machine, and in this is carried the three-quarter-inch manilla, or her rope which forms the heart of the cable, and gives it "life,"—that is, pliability and elasticity. It will readily be understood by even a novice, that if the heart or core of the cable was a wire, that it would make the rope stiff, brittle and hard to handle. Before the manilla core enters the column, it passes through a box of tar, and becomes thoroughly soaked and saturated, so that it remains impervious to moisture and retains its pliant nature.

In the basement is set the huge gearing which gives the machine its initial motion. Power is furnished from a small engine that looks ridiculously inadequate to do the work, but which, however, twirls the bobbins and spindles around as if they were light as feathers. Passing from the basement to the lower deck or platform one beholds the beginnings of each strand of the cable. Six up-

right spindles are arranged about the main column and each spindle has seven bobbins; a wire from one bobbin is drawn off to form the core of a strand and around it are twisted the other six wires. The system of gearing is so contrived as to give to the machine three separate, distinct and simultaneous motions. The whole machine revolves around the center column; each of the six sections or spindles has an independent twisting motion of its own to form the heart of the strand; each bobbin has an independent motion to take the twist out of the wire as the machine revolves. It is wonderful to watch and note one particular bobbin throughout an entire revolution of the machine. Never does the wire get into the strand with a twist in it.

This preserves the life of the wire by preventing the breaking and crushing of the molecules, as would be the case were the wire twisted out of shape. From this lower deck the six cores pass up through hollow columns to another deck where the strands are completed. By an arrangement similar to that on the lower deck, twelve bobbins unreel their wires around each core, thus completing the strand. By this it will be seen that each strand of the cable properly contains nineteen wires—seven forming the heart of each strand and twelve laid up around each heart. The work of the seventy-two bobbins on the second deck completes all the strands, and they then pass up over tension wheels to be laid up around the manilla rope which is to form the heart of the cable proper. The strands are passed over these tension wheels in order that each may have a uniform strain or tension, and thus avoid any irregularities in the finished rope. The tension wheels are regulated by movable weights on levers which throw the wheels in or out as may be desired. From the tension wheels the strands lead up and are twisted about the manilla heart, and the whole cable then passes up through a die which forces any irregularities there might exist down into the heart of the cable, leaving a smooth, evenly rounded surface and uniform diameter. This die is not absolutely necessary, but is used as an additional precaution in case the tension wheels should have failed from any cause to maintain a uniform strain.

The cable, when it passes through the die, is finally drawn off from the machine by passing over two immense wheels, which are driven by power transmitted from the main shaft on the lower floor by bevelled gearing connecting with a shaft on the upper floor, on which is a worm-wheel running in a wheel connecting with the drawing off wheels. These latter wheels draw off the cable so that it retains the tension given it on the machine. Beside the drawing off wheels is placed a revolution counter which records the number of yards of cable passing over the top of the wheel. From the drawing off wheel the cable passes through a box of tar and then down to the lower floor, where it is wound on an enormous spool, ready to be laid in the street, for every-day use. This machine

possesses the great advantage of requiring the material to be handled but once to complete the cable. In other cable-making machines the strands are laid up first, and then are put into another machine to lay up the rope. This machine lays up the strands and makes the rope by a continuous and uninterrupted process.

Superior advantages are also claimed for the cable itself, as it is so compactly twisted that it is well-nigh impossible for a strand or wire to be ripped out. The machine has the capacity of turning off a thousand feet of finished cable per day. In making the cable, in order to preserve a uniform diameter, the ends of the wires are carefully brazed together. The length of time which a cable can be used on the Market street system depends largely on which road it is laid. The cable on Market street is used by all the cars of the system—the Valencia, McAllister, Hayes and Haight street cars. The cable usually lasts about eight months. The average duration of a cable is from six months to two years. Generally a cable wears out first where the splice is. A cable in use continually stretches, and this slack is taken up in the engine house by a movable carriage, and when the cable has stretched a certain amount the carriage is moved up, the old splice cut out and a new splice put in, which is expected to last as long as will the cable. The cables made by the Market Street Railway Company are 1 1/4 inches in diameter and weigh 2 1/2 pounds to the foot.

The Market street rope is 23,858 feet long, the Valencia street 23,700 feet long, the McAllister street 20,580 feet long, the Hayes street 23,385 feet long, the Haight street 20,452. The Fulton street rope is 5,580 feet in length and the auxiliary rope at the Valencia and Market street curve 480 feet long. When a cable is no longer fit for use on the road it is taken out and sold for old iron to junk men or whoever wants to buy it. At two and one-half pounds to the foot it will be seen that the Market street cable, which is the longest rope, weighs on the reel nearly thirty tons. If any one who is not familiar with machinery wishes to become hopelessly bewildered, all he has to do is to go under Market street among the tunnels and chambers full of rumbling pulleys and swiftly passing cables where the Valencia street, Market street, Haight street and the auxiliary ropes come into and go out of the engine house.

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Owing to the press of matter our street railway directory is necessarily omitted from this issue. The directory is now being thoroughly overhauled and corrected, so that when it is printed in the October number it will contain several new roads not reported hitherto and many changes among the old ones, making it the most complete directory yet published.

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We are informed by Mr. W. J. Richardson, Secretary of the Street Railway Association, that he is rapidly completing his arrangements for securing reduced fares to the Cincinnati convention.

Car Starter's Indicator.

The car starter of the Brooklyn City R. R., at Fulton Ferry in Brooklyn, N. Y., is one of the busiest starters in the country. There are nine lines of cars centering there that are owned by the company in question. They all come down to the ferry on one line of rails and though there is siding room for seven lines they all converge into the up track before they have gone two short blocks.

During the busy hours of the morning and evening, many of these lines are run upon two minutes headway and none on more than five. It therefore frequently occurs that from fifteen to twenty cars are

rows of holes, each row having a hole in a line radiating from each minute point upon the dial of the clock.

There are one or two small wooden pins for each line of cars and the positions that these pins successively occupy, denote the time at which the car upon the line to which it belongs is to start.

We have shown the indicator with the pins in the position that they will occupy at ten o'clock in the morning, just as the headway is beginning to lengthen out after the rush trips. Where two lines are run upon the same circular row the pins are marked so that they may be easily distinguished.

The nine lines of cars are the Fulton Ave.;

same rule is followed for the four cars that should start at 10:02, and so on around the dial. The pins are jumped one over the other as in counting for a game of cribbage.

As the headway lengthens out the pins merely make a longer jump.

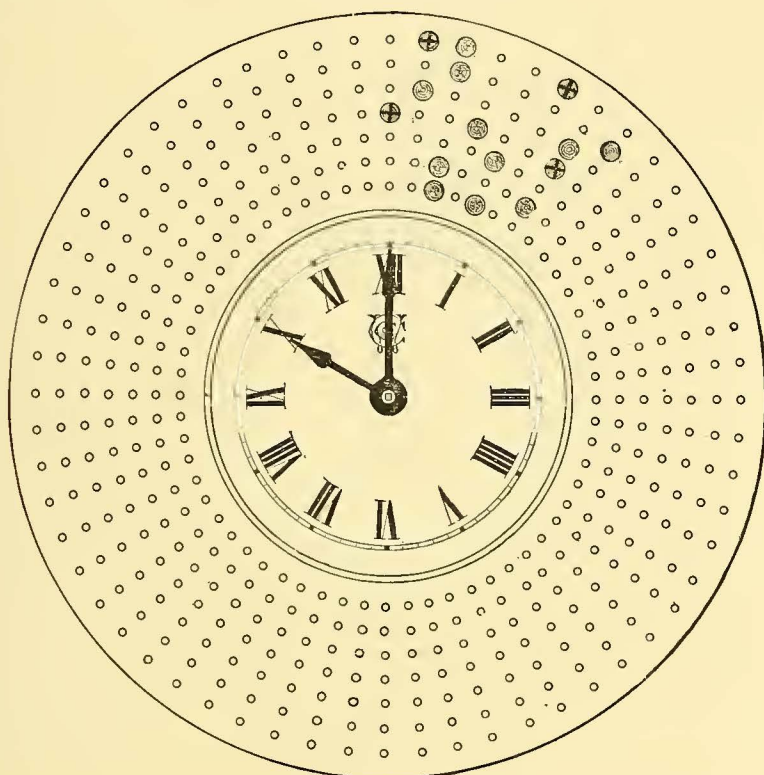
Besides the regular cars there is a continual arrival of extra ones. They are chartered for the conveyance of excursion parties, picnics, militia, etc., to and from the ferry; then they run extra to meet the theatres; and all these cars must be sent out without either blocking the line or running too near each other. So when a line that is running on four minute headway has an accession of say three extra cars, the starter uses his own judgment about shortening the time. The regular cars must run as nearly on their own time as possible. So if he shortens the headway to three minutes he can work one off every nine minutes and not have it noticeable along the line. Or he may despatch every two minutes and not disturb the running of the regular cars at all. If fewer extra cars come in then the work is simplified, if more it is made more complicated.

Any one who watches the precision with which the cars are sent out cannot fail to admire the system that is in vogue and the simplicity with which so many hundreds of cars are sent out over the same rails every twenty-four hours. But the starter's duties do not stop with the mere ringing of the gong; he must see to it that the cars come up into line without delay. He must hurry up the laggards and if a car misses its lead in coming in upon the down track where its line joins the main track he must hold the car that is ahead of it at the switch until its driver can take his horses out and get his car in the line. Where there are so many cars there is a tendency on the part of the drivers to lag and not follow their leader too closely, and it is a part of this starter's duties to hold every man up to the rack at all times.

The present incumbent has been there for twenty years and has all of the routes, streets, time tables and other details of the work at his fingers' ends, and his duties are performed with a clocklike precision.

An order having been made by the General Term of the Supreme Court recently denying the motion of the Cable Railway Company that the report of the Cable Commissioners be confirmed, the company applied to the Court to have the order resettled, the object being to have the argument before the Court of Appeals confined to one point, namely, whether the General Railroad act of 1884 repealed the rights and privileges of the Cable Company, founded upon the act of 1875. The Court has denied the motion to resettle the order, saying that the opponents of the company are entitled to urge before the Court of Appeals the other legal grounds on which they resisted confirmation of the order.

THE UNION ELECTRIC Co. Phila. claim that they are operating their cars for \$1.84 per day, as against \$4.74 for horse cars.



despatched in five minutes. As all of these cars are run upon a strict schedule time it is necessary that the starter should have some simple means of performing his duties.

He is placed in a small office in the corner of the ferry house, next to the down track and close to the cross walk where the cars stand while waiting for the signal to leave. He can thus note every car as it comes in and make a memorandum upon a slate of the trip upon which it belongs. The walls of the office are hung with time tables, all within easy reach, of the time of departure of every car for the twenty-four hours.

On the outside of the building there is a large gong; the number of strokes that are given upon it indicating the car that is to start.

In order to avoid confusion, and the necessity of making out a large time table that would soon be worn out, the starter has an indicator of which we give a full face illustration. It consists of a plain marine clock, with a copper casing set around the outside. This case has seven circular

Greene & Gates Aves.; Myrtle Ave.; Putnam Ave. & Halsey St.; Greenpoint; Court St.; Flushing Ave.; Flatbush Ave.; and Third Ave. Of these the Fulton Ave. runs the most frequently, the Greene & Gates Aves. next, the others following after. In the rush trips during the morning and evening these cars run every two minutes, and are therefore stationed next the starter. As the heavy travel drops off they run on two and then four minutes headway, an extra car coming in every six minutes at the entrance of the East River Bridge, making the cars to run every two minutes upon the line.

At ten o'clock in the morning we find a car upon the fourth line of rails that is running upon six minutes headway. The gong strikes four times, the car pulls out and the pin occupying that hole will be placed in the twelve minutes hole on the same line. At one minute past there are two cars to start. In order to avoid confusion, both in starting and coming in upon the main up track, the starter sends one out a few seconds before 10:01 and the other a few seconds after the time. The

Mechanical Traction upon Tramways.

It is our intention to present in this connection some general considerations upon the subject of this article, the importance of which for large cities is continually upon the increase.

It is evident that, if we meet on every hand a tendency to replace horses by mechanical methods of propulsion, it is because of the general recognition of the economy that will result; and this last is in reality the only consideration that can obtain in the choice between the several methods that are offered. Nevertheless, we are continually meeting those who claim that the cost of maintaining the traffic with horses is less than that of any other means that can be mentioned; and they support their opinion by a calculation upon the number of miles that a horse can traverse daily upon a trot.

Generally these speculations are those of an amateur, and are merely specious, because they are founded upon incomplete data, and neglect certain circumstances which practice imposes. It is nevertheless easy to understand that we expose ourselves to a liability of serious error if we only take one unit of the service into consideration, that is to say, a single vehicle equipped or furnished with its motor, and that these errors will decrease as we carefully note all the details of the question.

Traction with horses necessitates a very complete cavalry organization, that is of a nature to greatly surprise those who only see the manipulation of the street railway as they come in contact with it upon the public streets.

Each car that is put into service requires a certain number, and at times a considerable number of teams which draw it by turns; the horses being given such rest after their work as the conditions impose. If the ground should chance to be uneven, and the traffic is heavy along the route followed by the car, the service will be very hard; while if the ground is level, and the streets are for the most part clear, the traction is easy and the stops are reduced to a regular number. It may be remarked, right here, that, in every well regulated organization, no stops are made to take up or let off passengers except at points designated to the public by posts; from which there results a great lessening in the strains that are placed upon the team, which would otherwise perceptibly cut down their endurance.

The number of horses required, then, for each car, is subject to considerable variation, and is sometimes quite large. But besides those horses that are in the regular service, a certain number must be held in reserve, in order to meet the requirements of accidents, crowds and bad weather. Then we must count upon a certain proportion of sick ones, at grass or in the country at rest, which will afterwards come back into service and take the place of those animals that are broken down. Finally, we must not forget that mortality which always constitutes a figure of considerable loss, and presents a very serious item of expense.

All this requires a considerable collection

of conveniences: numerous buildings for stables, harness rooms and lofts for fodder, a large plot of ground in and another out of the city, a numerous corps of employees, and finally a veterinary surgeon to take charge. This constitutes a body that must be looked after, even to the remotest details.

The expenses which belong to the maintenance of this assemblage that we have just enumerated are necessarily charged to the cost of traction, since they are inherent in this method of traction itself. It follows, then, that the work performed by a team costs according to the exactions and the particular circumstances of each case; varying not only among the different lines of the same system, but especially between the routes of different systems.

In general, traction by horses is very expensive; though it is possible, in exceptional cases, that it may be more economical than any other, when small cars with a single horse are employed, upon a short route with easy grades. We also find that in certain extensive systems, where the organization is perfect and the ground level, especially where the wealth of the passengers gives the enterprise the maximum of receipts, that they feel less sensibly the advantages that would accrue from reducing the fares. But, in both cases, the advantage is continually threatened by the possibility of a partial or general epidemic that may fall upon the stock. It is hardly wise, then, to expose themselves to it, and we know that the management of certain street railways are only temporarily clinging to horse traction, and are waiting for some mechanical method of traction to free them from these encumbrances, while at the same time the safety of the street traffic is maintained.

It would therefore appear that the employment of mechanical motors reduces into one very important limit both the installation and the *personnel* necessary for the service; also, that the number of motors on the whole available force is far less than the number of teams or the total horse power. If we reflect that when these motors are not in use they are not consumers, we shall not be astonished to find that all these reductions in expense result in an economy in favor of the mechanical methods.

Divers systems of mechanical traction have been proposed and applied. They may be divided into two principal classes.

In one the means of locomotion is common to all the cars upon the line or circuit. It comprises traction by cable and electricity when the current is furnished by one station for the whole line, by means of a special conductor or of a line of rails.

We absolutely reject this class, for we can not allow that an accident, such as may at any time occur, the rupture of the cable or the circuit, shall cause the absolute stoppage of all the cars, and an interruption of the service that shall be more or less prolonged. While we withdraw this decision in certain particular cases, for small lines like that at Brighton for instance, or suburban roads like the one at Lichterfelde,

which use electricity, or where the ground is very uneven, as at San Francisco, necessitating the cable, we still maintain that it is inadmissible upon important systems where the street traffic is very great. Here, least of all, would it be advisable to put all of one's eggs in the same basket, for, admitting that the system is more economical than any other, this reason should not influence the final determination until after the obligations of a public service have been respected.

We pass then to the class of independent motors.

When we determine upon the use of motors for street railway service, the type which presents itself to the mind is that of the steam engine, furnished with a boiler and carrying its own water and fuel. Many designs of this kind have been employed, both as separate motors and as motor cars.

The locomotive upon the motor car offers this advantage, that it permits regular trains to be drawn, while the space reserved for the motor upon these cars is kept within the limits of the power corresponding to the service of the car which carries it. The locomotive, then, better fulfils the requirements of those lines that do a heavy business or upon which there are frequent delays.

Whether the motor be a small locomotive or not, the presence of the firebox with the resultant production of smoke, ashes and burning coals, which are scattered along the route, constitutes a serious inconvenience if not an actual danger. The use of engines requiring a fire, then, is not only intolerable in cities, but is very rarely permitted.

On the other hand, the price of these machines is considerable, their maintenance very expensive and their consumption of fuel relatively high. Add to this that the conditions of draft necessitate some method of exhaust, the noise of which is very disagreeable and often becomes a cause of accidents, from the fact that horses, especially carriage horses, are with difficulty accustomed to it.

Next to engines carrying their own fire, we look to the fireless steam engine and the one using compressed air, and finally to the electric motor using accumulators.

Our readers are familiar with the fireless engine; they know that the system presents none of the inconveniences of the ordinary engine, over which it guarantees, on the contrary, many advantages. We will afterward return to the question in discussing a very important application of the system.

Compressed air engines do not possess the inconveniences of the regular steam engines, but the system is inseparable from certain particular defects which the multitude of motors has not yet succeeded in surmounting.

As for electric motors driven by accumulators, if they seem to have resolved the problem of handling the car as though it were deprived of a motor, and were placed under the control of an ideal force, they still embody objections of another order, which appear in the form of expense.

Now, for mechanical traction, as in every other enterprise, the cost of carrying on the business is the criterion upon which every comparison must rest. And here we mean the real operating expense, that is to say, the one realized in actual service, and not an exceptional result obtained from a series of trials, no matter how conscientiously they may have been conducted. It is for this reason that we have attached only a relative importance to a report, although drawn up very copiously, of the trials at the Antwerp Exposition with the ordinary engine, a compressed air engine and an electric motor. He must be absolutely without experience who would imagine that all the special conditions of an exposition could be repeated in practice, so that to be adapted to the latter they must be singularly modified.

This report gives the palm for traction to the electric accumulators, and the interested parties are eager to scatter the news through those papers that will publish it, and even to insert it as an advertisement. It is, nevertheless, an unheard of proceeding that engineers should fix the operating expenses without having given particular attention to that important factor, the cost of maintaining the accumulators, and from the action of the electric motor on a selected route. It is the height of folly, and their appreciation of the other systems can no longer obtain serious attention, from the practical point of view. An exhibition of street railway engines can only be of value when it has, in addition to certain appreciable advantages of plans, or the sole representative of a system, or of designs officially established in some incontestable manner, some results of exploitation, and it can only be really conclusive when the local and particular circumstances are practically the same, as may be found on different routes. The machines need not be taken from the place where they are exhibited; for this set scene, dear to all exhibition juries, is absolutely superfluous, for they enter more in the form of an *attraction* to visitors than as a method of *traction* upon street railways.

Besides the operating expense for each system, where sufficient data are at hand to establish it, a simple reasoning suffices to show that it must really embody the two principal advantages, the economical production and utilization of the motive force.

Let us consider from this point of view the fireless engines, compressed air engines, electric motors using accumulators, and also the regular engine.

It is evident that in these last the utilization of fuel is deplorably deficient; this division into a series of small fireboxes offers such an obstacle that a regularity in steaming is difficult to realize. The small locomotive is the typical fuel waster, and this is the reason why it is avoided by careful managers. This serious defect is not encountered in the three other systems that are occupying our attention. In fact, in all three, steam is generated in stationary boilers, which may be chosen from the most perfect of their type, and be run with the

greatest possible intelligence and care.

In the fireless engine, the heat of this steam is confined in the water of a reservoir that is well protected against external influences, in such a way that loss from this source may be neglected, and the machine will be found, hours after it has been charged, in practically the same condition as at first. The steam from the reservoir drives the motor, so that the energy furnished by the boiler is so utilized in the work done by the motor that it is only reduced by a single coefficient.

For the compressed air engine, we have first the steam engine and the air compressor, then the air motor upon the car, giving three appliances and as many coefficients of reduction. For the same amount of energy taken from the boilers, the work performed would then be very sensibly less than in the preceding system. We do not ignore the claims of the interested parties, produced for the support of the pretended economy of the compressed air motors; but we are well aware that the figures furnished in opposition to those given by the fireless engine relate to the traction of only a single car, whereas this last machine drew two upon the Lille-Roubaix line and elsewhere. Furthermore, it appears from certain signs that the operating expenses are not what they should be, in consequence of certain transfers which materially lessened the traction account. The absence of official documents, which can not be obtained, warrants then every suspicion, and statements without proof can not cause us to change our appreciation of the effectiveness of the system.

It should be carefully considered that if the stationary plant of the fireless engines is reduced to the boilers with their attachments, that of the compressed air system includes besides the air compressors both in service and in reserve, their maintenance, interest and depreciation, constituting an important item in the cost of traction.

For the electric locomotive, the plant consists of a steam engine driving the electric generator, that is the dynamo which transforms the mechanical into electric energy, the accumulator which stores up the electricity, and the electric motor which transforms the electric energy into mechanical energy, so that four sets of machines are necessary for the utilization of the energy furnished by the boiler; that is to say, that this utilization must be subjected to a quadruple coefficient of reduction. Whatever may be the effectiveness of these different machines, the effectiveness of the system itself appears inferior to that using compressed air. The same remark can be further made upon the reserve machines and their maintenance, the interest and depreciation upon the plant, in adding those of the accumulators.

Another point that must not be lost sight of is the importance of the capital invested in the plant, which is far greater for the electric and compressed air systems, than for that of the fireless steam engine. Besides, the more complex the installation the

greater the number of employees that will be required.

It is easy to understand, then, how well founded is the surprise caused by the decision of the Antwerp jury, among competent persons. We note from memory, that this jury paid no attention to the fireless engine, which was not represented at the trials; the trials were then limited, and it is important that the public should receive the proper cautions, in order that it may not be led into error by those who will be interested in scattering abroad the decision proclaimed regarding the generality of the systems of mechanical traction.

We can demonstrate that all of the material necessary for the use of fireless steam engines costs far less than the simple purchase of the ordinary locomotives indispensable to accomplish the same service, and our demonstration will be based upon figures derived from a long practical experience with the system. The other systems at Antwerp, would be, we think very greatly embarrassed to fairly and squarely make the same demonstration, as much as they would be to justify their pretensions to the economic superiority of their service and their operating expenses.

The promoters of the electric, compressed air, cable and all those systems that have a stationary motor, have not yet spoken of using natural forces, but that will come. Only they know what the utilization of these natural forces really costs, especially in the investment in the plant. It is doubtful then whether this kind of application can ever become general, even where these forces are available, and it is still far less certain that they can employ the energy furnished in transporting it to any distance, whether by cable or electricity. The service will fall to a ridiculous figure and the expenses will increase in a way that will be entirely unacceptable. We only mention the possibility of such a project to show the foolishness involved in its accomplishment.

We have seen that the motor car cannot fulfill the requirements of the service in large cities, especially where the traffic varies between the termini. Beyond certain figures, the expense of rolling stock will be out of all proportion to the normal service; furthermore, the short intervals between the cars is far more troublesome in a busy street than the length of train.

These reasons, then, militate in favor of separate locomotives drawing several cars according to the traffic requirements; that is, in favor of trains.

The only serious objection that can be raised to this method of transportation in cities, is the difficulty of stopping a train as promptly as will be found necessary in the service of a city street railway; the moving mass being so great. Were there a brakeman upon each car it would be difficult for them to be constantly putting on the brakes, and furthermore, they could not apply the brakes upon the cars and engine simultaneously.

The objection falls to the ground if a good continuous brake is used, one that is

operated by the engineer and acts upon each car if necessary. For quick service upon street railways, the stopping might be made instantly. The solution of the problem lies then in this application. In our opinion the choice would fall upon the continuous and automatic Carpenter brake.

Finally, there is no longer any reason for maintaining the traction department of street railways with horses, economy and security of service being guaranteed by a rational adoption of mechanical traction.—*Moniteur Industriel.*

Fungi and the Decay of Timber.

P. H. Dudley in the *Popular Science Monthly* for August, gives an interesting account of the fungi that are active in producing the decay of timber, especially of that which is subjected to the peculiar exposure of railroad ties, stringers and telegraph poles. He states that timber cut in the spring growth, when the starch in the sap-wood is transforming, furnishes in this part of the wood a good media for the growth of various ferments which produce decomposition, and unless quickly checked will start the decay of the woody tissue.

It was the universal belief, until a few years since, and is still a common one, that the decay of timber was due to slow combustion. Improvements in, and the use of the microscope have shown, that the true cause of the decay of wood is due to the various forms of fungi. Many definite forms which cause fermentation have been traced and more are known to exist which are so small that they are beyond the definition of present microscopes.

In defining the fungi the author calls them "a great group of a low order of leafless and flowerless plants, destitute of chlorophyl, whose functions are under certain conditions to undo and return to the air and soil the elements assimilated by the higher plants and trees in their woody structure during growth," and of these fungi over fifty thousand species have been described.

When they grow on the underside of a plank, closely packed boards and railroad ties, they are usually similar to a series of fan-shaped stems and appear like skeleton leaves. As far as the actual decay of the wood is concerned the most important part of the fungi is the mycelia, so called. These are small filaments ranging from 1-500 to 1-2500 of an inch in diameter, yet they are able to pierce the walls of the wood-cells when softened by moisture. Where this formation "has once run over the wood in a dense growth, it destroys its strength from one-eighth to three-quarters of an inch in depth, and if the wood dries, cracks and crumbles to pieces, it forms the so-called 'dry-rot' in timber, which is said to take place when the wood is perfectly dry.

"This is, however, a popular misconception as it cannot commence unless there is some moisture and sufficient heat with a free access of air to supply the oxygen needed for the reduction of the tissue to lower compounds. If the wood does not dry, these filaments continue to grow until all of the wood cells are disorganized and fall

to pieces, or, in other words, are completely rotted. 'Dry rot' was named from the effect produced, and not the cause, to distinguish it from the so-called 'wet rot.' It has been an unfortunate designation, misleading many people, causing them to believe that timber will rot when dry, and proper precautions have not been taken to prevent decay, on the supposition that it would occur in any event."

"Hemlock inch boards can be completely rotted through in six weeks of July and August weather by the mycelia attacking both sides of the boards when damp, and piled up without air space between each. Cargoes of lumber and timber in long voyages are often badly injured by the growing mycelia between the pieces."

A little more care in piling and stacking green lumber by producers and consumers, permitting a circulation of air between each piece, would prevent this growth and annually save large quantities of valuable timber.

If moisture collects and remains on seasoned timber, the mycelia will also grow and destroy it. Large timber should be seasoned under sheds, otherwise the sun will season an outside layer, preventing the escape of moisture, and the internal growths of ferments and mycelia fungi will destroy the inside of the timber, a thin outer shell remaining sound for some time.

Experience has long since established the fact that wood kept perfectly dry will last for many hundreds of years, as has been the case in the roofs of foreign buildings, or when it is submerged in the water, as has been the case of piles used for foundations of the earlier bridges in older countries. Posts and telegraph poles can daily be seen which are decaying near the groundline, but are sound above after three to four years service. By comparing the different conditions of use, it can be seen how little change is required to render unstable what would be stable under other circumstances. In roofs, the conditions are dryness, circulation of air, plenty of spores, and sufficient temperature to germinate, but the necessary moisture is absent. In the case of submerged piles, plenty of water, sufficient temperature, but exclusion of air either to carry spores or to permit them to grow. In the case of posts and telegraph poles we have the spores, the moisture, and the necessary temperature in summer for germination, and decay ensues from the fact that these are the essential conditions for the growth of the fungi whose work is to undo and liberate the compounds in the woody tissue.

Dummies in City Streets.

The following report of the proceedings taken against a street railway company for not complying with the strictest letter of the law will be interesting to our readers.

The Brooklyn City Railroad Company has been having trouble with the heirs and representatives of the estate of the late George F. Hussner for years, and so far the railroad company has got the worst of it at

every stage of the conflict. Hussner owned two lots of ground with buildings on the northwest corner of Twenty-fourth street and Third avenue. In June, 1877, the railroad company applied to the Mayor and Common Council for permission to use improved motors on Third avenue, between Twenty-fifth street and the city line. The request was granted, both the Mayor and Common Council joining in the consent. Shortly afterwards the Common Council passed another resolution giving the company permission to run down to Twenty-fifth street, but the Mayor never signed the resolution as required by the law of 1877. Ever since that time, however, the company has run its steam dummies down to Twenty-fourth street, and up the street far enough to enable the trains to be switched down below Twenty-fourth street on Third avenue, and the engines turned around and put head on for the outward trip to Fort Hamilton. Hussner died a few years ago, and his administrator brought an action against the railroad company to recover damages to the real estate caused by the use of steam dummies. The case was tried before Judge Cullen, in the Supreme Court, and the jury gave the plaintiff a verdict for \$1,600 damages. The case was appealed to the General Term, and thence to the Court of Appeals, and resulted in a confirmation of the judgment, which the company had to pay, with costs and accumulations. About two years ago the heirs of Hussner brought another suit against the company for the damages they claimed to have sustained from the time the other suit was brought up to the time then ended. That suit was tried before Judge Brown, and resulted in a verdict for the plaintiff for \$1,100 damages. An appeal was taken to the General Term, and at the session held within the last few weeks in Poughkeepsie that tribunal affirmed the judgment.

Notwithstanding all these adverse decisions, the company has persisted in using the dummies precisely as though nothing has happened. Since then an application has been made to Judge Cullen, in Special Term of the Supreme Court, for an injunction restraining the company from operating its dummy engines below Twenty-fifth street. It was claimed that the proper consent had never been given the company to operate even an improved motor below the point named, inasmuch as the law of 1877 provides that both the Mayor and Common Council must join in the consent, which they did not do regarding the second resolution passed by the Common Council, and also that section two of the law of 1877 expressly provides that street railroads then in operation might be given by the authorities mentioned permission to operate "improved motive power, or motors," but as expressly forbids the use of the "ordinary steam dummy or box engine," such as is used by the Brooklyn City Railroad Company on Third avenue.

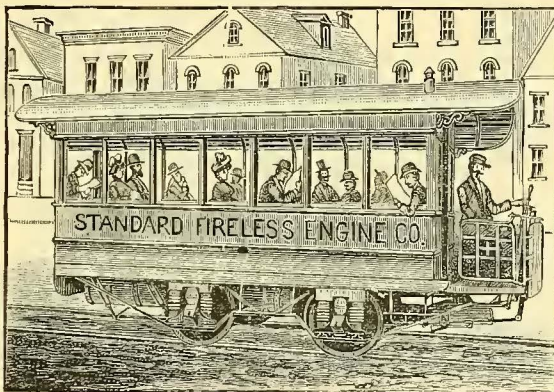
If you have cars for sale, advertise them in our Special Notice column.

Standard Fireless Engine.

This engine* is intended to operate with ammonia as a motive power for street and other cars, and also for other purposes.

The apparatus to be used is similar to that now in use for liquefying or distilling ammonia in the ice factories, where the absorption principle is employed, but with essential improvements.

These improvements relate to the more complete elimination of the gas from the weak solution blown off from the bottom of the retort or still, and to ensure the more complete saturation of the strong solution being fed into the retort or still by the gas eliminated from the weak solution; also to the method of charging one portion of the apparatus on the motor or other machinery with the liquid ammonia, and the other part of the same with a portion of the weak solution drawn off. To the method of expelling atmospheric air, which may have leaked in through the connections, and to the appliances, machinery and apparatus therefor; also to the motor car itself and its machinery and appliances, and the method of operating the same.



It is claimed that a car mile may be run on two gallons of liquid ammonia which in turn requires four pounds of coal for its formation; and that on a road running fifty cars they may be operated for \$2.40 per day each.

The car is fitted with a pair of small 4x4 engines, not unlike locomotive engines, but with essential modifications. It has also two tanks or receivers under the floor of the car, one within the other; the inner one is of special form and construction, and the outer one is a common tank containing water or a weak solution. The material is prepared at a stationary apparatus at the depot, and the process consists in separating ammonia from water by heat and reducing it to a liquid under its own pressure.

The inner receiver on the car is charged with a portion of this liquid ammonia, while the tank containing it is charged with a portion of the weak solution from which the ammonia was abstracted; and so charged, the car is ready for running by the opening of a valve. The gas, after operating the engine, is exhausted into this solution in the outer tank and instantly absorbed, so that there is no escape in the atmosphere.

When the car returns to the station this solution which has become concentrated by the absorption of the gas is withdrawn for re-separation and recondensation at the stationary apparatus. Therefore, there is no waste of the material. The cost of this system is measured by the cost of the fuel consumed at the stationary apparatus and the necessary attendance upon the same.

*Standard Fireless Engine Co., New Orleans, La.

Brooklyn's Rapid Transit Fight.

In 1879, the Mayor and the Common Council of Brooklyn, N. Y., granted permission to the Kings County Elevated Railroad Company to proceed with the construction of their line up Fulton street. Contracts were made for materials and labor, and ground was broken for the road; but by some sudden and, as yet, unexplained freak, the Board of Aldermen rescinded the franchise. The reason given, though palpably too weak to gain credence as the real one, was that the company had proceeded in an improper way in asking the grant from the Mayor in a matter where their majesties, the Aldermen, were concerned.

The representatives of the company and its friends were naturally somewhat indignant at such treatment, and they have tried, though ineffectually, to induce the board to reverse its arbitrary action. Eminent counsel were engaged and long arguments poured into the ears of the City Fathers. They were assured that the company was earnest in its intentions to complete the road as soon as possible, but the arguments were wasted.

Nevertheless, the company, feeling confident that the clouds would before many weeks roll away, erected a couple of arches at the corner of Fulton and Boerum place and dug a few holes along the proposed route. One day however, an injunction was slapped upon the Kings County people and the work stopped. Tiresome arguments were heard day after day in Justice Cullen's court room, and finally a decision was rendered which was not calculated to please them. While a petition to the Court of Appeals was being talked of another bombshell landed in the camp. Notice was served upon the Kings County Company that the Attorney-General proposed to prove that its charter had lapsed. Counsel prepared most exhaustive arguments to repel this last attack, and the Judges at

Poughkeepsie sat for hours listening to the combative arguments of the chief lawyer of the State and those who endeavored to defend the corporation's rights.

It was hardly expected that a decision would be rendered before fall, but a special sitting has been ordered at Poughkeepsie, as we go to press, which may clear matters up or may produce further entanglements.

While the Kings County men have been struggling in the courts a new candidate for rapid transit fame has been developed in the formation of the Union Elevated Railroad Company. Its original plans contemplated a most gigantic system. Routes traversing nearly all the big thoroughfares in the city have been laid out. The Common Council has granted permission to this corporation to proceed with the construction of its lines. Fifth avenue alone, as yet, has been surveyed, but the fun will undoubtedly begin when an attempt is made to build on Fulton street. Should the decision of the Court be favorable to the Kings County Company, and should it endeavor to resume building, it will not be surprising if the Union corporation applies for an injunction on the ground that whereas the rival company has had its grant rescinded, its (the Union's) is unassailable. Should the decision, on the other hand, be adverse to the Kings County people, an appeal will doubtless be taken. Thus will the fight continue in the courts, the lawyers getting richer while the citizens grow madder.

And that this action upon the part of the citizens may not appear unreasonable, it may be well to recapitulate the state of affairs. The Brooklyn City Railroad control the line of rails running from Fulton Ferry to the City Hall and thence branching out to the different sections of the city. They run their cars at such short headway over this line of rails that the heads of one team of horses are close to the rear dasher of the preceding car, and even with this service it is impossible to meet the demands that are put upon them during the evening rush trips. People living on the hill, about a mile and a half from the ferry, walk in great numbers to and fro every morning and evening. Under the circumstances an elevated railroad is an absolute necessity, and since the city is growing so rapidly, it is doubtful if the construction of an elevated railroad over the Fulton street line would materially injure it in the long run.

To have this desirable feature of rapid transit cut off at the mere whim of a board of men, on the ground that sufficient regard was not paid to the high and honorable position which they occupy, is an absurdity that may well arouse the indignation of all citizens who make the long tramp, or are obliged to travel in the overcrowded cars between the ferries and their homes.

A Street Car Episode.

The maid bewitching looked, and sweet;
The thoughtful man rose to his feet,
He tipped his tile,
And with a smile,
Said, "You are welcome to this seat."
He gave a startled look at her,
And from his face one would infer,
Confounded, dazed,
Stunned and amazed,
That she had said, "I thank you, sir."
[Pittsburgh Commercial Gazette]



Monthly, \$1.00 per Year.

F. P. HARRIS, General Manager.

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Boston, Mass., 185 SUMMER STREET, H. M. SWET-
LAND, Manager.

Philadelphia, 119 So. FOURTH ST. J. H. MCGRAW
Manager.

The Cincinnati Convention.

Indications seem to point toward the conclusion that the coming convention of the American Street Railway Association, to be held at the Burnet House, in Cincinnati, Oct. 20th., next, will be a decided success. Cincinnati is a central point. The growing interest in street railway matters and in the association, will probably bring together a larger number than have ever met before, on similar occasions. Secretary Richardson is negotiating with railroads for special rates of fare, and we are assured by Mr. Kerper, representing the local committee at Cincinnati, that no pains will be spared to make the convention interesting. The importance of the subjects to be discussed will be obvious to anyone who glance over the list given in these columns.

Better Cars.

It is a significant fact that the orders booked by the John Stephenson Co., last month, for new cars, which, by the way aggregate the largest in the history of the company, had an average value, including one horse car, of \$1050.00.

It is not merely a matter of good taste on the part of street railway managers, but is becoming obvious to the most casual observer of street railway practice, that fine cars pay in dollars and cents even on line where the traffic is comparatively light, to say nothing of those where the business is heavy.

In another column we publish a translation of an article on mechanical traction upon tramways, written by a French engineer. He discusses the problem of the various styles of motors with candor and upon a reliable basis, considered from a theoretical point of view, presenting the pros and cons of the discussion, though evidently from his particular standpoint. It is amusing, however, to see the coolness with which the cable and electric roads are put out of the race after the thorough demonstration of their effectiveness that has been made in this country. But for those who are interested in the subject of street railway motors, the article is worthy of attention.

Exhibition of Street Railway Appliances at the Cincinnati Convention.

For the convenience of manufacturers of railway appliances, and others who desire to exhibit goods at the convention of the American Street Railway Association, to be held at the Burnet House, in Cincinnati, Wednesday Oct. 20th., next, the publishers of the STREET RAILWAY JOURNAL have arranged with the proprietor of the Hotel for such space as may be required for that purpose, and will assign space for all articles for exhibit which the owners see fit to send to their care.

By this plan which was successfully carried out last fall, at the Southern Hotel, in St. Louis, the exhibits may be attractively arranged, and unless desired by the exhibitor, need not be accompanied by a man in special charge. No charge will be made for space, and no expense need attend the exhibit excepting for transportation and such incidental charges as unpacking placing in position, etc. Freight and express charges should be prepaid and goods sent to the owner in care of the STREET RAILROAD JOURNAL, at the Burnet House, Cincinnati, Ohio.

Exhibitors will please advise our New York Office, as early as possible, giving an approximate idea of the amount of space required, and of the nature of the exhibit.

So far, as we are enabled to judge from inquiries thus far made, all those who participated last year, will take part in the exhibits at the coming convention, and doubtless numerous others. This is an especially desirable opportunity of bringing before a large number of representative railroad men, from all parts of the country, whatever is new and valuable in connection with street railway equipment.

Supply Men at the Convention.

It is evident that conventions of large purchasers of any kind of supplies are exceedingly popular among the dealers in these supplies. If they were not, the presence of so large a number of agents, salesmen and representatives, added to the willingness manifested on the part of these same representatives to spend money in a most open-handed way for the entertainment of the delegates, would be wholly unaccounted for. There may be a certain feeling of good-fellowship and unselfishness upon the part of the supply men, while actually pouring out their ducats; but the strong current that takes them there is profit. They go with the resolve to convince as many delegates as possible that they can build the best and the cheapest car or make the best and cheapest harness, halter or window attachment.

The delegates, on the other hand, go there for the express purpose of comparing notes and discussing the best methods of attaining success in the peculiar industry in which they are interested. There may be a few who look upon the affair as a kind of junket, but these may be counted out.

It follows, then, that as each member goes

away convinced that he has gained information from the experience of others that will assist in the management of his own affairs, so will he consider his time and money well spent. But if he finds that his time is wasted, that there is nothing new to be seen or learned, that he has neglected his business for no purpose, and that the money expended would have brought more pleasure or profit if spent in other directions, he will be disposed to regard the convention as a fraud, withdraw from the Association and drop the matter entirely.

The continuance of the meetings depends, therefore, upon the success of the convention from the standpoint of the delegate; and, as the supply man's profit hinges upon this success, it behooves him to contribute toward it in every possible manner; to attend the meetings, listen to the discussions and know something about what has been done when it is all over. It may be that the harness man would not be particularly interested in the ventilation of cars, but it would be a very queer convention that did not at least touch upon some topic that will interest. But for the supply men to go there, and use every endeavor to make the whole affair one big advertisement, is in reality an effort directed against their own interests, and for which they will pay by losses in the future. It is the skillful covering up of their real designs, and the attractive disguising of the matter and at least a seeming enthusiasm in the proceedings in hand, that will push the convention onward in popularity, and the wily supply men will reap the profits which they so greatly desire.

It is curious to note how people will fight and people will swear to keep a street railway from laying its rails. But when they are once down and the cars have been run, the very same people are anxious to ride. If the road asks a privilege that has not been given, they look askance at the asker and like to refuse. But if there is talk of a removal of rails, a stoppage of cars or a less frequent service, the hands and the voices of the growlers are raised to keep the company up to a full service. After the fight for the right and its demonstrated value, one would naturally think that the Broadway line of cars would serve to choke off a few of these croakers. But a big New York daily, in commenting on the proposal to haul the Third avenue cars by means of a cable, says the people have rights, and may strongly object to the passage of trains or of single cars, even at the speeds that have been proposed by the company. Our daily forgets, if ever it knew, that a cable car may crawl, and at less than snail's pace, through a street that is crowded, while the cable is running at ten miles an hour. And the control of these cars is so perfectly placed in the hands of the driver that it has been clearly shown in Chicago and San Francisco that there is no greater danger to pedestrians and wagons than with the system of horse propulsion. If the changes referred to should ever be made, the advantages accruing to the road and the public are so great and so perfectly apparent, in the bet-

ter transit facilities that can be offered at a lower rate, that it seems a pity that there should be croakers in positions of sufficient influence to stir the public mind up against the scheme while it is yet in its infancy.

Guesswork Construction.

It does not take much engineering skill to nail an iron strap upon a plank, nor are the scientific attainments that are brought to bear in the digging of a ditch of a very high character. So when it comes to putting the plank in the ditch, and letting the edge project above the surface, the latest graduate from an engineering school considers himself fully competent to do it; and even the stable man or car washers see nothing so very big in that. But when the plank becomes the stringer and the strap the rail the first man that comes along who can handle a level and run a tangent, is put at the work, and made engineer of the proposed line. The company seeing no need of scientific skill or the services of an experienced contractor, proceeds to build its own road.

But the forces of nature are no greater idlers in the streets of a city than upon the plains or among the mountains. Expansion always follows the application of heat, and contraction its withdrawal. A spike can cut away the wood, create havoc with the strength of the stringer, and leave the strap rail loose as well as the T rail that is supposed to be fastened to the tie. Frost will heave the pavement; and these pavements will be found to possess all the peculiarities and sinfulness of the worst of ballast. The rain and sunshine conspire to destroy the road, cross-ties are loosened, knees fail to hold, the plates cut into the timber, and the stringers are crowded in and out until they are all askew.

And why? The timber may have been poor, and the paving worse, while there was no drainage given to the track at all. Bolts were put in holes too large to give a bearing, the seating of the stringers on the ties was not square, and the rails were not securely held. At first it seemed all right but though you could not shake the new-laid structure with your hand, it did not have those elements of strength, that only come from skillful workmanship; so when the rains fall and the frosts come and pry upon that track, it is loosened at every joint, the cars wander from the rails and a reconstruction is required.

Then the skilled constructor is called in, he digs, and tamps and hammers, and pries, until a good repair job is effected; then sends in a bill that rolls the outlay far beyond what would have been a fair original cost.

Companies cannot be too careful in this matter, of their track laying and construction, and should learn that the road is something more than a log in a ditch, and a car requires a better roadway than a wheelbarrow that will roll upon a plank. A good roadway means much to a new company. It means less power to haul its cars, a small expense for years to come in overhauling

and repairs, a smoother riding car that will attract a larger patronage than the bumping box we too often see; and lastly, it may give a profit and a dividend where otherwise a loss that endeth in a sheriff's sale may stare them in the face. The moral then is:—All roads should be built by well-skilled men, and not by those who know nothing of the trade.

The Recent Strike.

There is a homely phrase about biting off more than one can chew, that is applicable to a great variety of human conditions. It is a feat that invariably causes inconvenience and at some times disaster to the biter, and and it requires strong jaws and a good digestion to come out of the trial unimpaired. It would seem to the casual looker-on that the labor organizations have placed themselves in this same condition. They have repeatedly tried during the past few months to enforce unjust and unreasonable demands; they have resorted to violence wherever the slightest opposition has been offered; they have squandered, destroyed and wasted millions of property; they paralyzed in one case the industries of a large territory; they have been responsible for a large loss of life, and have been in almost every case unconditionally defeated.

It is true that the laboring man, so called, is poor, that his surroundings are not noted for their luxury and that he is subject to many and great sufferings. But his condition is far better than that of his predecessor, his wages are higher and their purchasing power is greater than they have been before. And if he would ameliorate his own condition and that of his kind it can be done by following two very simple rules of abstinence. Let him drink less whiskey and have fewer children.

The street railway lines have been the corporations most bitterly attacked; probably because the grade of labor, that they employ is lower, and the men more ignorant and are therefore more easily influenced by the harangues of those demagogues whose very existence depends upon the troubles they can breed between the employer and the employed. They succeeded in maintaining an unjust fight for several weeks with the Third Avenue Co., but were defeated, and now two hundred of the former employees are out of work.

No compromise was made, and the strikers have to stand the brunt. Now just as we go to press the Broadway road resumes its work after a three days fight with hoodlums, roughs and strikers. The management put out a new schedule, which the men claimed could not be filled in twelve hours work; and to this it was agreed that all overtime required should be paid for at an advance. But this could not be swallowed by the committee-men in charge, and so a strike was ordered. All men were then discharged and applicants came flocking in from every side to fill the vacancies thus formed.

For two days the streets were full of rioters and thieves, some few have lost their lives, and many have been carried

home with broken bones and heads, cars have been demolished, and the police have had to fight all day. And now when the road has shown no disposition to withdraw from that position, which it first assumed, the organization yields and the men come back and ask for work. They come alone, and each one takes what he can get, and some are turned away because another has been taken on to fill his place. Then when the road was well at work the men propose that they give up twenty-five cents a day in pay, and have one less trip to make; to clinch the matter and reduce expense the road agrees.

The men who lose are those who blindly follow in the course that the masters bid them walk, and think because they dare to raise a riot in the streets, defy the law and bluster through a day, that they can overturn the law to which they owe their lives and make again those great unwritten laws of trade, by which all intercourse between those who come to buy and sell is regulated.

We are sorry for the men, and only hope that those who lose learn what, as a mob they never can, that they must first reform their lives and minds, and fit themselves to take a higher stand than they can ever fill while they allow their every action to be dictated by an irresponsible executive committee. And finally we add, that it seems strange that after the hard lessons that they've learned and blows they have received, they do not see that society is founded on a rock, and turn their backs upon those men whose dislike of work leads them to harangue for a reform in labor.

New York Railroad Revenues.

The reports of the gross earnings of corporations for the year ended June 30, 1886, continue to show a good many interesting facts not usually visible in a cold array of statistics. The city railroads show gains except the Third avenue, which presents a falling off in revenue of \$117,000, and the Forty-second street, which drops \$42,060, in its revenue as compared with its revenue of last year. In both these cases the loss is due directly to strikes. The immediate competing lines of the Third avenue, the Second and Fourth avenue lines, show respectively an increase, on the Second of \$98,000 and on the Fourth avenue of \$82,425. The city roads, as reported, are herewith stated:

	1885.	1886.
Fourth ave.....	\$840,008	\$722,436
Sixth ave.....	851,698	846,703
Forty-second st.....	419,898	377,835
Belt Line.....	766,794	768,623
Houston & Pavonia.....	215,764	229,748
Central Crosstown.....	117,888	201,569

The Brooklyn horse-railroads show a slight increase generally, while the Atlantic avenue, notwithstanding Deacon Richardson's labor troubles, shows the remarkable gain in revenue of \$34,265 during the year. The small parlor railroad at Coney Island called the Marine railway, of which it was once said that it paid heavier dividends on its capital than any other railroad in the world, has evidently lost its grip since a walk was constructed between the two beaches of Manhattan and Brighton. It reports this year its gross earnings at \$16,010, as against \$150,242 last year.

Progress of Cable Roads.

The profitable investment that has been opened to the public since the introduction of street railways as a method of conveying passengers, who have not the means to own private conveyances, from one part of thickly populated towns and cities to another, has rendered their construction and growth a matter of interest to all classes.

It is well known that for years after it was discovered that a load could be drawn more easily upon rails than upon a rough or even a macadamized road, these tracks or tramways were used almost exclusively for the transportation of freight. And after the construction of the roadway received its one improvement of bolting iron straps or plates upon the wooden stringers that had previously been used, the track remained in that condition down to the latest practice, with the solitary exception of the introduction of the combined metallic rails and stringers that are now gradually coming into use.

The car is the same four wheeled vehicle with a short wheel base that it was when it was first used for carrying coals in the north of England in the last century. To be sure, the body has been lengthened out and the box made higher and broader, with seats and cushions, windows, shades, lamps and springs, yet the fundamental principles of construction are the same in the old coal car at Newcastle-on-Tyne and the elegantly upholstered car of the Boston Back Bay line. The driver and the motive power are the same.

With the growth of our western civilization, it was found that there were places where the power of a horse was found to be insufficient to haul paying loads. Under these circumstances recourse was had to the old idea that obtained such a strong support from theoretical engineers in the early days of steam transportation, and which made such a strong fight against the locomotive before the efficiency of the latter had been practically demonstrated. The endless cable gave the means of securing a positive motion from one point to another.

It remained then for our western engineers to put this cable out of the way so that while its own motion and free action is uninterrupted, it will not in any way block up or interfere with the traffic of a busy street. The underground conduit with the narrow longitudinal slot in which the grip can run, solved the problem; and after as many objections to its practicability as had been raised in its favor some sixty years ago, after long arguments to persuade capitalists to invest, and after hindrances without number on every hand, the San Francisco road was finally completed and demonstrated itself to be a practical success. This was followed by others, in spite of the still tenacious objectors that the cables would soon wear out, that they would break, that the speed of the cars could not be regulated, and that they never would work when the ground was covered with snow.

Encouraged by the success at San Fran-

cisco, Chicago began the construction of a cable road, and it was clearly demonstrated by all of the wisacres that the snow would render their use an utter impossibility during the winter. But the winter came and piled its snow and ice and slush and mud upon the tracks. It was quickly swept aside and the cable-hauled cars ran with a speed and regularity that had never been dreamed of as a possibility with the horse lines.

Troubles and difficulties have existed from the first in every stage of the development. Cables have not always been what they should have been, the grip has cut the wires, slipped, broken, strained the cars and failed. But there has always been good enough behind it all to keep the project still alive and bring it into a high degree of usefulness.

As these details have been improved other cities have taken the matter up, and New York, Kansas City and others have either begun or completed a cable system of tramway traction.

There is but one indispensable condition for the profitable employment of this method and that is a large service. A little one track road running through a thinly settled village for two or three miles and running six or eight one horse cars cannot afford the expensive plant required for cable work; but for the heavy traffic of our large cities, where the annual passenger list runs up into the millions, the universal testimony of those who have tried it is that it pays. So as we have seen the locomotive drive the through stage coach from the road and build up cities where the ancient vehicle had only located hamlets, so we may expect the cable to drive the horse from the street car in our cities, and leave him to haul the cars in small towns as he now hauls the stage coach over rough mountain roads and through sparsely settled districts where the traffic is not sufficient to warrant the investment of the capital necessary to the employment of steam.

Graphite as a Lubricator.

In his report in the "Mineral Resources of the United States" for the year 1883-84, Prof. John A. Walker gave some very interesting data relative to the use of graphite as a lubricator, from which we find that "with the introduction of heavier machinery the service demanded of a lubricant has become more and more severe. For much of this work it is found that oil will not answer at all, and for much more it answers only at great expense; hence, the uses of greases and the more solid lubricants, such as graphite, mica, soapstone, sulphur, etc. When graphite first began to be used as a lubricant, anything which gave a stove-polish luster when rubbed was assumed to be 'black lead' and fit for lubricating purposes. Experience soon proved it to give varied results—sometimes very good and sometimes the reverse; in fact, it was not reliable because of lack of uniformity, correct sizing and purity, and soon fell into disrepute among practical men, though continuing to be well spoken of in the

books. In 1868, however, systematic experiments were begun in this country with a view to producing a reliable lubricant from graphite, and the final result has been very satisfactory.

"Water-dressed dry foliated American graphite is a little thin flake of graphite of extraordinary properties. Its superiority as a lubricant has been attested by all recent writers on friction. Its coefficient of friction is very low. Its enduring qualities are several times greater than those of any oil. Unlike either oil or grease, it is not affected by heat, cold, steam, acids, etc., and acts equally well under varying conditions of temperature and moisture.

"Many and carefully-conducted experiments in the laboratory with Professor Thurston's testing machine, and experience in shops, have shown that for the highest usefulness the flake must be of a certain size and dressed perfectly pure. Graphite never occurs of the proper size and purity for use. Its natural impurities contain substances fatal to anti-friction purposes. Its proper selection, sizing, and perfecting for lubricating purposes is a matter requiring large skill, much machinery, and great experience. The difference between a perfectly pure graphite and one almost pure, but still totally unfit for lubricating, can not be detected by either sight or touch.

"It is recommended dry for steam and air cylinders, mixed with grease for heavy bearings, and mixed with oil for light bearings. On being applied to a bearing, it readily coats the surface with a shiny, unctuous veneer. These surfaces then slide on each other with very little friction. On being applied to heated bearings, the graphite soon fills up any inequalities of the bearing surfaces due to cutting, abrasion, etc., making them smooth and even, after which the bearing soon cools down. It is equally useful for wood or metal surfaces; in short, in all cases where friction exists. If the bearings are loose enough for the introduction of this thin flake graphite, it will prevent heated bearings, cool those already heated, and reduce friction better than anything else. In all cases where the service required of a lubricant is very severe, graphite will be found specially useful, as in mill steps, gears, heavy bearings, bed plates, etc.

TABLE OF TESTS.

Lubricant.	Quantity in milligrams.	Total pressure in pounds on bearing.	Temperature at the close, F.	Average coefficient of friction.	Time in minutes till the bearings "spun."	Total number of feet friction surface traveled.
Best sperm oil.....	325	180	240	.0555	11	7,198
Graphite mixed with enough water to distribute it over bearings.....	120	180	234	.0596	30	19,635
Graphite mixed with tallow.....	325	120	240	.0936	38	24,216

"This is the most rapidly growing use of graphite. In 1884 a single company sold 250,000 pounds of it for this purpose, branded as 'Lubricating graphite,' and probably as much more not so labeled, which was used for the same purpose."

Notes and Items.

Appleton, Wis.

THE APPLETON ELECTRIC RY. is nearly completed and will have five cars run separately on the Van Depoele system. The generator will be run by electricity.

Baltimore, Md.

THE BALTIMORE & HALLS SPRINGS R. R. has been sold, and is now owned by the Baltimore City Passenger Ry. Co., and is operated in connection with their other lines.

Birmingham, Ala.

The exclusive right to build a street railway line to Elyton is claimed by the Birmingham and Pratt Mines Street Railway Co., and a notice has been served on the Birmingham Street Railway Company to that effect.

A street railway has been incorporated with a capital stock of \$50,000. J. T. Milner is President, and J. C. Westbrook and others are interested.

Boston, Mass.

THE HIGHLAND AND MIDDLESEX street railways have consolidated. Chas. E. Powers is president of the new company.

Brooklyn N. Y.

THE BROOKLYN RAILWAY SUPPLY Co., 37 Walworth street, report that orders for sweepers are coming in much earlier than ever before. They are already busy with a moderate force filling orders for New York, Jersey City and Trenton. The business outlook is good. By their recent improvements in raising and lowering brooms on sweepers, the wear of the rattan and consequently the cost is reduced to a minimum.

C. J. Campbell, Manager of the Steinway & Hunter's Point R. R., has defaulted to the amount of \$3,200, and departed for parts unknown.

There is considerable dissatisfaction among the employees of the De Kalb avenue line over the change of schedule. A tie-up is feared, though nothing has been done as yet.

There has been a rumble and a grumble among the employees of the Atlantic avenue line for some time past. There have been complaints of various kinds against the management, but no further trouble has yet occurred.

Since Justice Dykman's decision against the Kings County Elevated Company was made public the Union Elevated Company have had little trouble in securing the consent of property-owners along the line to build its structure. Rapid strides have been made in pushing forward the plans for beginning work. Surveys have been made on Fifth, Flatbush and Myrtle avenues and on Fulton street. It is expected that the road will be in operation from Lexington avenue to the Broadway ferries within a year. The charter fixes fares at not to exceed five cents between 5 and 8 P. M. and 4.30 and 7.30 P. M. on week days, and 7 A. M. and 10 P. M. on Sundays, and ten cents at other times.

Recently a car on the Nostrand avenue line could not be controlled because the brake was out of order, and it rolled down the hill from the Penitentiary to Malbone street. John Linker, the driver, drew the pin and turned his horses to the side of the street, jumping off the car to take care of the horses. Annie Dexter either jumped or was thrown from the car, receiving severe injuries, and is still confined to St. Catherine's Hospital. Linker was arrested and the case tried before Justice Kenna. As there was no evidence against him he was discharged.

Permission has been granted to Pres. Richardson of the Atlantic Avenue R. R., to build a cable road along Park avenue. A franchise has also been granted A. H. Matheains for a cable road through Montague street from Wall street ferry to the City Hall.

Chicago, Ill.

The La Salle street tunnel has been granted to the North Side City Railway Co. The company is to erect two bridges, keep the tunnel in repair and pay a yearly rental for the latter.

The recently formed union of north side street car drivers and conductors complain of the discharge of men who have entered upon full pay, the compulsory purchase of uniforms from the company's tailor, and the exorbitant charges for the same, heavy security required for punches, long and irregular hours and insufficient pay. It is understood that the company has asked time to consider the complaints.

THE CROSSTOWN PASSENGER RAILWAY Co. of Chicago has been incorporated with a capital stock of \$1,000,000. They contemplate building fifteen miles of double track, and will commence business with seventy-five cars and from 500 to 800 horses. The present officers are, John J. Curran, Pres.; George P. Bunker, Treas.; James A. Taylor, Sec. The general office is room 18, 164 Washington street. It is as yet undecided when the road will be commenced or opened.

THE CHICAGO CITY RAILWAY Co. have issued a very convenient timetable for night cars. The tables are placed in boxes, of which there are 15,000 at all night drug stores, hotels, etc., so that any one belated can tell when a car will start on any line controlled by the company. They are now operating sixteen different lines, namely: the State Street, Wabash & Cottage Grove Avenues, Hyde Park Dummy, Indiana Avenue, Archer Avenue, Wentworth Avenues, Hanover and Butler Streets, Ashland Avenue, Clark and Van Buren Streets, Halsted Street Stock Yards, State and Sixty-third Street, Wentworth Avenue and Sixty-third Street, Halsted and Sixty-third Streets, Thirty-first Street and Thirty-ninth Street.

The improvements made during the past season by the Chicago West Division Railway, consist of an additional line of double track on Division street from Mil-

waukee avenue to Humboldt Park (1½ miles); stables and car-house buildings for that line; construction of an extension of the Lake street tracks from Garfield Park to Crawford avenue (¾ mile); construction of new car-house and stables on Clybourn avenue (for Noble street line constructed last fall); construction of car-house and stables at Kedzie avenue and construction of an extension of Van Buren street tracks from Western avenue to Kedzie avenue (now in course of construction,) (1 mile); construction of additional stable at Blue Island avenue and Leavitt street, and construction of double track extension of Halsted street railway on Eighteenth street from Halsted street to Leavitt street (2 miles.) An addition of 400 horses and 66 cars has also been made since January first.

Cincinnati, Ohio.

It is proposed to build an elevated railroad. A company has been organized and a charter applied for by E. Zimmerman, M. Ingalls and others. The name of the company is the Cincinnati Elevated Railway Co.

Cleveland, Ohio.

THE FULTON FOUNDRY has just closed a contract with Cincinnati St. Ry. Co. for the wheels to be used by them during the coming year. They have also recently shipped fifteen turn-tables distributed among the following roads: Council Bluffs St. Ry. Co., Harrisburg City Pass. Ry., Central Pass. Ry. of Louisville, Utica and Mohawk St. Ry. and Erie City Pass. Ry. Co.

The Fulton Foundry, of Cleveland, Ohio, of which Mr. S. M. Carpenter is the proprietor, has issued a very handsome leather bound catalogue of their street car wheels, curves, frogs, and turntables. The engravings are finely executed and describe themselves.

Clarksville, Tenn.

THE CLARKSVILLE STREET RAILWAY Co. is now completed and has been opened to the public. The road is two miles long, and laid with 16 lbs. T rails. Two cars are in use and two more will soon be ordered. The officers are John F. Shelton Pres. and John W. Faxon Sec. and Treas.

Columbia, S. C.

Work is progressing rapidly upon the Columbia Street Railway, and it is expected that it will be opened about Sept. 15th. The road is laid with 32lbs. rails. The officers are Pres. J. S. Pierson; V. Pres. H. M. Pierson; Treas. W. E. Lawton and Sec. E. M. Cole; 32 Liberty St., New York City.

Covington, Ga.

W. C. Clark & Co. have in contemplation the construction of a line of street railway 1½ miles long.

Denver, Col.

THE DENVER CITY RAILWAY Co. are extending their tracks and enlarging their stable accommodation. The additional length of track will amount to four or five miles in all. At present the total mileage is 19.38. They have 306 horses and 52 cars.

Fulton, N. Y.

The Fulton and Oswego Falls Railway

Co., was opened on August 14. The track is 6,000 feet long and is laid with Gibbon's metallic system of rail and stringers. Three cars and ten horses are used. The general office is 15 Broad St., New York city.

Galveston, Tex.

THE GULF CITY STREET RY. and Real Estate Co. have been refused an extension of time to complete their work.

Grand Rapids, Mich.

The city authorities have declared that unless the present company begins work on certain streets immediately another street railway company will be granted the franchise. The road is considered a necessity.

Halifax, N. S.

THE HALIFAX ST. RY. Co. (Lim.) have completed their track. It is seven miles in length and laid with 45 lb. rails. Fifteen cars have been ordered and are being built by the John Stephenson Co. The officers are: President, John R. Bothwell; Secretary and Treasurer, H. K. Adams. The offices are at present in the Drexel Building, New York City. It is expected that the road will be opened about September 15.

Mankato, Minn.

THE MANKATO STREET RY. Co., have now 1½ miles of track in operation and contemplate adding two miles more very soon. This certainly shows prosperity as the road was only opened on July 22. The officers are W. M. Faxon, Pres. and Man.; John C. Noe, Sec. and Treas.; with offices in South Front St., Mankato.

Melbourne, Australia.

The cables for the new cable railways have been made by Bullivant & Co., of Millwall, England. One is about 26,000 feet and another about 15,000 feet long. They weigh 24 and 16 tons respectively and are made with a hempen core, about which six wire strands are wound, each strand being composed of 31 steel wires. The circumference of these cables is 3½ inches; and the breaking strain is said to be 150 tons per square inch of section. These figures are taken from "Iron" and are the highest we have seen. The Americans have, however, secured a contract for furnishing 280,000 feet.

New Bedford, Mass.

Justice Barrett recently refused to grant an injunction to the New Bedford & Fair Haven St. Ry. Co. restraining the Acushnet Railway from using the former's track in New Bedford, according to an order granted by the mayor. It was claimed this order was invalid.

New York, N. Y.

THE TENTH AVENUE CABLE line operated by the Third Avenue Co. are running cars on two minutes headway; the traffic on this line has increased to so great an extent since the opening that the rolling stock is not sufficient to meet the demand. As the cars are now running down 125th st. to Eighth Ave. only, a car is run over from the East River and there coupled the grip car and hauled to High Bridge;

even with these accommodations the cars are crowded to overflowing on Sundays and holidays. The company are thoroughly pleased with their whole plant. The grip was recently put to a pretty severe test. The cable broke and there being no means of picking up the auxiliary cable all the cars were at a standstill until the car leaving the end of the route could pick them up. One car picked up no less than twelve of the helpless ones, and brought them to the engine house. Difficulties of this kind will be avoided in the future by placing man-holes at the foot of each grade where the auxiliary cable may be taken.

THE TENTH AVENUE CABLE line is experimenting with an air attachment for operating the grip and brakes. Compressed air is used and is obtained from a compressor driven from the axle.

THE ST. NICHOLAS AVENUE & CROSS-TOWN R. R. have laid out an elaborate project of street railway network, but inasmuch as they have not yet secured their charter the plan cannot be said to have assumed what might be called tangible proportions. However, if none of their plans miscarry the following system will be the result: The proposed system begins in East One Hundred and Sixteenth street at the Harlem River and runs through to Manhattan avenue, with double tracks to St. Nicholas avenue, to the northerly terminus of the avenue; also from St. Nicholas avenue at One Hundred and Twenty-sixth street, with double tracks along One Hundred and Twenty-sixth street, to Lawrence street, to Broadway, and with a single track to One Hundred and Thirtieth street, to Twelfth avenue, to One Hundred and Twenty-ninth street, to Lawrence street, thence to connect with a double track at Broadway; also from St. Nicholas avenue at One Hundred and Thirty-first street, with double track along One Hundred and Thirty-first street, to Fourth avenue, to One Hundred and Twenty-eighth street to Second avenue; also from tracks at Third avenue and One Hundred and Twenty-eighth street, along Third avenue to One Hundred and Twenty-ninth street, through One Hundred and Twenty-ninth street, to connect with tracks at Fourth avenue; also from One Hundred and Twenty-ninth street and Fourth avenue with single tracks along Fourth avenue east of the Harlem Railroad to connect with tracks at One Hundred and Twenty-eighth street.

THE JOHN STEPHENSON Co., has just shipped two very fine specimens of street cars to Tom L. Johnson, Cleveland, and twenty more of the same pattern, are building for the Brooklyn cable railway which is to be operated by Mr. Johnson's system.

Edward Beadle, 1193 Broadway is successors to the firm of Beadle & Courtney, manufacturers, of the Eureka Folding Mat. Mr. Beadle having purchased the interest of Mr. Courtney is now sole manufacturer. He remains at 1193 Broadway, with factory at Cranford, N. J. Among recent orders for the Eureka mat, are twenty for the Buffalo street railway, twenty for the Citizens'

Passenger Railway of Pittsburg; six for the Jersey City & Bergen. These mats seem to be giving growing satisfaction.

Omaha, Neb.

THE OMAHA HORSE RAILWAY Co. has obtained a temporary injunction restraining the Omaha Cable Co. from proceeding with its work of laying the cable. Exclusive rights on all streets are claimed by virtue of an act of the legislature.

Plainfield, N. J.

A street railway is to be built by a New York company.

Palatka, Fla.

The right of way for a street railway company has been granted.

Philadelphia, Pa.

An electrical alarm system has been introduced on the Market street line of the Traction Co. It is intended for use in case of accident.

MESSRS. HALE & KILBURN report an increasing and satisfactory trade in their new patent seats for street cars. Among orders recently shipped, was one of 50 cars for the Chicago City Cable Railway. They have now orders for about 200 cars which they are filling.

THE EMPIRE PASSENGER Ry. Co. have a gauge of five feet two inches, and are running thirty-two cars with 250 horses. The total length of track is 8½ miles. The officers are James McManes, Pres., and John J. Adams Sec. & Treas.

Pittsburg, Pa.

The Wilkesburg and East Liberty Ry. Co. have completed their roadway and are waiting for cars and horses before beginning to run. This road is three miles long, and they are using the Johnson Steel street railway rail. They anticipate employing about five cars and 20 horses. The following are the officers. President Ed. Jay Allen, Sec. and Treas. Wm. H. Allen. The capital stock is \$15,000.

Plymouth, Mass.

THE PLYMOUTH AND KINGSTON STREET R. Co. has been incorporated with a capital stock of \$25,000. Mr. Jos. D. Thurber and others are interested in the scheme and if the money can be raised work will be commenced in the spring. The road is to be 2½ miles in length of four feet eight and a half inches gauge. It is intended to put on from six to ten cars, and draw them with horses. The officers have not yet been elected.

Quebec, Can.

THE ST. JOHN ST. RY. Co. Limited are running four busses out four miles from the city limits in connection with their regular line.

Rutland, Vt.

At the recent election of officers the old management was reinstated. The road has now eight miles of track, and runs eight cars with thirty horses.

San Francisco, Cal.

A double track line of street railway has been constructed by the Market Street Cable Ry. Co., from the junction of Market and Hayes streets, along Hayes to Stanyan

street. The length is over two miles. It is to be operated as a cable line and will require thirty-five additional cars. The car house and engine house have already been erected.

Scranton, Pa.

The pink eye has attacked the horses of the People's Streets Ry. Co. Three fourths of the horses are sick.

Springfield, Ill.

The report that is being circulated to the effect that the Springfield Belt Railway Co. has been incorporated by Mr. Frank W. Tracey, is denied as being without any foundation whatever, and no such enterprise has been heard from.

Scranton, Pa.

THE SCRANTON SUBURBAN Railway Co. have adopted the Van Depoele electric system for propulsion, and expect to have their road in operation by Oct. 1.

St. John, New Brunswick.

THE ST. JOHN CITY RY. Co. are about to commence the work of building seven miles of road. The contracts are let, and a large force of men will be set at work immediately. The officers are: President, John H. Bothwell; Secretary and Treasurer, John J. Pyle,—with headquarters in the Drexel Building, New York. It is expected that the road will be opened to the public about November 1.

Stillwater, Minn.

THE STILLWATER ST. RY. Co. has been incorporated. R. F. Hersey, E. S. Brown, Samuel Matheres and G. A. Tormus are interested.

Syracuse, N. Y.

THE WALES MANUFACTURING Co. are running up to their fullest capacity in the manufacture of their improved street-car fare-boxes. The advantages of this invention are recognized wherever they have been tried. They are a protection against dishonesty, and economize the expense of operating street railroads. The saving of a conductor for each car is a matter of great moment, and this fact is attracting more and more attention. At a time when the question of labor is involved in so much uncertainty, this fare-box is proving its utility, and horse-railroad companies are adopting it as a protective measure. A single company has just placed its order for a large number of boxes, a step to which they were impelled by the recent strike, and their example is destined to be followed by many other lines. In evidence of the growing popularity of this system, it may be stated that for the present year, up to June 1st, the orders of this company have exceeded the entire orders of the past year. This system has just been adopted by the Montgomery, Ala., Electric Railroad Company, with the greatest satisfaction. The superiority of the Wales box is attested by leading street-car authorities in all parts of the country.

Washington, D. C.

It is rumored that a cable railway company under the name of the Washington Cable Railway Co. is to be incorporated.

West Troy, N. Y.

G. M. Clute reports an increasing demand for his patent double bottom car lamp and chimneys.

The Jones Car Work, have two of the twelve closed cars for the Providence Street Railway in the paint shop. These cars are 16 feet long, equipped with Bemis Gear, and have five windows on the side each 28 by 36 with enameled plate glass, plate glass mirrors at the ends, and two Smith center lamps. The cars for the St. Paul road are 14 feet long. Windows extend to the top of car, 32 by 35. These cars are equipped with Slosson box and fare collector.

Winfield, Kansas.

THE UNION STREET RAILWAY Company have commenced work upon 2½ miles of track and will make it 3½ miles in the near future. The gauge is four feet 8½ inches. Two cars are now in readiness to haul and it is intended to use eight mules. The officers are H. B. Shuler, President; H. E. Silliman, Vice President; John D. Pryor, Treas; and John B. Eaton, Sec. Work is being pushed and it is expected that the road will be opened about September 15th.

Winsor, Ont.

THE VAN DEPOELE MANUFACTURING Co. have been running a train upon the track of the Windsor Electric Street Railway Co., since June 6th, which has given good satisfaction. The distance traveled is about two miles. It is intended that the electrical apparatus shall all be in place as soon as the track is laid for the Detroit road. In addition to these, the company have several other contracts on hand, and are enlarging their shops to meet the demand for motors.

STREET RAILWAY STOCK QUOTATIONS.

Corrected by H. L. GRANT, 145 Broadway, N. Y. City.

New York Stocks.	Par.	Amount.	Period.	Rate.	Date.	Bid.	Asked.
Bleecker St. & Fulton Ferry	100	900,000	J. & J.	3/4	January, 1886	28	30
1st mort.	1,000	700,000	J. & J.	7	July, 1900	113	116
Broadway & Seventh avenue	100	2,100,000	Q.—J.	2	January, 1886	280	290
1st mort.	1,000	1,500,000	J. & D.	5	June, 1904	108	112
2d mort.	1,000	500,000	J. & J.	5	July, 1914	108	109
Broadway Surface Guaranteed	1,000	1,500,000	J. & J.	5	July, 1924	110	112 1/2
Additional	1,000	1,000,000	J. & J.	5	July, 1905	106	107
Brooklyn City—Stock	10	2,000,000	Q.—F.	3 1/2	February, 1886	205	210
1st mort.	1,000	800,000	J. & J.	5	January, 1902	106	110
Brooklyn Crosstown	100	200,000	A. & O.	4	October, 1885	165	175
1st mort bonds	1,000	400,000	J. & J.	7	January, 1885	105	112 1/2
Central Park North and East river	100	1,800,000	Q.—J.	2	January, 1886	141	142
Con. mort. bonds	1,000	1,200,000	J. & D.	7	December, 1902	132	135
Christopher & Tenth	100	650,000	F. & A.	2 1/2	February, 1886	132	138
Bonds	1,000	250,000	A. & O.	7	October, 1898	110	116
Central Crosstown	100	600,000	Q.—F.	1 1/2	January, 1886	162	165
1st mort	1,000	250,000	M. & N.	6	November, 1922	114	115
Dry Dock, East B'way & Battery	100	1,200,000	Q.—F.	2	February, 1886	202	206 1/2
1st mort consol	500	1,900,000	J. & D.	7	June, 1893	114	116 1/2
Scrip	100	1,200,000	F. & A.	6	August, 1914	106	107
42d & Grand St. Ferry	100	745,000	Q.—F.	4	February, 1886	255	260
1st mort	1,000	235,000	A. & O.	7	April, 1893	111	116
42d St., Manhattan & St. Nich. av.	100	2,500,000	M. & S.	5	1910	45	50
1st mort	1,000	1,200,000	J. & J.	6	1915	70	73
2d mort. In. bonds	1,000	1,200,000	Q.—J.	2 1/2	January, 1886	240	265
Eighth Avenue—Stock	100	1,600,000	F. & A.	6	August, 1914	105	110
Scrip	100	1,000,000	Q.—F.	2	August, 1885	150	156
Houston, West St. & Pavonia Ferry	100	1,000,000	J. & J.	7	July, 1894	112	113
1st mort	500	250,000	J. & J.	5	January, 1886	205	210
Second Avenue—Stock	100	500,000	M. & N.	5	November, 1909	108	110
1st mort.	1,000	1,862,000	M. & N.	7	May, 1888	106	108
Consol.	1,000	550,000	M. & N.	5	September, 1885	200	210
Sixth Avenue	100	1,050,000	J. & J.	7	July, 1890	112	116
1st mort.	1,000	500,000	Q.—F.	4	February, 1886	315	330
Third Avenue—Stock	100	2,000,000	J. & J.	7	January, 1890	110	112
1st mort.	1,000	2,000,000	F. & A.	4	November, 1885	280	300
22d St.—Stock	100	600,000	M. & N.	7	May, 1893	110	113
1st mort.	1,000	250,000	M. & N.	3	September, 1885	138	145
Ninth Avenue	100	800,000				299	325
Chicago St. Railway	100						

Phila. Street Railway Stocks.

Corrected by ROBERT GLENDINNING & Co., 303 Chestnut street, Philadelphia, Pa.

	Par.	Period.	Amount.	Rate.	Date.	Bid.	Asked.
Citizens'	50	Q.—J.	500,000				
Continental	50	J. & J.	1,000,000			120	126
Frankford & Southwark	50	Q.—J.	750,000				
Germantown	50	Q.—J.	1,500,000			98	98 1/2
Green & Coates	50	Q.—J.	500,000			119	
Hestonville	50	.....	2,050,000			28	
Lombard & South	50	.....	500,000			76	
People's	50	.....	1,500,000			36	
Philadelphia City	50	J. & J.	1,000,000				146
Philadelphia & Gray's Ferry	50	J. & J.	617,500				
Philadelphia Traction	50	.....	6,000,000			76	77
Ridge Avenue	50	J. & Q.	750,000				250
Second & Third	50	Q.—J.	1,060,200			201 1/2	202 1/2
Seventeenth & Nineteenth	50	J. & J.	500,000				
Thirteenth & Fifteenth	50	J. & J.	1,000,000			150	
Union	50	J. & J.	1,250,000			183	
West Philadelphia	50	J. & J.	750,000				

SPECIAL NOTICES.

Rates for Special Notices.

Advertisements of Street Railway Property "Wanted" or "For Sale," "Positions Wanted" or "Men Wanted," or similar matter inserted under his heading at 10 c. per line, eight words to a line. The name of the advertiser kept confidential when desired. Replies may be addressed "Care of STREET RAILWAY JOURNAL," at its New York, Chicago, Philadelphia and Boston Offices, as is most convenient to the advertisers. Replies will be forwarded, if desired. Excellent results have been realized by advertisements in this department.

FOR SALE—First class street railroad property in a live city of 50,000; a monopoly and a rare opportunity for an investment on account of present owner's time being demanded for other interest. Address, BANKER, care STREET RAILWAY JOURNAL, 32 Liberty st., New York.

SWEEPERS FOR SALE CHEAP—We have several sweepers for other makers taken in exchange which will be sold thoroughly refitted very low on early orders. "Rattan lower than ever before."

Write for prices. Address, Brooklyn Railway Supply Co., 37 Walworth st., Brooklyn, N. Y.

SUPPLIES WANTED—We anticipate building short line Street Railroad, gauge 3 1/2 feet; need two or more light passenger cars and two or more flats and all supplies except Iron. Address, S. W. S., Alvarado, Tex.

FOR SALE—Three NEW one-horse cars, never have been used. Built by Jones of Troy, with Fare Boxes, fitted with Andrews & Clooney wheels. For sale low. The road for which they were built never having been completed. Address "W," this office.

WANTED AT ONCE—Good second-hand cars, both one and two-horse. Address, BROOKLYN RAILWAY SUPPLY CO., 37 Walworth St., Brooklyn N. Y.

CARS FOR SALE—22 one-horse cars, all in good running order. Gauge 4 ft. 8 1/2 in. Length 10 ft. Stephenson running gear. Single step in rear. Fare boxes, change gates and money boxes complete. Address, WASHINGTON & GEORGETOWN, R. R. Co., Washington, D. C.

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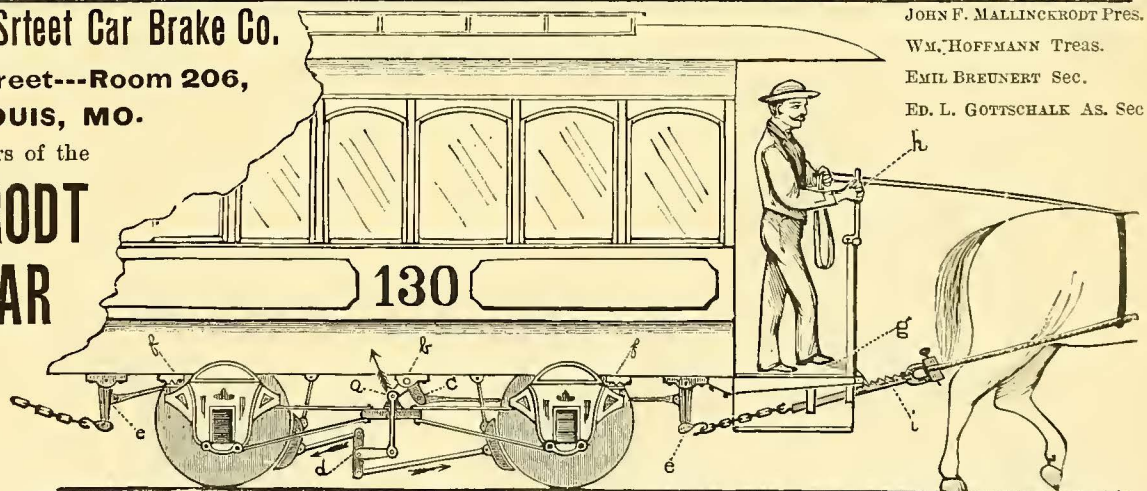
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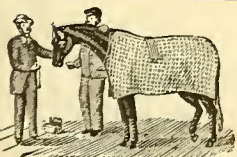
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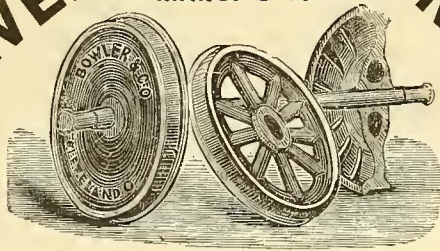
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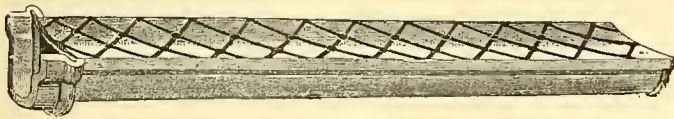
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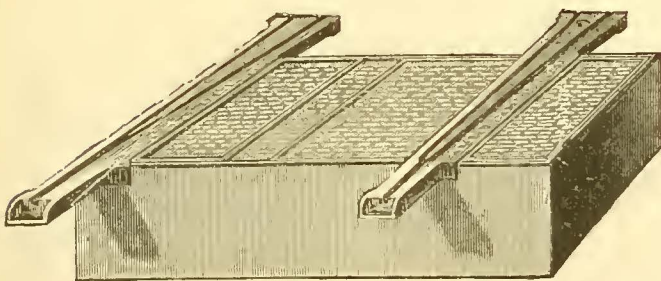
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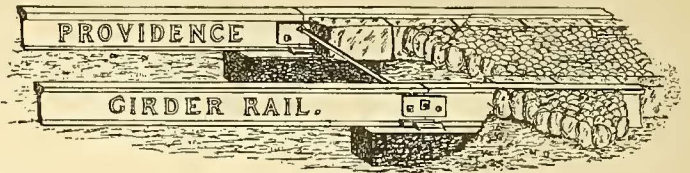


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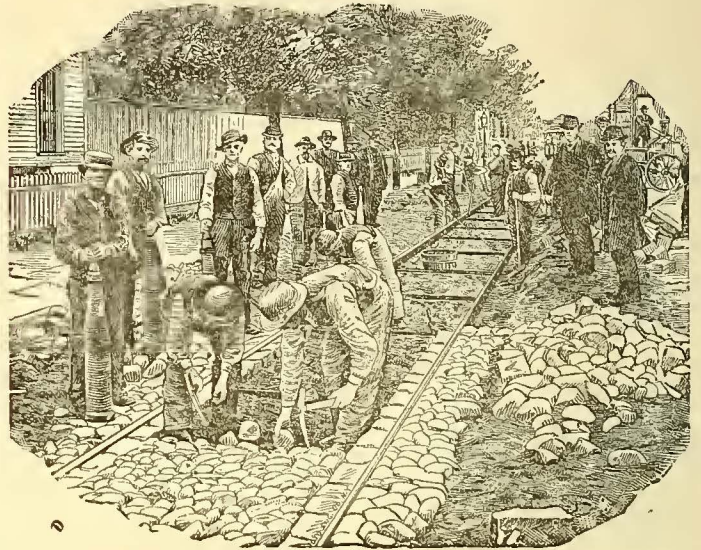


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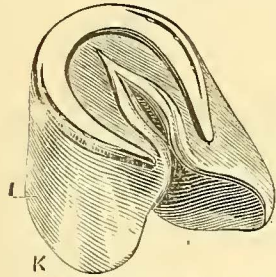
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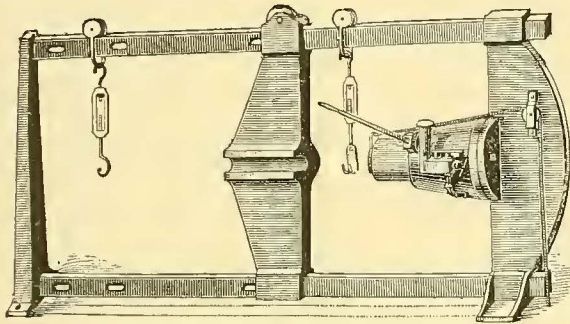
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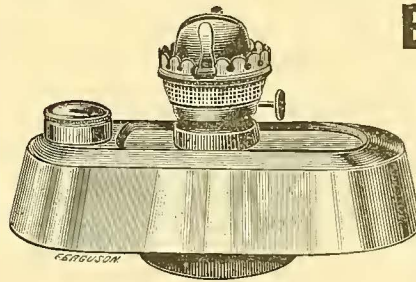
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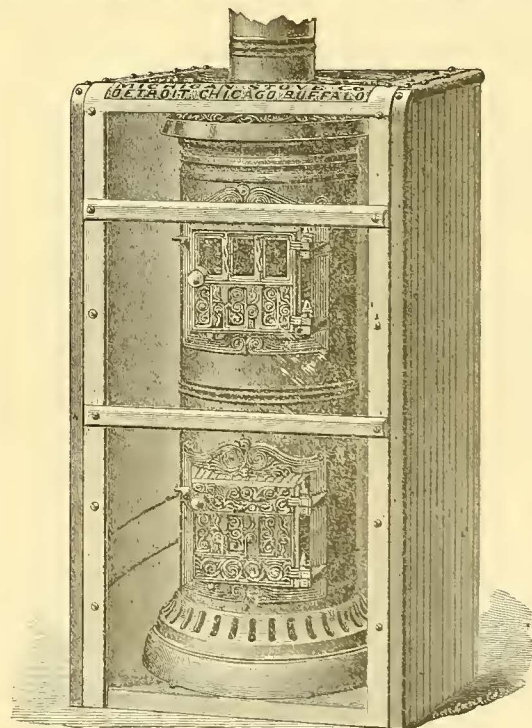
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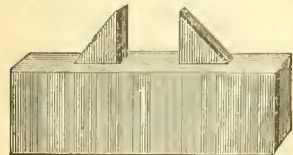
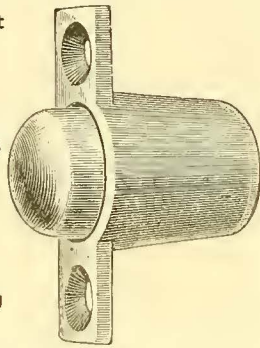
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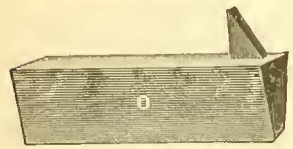


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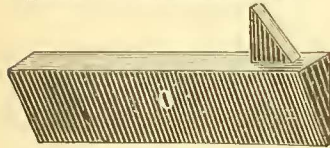
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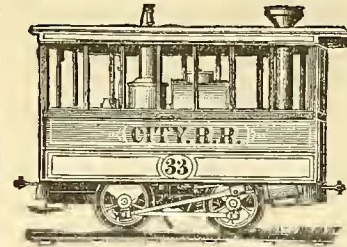
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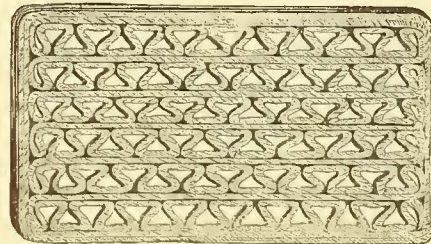
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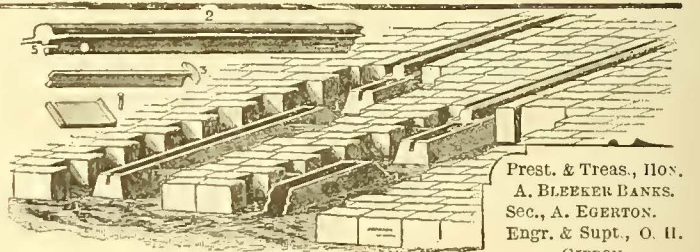
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| ENGLAND, | BELGIUM, |
| GERMANY, | DENMARK, |
| AUSTRIA, | VICTORIA, Australia, |
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| ITALY, | |

D. J. MILLER, ENGINEER,

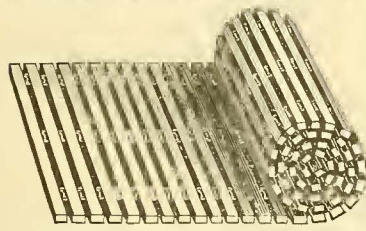
234 BROADWAY,

NEW YORK.

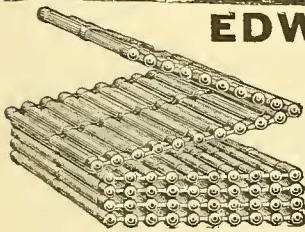
O.W.CHILD & CO.

STREET RAILWAY EQUIPMENT,

Rails, Spikes, Fastenings, Cars, Etc.
150 Broadway, New York City.



WARNECK & TOFFLER,
 211 East 22d St., New York,
 Sole Manufacturers and Patentees
 of the only
"ROLLING WOOD MAT"
 in the market. This matting, either
 in round, square or flat slats, is the
 most convenient one for horse cars, as
 it is a self cleaner and can easily be
 repaired.
 Price, a running foot, 3 feet wide,
 only 70c. Orders respectfully solicited.



EDWARD BEADLE.

Sole Manufacturers of the

"EUREKA FOLDING MAT."

The most durable, easiest cleaned and
 repaired wood mat ever made. We would
 respectfully call the attention of Managers
 of Street Railways to our latest improved
 Reversible Folding Mat, made to fit any size
 car. Sample order solicited.

1193 Broadway, New York.
 FACTORY, Cranford, N. J.

EUREKA COLOR WORKS.

Established for the Manufacture of Pure Colors.

EDW. E. JILLARD,
 DEALER IN

PAINTERS' MATERIAL, GLUE, ETC.

1645 NORTH TENTH STREET, - - - Philadelphia.

Specialty in Strictly Pure Tinting Colors for Car, Carriage, Shp and House
 Painters' use.

WM. P. CRAIG,

Street Railway Builder,

and Dealer in Supplies.

Office 95 Liberty St., N. Y.

GROOVE RAIL FOR CURVE constantly on hand, Straight or Curved to
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CURVING MACHINES of Best Style and Make.

SPECIAL RATES given on AUTOMATIC SWITCHES, TURNABLES,
 TRACK CASTINGS, KNEES, JOINT PLATES,
 SPIKES and all other material for Railway Construction.

Having had over 25 years' practical experience in Street Railway Construction
 feel confident in saying to parties who contemplate building will find it t their
 interest to correspond with me before making contracts or ordering material.

Established 1856.

Incorporated 1883.

The Feigel Car Co.,

BUILDERS OF

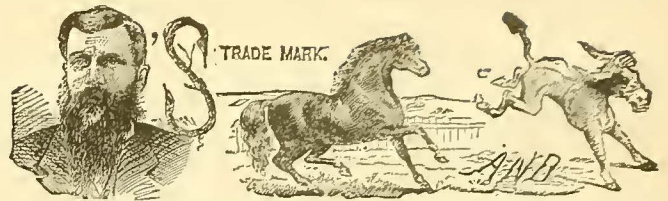
Cars for Street Railways.

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OFFICE

New Utrecht, N.Y.

No. 108 Wall Street, N.Y



(This Trade Mark on all Genuine Covert Goods.)

We call particular attention of all horse railroad companies to our celebrated

Covert Bristle Card.

The Most Ser-
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 Best Quality
 Brush ever
 Made for All
 Purposes of
 the Horse's
 Toilet.



EVERY BRUSH
 GUARANTEED
 BEST RUSSIA
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 EVER
 OFFERED
 THE TRADE.

Being Drawn
 Penetrating it
 Works Right
 Down to the
 Hide.

The Best Mane or Tail Brush
 Manufactured.

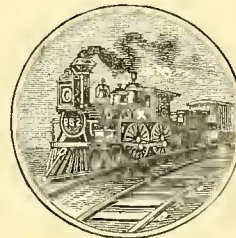
ALSO, HARNESS SNAPS, SWIVEL SNAPS, OPEN EYE
 BIT SNAPS, CHAIN AND TRACE SNAPS, ROPE AND WEB
 HALTERS, HALTER LEADS, BREAST CHAINS, HALTER
 CHAINS, REIN CHAINS, BREAK CHAINS, AND A SPECIAL
 GRADE OF TRACE CHAINS, AND HEEL CHAINS.

Send for illustrated catalogue and price list.

COVERT MANUFG. CO.,

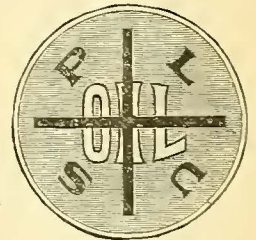
SOLE MANUFACTURERS,

WEST TROY, N. Y.



Trade Mark Pat. Mar. 13, 1883.

Dux
 Lubricant,



Trade Mark Pat. Mar. 13, 1883.

The Leading New Grease for Street Railways.

The Best Lubricant for Street Railways known. Will run for one year on one
 packing Cars will run easier packed with Dux, than with oil and waste. Why?
 Because we give you a better Lubricant. No drip from car boxes when packed
 with Dux, and therefore, keeps the car boxes and trucks clean.

Try It, and You Will Use No Other Lubricant.

OFFICE OF CAMDEN HORSE RAILROAD CO.,
 Camden, N. J., May 25, 1885.

Leib Lubricating Co., 196 and 198 Chicago St., Buffalo.
 GENTLEMEN—Please send this Company to the above address one barrel of
 "Wool Compound Dux Lubricant."

Your agent sent us sufficient to pack one car in September last, and that car
 has been running steadily six days in the week since Sept. 15, '84, making from
 43 to 50 miles per day. The car referred to looks as if it would not require re-
 packing for a year.

Yours respectfully,
 JOHN HOOD, Supt., etc.

Manufactured by

The Leib Lubricating Co.,

196, & 198 CHICAGO STREET,

BUFFALO, N. Y.

"PAY HERE."
Fare Boxes and Change Receptacles for Street Cars.

OUR NEW FARE BOX NO. 3.

The following are some points of superiority in this box over others:

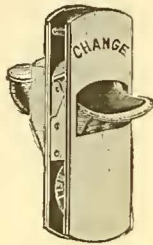
SIMPLICITY OF CONSTRUCTION, QUICKNESS AND CONVENIENCE OF CLEANING, SECURITY OF MONEY DRAWER, BEAUTY OF FINISH, and MUCH CHEAPER IN PRICE.

We have just added to this box a very valuable improvement, viz., a small mirror placed back of first slide or rest, which presents to driver's view the back side of fare as well as front, when resting on first rest. He can by this quickly detect any spurious or mutilated coin or ticket that may be split and put in box.

It often happens in all Fare Boxes, to the annoyance of driver and passenger, when several fares are resting on first slide, one or more coins are liable to be behind a ticket, and the driver cannot see them, and quite often a passenger is "rung up," when his fare is concealed behind the ticket, from the driver. This arrangement gives driver view of both sides of fare.



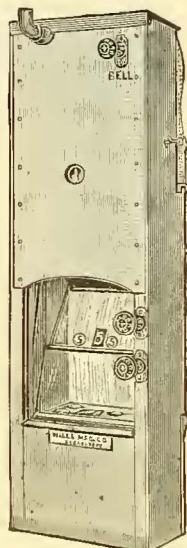
Box No. 3.
 Front of Passengers' View.



CHANGE RECEPTACLE.

The only satisfactory arrangement in use for making change with the driver.

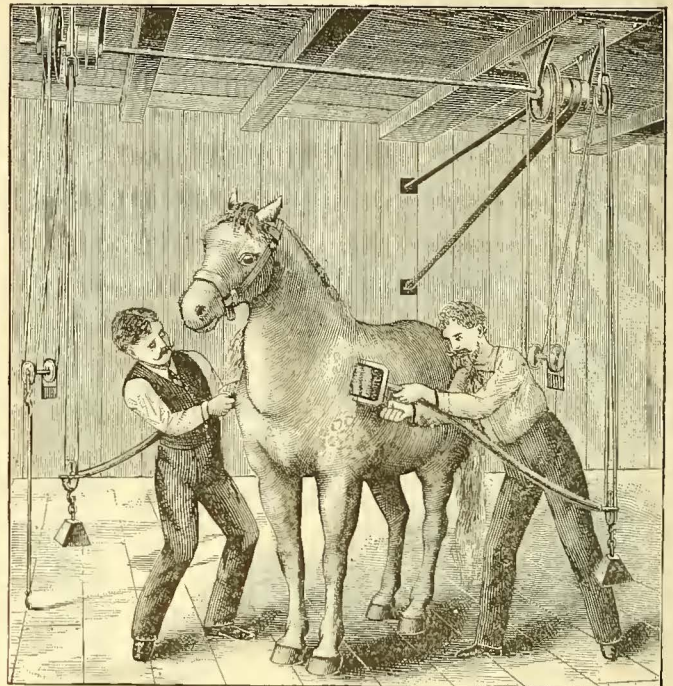
Descriptive and illustrated circular on application. Get our prices before buying.



Box No. 3.
 Back of Driver's View.

WALES MFG. CO., 76 & 78 E. Water St., Syracuse, N. Y.

PENNINGTON'S GROOMING MACHINE.



The brush is caused to revolve by gear wheels actuated by a flexible shaft. Both hands free to handle brush. Swings and turns in any direction. Direction of motion quickly changed. The cheapest and best Grooming Machine yet invented. Motion supplied by hand, steam or animal power. Rights to use or manufacture. For full particulars and rates apply to

ELLIS PENNINGTON,
 204 Walnut Place, - - - - Philadelphia, Pa.

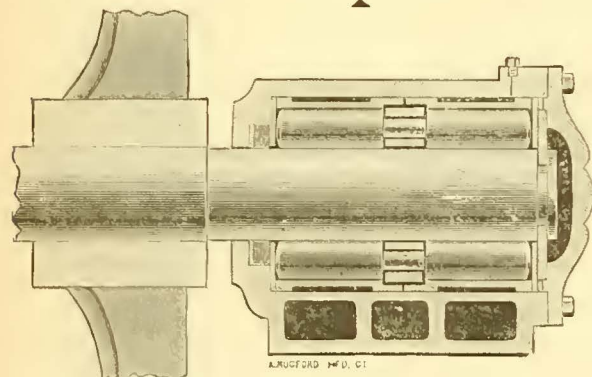
—The Chaplin Roller Bearing Tramway—

CAR BOX AND GEAR.

LIGHT DRAFT EASY RIDING DURABLE
POSITIVELY DUST PROOF AND OIL TIGHT

Boxes Hold Sufficient Oil for One Year. No Waste Used for Packing nor Babbitting for Boxes
 Overcomes Friction in Taking a Curve

CHAPLIN MFG. CO., MESSRS.—In reply to your note I will say we have had a set of your Gear under car, "Gov Rice," for the past four years and it has proved very acceptable, so much so that we have decided to put on 50 sets of your improved pattern. The wear on the journal is impenetrable, and it is beyond question the easiest running gear in the market. Respectfully, J. E. Rugg, Supt.



THE CHAPLIN MANF. CO., Bridgeport, Conn

Berry's Patent Hames and Regan Snap



They have the advantage of easy adjustment. No buckles or straps are used. They can be applied in an instant, being fastened to the collar. The collar is divided and there is no strain upon the collar or the eyes of the horses. In case of accident the whole harness can be removed at once. They are adapted to the use of Fire Departments, Horse Railroads, Express Wagons, Teams and Light Carriages, and are in use in over one hundred cities and towns in the United States and Canada.

REGAN PATENT SNAP.

They are made of the best gun metal and malleable iron, with a brass spring which is inclosed in a water-tight socket and made rust and dust proof. It is an impossibility for it to become detached. Write for illustrated catalogue and prices.

CHARLES E. BERRY, Cambridge, Mass.

ESTABLISHED 1857.

INCORPORATED 1875

BROWNELL & WIGHT CAR COMPANY,

ST. LOUIS, MO.

BUILDERS OF

Street Cars

OF EVERY STYLE AND SIZE,

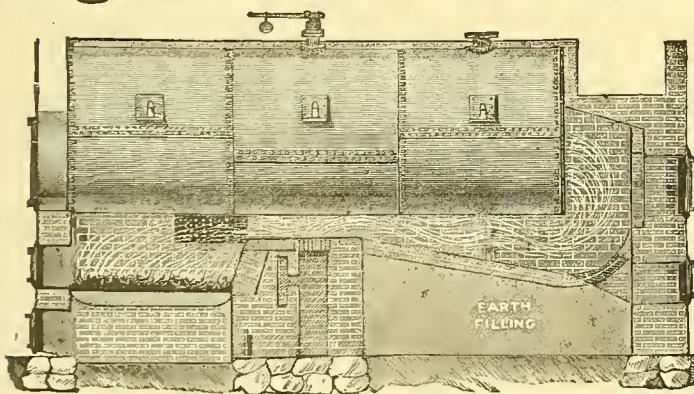
For Horse, Cable or Other Motive Power.

EXCLUSIVE MANUFACTURERS OF

BROWNELL'S PATENT COMBINATION CARS

FOR SUMMER AND WINTER SERVICE.

JARVIS ENGINEERING CO., Engineers & Contractors



FOR ERECTING STATIONS
FOR
ELECTRIC POWER AND CABLE RAILWAYS,
USING
Jarvis Patent Furnace

For Setting Steam Boilers to Burn Cheap Fuel, such as Wet Saw-Coal Screenings or Slack Coal.

ALSO

ARMINGTON AND SIMS ENGINES,

Belting direct to Power Dynamios without using Shafting.

NO. 61 OLIVER STREET, BOSTON, MASS.

SEND FOR CIRCULAR.

J. M. JONES' SONS,

AGENTS,

Street Railway Car Builders

WEST TROY,

NEW YORK.

PENNSYLVANIA STEEL COMPANY,

MANUFACTURERS OF

STEEL RAILS

Of T patterns, weighing from 16 to 76 lbs. per yard.
CENTRE BEARING Street Patterns, 42 to 60 lbs. per
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and Street Patterns for STEAM ROADS.

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MANUFACTURERS OF

STREET RAILWAY SUPPLIES,

Carpenter's Patent Turn-tables and Transfer-tables,

Open Wheels of all sizes & weights.

Wheels and axles of all sizes fitted on short Notice.

Chilled curve rail, Turnouts, Switches, etc., etc. Blue prints and Bills Furnished on Application.

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THE WAY FOUNDRY COMPANY.

WAY, RHODES & BLANKLEY,

“STREET RAILWAY SUPPLIES A SPECIALTY.”

Contractors for Construction of Street Railways,

Manufacturers of

Curves, Frogs, Turnouts, All sizes of
Crossings, Switches, Joint Plates, Knees.

Steel grooved and Tram Rails at special rates.

Pedestals & Boxes, All kinds of Brake Shoes. Turntables,

AND ALL MATERIALS USED IN THE CONSTRUCTION OF STREET RAILWAYS.

Twenty-third & Wood Sts., Philadelphia, Pa.

TOM. L. JOHNSON'S IMPROVED FARE BOX.

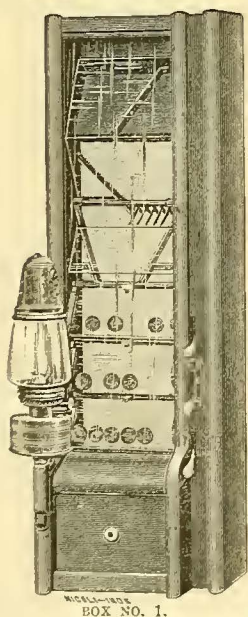
NOW IN GENERAL USE IN CITIES THROUGHOUT THE U. S.

Ornamental to any Car.

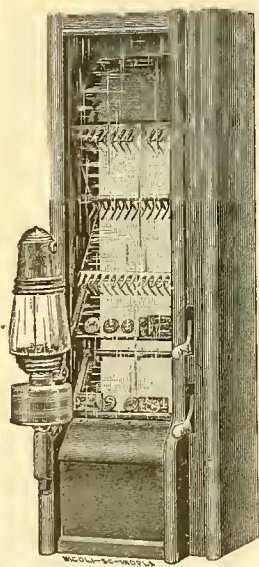
REDUCTION IN PRICE WHERE TWO
BOXES ARE PLACED IN ONE CAR.

Roads Equipped with Boxes on Trial, and if not Satisfactory, Returned Without Any Expense to the Company trying them.

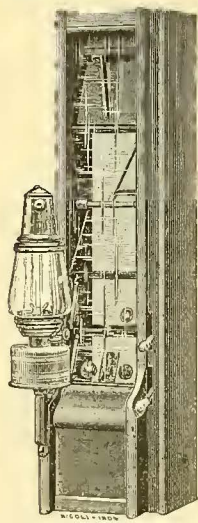
Patented Oct. 14, 1873.



BOX NO. 1.



BOX NO. 2.



CHARIOT PATTERN.

One of the principal merits of these Fare Boxes over all others, consists in the fact that the fares are not turned out of sight at once by the drivers, leaving nothing but the bare word and memory of the parties as evidence of the payment, thereby making it easy for deception to be practised, even though an officer is on the car, and is endeavoring to see that the driver is faithfully performing his duties. They are so constructed that the fares are kept in sight from one end of the road to the other, and at any point on the line an officer of the company, or indeed any other person, can tally passengers with the fares. The drops can easily carry from 75 to 80 fares, and can be counted without mistake, and counterfeit money can be easily detected. These boxes are very simple in construction, being cleared, when required, in five minutes, whereas any other box takes a much longer time. The glass fronts and drops render them so transparent that a person sitting in the further end of car can readily count the fares and make the tally, without making himself conspicuous in the matter, if desirable. They are lighted from an outside lantern, (which is only on the car at night, and should be taken off during the day,) giving an excellent light, for the fares can be seen almost as plain as by day. When the box is put in a car it can not be taken out or tampered with, unless the keys are obtained from the office, and can not be robbed without violence. Special attention given to correspondence on the subject of street railway construction, equipment and operation. Address all correspondence to

A. A. ANDERSON, with TOM. L. JOHNSON, Indianapolis, Ind.

D. W. Pugh, J. S. Pugh, F. D. Russell.

PUGH & RUSSELL, STREET CARS, RAILS, AND EVERY DESCRIPTION OF STREET RAILWAY SUPPLIES.

General Representatives of
THE JOHN STEPHENSON COMPANY, Limited,
NEW YORK.
STREET CARS.

General Agents of
THE A. FRENCH SPRING COMPANY, Limited,
PITTSBURG, PA.
STREET CAR SPRINGS.

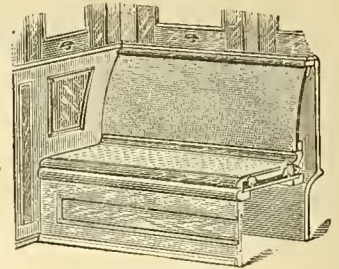
Agents for New York District, Indiana, Michigan and Ohio of
THE JOHNSON STEEL STREET RAIL COMPANY,
JOHNSTOWN, PA.

NEW YORK, **CHICAGO,**
STEWART BUILDING, **ADAMS EXPRESS BUILDING,**
Broadway, Reade and Chambers Sts. No. 183 Dearborn Street,
P. O. Box 3524. Rooms 13 and 14.

THE HALE & KILBURN MANFG. CO.,

Extensive makers of Patented
Street Car Seats
of every description.

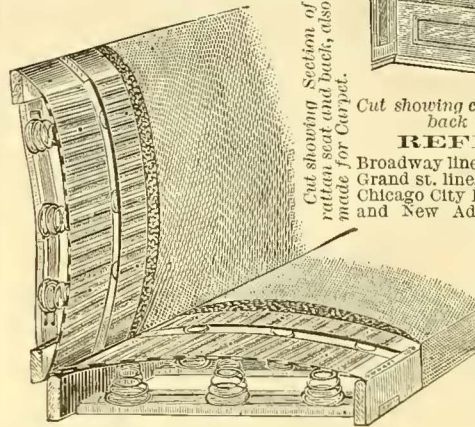
Our Patent Spring Seats covered with Rattan or Carpet are fast being adopted by the best railroads in the country. Seats for Steam Cars a Specialty. Owners and makers of all the Cobb patents



Cut showing car with rattan seat and back without springs.

REFERENCES:

Broadway line (Pullman cars) New York
Grand st. line, 3d and 4th ave lines, NY
Chicago City RR. Chicago W. Div. line,
and New Adams street line, Chicago;
East Cleveland R. R. Co.
and Woodland Ave. and
West Side R. R. Co.,
Cleveland; Union Line,
St. Louis; 2d. & 3d St. R.
R. Co., Frankford and
Southwark R. R. Co.,
Union Line, Chestnut &
Walnut R. R. Ridge Ave
R. R., or any other road
in Phila.; and 100 others
elsewhere.



Cut showing Section of rattan seat and back, also made for Carpet.

Many R. R. Co's use our Rattan Pat. Canvas Lined Seats for Summer and cover the same with carpet for Winter. This method of seating we recommend as a durable and economical, for the reason both a Summer and Winter seat is obtained in one.

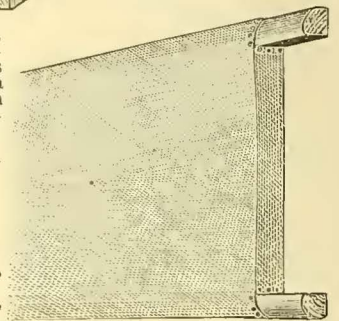
Estimates & Particulars cheerfully given, (mention this paper) satisfaction guaranteed.

A TRIAL SOLICITED.

OFFICES: 48 & 50 NO. SIXTH ST.,

FACTORIES: 615 to 621 Filbert St.,

PHILADELPHIA, PA. Cut of section of cross for summer car



JOHN A. EMERICK, President,

EDWARD H. JOHNSTON, General Manager,

SAMUEL LEES, Treasurer.

Johnston Railroad Frog & Switch Co.

MANUFACTURERS OF

Railway Switches, Stands, Frogs and Crossings.

ALL SUPPLIES FURNISHED APPERTAINING TO

Steam & Street Railways.

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Blue Prints and Bills Furnished on Application. CORRESPONDENCE SOLICITED.

Works, Chester, Pa.

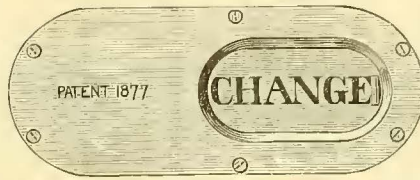
Office, 307 Walnut Street, Philadelphia.

SLAWSON'S PATENT FARE BOXES

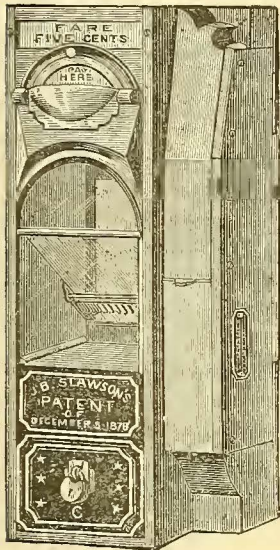
These Boxes are of the latest and most approved pattern, and contain a front door, by opening which all of the glass inside can be conveniently cleaned. This is a late patent, and is a very valuable improvement over the old method of taking the boxes apart for that purpose. They are well made and not liable to get out of order, cannot possibly be picked, and even if all the glass is broken no fare can be extracted from the drawer.

The late J. B. Slawson originated the "FARE BOX SYSTEM," and all of his Boxes, Change Gates and Drivers' Change Box are protected by several patents, and parties using them are not liable to claims for infringements, as may be the case with some boxes which are now being offered for sale.

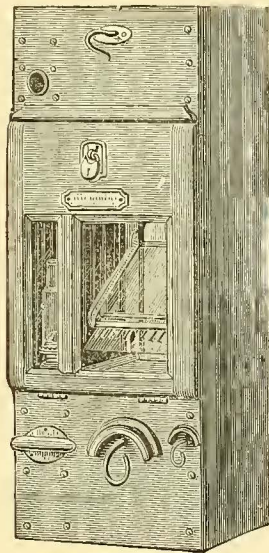
These Boxes, etc., are now in use not only in the United States and Canada, but in Mexico, South America, Europe, Asia, Africa and Australia—in fact, nearly all places where street cars are used.



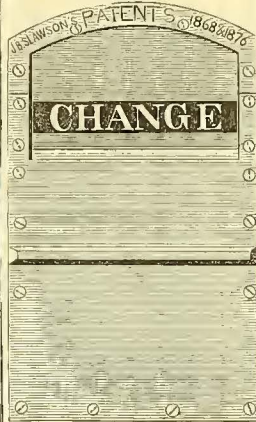
Change Slide. Outside View.



C. Front View.

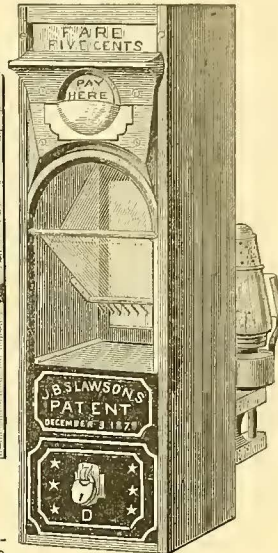


C. Back View.

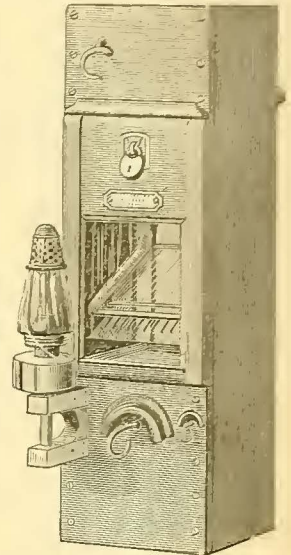


Change Gate. Outside View.

The prices have been greatly reduced, and are made to fit the times. Orders will be promptly filled by addressing,



D. Front View.



D. Rear View.

MILTON I. MASSON, Agent, 365 AVENUE A, NEW YORK.

or the JOHN STEPHENSON COMPANY, Limited, 47 EAST TWENTY-SEVENTH STREET, New York.

WM. WHARTON Jr. & CO., Limited,

Engineers, Manufacturers & Contractors,

Twenty-Fifth Street and Washington Avenue,

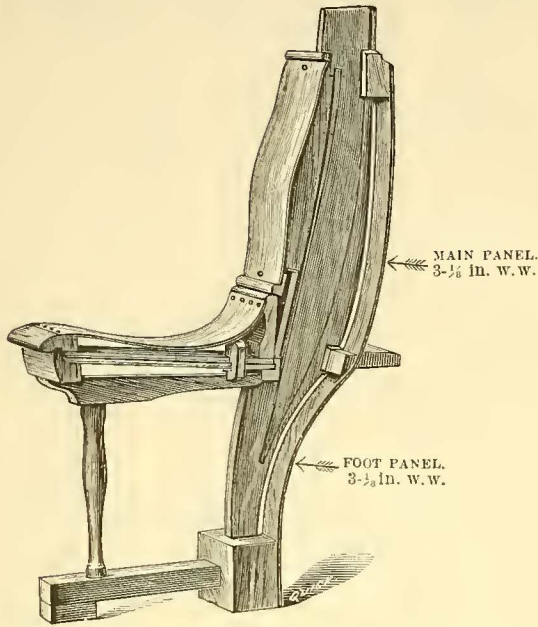
PHILADELPHIA, PA.

CABLE RAILWAYS, GRIPS,

And All Appurtenances.

The Oldest and Largest Manufacturers of Street Railway Track Appliances in the World. Responsible parties contemplating Building, Renewals or Extensions will find it to their interest to correspond with us.

STREET CAR SEATS & BACKS.



THREE-PLY CAR SIDES.

Having given our three ply white wood car sides a thorough trial for a number of years in our city street and railway lines, which test has left them as firm and good as the day they were put in, we unhesitatingly place these sides in the market as a superior article. They are composed of three white wood (or poplar) veneers, each 1/2 inch thick, the grain of the center layer running at right angles with the two outside layers. Hence they derive all the special and well-known advantages of glued up wood over single ply, namely:

- 1st. They are fully 75 per cent stronger, for they brace and stiffen the car.
- 2nd. They are lighter, being only 3-8 inch thick, and so do not add so much dead weight to the car.
- 3rd. They will not check or split by change of atmosphere.
- 4th. They will not split or crack when nailing into place, even though the nail be placed near the edge.
- 5th. Being laid over a form to suit the shape of the car frame or post they cannot buckle or twist, a feature which also adds strength to the car.

For repairing cars these sides have no equal.

Our Three Ply Car Seats and Backs, so well known all over the world, are now the most popular seat and back in the market, and recommend themselves especially for their *Lightness, Cleanliness, Healthfulness and Beauty*, as also their *Cheapness and Durability*. For they are indestructible by moths (the great enemy of upholstering), and will not harbor vermin or insects, or carry or communicate contagion or disease. Our trade in this line has grown in thirteen years to vast proportions, which in itself is a sufficient guarantee of their merits. They are made either perforated or plain to suit customer. Birch is the wood most generally used. Today fully one-half the railroads in the country are using these seats and backs. We would also call attention to our *Veneer Ceiling* for cars. They are made either plain, perforated or decorated, and greatly add to the beauty of the car. For repairing cars they have no equal; for they are placed over the carlines and cover all the old paint and wood work. The woods generally used are *Birch, Birds-eye Maple, Oak and Mahogany*.

GARDNER & CO.

Manufacturers of Car Seats and Ceilings and Depot Seating,

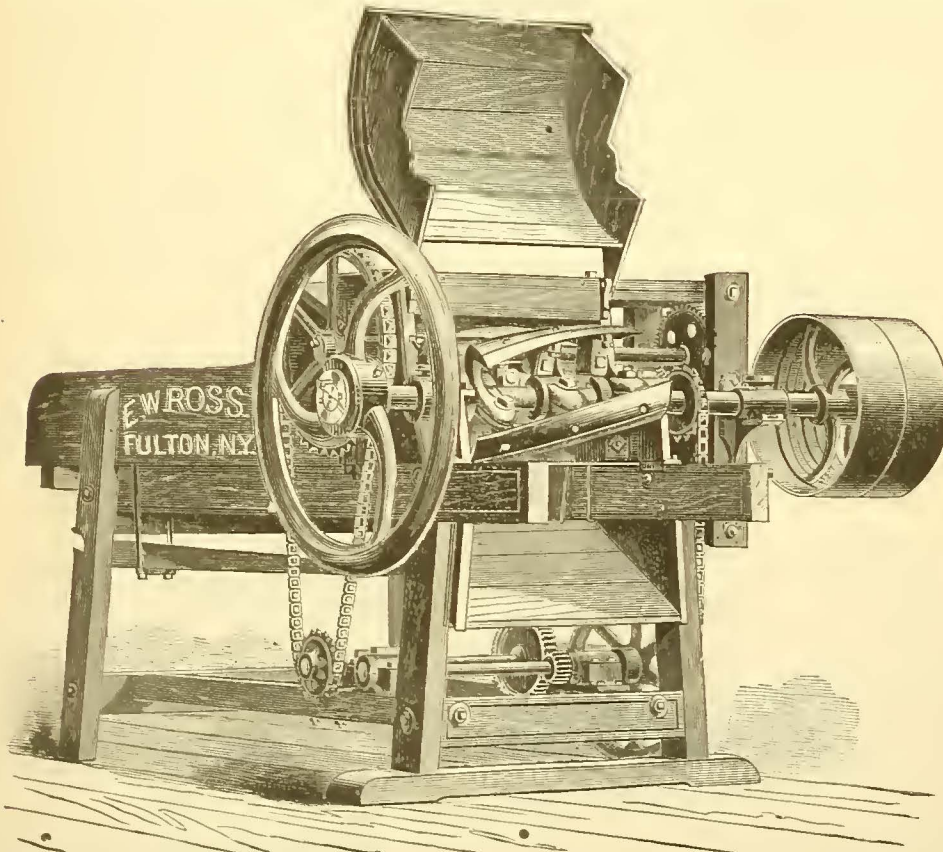
OFFICE AND FACTORY: 643, 645, 647, 649, 651, 653, 655 and 657 West 48th St., New York.

Sample and Salesroom: 206 Canal St., cor. Mulberry.

Send for Catalogue.

Address all Communications to Office.

THE ROSS HAY CUTTERS



A FULL LINE OF CUTTERS BUILT EXPRESSLY FOR STREET RAILWAY BARNs.

THEY HAVE COMBINED STRENGTH, DURABILITY AND GREAT CAPACITY.

ARE EASILY OPERATED AND CAN BE RUN TO FULL CAPACITY BY SMALL GAS ENGINE.

MACHINES SENT TO ANY PART OF THE U. S. ON APPROVAL IF DESIRED.

GUARANTEED TO BE THE BEST.

ILLUSTRATED CATALOGUE AND FULL PARTICULARS FURNISHED WHEN REQUESTED.

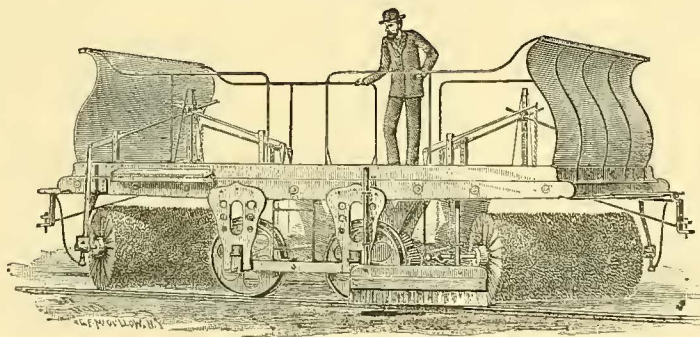
E. W. ROSS & CO., SPRINGFIELD, OHIO.

THE BROOKLYN RAILWAY SUPPLY COMPANY.

37 WALWORTH ST., BROOKLYN, N. Y.,
U. S. A.

RAILWAY SUPPLIES.

Yellow Pine Timber for Track Construction of Best Quality. Knee Spikes and Joint Plates.
Rail Spikes at Lowest Manufacturer's Prices, Made to Order, to Fit any Rail.
Any Kind of Materials Promptly Furnished Responsible Parties and Satisfaction Guaranteed.
Second-hand Cars Selected by Experts for Parties at a Distance on Small Commission.



SPECIALTIES.

Latest Improved Snow Sweepers of OUR OWN MANUFACTURE. Now used in nearly all the principal Northern cities. Rattan for refilling Brooms. Snow Plows. Sand Cars.

We have several Sweepers of other makers, taken in exchange, which will be sold, thoroughly refitted, very low on early orders. Rattan lower than ever before; write for prices.

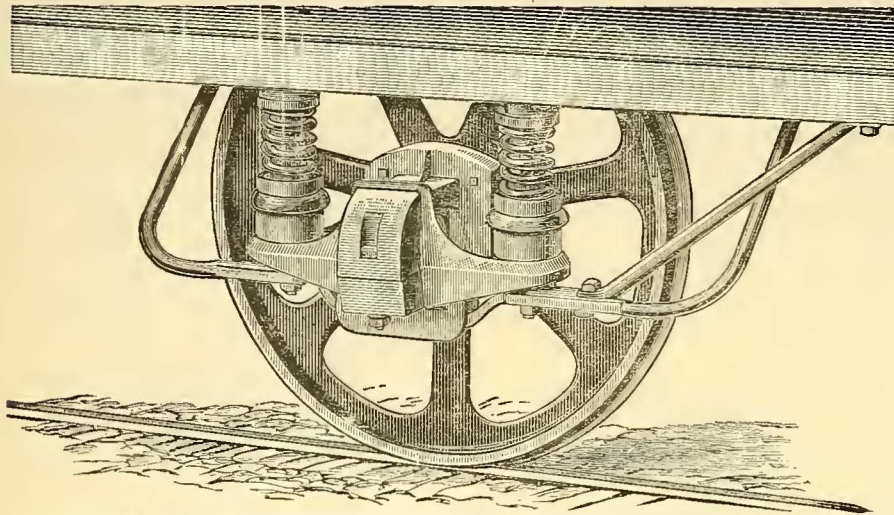
CORRESPONDENCE SOLICITED.

THE BEMIS CAR BOX COMPANY,

MANUFACTURERS OF

The Bemis Patent

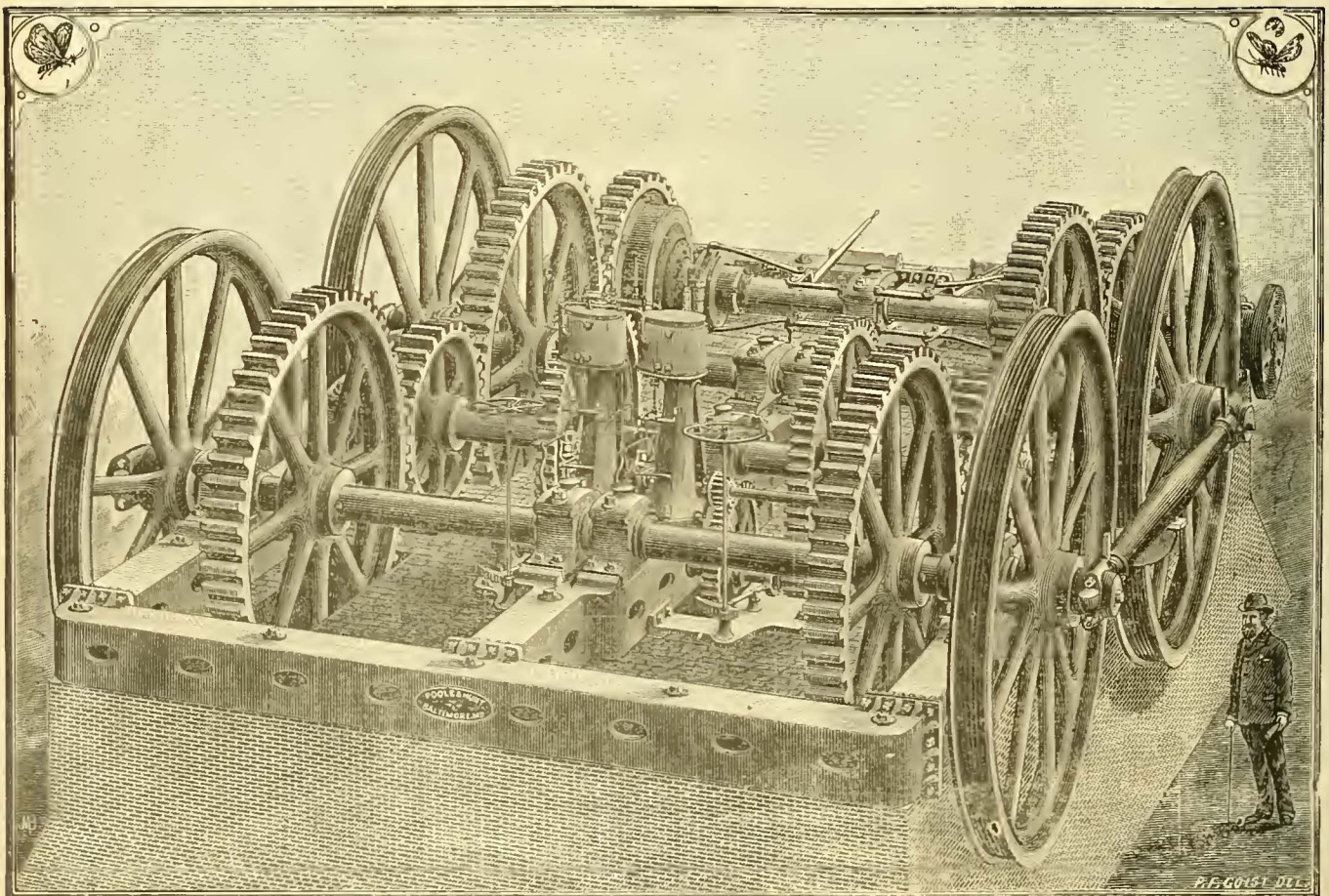
Journal Box.



Light Draft, Easy Riding, Durable, Economical. Brasses are warranted for 10 years, and Journal for 20 years. Requires oiling or inspecting but once in 12 months. Boxes are positively dust proof.

30 Taylor St., Springfield, Mass.

POOLE AND HUNT,
Baltimore, Md.



Manufacturers of Cable Railway Plant.

Machine Moulded Gearing for Mills and Factories.

CORRESPONDENCE SOLICITED.

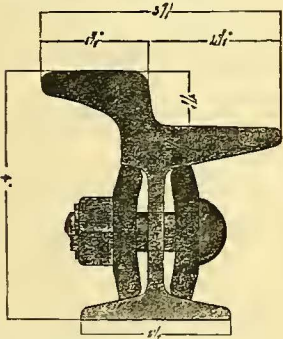
THE GIRDER SYSTEM OUR SPECIALTY.

THE

Johnson Steel Street Rail Company.

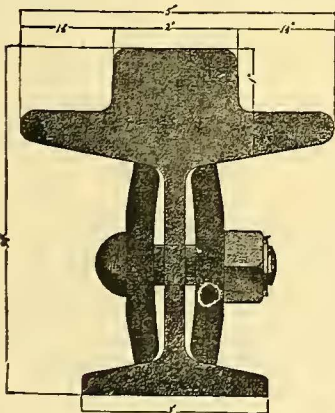
JOHNSTOWN, PA.

Section C. 38, No. 111.



Patented February 20, 1883.

Section E. 76, No. 117.

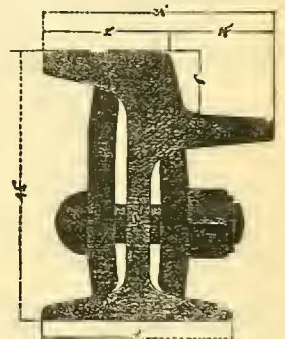


Patented January 29, 1884.

SIDE BEARING GIRDER RAILS

OR

Section D. 45, No. 11.

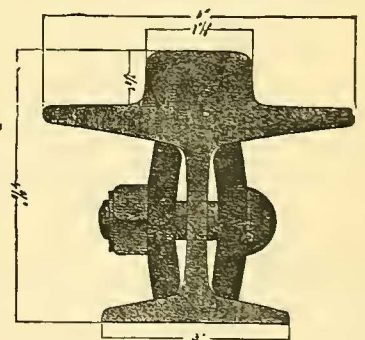


Patented November 27, 1883.

CENTER BEARING GIRDER RAILS.

Large Assortment of different Weights and Sections.

Section G. 58, No. 120.



Patented January 29, 1884.

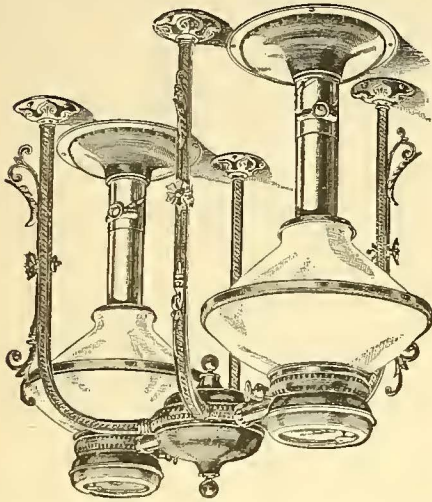
Rolled Steel Switches, Frogs, Curve Crosses, Etc.

We Furnish Every Detail Wanted in Track Work.

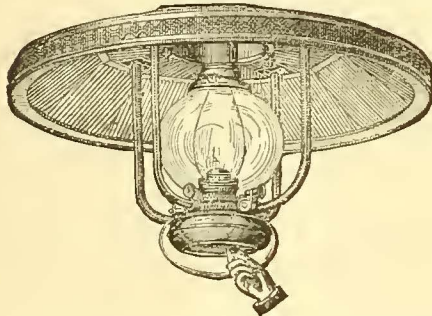
Our customers are guaranteed against all suits for infringements on goods purchased from us and we further undertake to defend the patents covering the details of our Girder System.

To those contemplating the use of the Girder System, we offer, FREE OF COST, to survey their routes, and after consultation as to the best and most economical construction, to furnish full and complete estimates of cost of the completed work. Send for Illustrated Catalogues.

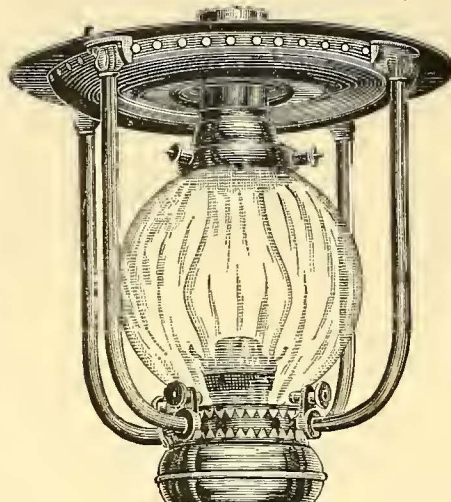
JOSEPHINE D. SMITH, Successor to the late WILLARD H. SMITH, 350 & 352 PEARL STREET, NEW YORK.



No. 10.
Two-light Car Lamp as used on Tenth Avenue (N.Y.) Cable Road.



No. 1.
Center Car Lamp with 25 Inch Corrugated Glass Reflector.

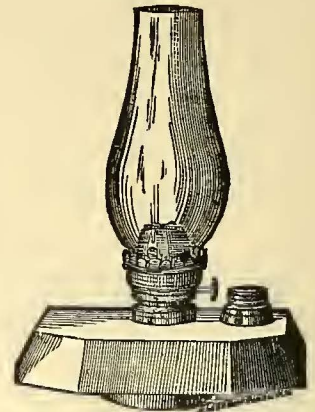


No. 2.
Center Car Lamp in general use on Horse Railroads throughout the United States and Canada.

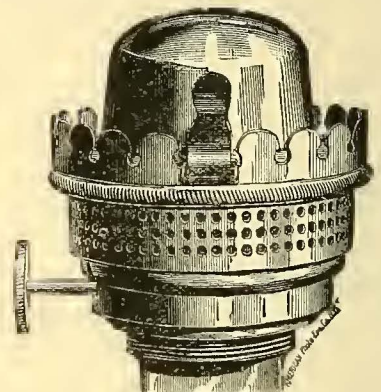
MANUFACTURER OF
RAILROAD

CENTER LAMPS & REFLECTORS.

ALL KINDS OF TRIMMINGS PERTAINING
TO CAR LAMPS.



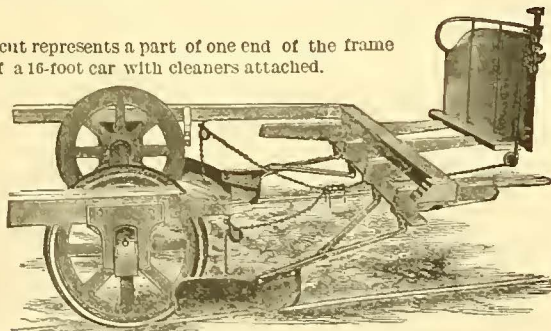
No. 1.
Tin Box Lamp, Brass Bottom.



J. B. M. 2 Spring Burner.

DAY'S IMPROVED STREET RAILWAY TRACK CLEANERS.

The cut represents a part of one end of the frame work of a 16-foot car with cleaners attached.



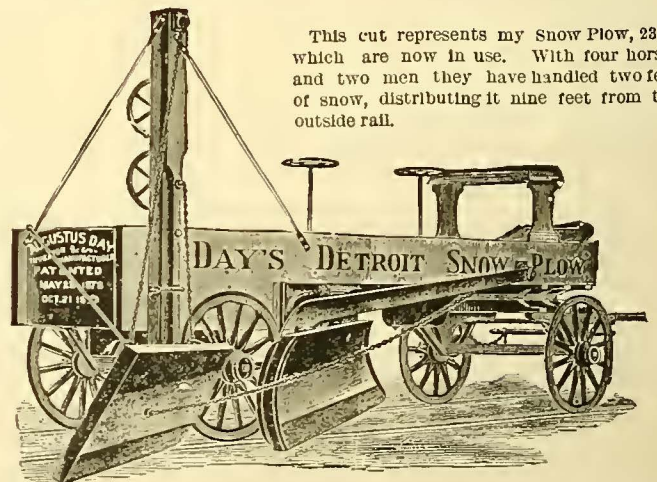
These Track Cleaners need no extended statement of their great superiority over all others invented. The fact of over three thousand pairs being now in use is sufficient evidence of their necessity and utility. Are adaptable to all kinds of rails and styles of cars. Clean Snow, Ice, Mud and Stones from the rail. The driver can raise or lower them instantly with one hand. To secure the largest benefit they should be attached to every car.

No estimate can be made of their advantage in saving of horseflesh hand labor, salt, and the making of time in stormy weather. Since their introduction new and valuable improvements have been made in their construction, mode of attachment, and convenience of handling. They are finished in a thorough, workmanlike manner of the best material obtainable, the design being to manufacture the most efficient article in preference to other considerations. Price includes right of use and is less than heretofore.

Reference is made to a few of the roads using these Cleaners.

Detroit City Ry., Detroit, Mich.	154	Pair
Chicago City Ry., Chicago, Ill.	100	"
Rochester City & Brighton R. R., Rochester, N. Y.	100	"
Albany Ry., Albany, N. Y.	75	"
Lynn & Boston R. R., Boston, Mass.	68	"
Boston Highland Ry., Boston, Mass.	46	"
Grand Rapids Street Ry.	45	"
Milwaukee Street Ry., Salem, Mass.	69	"
Bridgeport Horse Ry., Bridgeport, Conn.	40	"
Cream City Ry., Milwaukee, Wis.	40	"
Milwaukee City Ry., Milwaukee, Wis.	50	"
Buffalo Street Ry., Buffalo, N. Y.	32	"

This cut represents my Snow Plow, 23 of which are now in use. With four horses and two men they have handled two feet of snow, distributing it nine feet from the outside rail.



It is adapted to single or double track roads, adjustable where necessary; built in the most thorough and substantial manner of the best material. The Plow is not intended to supply the place of the small Track Cleaners, but the auxiliary to them. For execution in deep snow, ease, and convenience in handling, it surpasses all others in use. Orders should be given three months in advance.

Reference is made to the following roads that use them:—Detroit City Ry., Detroit, Mich. (Two plows.) Rochester City & Brighton R.R., Rochester, N. Y. (Two plows.) Cream City Ry., Milwaukee, Wis. West Side Street Ry., Milwaukee, Wis. Chicago City Ry., Chicago, Ill. (Three plows.) Grand Rapids Street Ry., Grand Rapids, Mich. Highland St. Ry., Boston, Mass. Buffalo St. Ry., Buffalo, N. Y. (Two plows.) Johnstown Pass. Ry., Johnstown, Pa. Minneapolis St. Ry., Minneapolis, Minn. (Two plows.) St. Paul St. Ry., St. Paul, Minn. (Two plows.) Kalamazoo St. Ry., Kalamazoo, Mich. Worcester St. Ry., Worcester, Mass. South Bend Ry., South Bend, Ind. Milwaukee City Ry., Milwaukee, Wis.

For Further Information and Price, Address:

AUGUSTUS DAY, 76 State Street, cor. Park Place, - - - - - Detroit, Michigan, U. S. A.

RAILWAY REGISTER COMPANY.

MANUFACTURING

MANUFACTURERS AND OWNERS OF THE Latest Designs, Improvements and Inventions in Registers, Indicators, Classifiers and Punches, for the Recording of Fares Collected on Street and Steam Railroads.



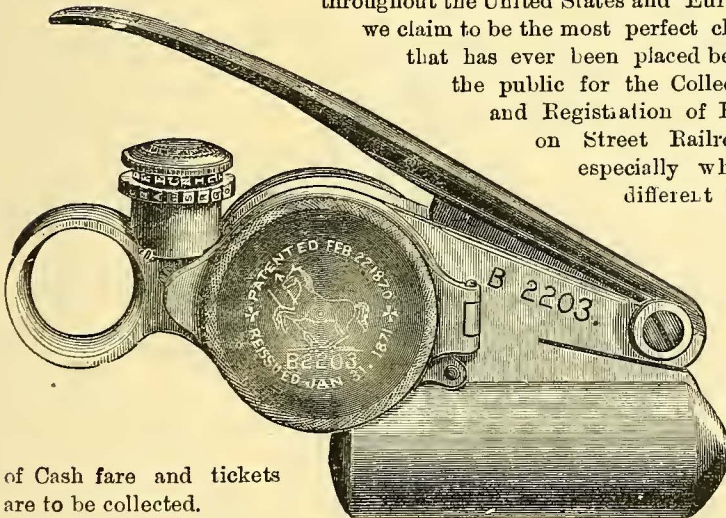
JAMES McCREDIE, Pres., Buffalo, N. Y.

COMPANY.

This company owns over 100 Patents embracing all the Valuable Features of Fare Registers, Indicators, etc., and was awarded three Medals at the Chicago Exposition of Railway Appliances.

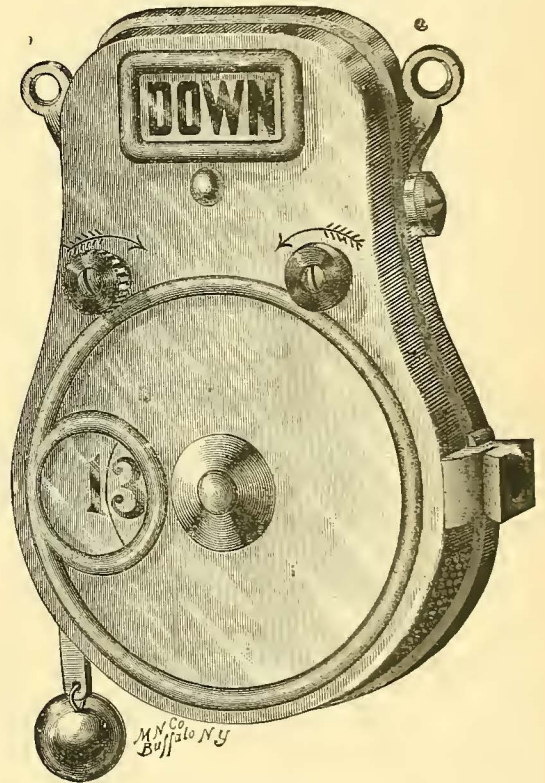
The Alarm Registering Punch.

This Register, which is so generally used throughout the United States and Europe, we claim to be the most perfect check that has ever been placed before the public for the Collection and Registration of Fares on Street Railroads, especially where different rates

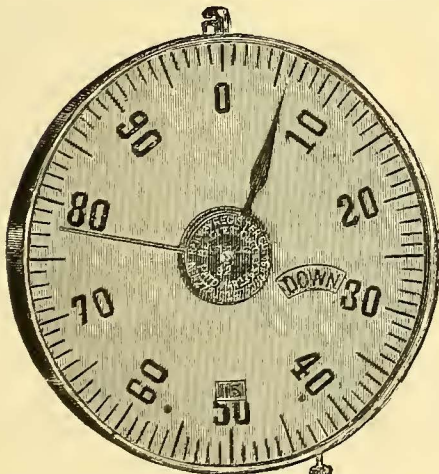


of Cash fare and tickets are to be collected.

Benton Register.

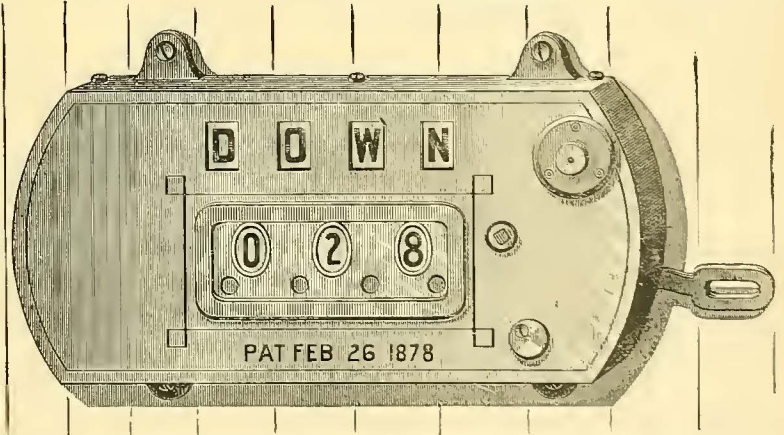


The Monitor Register.



Railway companies desiring to use a Stationary Register will consult their own interest by examining this Register before adopting any of the cheap devices now offered as it is the most Reliable Register of its kind. For further particulars address

The Pond Register.



BEADLE & COURTNEY, Gen'l Agents, 1193 BROADWAY, NEW YORK. Branch Office, 423 Walnut St, Ph'a.

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27 to 35 Walworth Street, and 31 to 37, and

PATENTEES & MANUFACTURERS OF

THE

IMPROVED

USED BY RAILWAY COMPANIES IN ALL

PARTS OF THE COUNTRY.

⊖ ⊖ ⊖ **“ALARM”** ⊖ ⊖ ⊖

KEPT IN REPAIR ONE YEAR
FREE OF CHARGE.

PASSENGER

GUARANTEED THE MOST COMPLETE
MACHINE IN THE U. S. FOR
THE PURPOSE.

REGISTER.

SPECIAL NOTICE

MANAGERS OF STREET RAILWAYS, WHEN VISITING THE EAST SHOULD SEE THE LARGE OPEN CARS ON THE PAVONIA HORSE RAILROAD, JERSEY CITY, WHICH ARE RUN BY THE DRIVER AND “SMALL'S AUTOMATIC FARE COLLECTOR.” THEY ARE TWENTY-TWO FEET LONG, SEAT THIRTY-FOUR PASSENGERS, AND FREQUENTLY CARRY SEVENTY AT A LOAD.

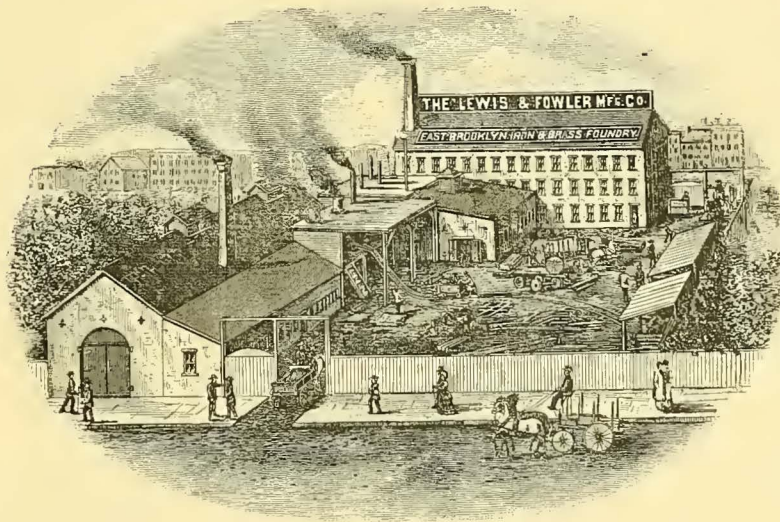
The Lewis & Fowler Manufacturing Company, Sole Agents.

FOWLER MFG'G Co.

32 to 40 Sandford Street, BROOKLYN, N. Y

Materials Furnished for Street and Cable Railway Construction

Knees
 Spikes
 Channel Plates
 Frogs
 Points
 Tongue Switches
 Grooved Rails for
 Curves
 Bent any desired radius.



Pedestals
 Oil Boxes
 Brake Shoes
 Wheels and Axles
 Brass Bearings
 Turntables
 Snow Sweepers
 Plows
 Etc. etc. etc.

RAILROAD CASTINGS

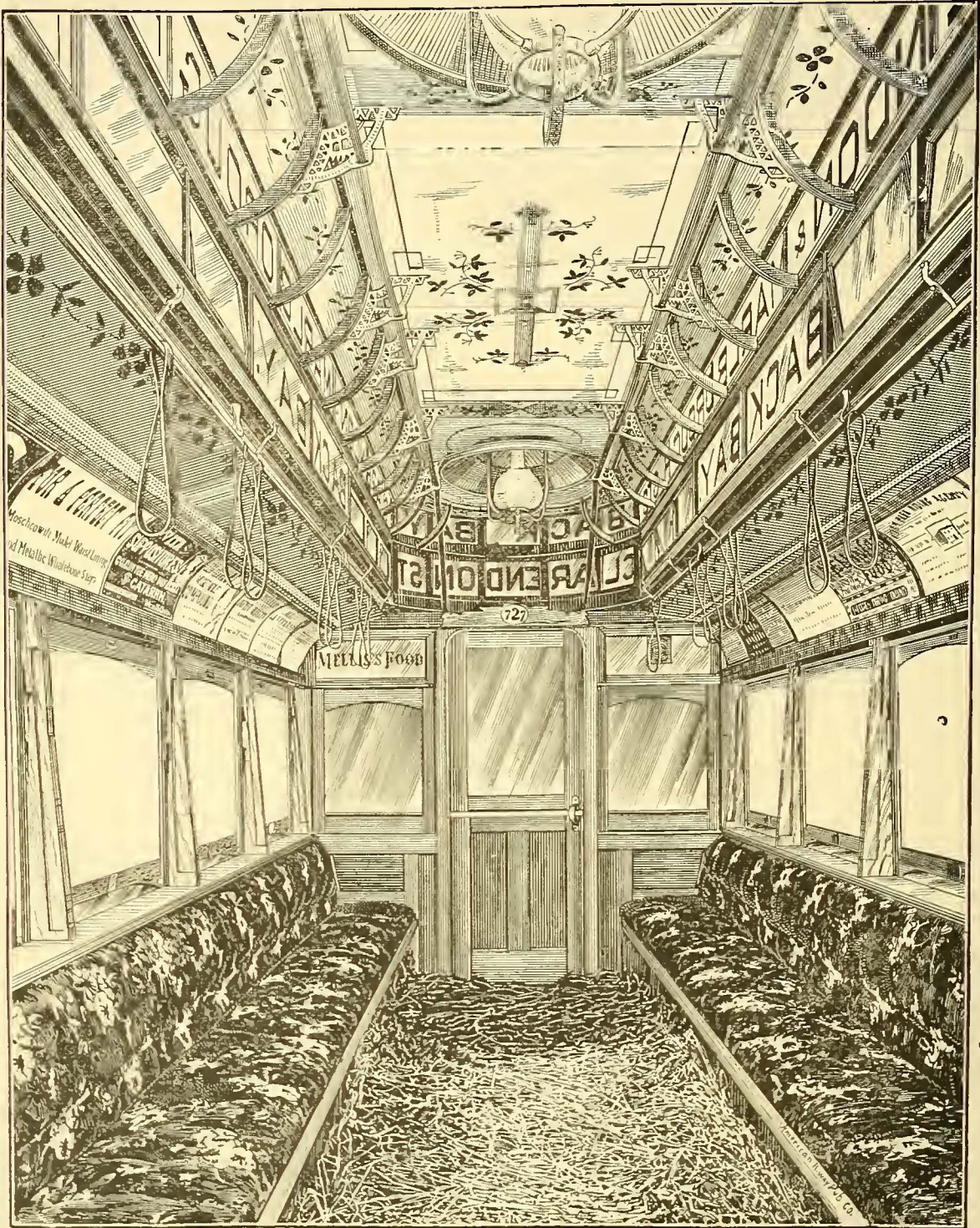
Of every description and most approved patterns.

FOWLER'S IMPROVED

RANDALL BOX & RUNNING GEAR.

The United States Steam and Street Railway Advertising Company, Limited,

Sole Agents For The Blackmer Vibrating Sign.



Sole Agents For The Randall Car Advertising Rack.

Contractors For Advertising Space in Street Railway Cars.

WM. F. CARLETON, Manager, 239 Broadway, N. Y.

P. O. BOX 2366.

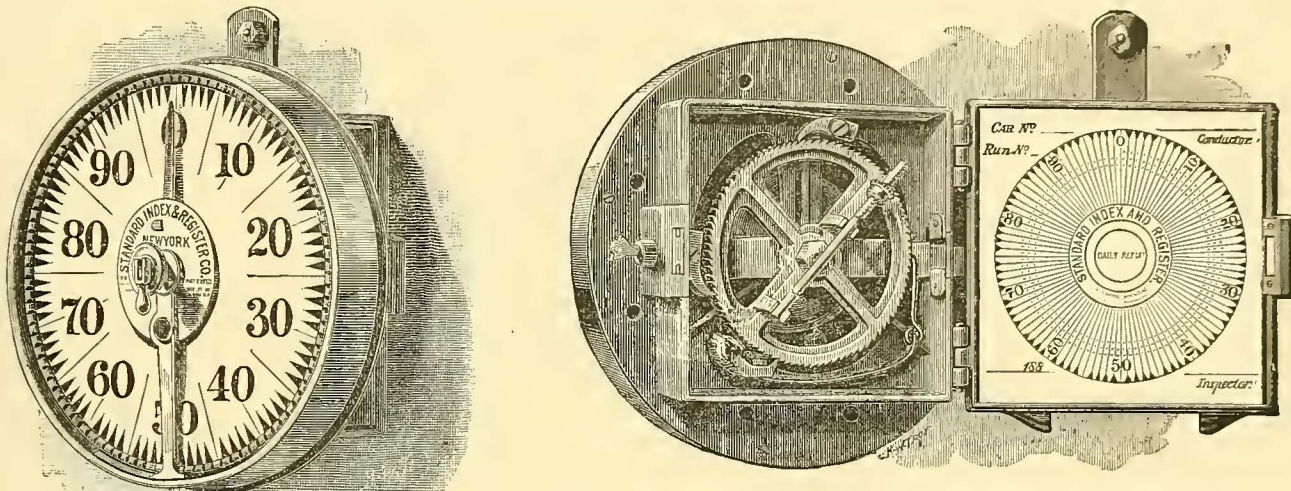
THE STANDARD INDEX & REGISTER CO., NEW YORK,

SOLE LICENSEES AND MANUFACTURERS OF

THE STANDARD INDEX AND REGISTER,

ADOPTED BY THE LEADING RAILROADS IN THE UNITED STATES,

For Indelibly Recording upon paper the number of trips made, and passengers carried for each trip as well as for any number of trips for any period of time, and sounding an alarm simultaneously with each registration made.



The recent decision of the U. S. Circuit Court in our favor after three years of litigation in which the Standard was involved, justifies us in accepting orders from railway companies generally for our Registers, which are celebrated for simplicity efficiency and infallibility as an indicating and recording register.

It will appear obvious upon inspection that the Standard Register is the only device that should be adopted by railway companies anxious to secure a correct report and record of trips made and fares collected, for the reason that, in addition to the visual dial and indicator, a permanent registration of each trip made, and the exact number of fares collected or passengers carried, is automatically made by mechanical means upon paper, by which the latter is punctured in a manner that prevents obliteration, and can be preserved in the office of the company for reference and comparison with fares turned in by the conductor, and for filing for future purposes.

TESTIMONIALS.

METROPOLITAN RAILROAD COMPANY.
PRESIDENT'S OFFICE. C. A. RICHARDS. 16 KILBY STREET,

BOSTON, March 9, 1883.

ELI BALDWIN, Esq., Prest. Standard Index & Register Co.,
New York, N. Y.,
Dear Sir,—In answer to your inquiry of March 8 I would most respectfully state, that after a trial of some months of the two hundred odd registers that you have placed in our cars, I feel that I do no more than exact justice to your company in giving you in the strongest and most unqualified manner my entire approval of them. They are in every way all that you claimed, and all that you promised me they would prove to be. In short, I like them. They answer my purpose completely, and I would not exchange or part with them for any other device of the kind I have yet seen.

Very respectfully yours, &c.,
C. A. RICHARDS,
President Metropolitan Railroad Co.

C. A. RICHARDS, President. CHAS. BOARDMAN, Treas. W. P. HARVEY, Secy.
OFFICE OF

THE METROPOLITAN RAILROAD COMPANY,
No. 16 KILBY STREET,

Boston, March 23, 1886.

E. BALDWIN, Esq., Prest. Standard Index and Register Co.
Dear Sir,—We have now in daily use four hundred and twenty-five of your registers. They have by repeated purchases come to this number. We like the registers very much, and have no fault to find with them. With an experience of four years we feel that we are justified in recommending them.

Very respectfully yours, &c.,
C. A. RICHARDS, President.

CENTRAL PARK, NORTH & EAST RIVER RAILROAD COMPANY.
G. Hilton Scribner, Prest. C. Densmore Wyman, Vice Prest. J. L. Valentine,
Secy. and Treas. W. N. A. Harris, Supt.
OFFICE, 10TH AVENUE, 53D AND 54TH STREETS,

NEW YORK, August 31, 1882.

The Standard Index Register instruments purchased from you about a year and a half ago have since that time been in constant use upon the cars of this line, and I am very free to acknowledge their superiority over any device hitherto tried by us. We believe from our experience that in their construction

and result they attain the object sought with accuracy and at the same time with a minimum liability to external tampering or dishonest manipulation.

Very respectfully,
C. DENSMORE WYMAN, Vice President.

CENTRAL PARK, NORTH & EAST RIVER RAILROAD COMPANY
G. Hilton Scribner, Prest. C. Densmore Wyman, Vice Prest. J. L. Valentine,
Treas. Howard Scribner, Secy. W. N. A. Harris, Supt.

TENTH AVENUE, 53D AND 54TH STREET,

NEW YORK, March 24, 1886.

ELI BALDWIN, Esq., Prest. Standard Index & Register Co.,
138 Fulton Street, New York:
My Dear Sir,—We have used about 150 of your "Standard Index Registers" for the past five years and such use has demonstrated their entire utility and adaptation for the purposes intended in their construction. We are more than satisfied with them, finding that by reason of the simplicity of their construction they require hardly any repairs, while they are accurate and reliable and at the same time by virtue of the inside paper dial are free from the danger of being tampered with. In a word we are thoroughly satisfied with the Standard and it is but just to you that I should express this opinion to you.

Very sincerely yours,
C. DENSMORE WYMAN, Vice President.

OFFICE OF
THE BROADWAY AND SEVENTH AVENUE RAILROAD COMPANY,
COR. 7TH AVE. AND 50TH STREET,

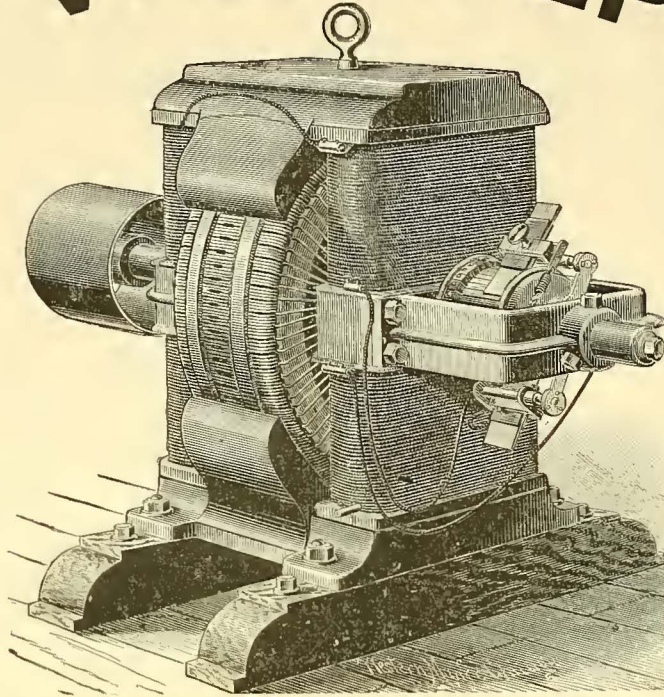
NEW YORK, March 25, 1886.

ELI BALDWIN, Esq., Prest. Standard Index & Register Co.:
Dear Sir,—Concerning your inquiry as to the result of our experience in the use of the Standard Register furnished by your company and the satisfaction given I will state that after five years' test during which they have been in use on the cars of our roads, we have found them the embodiment of all that you have claimed, and I cheerfully endorse them as the best registers that we have ever seen and have found them reliable and not easily put out of order. In short we would not be without them. The paper register or tablet upon which registrations are recorded of the number of passengers carried and trips made is an invaluable feature, producing as it does an infallible and indelible record of fares collected, serving as a check where a division of trust is questioned. We have upwards of two hundred of your Registers on the cars of our roads at the present time.

Very Truly Yours,
J. W. FOSHAY, President.

STANDARD INDEX & REGISTER COMPANY, 138 Fulton St., N. Y.

THE VAN DEPOELE



RAILWAY ELECTRIC SYSTEM.

The Van Depoele Electric Manufacturing Company

21 NORTH CLINTON STREET, CHICAGO, ILL.,

Owning the Van Depoele Patents for Electric Railways and or Van Depoele Motors, are prepared to equip railways with their Electric System.

We claim to have the best and most economical Electric Motor in the World.

We are not Selling Stock, but Doing Business.

Would be pleased to furnish estimates to new companies or those desiring to extend lines or wanting more rapid transit.

Van Depoele Electric Manufg. Co.

RICHARD VOSE,

13 Barclay Street, . New York,

PATENTEE AND MANUFACTURER OF

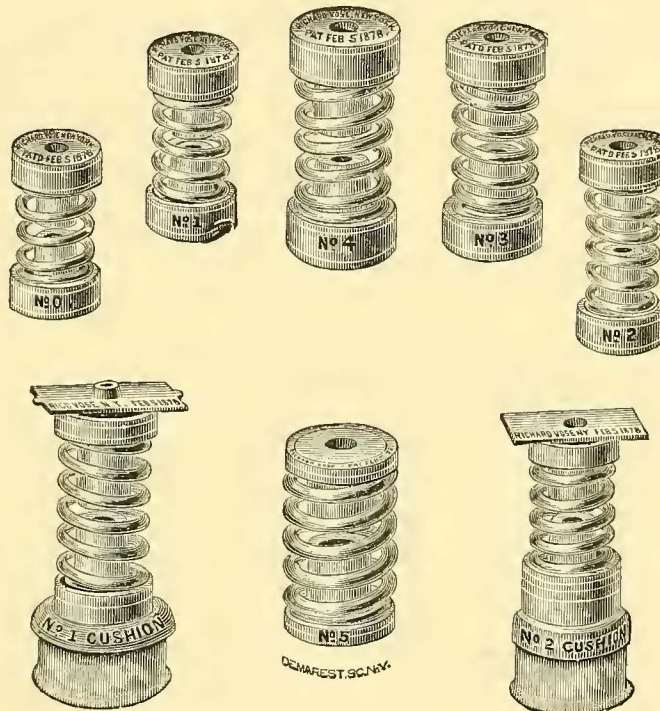
Graduated Street Car Springs.

RUBBER CONE.

Patented, April 15th, 1879.

ADAPTED TO THE

STEPHENSON,
 BEMIS,
 RANDALL,
 HIGLEY,
 BRILL,
 JONES,
 BALTIMORE
 VOLK
 And all other Boxes.



No. 0, for 10-ft. Light Cars.
 No. 1, for 10-ft. Cars.
 No. 2, for 12-ft. Cars.
 No. 3, for 14-ft. Cars.
 No. 4, for 16-ft. Cars.
 No. 5, for 16-ft. Cars.
 (Single Pedestal)
 No. 1, Cushion, for 16-ft. Cars.
 No. 2, Cushion, for 12 and 14-ft. Cars.

TESTIMONIAL.

MIDDLESEX RAILROAD CO., BOSTON, MASS.
 RICHARD VOSE, Esq. Dear Sir,—We have had in constant use upon this road for several years the "Vose Graduated Spring," and they have given very general satisfaction. So much so that we shall continue to order them. Very truly,
 CHAS. E. POWERS, Prest.

NO. CHICAGO CITY RY. CO., CHICAGO, ILL.
 RICHARD VOSE, Esq. Dear Sir,—This company has had in use for the past seven or eight years your Patent Graduated Car Spring, and our experience leads us to the conclusion that they are all in every respect which you represent them to be. And certainly all that we desire. Yours Respectfully,
 V. C. TURNER, Prest.

RDWAY & 7TH AVE. R.R. CO., NEW YORK CITY.
 MR. RICHARD VOSE. Dear Sir,—We have 125 cars equipped with your Graduated Springs. They have given entire satisfaction. They are undoubtedly the best in the market. Very Resply,
 J. W. FOSHAY, Prest.

BROOKLYN CITY R.R. CO., BROOKLYN, N. Y.
 RICHARD VOSE, Esq. Dear Sir,—Yours of May 27 to Mr. Hazzard, Prest., has been referred to me for reply. And would say that we have now in use about 600 sets of your Patent Graduated Car Springs. And up to date have given perfect satisfaction. Yours truly,
 A. N. DICKIE, Supt.

CHICAGO CITY RY. CO., CHICAGO, ILL.
 RICHARD VOSE, Esq. Dear Sir,—Replying to your favor of a recent date I beg to say that we have been

using your Graduated Car Springs since 1881 and have increased the number, until at the present time we are using 369 sets, and the same have invariably proved satisfactory. Yours truly,
 C. B. HOLMES, Supt.

CAMBRIDGE R.R. CO., CAMBRIDGE, MASS.
 COL. RICHARD VOSE. Dear Sir,—We have used your Graduated Street Car Springs for several years and I need only say with such success that we continue to use them. Very Resply,
 W. A. BANCROFT, Supt.

CINCINNATI I. P. R.R. CO., CINCINNATI, O.
 RICHARD VOSE. Dear Sir,—Send us 6 more sets of your new pattern Car Spring, same as the lot we ordered of you last Sept. In every way. This is the best answer we can make to your question of "How we like them." Yours truly, J. M. DOHERTY, Supt.

LYNN & BOSTON R.R. CO., CHELSEA, MASS.
 RICHARD VOSE, Esq. Dear Sir,—All I can say in favor of the Vose Spring is that we continue to apply them to most of our new cars. Have about 60 cars equipped and think very well of them. If they could be produced for less money should think better of them. Very Respectfully Yours, E. C. FOSTER, Supt.

CREAM CITY R.R. CO., MILWAUKEE, WIS.
 Gentlemen,—Yours of May 28 at hand, with regard to your Car Springs. We find they are the best in use. They come a little higher than the Barrel Spring, but they are much the better springs. Yours truly,
 H. J. C. B., Supt.

LOWELL HORSE R.R. CO., LOWELL, MASS.
 TO WHOM IT MAY CONCERN: We have used the Richard Vose Graduated Car Springs for several years, and are well pleased with them. Should be unwilling to change them for any other. All of our cars use these springs. Yours Respectfully,
 J. A. CHASE, Treas.

DAYTON STREET R.R., DAYTON, O.
 MR. RICHARD VOSE. Sir,—We have eighteen cars equipped with your Patent Graduated Spring, and will use your springs to replace all other kinds as fast as repairs are needed. Your springs give the best satisfaction to our company and patrons of any that we have ever tried. Yours Respectfully,
 A. W. ANDERSON, Supt.

FT. WAYNE & ELMWOOD RY. CO., DETROIT, MICH.
 RICHARD VOSE, Esq. Dear Sir,—For the past four years we have been using your Graduated Springs on all of our cars (30). Our Superintendent says that none of them have ever had to be repaired and that they are the best springs we ever used. Yours truly,
 N. W. GOODWIN, Secy.

DETROIT CITY RY., DETROIT, MICH.
 RICHARD VOSE, Esq. Dear Sir,—I have your favor of the 20th ultimo. We have about 70 cars equipped with your springs. Our experience is that they wear well and give general satisfaction. Yours truly,
 GEO. HENDRIE, Treas.

FRANK H. ANDREWS,

SUCCESSOR TO

ANDREWS & CLOONEY,

F. T. LERNED, Gen'l Agent.

Manufacturers and Contractors for Constructing Street Railways.

THE BUILDING OF

CABLE ROADS,

AND FURNISHING MATERIALS FOR SAME, A SPECIALTY.

All Kinds of Steel and Steel Grooved Rails,

Straight or Bent to any Radius.

Knees, Fishplates, Spikes, Bolts, Etc., Etc.

MACHINERY:

Wheel Presses, Wheel Borers, Axle Lathes, Drills, &c.

EITHER FOR STEAM OR HAND POWER.

Promptness and Reasonable Prices,

Send for Illustrated Catalogue..

Branch Offices:

BOSTON,
37 Centre Street.

ST. LOUIS,
Southern Hotel.

CHICAGO,
Lakeside Buildin

Represented in California by WM. B. ISAACS, 258 Market St., San Francisco.

FRANK H. ANDREWS,

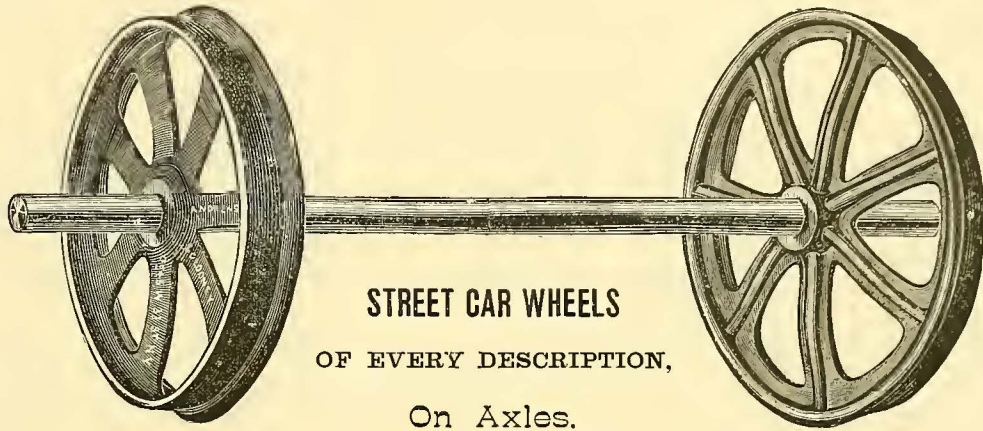
F. T. LERNED, Gen'l Agent.

OFFICE :

545

W. 33d St.,

NEW YORK.



STREET CAR WHEELS
OF EVERY DESCRIPTION,
On Axles.

WORKS :

535 to 551

West 33d St.,

AND

538 to 552

West 34th St.,

NEW YORK.

Manufacturers of

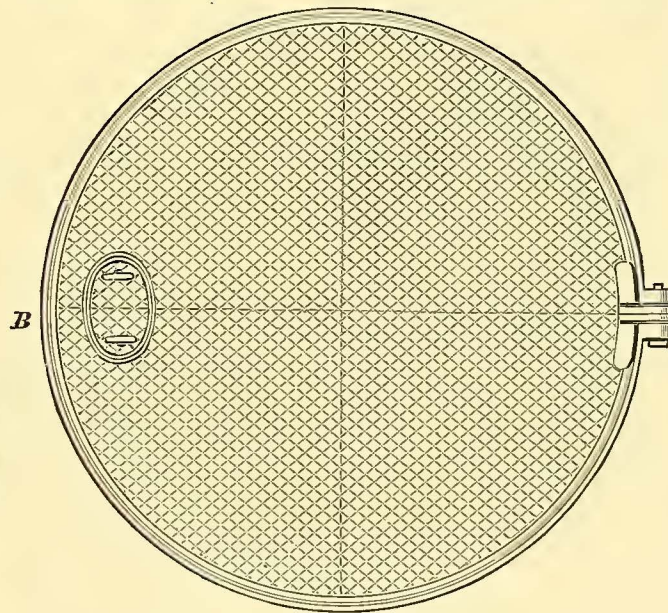
Elliptic, Spiral,

Volute, Car and

Engine

SPRINGS

Of Every Description.



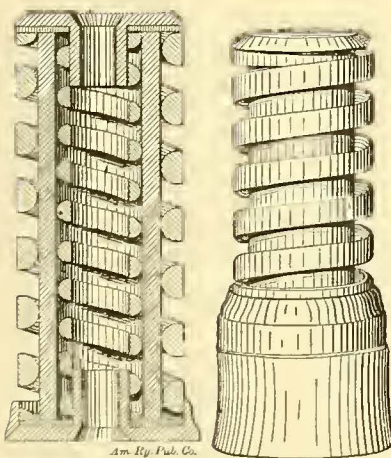
Street Railway Turn-table.

Car Wheels,
Axles,
Brake Shoes,
Pedestals,
Boxes,
Brass Bearings
AND
Castings

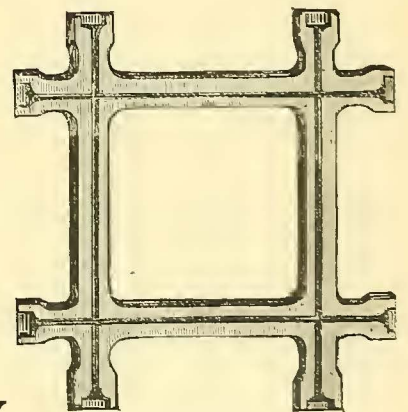
of all Descriptions where great
Strength is Required.

ALSO

Sweepers, Snow Plows,
Turn-Tables,
Track Work, Automatic
Switches, Etc.



Improved Springs.



Street Railway Crossings.

REPRESENTED IN CALIFORNIA BY

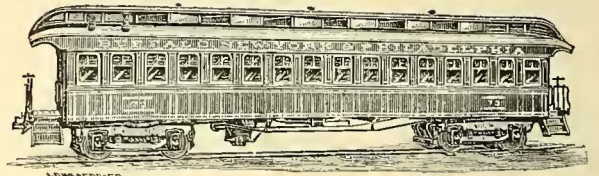
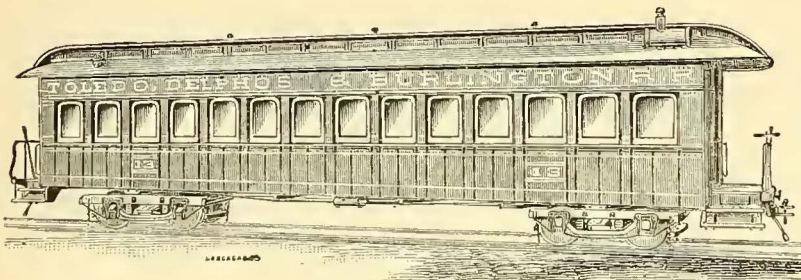
WM. B. ISAACS, 258 Market St. San Francisco.

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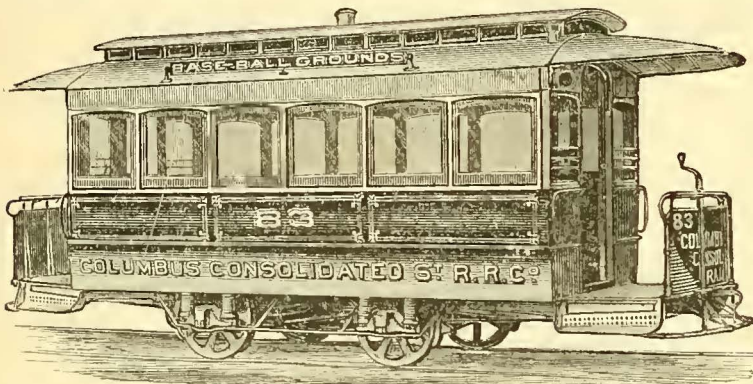
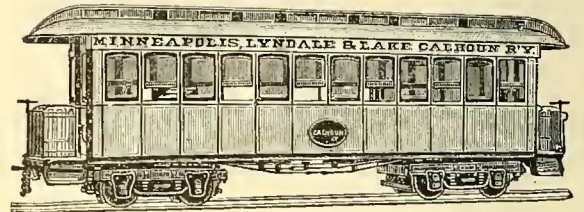
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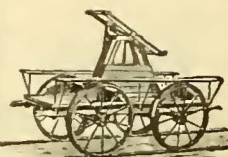
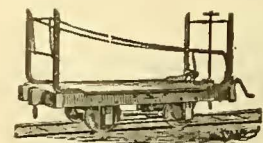
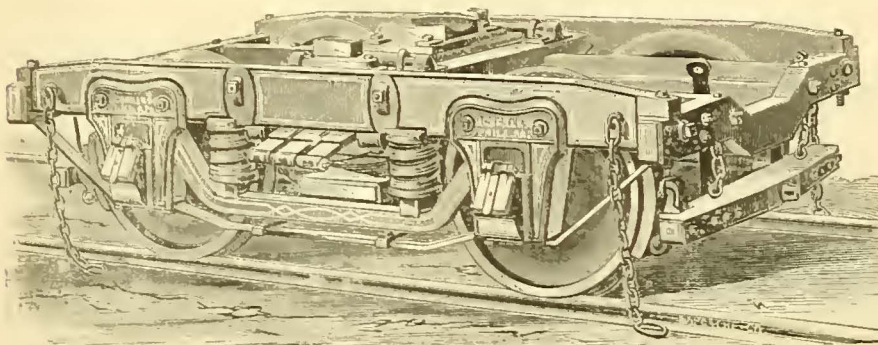
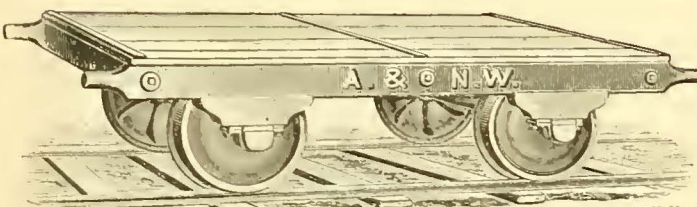
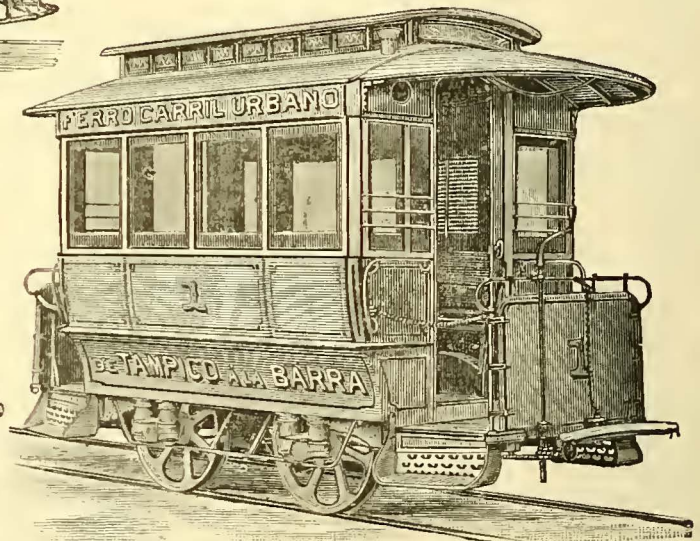


Passenger Cars of all kinds,



Light Cars for
Suburban Roads,

Construction Cars, Power Hand
Cars, Small Merchandise
Cars, Cane Cars.

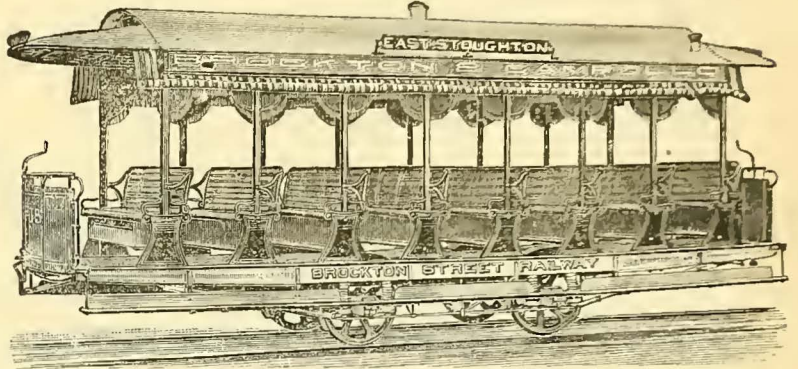
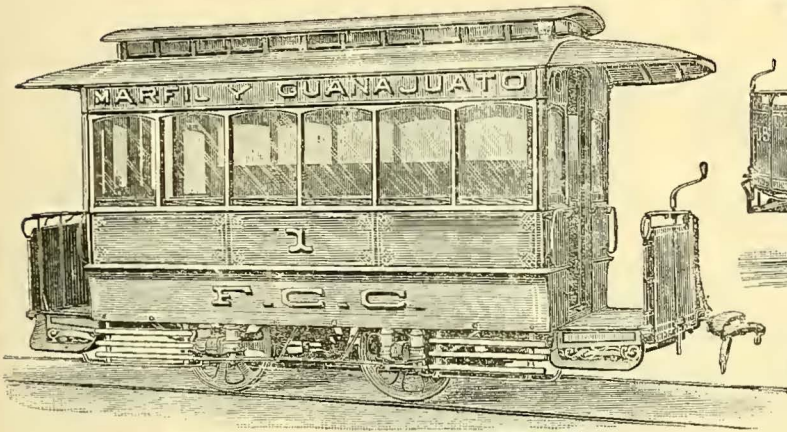


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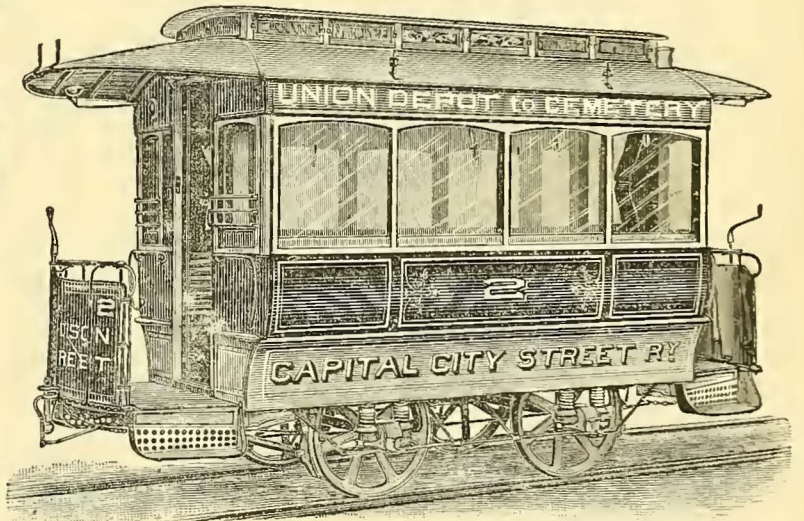
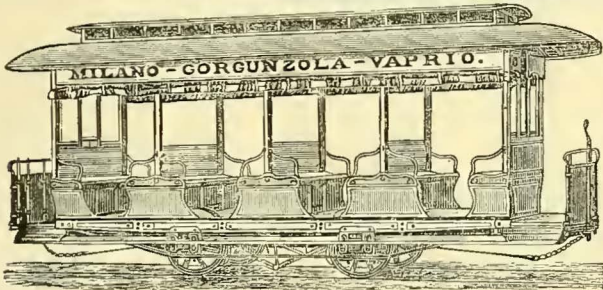
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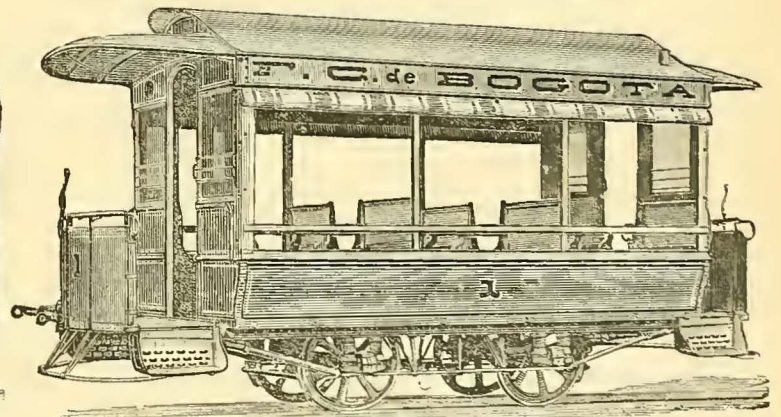
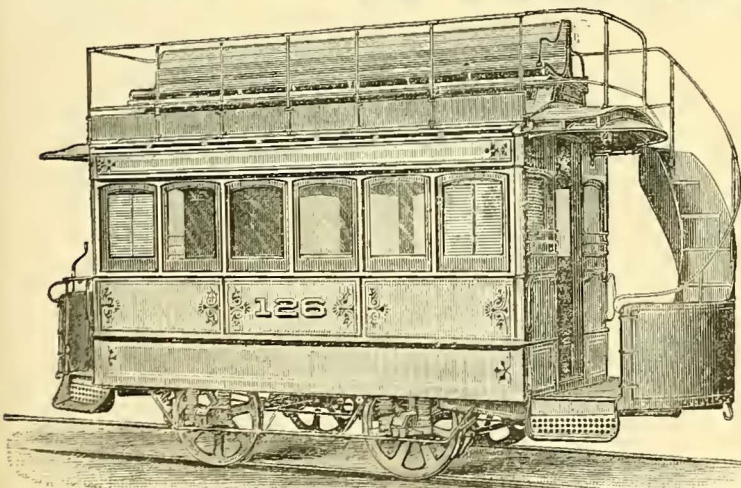
Railway and Tramway Cars



Gold Medal at Chicago Exhibition
OF
1883.



Gold Medal at New Orleans Exhibition of 1885, for Best Open Cars.



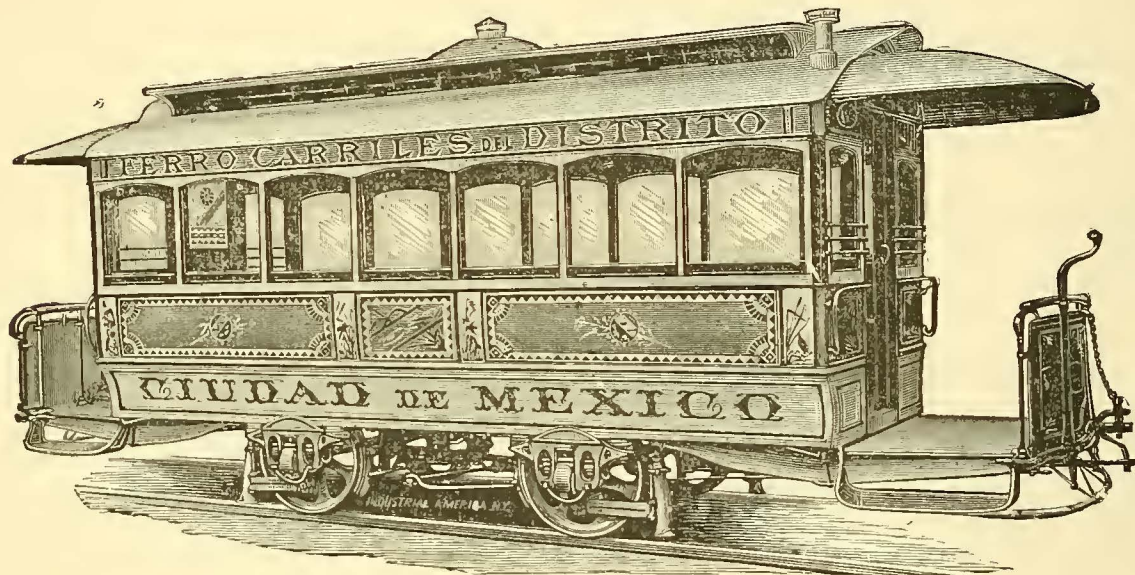
JOHN STEPHENSON COMPANY

(LIMITED),

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MEDAL OF FIRST CLASS, WORLD'S INDUSTRIAL COTTON EXPOSITION, NEW ORLEANS, 1885.



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Every Description.

Best Materials.

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