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# THE STREET RAILWAY JOURNAL

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### The Orange Electric Railway.

The Orange Crosstown and Orange Valley Street Railway Co. have been trying for some time to persuade the City Fathers of Orange, N. J., that it would be a right and proper thing to allow them to use elec-

were placed upon the track, one only being provided with the Daft motor.

The Daft company place their motor in a box under the floor of the car and resting upon I beams that are furnished with bearings resting upon the axles. These bearings are further supported by a rubber

axles and the pinion upon an extension of the armature shaft that projects beyond the box. The ratio of the two is as five to eleven. The gears are carefully cut, and as there is no variation of distance between the two shafts as the car runs, the gearing is practically noiseless, when a speed of



THE DAFT ELECTRIC RAILWAY SYSTEM AT ORANGE, N. J.

tricity as the motive power upon the road which is now in process of construction. Objections were raised to the danger and unsightliness of the poles. At last, however, permission was granted to put up an overhead line on Scotland street, and on Saturday, April 16, the road was opened for exhibition trips.

The length of road that is equipped is about 2,700 feet. Two Stephenson cars

bushing placed outside of the brasses and absorbing all disagreeable vibrations.

By this arrangement the springs supporting the body of the car can be maintained at the standard capacity, and the ease of riding is in no way affected by the motor underneath.

Connection is made between the motor and the axle by means of a gear and pinion, the gear being placed upon one of the

ten miles an hour is maintained on the car.

The car can be operated from either platform and be driven in either direction at the will of the operator with either a current of the full intensity or in part as may be desired.

Incandescent lamps are also furnished, which are maintained by the current from the wires. There are six lights in the car,

four in the center and one at each end for the lenses.

At present the electricity is furnished by a dynamo driven by a 12 H. P. engine in the hat factory at the Highland avenue station at Orange.

The trolley that is used to take the current from the wires is of a special construction. Two wires are used, one of which is for the return current. The trolley has copper wheels that are insulated from each other, and which run upon the wires, taking the current from one, allowing it to pass down through the motor on the car and thence back through the opposite wheel and wire to the dynamo.

All of the opening day, the car was kept traveling up and down the stretch of track that had been equipped for it. Many people were drawn thither out of curiosity to see the electric road, and all were given an opportunity to ride. Many of these were ladies, and one of them testified most strongly and unconsciously to the great advantage that is claimed for mechanical motors, namely, their cleanliness. After a ride the lady in question said to one of the gentlemen interested in the road,

"Well, this is a delightful way to run a road in Orange, but I sincerely hope that the electric system will never be introduced in New York."

"And why?" asked the gentleman.

"Because," with the utmost innocence, "my husband is in the fertilizing business."

The managers of the road succeeded in getting several of their opponents to ride upon the car, and more than one announced that they would withdraw from their opposition; and it is hoped that they will succeed in persuading the people that it will be for their own best interests to do away with the sight of tired and jaded horses, the noise of their clanging feet, and the jingling of their bells, and substitute for the slow, snail-like pace the comparatively noiseless cars and greater speed of the electric road.

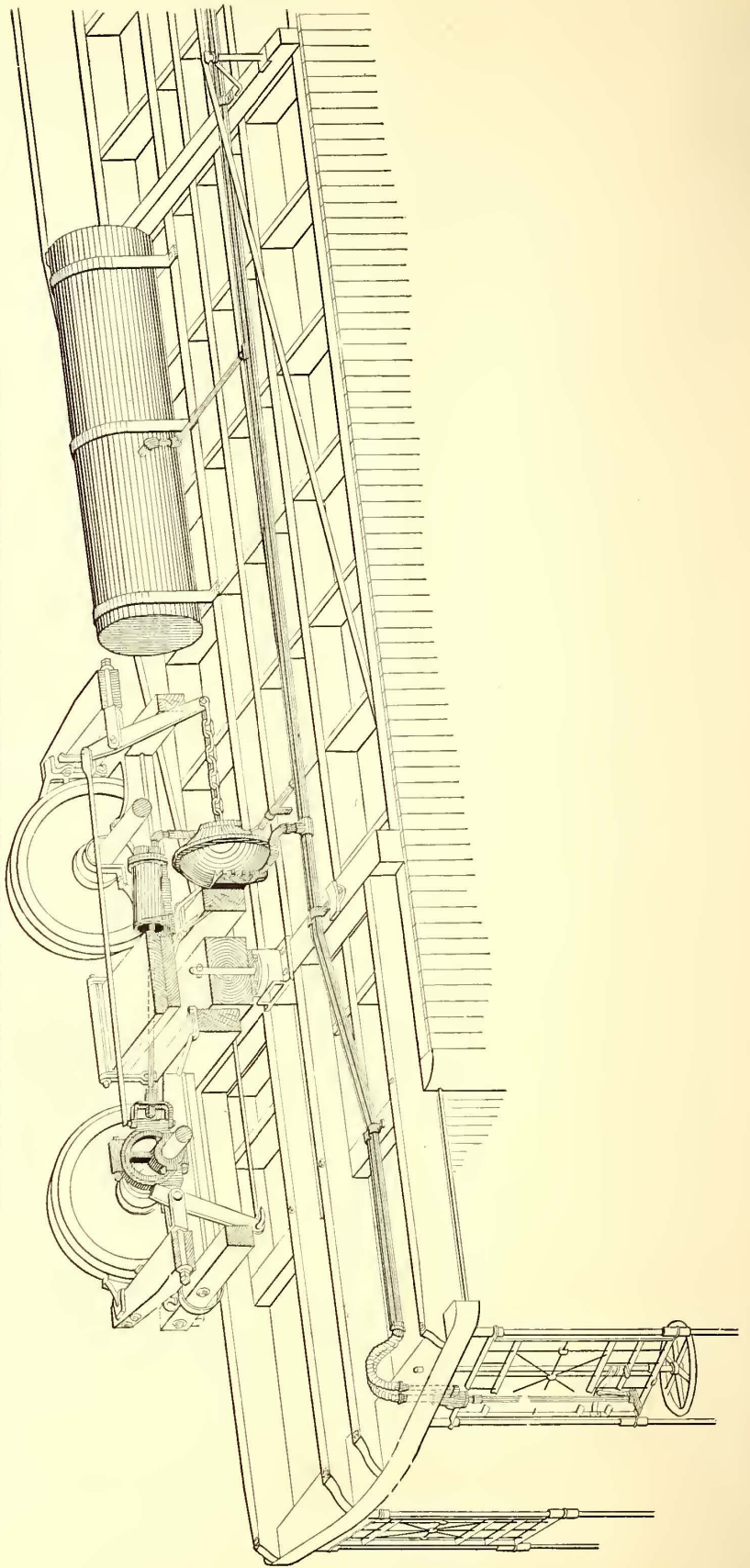
#### The Eames Brake for Street Cars.

The accompanying illustration represents an application of the Eames Vacuum Brake to the cars of the Brooklyn Bridge, and it is the intention of the owners to make the same application to the cars of the ordinary cable road. When the bridge was first opened the cars were all equipped with diaphragms for the Eames brake and a reservoir with which it was connected by means of a three-way cock, the vacuum on the cars being produced by the locomotive. This latter was furnished with the Eames ejector, so that, at the end of the line, the pipes were connected, and the ejector worked until an auxiliary vacuum was created for use in emergency service. It was not the intention at first to use this for regular practice but only in cases of emergency, the hand brakes being used for regular service. As the travel upon the bridge increased, necessitating a greater number of trains, it was found that the

bridge employees would neglect to connect the cars to engine and thus provide a vacuum, so that in many cases there was none and slight accidents occurred. Owing to public feeling upon the subject, the bridge trustees appointed a committee to consider the various appliances which might be presented to overcome these difficulties. At this time the Eames company presented the vacuum apparatus which we have illustrated in this connection.

It consists of a vacuum pump having a diameter of  $5\frac{1}{2}$  in. with a stroke of  $5\frac{1}{2}$  in., that is attached to the transom of the track and operated by an eccentric fastened to the car axle. By this means a vacuum is created and constantly maintained in the reservoir under the cars. The movement of the car from the starting place in the yard to the station produces an effective working vacuum which is increased to its maximum by the subsequent passage of the

THE EAMES VACUUM BRAKE IN USE ON THE CABLE CARS OF THE BROOKLYN BRIDGE.



car, a vacuum of 24 in. being created by the time the car reaches the first tower. The reservoirs are 6 ft. long and 8 in. diameter, having a cubical capacity of 18,000 in. There are two diaphragms upon the car, with a cubical capacity of 1,100 in. each.

With a vacuum then of 24 in. in the reservoir, and by opening the communication between the reservoir and the diaphragm, the vacuum in the whole will be reduced to about 20 in., causing a collapse in the diaphragms and a pull upon the brake rods to the amount of about 10 lbs. to each square inch of diaphragm. On full application of the brakes, the diaphragm vacuum is decreased only 4 in., which is soon re-established when the car is started. The regular speed of the train being about 10 miles an hour, gives something over 100 strokes a minute to the valve. The piping is so arranged that the cars may be operated together or separately.

When the train is coupled the movement of any one of the three-way cocks will apply all the brakes. The cock is also so arranged that a slow or rapid flow of air from the diaphragms to the reservoir may be obtained.

One of the experiments in testing this apparatus was the releasing the car from the cable at the top of the grade in the center of the bridge and running it into the station, where it was found that the speed could be perfectly controlled.

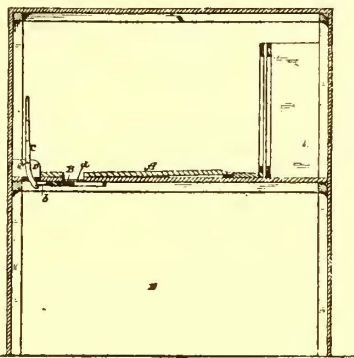
It will be seen that such an application as this to the cars of an ordinary cable road will prove a great advantage in the ease with which the driver can handle them. Now it is necessary for him to throw off his grip and then twist the brake rod, throwing all of his strength into the work in case a sudden stop becomes necessary. This will sometimes be impossible, because a man with his grip set and a clear track before him will naturally relax a little and assume an easy position upon the platform, possibly letting go of the grip and brake handles entirely. Then, should anything come upon the track, he must spring into action quicker than will probably be possible where a great exertion is necessary, whereas if it was simply necessary to throw off his grip and move a small lever it could be readily done while he was still in a relaxed position and a much more effective braking of the car be accomplished. It will be remembered, too, that the speed of the cable cars is almost invariably higher than that ever obtained by horses, and that access is obtained to the track immediately in front of the car, whereas with the horse car the obstruction must come upon the track in front of the horses, giving the driver at least eight or ten feet leeway before the car would strike it, which is ample time to stop with the ordinary hand brakes. Quicker stops are necessitated by the use of the cable, and some mechanical appliance for accomplishing it is certainly a very valuable attachment to the car. The brake is also perfectly applicable for use upon electric or any other street cars, though it was specially designed for use upon cable systems.

Mutual Benefit Organizations.

BY H. A. EVERETT.\*

Several members of the Association have asked for the modus operandi of the Employees' Independent Mutual Benefit Association in operation upon the lines of the East Cleveland R. R. Co. For several months last past a movement has been under way among the various employees of the several street railway companies of Cleveland to incorporate an organization presumably for mutual benefit and relief among the employees, but in reality an undercurrent of decidedly different purpose has been noted among the leaders of the proposed organization, throwing the control entirely in the hands of a few unreliable men, and all from one company.

The officers and directors of the East Cleveland Company believing that an organization for mutual benefit, and limited to employees from its own lines, would prove advantageous and deserving of success, decided to offer its men the following inducements if the men would get up an organization of their own and elect such offi-



THE VERMONT STABLE FLOOR.

cers as they might deem proper, and pay into the treasury such initiation fees and dues as they chose to adopt: The company would pay in dollar for dollar to the fund, subject to draft only by the Secretary elected by the employees and approved by two fund trustees nominated by the company, and a director elected by the employees and serving upon the line upon which the member receiving the benefit was engaged at the time; the company also to tender a meeting room rent free.

The employees had several preliminary meetings and unanimously resolved to adopt the company's offer; a committee was appointed to draft a constitution and by-laws, which were closely copied from the Police Mutual Benefit Association, which has worked so successfully in Cleveland.

The Board of Directors of the Association consists of nine members, eight of whom are elected by the employees annually in January, and one is appointed by the railroad company; the director appointed by the railroad also serves as Treasurer of the Association, giving a satisfactory bond to the Association in the sum of \$1,000.00 for the proper security of the fund.

\*Paper read before the Ohio State Tramway Association.

The membership received the first night after the adoption of the Constitution amounted to \$35.00, which amount, together with an equal sum, was deposited at interest in a savings bank to the credit of the Employees' Independent Mutual Benefit and Relief Association of the E. C. R. R. Co. The organization has been in existence five weeks, and now has an active membership of 94, and the treasury contains \$235.00, no drafts having as yet been drawn by the Secretary.

The membership may include any employee from the President to hostlers, and it is desired that they all feel free to attend any or all meetings.

The company in its proposition suggested the use of a portion of the funds for the subscription to newspapers or magazines for the meeting room; nothing of the kind has as yet been done, however.

The members voted that the initiation fee should be placed at \$1.00, the monthly dues at 25 cents, and that in event of a member becoming sick or disabled, should be allowed the sum of \$1.00 per day while so sick or disabled after the first week.

They also voted that a member should be allowed a rebate of all moneys paid in, in the case of dismissal or resignation, provided that such member had received no benefits while belonging to the Association, and less such members' just proportion of all expenses paid during such membership of the organization.

Vermont Stable Floor.

Our engraving shows a vertical section of a new arrangement of stable floor which is designed to lessen the disagreeable part of the work of caring for horses. The device consists mainly of a movable slide which forms the bottom of a trench one foot or more in width at the rear of where the horses are standing, and resting upon the joists.

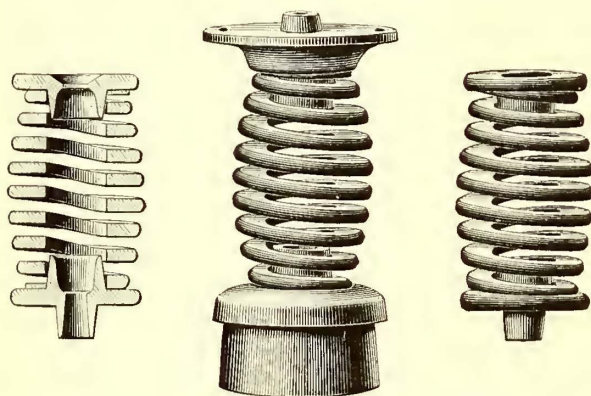
This slide is moved back by a lever, and opening allows all droppings to fall to the floor below, thus entirely obviating the use of shovels and permitting all the work to be done by a scraper.

The moment the work is done, the slide is replaced and the trench again formed. In equipping a stable, a slide is put at the foot of each stall or stanchion, the lever operating this slide being placed upright against the wall and fastened for the sake of security, so there is no obstruction whatever in the stable. In short, it consists of a strong and substantial trap door placed at the foot of each stall. In street car stables it would necessarily be connected with a shoot or conveyer running to the pit.

HALTER-PULLING in the stall may be effectually and easily broken. Put a slip-noosed rope around the body, lead the end of it between the animal's fore legs up through the halter and make it fast to the halter. Never allow anybody to put the cruel "twitch" on your horse's nose to hold his head still.

### Street Railway Franchise.

In a bill which has been introduced before the Massachusetts Legislature it is proposed that hereafter the franchises for street railroads in cities and towns shall be sold at public auction to the highest bidder. In some respects this bill would certainly appear to be a fair one, yet at the same time it might act unjustly towards those who were the first promoters of the railroad and towards whom some consideration ought to be shown. For instance, a company may be organized to build a street railroad, work the idea up among the citizens, do a large amount of work in gaining the subscriptions of stockholders and then in securing its franchise, and then be liable to be brought into competition in bidding with outside parties who have in reality been interested in the matter through the agitation of the first company. If the outsiders happen to have the largest amount of capital at their back they could easily outbid the first and thus take away from them the fruits of



THE VOSE GRADUATED TAPER BAR SPRING.

their labor. But in the main the law will probably act justly, because those parties who have been interested in promoting street railway matters in any particular place will undoubtedly be the ones who will bid the highest for the franchise. It simply throws the matter open to the public and does not grant the direct monopolies against which there has been so much complaint. It also takes away from the city fathers that temptation to accept pecuniary inducement for the granting of franchise which has acted so disastrously upon the reputations of the New York Aldermen of 1884. There is no doubt whatever that the granting of franchises to street railroads should be modified in some respects, and it will be seen that this new law, on the whole, is a step in the right direction.

### The Vose Graduated Taper Bar Spring.

This spring is made from a bar of steel that is of equal thickness, but tapered from the center toward each end, and, when coiled upon a mandril of equal diameter throughout, forms a keg shape or double cone, the great advantage being that the greatest power of the spring is in the center, where the most steel is concentrated, the weakest point being at each end, making it perfectly graduated.

Springs made from these bars are capable of great capacity, have few vibrations, and ride a car smooth and even, entirely obviating the rocking motion so disagreeable to passengers, and which produces a feeling akin to sea-sickness.

In appearance they are very handsome. The design of the spring is entirely new and original, a machine having to be especially designed to roll the bar, no such bar having been made before. As soon as machinery can be perfected it is the intention of Col. Vose to produce that which has long been needed—a buffer for passenger and freight cars that is perfectly graduated and of any power required up to 20,000 lbs.

### The Fare Receivers.

A reporter chanced to meet an elderly gentleman in the Arcade recently who has the reputation of being assiduous in his attentions to the fair sex. He had just stepped out of a Park avenue car and looked back

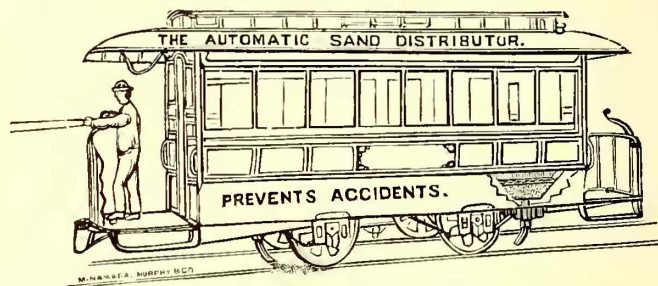
at it ruefully. "I am disgusted with those new fare receivers that the company is inflicting upon the patrons of that road," he said. "I used to make it my special business to take fare of all the nice girls in the car. Now there is nothing to do but sit and mind your own business, and I am not fond of that. Why will the inventors make it their special aim and end to rob a man of what little pleasure he may get in riding in a Rochester street car? Now this morning I forgot that boorish invention—for I'm sure no gentleman would ever have thought of contriving such a thing. I approached the prettiest little school girl you ever saw." Here the enthusiastic gentleman gave a description of the charmer which we omit. "I have ridden down town in the same car with her a dozen times during the last month. I arose and offered to take her fare with extended hand. After the usual delay in getting at her purse and selecting the correct change she turned her back on me, placed it in that confounded toboggan chute, and watched it roll into the box with ghoulis—! I mean girlish glee. Why don't the inventors leave us poor men alone and turn their attention to the girls, a much more interesting subject, I am sure? Why can't they get up some infernal contrivance by which the other sex will be enabled to stow away their skirts, thus pre-

venting a few women from monopolizing the entire sitting room on one side of a car? Why can't they contrive that every time a lady accepts a proffered seat a little whistle shall blow, and thus save her the trouble of saying, 'Thank you?' You say a second story should be built for men in a crowded car. Now, that's a good idea, and I hope the company will act on the hint on a route where no trouble would arise from such cars. Why not seat men on deck during pleasant weather?"—Rochester Post-Express.

### Jordan Rail Sander.

The apparatus herewith illustrated is designed to overcome the difficulty which has been experienced by railway companies in keeping the requisite amount of sand on the tracks on down grades to hold the cars in cases of slippery track, and at the same time to obviate the necessity of special attention to the subject.

The apparatus consists of a box placed at the ends of the car beneath the seats, as shown in the illustration, with a pipe leading down in front of the wheel. It is operated by means of a treadle placed conven-



THE JORDAN RAIL SANDER

ient for the driver to step upon, and with a spring that will automatically close the valve when the pressure of the foot is removed. Sand may be put in the box, either through an opening in the seat or from the side, as may be preferred. The valve consists of a small sliding valve running underneath its seat, so that the sand has no tendency to work underneath it and cause it to wear its surface.

It will be readily seen that no sand need be wasted by throwing it along the track, but that each driver has the means at hand for sanding the rails in front of his own wheels just when and where he needs it, and he will not be apt to do so unless the track actually requires it. This will also enable him to make use of the sand-box should it become necessary to make a quick stop in case of accident on a level road where sand is not usually distributed. The step of the treadle is so arranged that it can be taken off and carried from one end of the car to the other, so that passengers will not be liable to step upon it and sand the rails behind the car.

### Sending Dailies.

Our friends who send in daily papers will confer an additional favor by always marking the article to which our attention is called.

**The Beaman Fare Box.**

This fare box is designed to provide an effective safeguard against the abstraction of fares.

In the use of boxes where no provision has been made to render them secure when not permanently fastened to the car, the railways have not the slightest protection against the dishonesty of their employees, who at their discretion can, by simply inverting and shaking the box, turn out and appropriate as much as they desire.

The box is made in several styles, one of which is shown in the annexed cuts. Several sizes are also made, and particular attention is given to making boxes of sizes to fit existing cars.

The shell or casing of the box shown is composed of the two side walls *AA*, and the crosspieces *a, a<sup>1</sup>, a<sup>2</sup>, a<sup>3</sup>, a<sup>4</sup>, a<sup>5</sup> and a<sup>6</sup>*, and the large rear glass plate *C*. This plate glass fits in grooves on each side, and is fastened on the inside of the box by a strip. The groove where it is slid through the top cross piece *a<sup>6</sup>* is closed up by the strip *c<sup>1</sup>*, which is fastened by inside screws as shown. By taking out the strips *c* and *c<sup>1</sup>* this plate can be readily removed for varnishing, or if it should get broken, it may be very easily replaced.

The door *K* is composed of the side bars *k k<sup>1</sup>*, top rail *k<sup>2</sup>*, bottom rail *k<sup>3</sup>*, and large plate glass panel *N*. At the sides the door is held in rabbets of the side walls *AA*. The top rail *k<sup>2</sup>* has a rabbet which fits into an opposing rabbet in the head block *a* at *b<sup>1</sup>*; the bottom rail *k<sup>3</sup>* is rabbeted at its lower edge *b<sup>1</sup>*, into which the top of the drawer front overlaps; and when drawer is locked this door is securely held by it and cannot be removed. An additional fastening for holding the door in place, when the money drawer is out, is provided by a small flush bolt.

The pay chute has its outer mouth flared or widened. Its inner mouth is contracted, is placed clear of the side walls and is provided with a series of points *g*. The chute has an ornamental outside facing, and is fastened on the inside by the angle plate *o<sup>1</sup>*. In preventing fares from being turned or shaken out of the box, the action of this pay chute is so certain and effective that, even if all the interior parts of the box be removed, no fares can be turned or shaken out of the box.

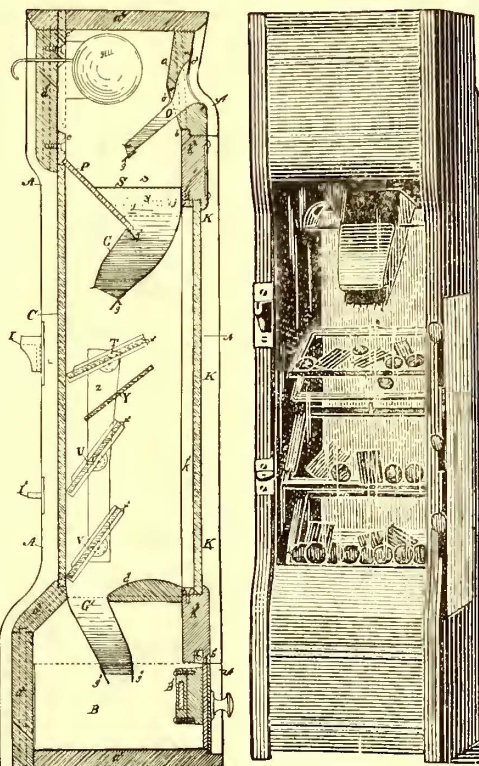
The plate *P* is fitted in at about a right angle with the body of the pay chute; and together with the hopper chute *G* forms a very effective safeguard. They make a close joint with the side walls of the box, forming a partition separating the upper end of the box into a distinct compartment. It is not possible to turn fares back through this hopper chute, as the lower mouth is small and is located clear of the side walls of the box; hence fares cannot be shaken or turned, so as to come directly beneath the mouth of the pay chute, where they could be fished out.

This hopper chute and its accompanying glass plate *P*, form a sinuous passage for fares, from the pay chute to the fare rests.

At the angles of this passage are located three series of serrated and wire points *g, g<sup>1</sup> and g<sup>2</sup>*. Should it be attempted to abstract fares from the box by means of a strap, wire forceps or other flexible instruments which could be passed down this sinuous passage, these series of wire points would catch and hold said instruments, and also strip off any fares that might be caught by them.

The hopper chute *G* has the horizontal wings *SS*, underneath which are angle blocks provided with the ways *Y* which slide over the screw heads and hold the chute and the plate *P* in place.

Three fare rests, *T, U* and *V*, are provided to enable the driver, officials of the road or passengers to accurately inspect



THE BEAMAN FARE BOX.

and tally the fares. Located under the upper rest *T* is the mirror *V*, which shows both sides of the fares, and by which spurious coin or split tickets are very easily detected.

These fare rests are dumped from one to the other, by simply pressing down the levers.

The two lower levers and fare rests are controlled and locked by the upper one. In order to dump the contents of the middle rest into the lowest one, or to dump even the lowest one *V* into the money drawer, it is necessary that the upper rest *T* be first dumped and then held firmly down, which will release the two lower ones. The lower rest *V* cannot be dumped except by dumping all three rests.

In constructing the box special attention has been given to make it so as to be quickly cleaned. All those parts which are at all necessary to remove to clean, can be taken out without removing a single screw.

There are two brackets, *II<sup>1</sup>*, for attaching an outside lantern, which is quickly removable and should be taken off during

the day; but the box may be lighted in any other approved manner. A U. S. Brass Tubular lantern is furnished with each box, which gives an excellent light and does not smoke. This is considered preferable to an inside light, which is dangerous, and gives much annoyance from smoking. However, boxes will be made to special order with inside lamps, and also to use reflected light from the lamp houses of the car.

The entire money drawer *B* is made of brass, and is securely locked by two heavy Yale locks.

The claims made for the box are:—

That no fares can be turned out of the box, in any manner, even though it be inverted and roughly shaken.

That no fares can be abstracted from the box, by strap, wire forceps, or by any other known means, and that it cannot be robbed without violence.

That even if all the interior parts of the box are removed, that then no fares can be turned or shaken out of the box.

That the fare rests are so constructed as to give great convenience for accurately inspecting and tallying fares.

That the box can be very quickly taken apart for cleaning; and that as the woodwork of the box is very strongly made, it will bear rough usage.

**A Conductor's Duty.**

In street-car service, every driver and conductor needs peremptory reminders that politeness and attention to the wants and whims of passengers is as much demanded of them as any other duty. No service brings its employees in contact with such numbers of persons each day. Many of these are often unreasonable; many are far from well; many are women; some are fat women, who have run puffing to catch a car, and who had not much wind to start with. Employees, while enforcing the rules of a company, should learn to resent nothing short of personal assault, but to report any abuse at the trip's end. Some good men are constitutionally unable to do this. I have in mind a street railroad officer, honest, experienced, sleepless, in every way valuable and efficient, but who was born, will live, and some day die, in hot water. No railroad company ought to continue the service of that employee who is always arguing, always ready to clearly show he was in the right, and who is always in trouble with somebody.—A. A. Thomas.

**Our Directories.**

The three street railway directories are published in each issue of the paper. For information relating to any street railway consult our directory of street railways, which in this issue occupies page 430 to 443. To learn the makers or dealers in any kind of street railway appliances or supplies consult our street railway supply directory, which is on pages 449 and 450. To find quickly the address of a person or firm in the supply business consult personal directory on page 448.



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### New Advertisements.

THE STREET RAILWAY JOURNAL is the recognized medium of communication between manufacturers and the street railways of this country, and its beneficial effects on the business of those who use its advertising columns are not confined to the promotion of their interests in the United States and Canada, but extend to Central and South America and across the Atlantic. Its Directory of STREET RAILWAY APPLIANCES is the most complete published in any form, and is constantly referred to by the purchasing officials of hundreds of street railways.

In New Advertisements or changes in "copy,"

THE FAIRCHILD TWIN CABLE CO. sets forth the advantages of its system;

THE EMPIRE CAR AXLE MANUFACTURING CO. publishes the claims of Watkeys' adjustable clutch axle;

RUFUS MARTIN & Co. make new announcements;

C. B. MILLER publishes strong testimonials and results of tests of the "Magnolia" metal;

THE BROOKLYN RAILWAY SUPPLY CO. mentions new points;

RICHARD VOSE shows his new graduated taper bar street car spring; and a number of minor changes are made in other advertisements.

For page of advertisements see directories, which in this issue are in the center of the paper, where it opens naturally, from the way in which it is bound.

The street railway companies of New York have 2,167 cars and 16,039 horses; while those of Brooklyn, though they have more cars—2,241 in all—have only 8,594 horses.

A brief summary of the street railways of the United States and Canada may be put as follows: There are now in operation 635 street railway lines, owning 4,800 miles of track, upon which are run 20,800 cars, which, in turn, require 106,000 horses.

"Street railway management," says A. E. Lang, "affords infinite scope for the display and study of human nature." Just so; and it should not be forgotten that a knowledge of the nature and habits, likes and dislikes, of passengers is as important as a knowledge of horses.

President Richardson has a bill which has passed the New York senate, prohibiting the fraudulent use of the bell punch or other fare register or the carrying of any instrument intended to deceive or defraud. The violation of the law is a misdemeanor punishable by fine of not exceeding \$250. Every provision of this sort against dishonesty ought to be welcomed by the honest conductor, as the chances of suspicion against him are thereby materially reduced.

A. J. Best, of the Empire Protective Union of Brooklyn, however, takes occasion to call the bill a slur upon honest men. That conductors sometimes steal is not merely matter of opinion but of history.

Suit was brought by the Jersey City & Bergen Railroad Co. against John Costigan and Thomas Egan to recover damages on account of obstruction of street by the latter in moving a building. Judge McGill, to whom the case was appealed, has handed down his decision to the effect that both Costigan, the owner of the building, and Egan, the mover, were liable, on the grounds of producing a nuisance. Though the railroad company had served an injunction, the street was obstructed twenty-seven hours. The judge's decision covers the point that the Board of Aldermen to whose supervision by the charter of Jersey City the matter is left, cannot grant a permit to move a building in cases where, by obstruction of traffic, it becomes a nuisance.

If street railway managers represent soulless corporations, there are frequent indications that they are not themselves heartless. The truth is that there are few companies or men in any line of business who render their customers more unselfish service than street railway companies and managers, or who get less thanks.

The action of President Hathaway of Cleveland, of which an account is given elsewhere, is a case in point. No time, money or care were spared to render comfortable the injured man for whose injury his own intemperance alone was responsible.

Cases frequently occur in which railway companies and their officers perform simi-

lar offices of generosity, cases in which the passenger alone is to blame for his injury, but where every assistance is rendered by the company, regardless of where the blame lies.

The case here referred to also furnishes an example worthy of imitation as to making every possible effort to save an injured limb before amputation.

Of course a flat rail in the streets is less objectionable to street traffic than the T, or even the side bearing rail, but no rail at all would be still better, and the same principle which seems to prompt the legislators who are endeavoring to compel street railroads to substitute English rails, would also exclude street railways from the streets altogether if that principle were carried far enough.

If it is advantageous to have street railroads, a question which from the opposition that is sometimes manifested to them would seem to be a matter of doubt with some, it is also advantageous to impose as few conditions as possible to their construction. And, by the way, has it been made to appear that the present rail is any more of an obstruction to street traffic than it has always been, or is it that the rights of street railways are less recognized than formerly?

It should be borne in mind that the way in which the streets are cared for in Europe is very different from our American methods, and street railways here could hardly afford to have a large corps of men whose entire duty it should be to remove obstacles from a narrow groove in the center of a flat rail.

Since public attention has been turned more toward street railway matters, and the magnitude of street railway interests in this country has been made more apparent by the STREET RAILWAY JOURNAL and other means, it is not surprising that some changes should be noticeable in the trend and drift of investment in securities of this class.

Among these changes there is one which is probably recognized only to a very slight extent, and that is the tendency of syndicates controlling large capital to invest in and secure the control of large street railway interests, not only at home but in large and small towns at a distance. A case in point is the purchase of the Boston system by the Philadelphia syndicate, and the investment by that same syndicate in various other roads in the country. We will not attempt to interpret the significance of this movement, nor to forecast its effect upon the street railway interests of the country at large, but it is safe to say that for local interests it would be quite as safe for the street railways of a given town to be controlled by home capitalists. The street railway is so closely allied to the social interests of the locality through which it passes that it would seem that entire familiarity and sympathy with the habits and enterprises of the town would be very essential to the wisest administration of the road's affairs.

### Cost of Street Railway Operation.

From the recent annual report of the City Railway Company of Trenton, N. J., we cull the following particulars which may be of interest to our readers in the matter of the care and expense of operating street railways by means of horses. This company operates a road 7 miles long and uses, on an average, 96 horses to haul 20 cars. The expense of feeding each horse for a year was \$106. The expense of replacing horses averaged \$54 each. Miscellaneous expenses in care of horses, \$8 each, making a total of \$168. This does not include stable men or hostlers, harness makers, or any of the details connected with the various employees of the stable, because the report gives us only the total number of employees upon the road and the wages paid to them, so it will be impossible to deduct what strictly belongs to the horse department. But, taking this matter as it is, the data given will be valuable to those who have an interest in the promotion of street railways or the consideration of the matter of applying mechanical means of propulsion. The additional expense which must be added to the \$168 per horse can be easily calculated by estimating the number of men required about the stable, and from this may be deduced a comparison which will be very valuable in connection with electric or cable railways.

### Electric Roads.

The Electric World, in a late issue, has this to say of the future of electricity as a motive power for street railways:—"Electric railways are now running, or building, or under contract in New York City, Philadelphia, Baltimore, Boston, San Francisco, Detroit, Ansonia, Conn.; Montgomery, Ala.; Pittsburg, Los Angeles, Cal.; Denver, Col.; Windsor, Can.; Scranton, Pa.; Carbondale, Pa.; Ithaca, N. Y.; Binghamton, N. Y.; Lima, O.; Appleton, Wis.; Orange, N. J.; Kansas City, St. Louis, Chicago and Cincinnati. Some of these places will soon have two or three roads running. There are also scores of places where roads are seriously proposed, like Newton, Mass.; Bangor, Me.; Selma and Birmingham, Ala.; San Diego, Cal.; Atlanta, Ga.; Jacksonville, Fla.; Reading, Pa.; Brooklyn, N. Y.; and Jersey City; and a great many other places might be mentioned if the negotiations were ripe enough to admit of publicity. Last year it was said on this page that 1887 would see at least fifty electric railways in operation or construction in the United States. The prophecy was laughed at. We still stand by it and feel inclined to raise the limit."

If we are not mistaken, our contemporary is somewhat ahead of time on some of the towns it has given as those having electric roads contracted for, but it is safe to say that the feasibility of electric roads is rapidly gaining ground. It would be somewhat singular if the great question of drawing street cars should be solved by the adoption of what some time ago seemed to be the most visionary and least tangible method.

### Personal.

W. L. EVERIT is about to make a trip to Florida and through the South.

E. P. HARRIS, of the STREET RAILWAY JOURNAL, is making a trip West.

D. B. ANDERS is in New York, looking after the interests of his cable grip.

H. C. SIMPSON, Secretary of the Lewis & Fowler Manufacturing Co., is in the West.

Col. THOMAS LOWRY, of Minneapolis, seems to be as busy as ever in street railway matters.

C. B. FAIRCHILD has complete models of his cable system at One Hundred and Eighteenth street.

SUPERINTENDENT D. W. SHARP, of the Minneapolis Street Railway, has been visiting Eastern cities.

GEORGE W. MANSFIELD has been made superintendent and electrician of the Cleveland Electric Motor Co.

WILLIAM P. WILLIAMS, Western representative of Richard Vose, has recently visited the Pacific coast.

WILLIAM WHARTON, JR., it is said, is a believer in the storage electric system, and will soon make public the results of experiments in this line.

Mr. JOHN H. GOULD, proprietor of the Gould Double Conduit Railway System, we are glad to note, has recovered from injuries received by his severe fall on the pavement.

GEORGE L. FOWLER, mechanical editor of the STREET RAILWAY JOURNAL, will leave for Europe in a few weeks to attend the Paris railway exposition, for which he is First Assistant United States Commissioner.

CHARLES B. HOLMES. A description as brief and incomplete as even this is, says H. H. Windsor in a brief sketch of the Chicago cable system, would be sadly wanting did it not render "honor to whom honor is due" and make this grateful acknowledgment of an appreciative public to one to whom more than all others is due the credit of conceiving and adapting the system to Chicago. That one is Mr. Charles B. Holmes, the present President and Superintendent of the Chicago City Railway Co., who with courage and foresight laid the plans and personally carried through to successful operation what most people predicted would be an ultimate failure. None but those personally connected with the enterprise can ever realize the magnitude of the undertaking or the multitude of details that at the same moment required instant attention, to secure results which are now enjoyed in the sure and regular operation of the cars. When vexatious delays occurred in receiving material, and storms delayed the work and others grew faint-hearted, he was strong in his faith, and encouraged and inspired by his example the army of workers to push on with renewed vigor, until all was completed. The cable system in Chicago will stand a lasting monument to his courage, indomitable energy and public-spirited wisdom.

### Car Lubrication.

BY W. E. HALL,\*

What will be the result of the many attempts to improve the present condition of car lubrication and to overcome some or all of the various annoyances, particularly that of the heating of journals and brasses, which are now connected with this important part of the transportation and motive power departments of railroads, is a matter of great interest.

The distinction between good and bad lubrication is simply a comparative one, but the efforts should always be directed toward reducing the frictional resistance, wear of journals and bearings, the combination of which with the quantity and quality of lubricant required per car per mile should be taken when it is desired to obtain the most economical practice. For instance, it is frequently argued that the wear of bearing metal per journal per unit of distance run is the one important consideration, and the metal which gives the minimum abrasion for this unit of service—results from a large number of tests—is the best. But there is another wear going on at the same time, that of the journal, and with this it will be remembered that when but a small part of the journal is worn off it is necessary to scrap the whole axle. It is but proper that this point should be taken into consideration, for while the bearing metal may be giving the best of service as regards low percentage abrasion, the journals may, at the same time, be rapidly wearing away, and the efficiency of the car service, therefore, be not what it should be.

It is often asserted that the softer metals when used for bearing purposes will wear journals more rapidly than will the harder ones. This is claimed from the amount of foreign matter which becomes imbedded in the softer metal and which produces a grinding action upon the journal. Car oil boxes are very imperfect dust-excluders and this point may be of some importance, but with stationary engines, and especially with high speeds, the general practice has been in favor of the softer metals. No results have ever been seen to verify the general opinion of the effect of soft metals when used for bearings upon car journals, and, as far as known, the results are simply surmised. We do not believe that in car work the softer metals are as injurious to journal wear as are the harder ones.

Practical requirements alter somewhat the conclusions previously drawn in regard to the comparative wear of journals and bearings to obtain the most economical results. It is still considered proper that axles should be withdrawn from service after having made a given mileage, as it is still supposed that the metal—steel or iron—deteriorates and is unsafe after this given service. With this in mind the bearing metal should be selected such that the wear of the journal from the maximum to the minimum diameter would take place when

\*Paper read before the Engineers' Club of Philadelphia, Pa.

the axle had made the given mileage. The bearing metal which will meet this requirement, and at the same time give the minimum abrasion with cost, would be the most economical. The point of liability to heat and lack of uniformity in mixture are, of course, to be eliminated before the abrasion and cost are considered, as they are such as influence the expense and difficulty of conducting transportation to an extent which should be prevented when it is possible.

Economical railroad practice requires the consideration of these matters, and the combination of all such as to give the most efficient results is desirable.

In this connection the lubrication proper enters to influence the wear of both journals and bearings.

The method of lubrication which is now used for passenger and freight car journals is somewhat imperfect at its best, and much more so as carried out in railroad work. The principle of its action is that the material used in the boxes, whether fibrous, cotton or woolen waste, is of such a nature as to retain and, it is claimed, draw oil from the bottom of the oil box to the journal with which it is in contact, kept so by packing it sufficiently tight in the boxes that the elasticity of the waste will thus retain it in position. There are then these points claimed for the material used in packing the boxes with this method of lubrication. It has elasticity, and the capillary property is of such strength that it will not only retain but actually draw oil from the bottom of the box journal. As to what extent the fibrous, cotton or woolen waste meet the second claim, a simple test will be sufficient to convince a person. Take, for instance, a small amount of dry woolen waste, this having the strongest capillarity of the three, and place one end in a large cup half filled with oil, allow the waste to pass over the side of the cup and the second end to rest upon a table. After some twenty-four hours thus standing the waste will be found to be more or less oily to the touch, and more than likely an oil-spot will be found upon the table where one end of the waste has been resting. From such a test the amount of oil, mineral, which woolen waste had thus absorbed after some three or four days in this condition, was not much more than noticeable, and certainly far from being sufficient to lubricate a car journal. The waste appeared to reach the maximum of absorption after twenty-four hours; that is, no increase in the amount of oil absorbed was noticeable by a duration of the test beyond this time. In this case the conditions rather favored the waste, as the fiber was placed so as to be continuous from the cup to the table, which is much better than that found in practice.

As it is evident, then, that the capillary property goes for naught, the next best point with the method of lubrication in question is the power of the packing material to retain oil, by which that in contact with the journal, when oil is poured upon it, will be in good condition for lubrication.

From the manner of attending to car boxes it is found that the waste from the frequent but small doses of oil which it receives does not reach its best condition, that is, the waste thoroughly saturated when the upper part, or that next to the journal, is able to retain a larger percentage of oil, until after it has made considerable mileage and then it is that the lubrication of the journal obtained by this method is the most efficient. So it is that new waste when put into boxes will always make the journals reach a higher "running heat," which although advantageous as increasing the fluidity of the lubricant and, therefore, decreasing the co-efficient of friction, yet is objectionable as reducing the condition of lubrication to a more sensitive one, and more likely to influence the production of hot journals. For this latter reason a low "running heat," of say seventy-five (75°) degrees F., while giving a somewhat higher frictional resistance, is desirable.

It is always advisable to saturate new waste as thoroughly and as long as possible before placing in car boxes and to use waste for repacking, and when it does not contain sand or grit that has seen more or less service.

It will then be noticed in the present method of lubricating car journals, that immediately after the box has been oiled, the top of the waste is well saturated and all in good condition, but a short time will dry the waste in contact with the journal of whatever oil it may contain by its falling to the bottom of the box, dissipation and leakage at the mouth and back. While the box may contain abundance of oil at the bottom, the top of the waste, where it is desired the oil should be, is comparatively dry and inefficient. In this connection a mixture of cotton and woolen waste—half and half—is found to give better service than either used alone. The woolen waste has the elasticity, and the cotton waste, while not absorbing as well, seems to keep the oil in the desired position better than does the former. This is due to the cotton packing closer and tighter than does the woolen waste.

The recent experiments of Mr. Beauchamp Tower have thrown much light upon the subject of lubrication. Three methods of lubricating were tried, and it was found that the oil-bath under the journal gave by far the most efficient results. With the several methods the comparative frictional resistances were:—

Oil bath.....	1
Pad saturated with oil under and in contact with journal.....	6.46
Syphon lubricator.....	7.06

The syphon lubricator was placed in the bearing at a point where the maximum pressure was exerted, in the center line, and showed conclusively after many trials that such a method of lubrication, with even much lower pressures than used in car work, was next to useless. These figures are surprising, and show beyond question, from the reliability of the experiments, that the attempts to improve the manner of lubricating car journals should be di-

rected toward the use under the journal of an oil bath, or its nearest practical approach.

It is not intended, however, to discuss now the experiments referred to, but it is hoped an opportunity will enable an early presentation of a paper upon the general subject of car lubrication for discussion by the members.

It is thought that sufficient has been said to show the crude and inefficient condition of the present method of car lubrication; the practical reasons for so concluding can be more forcibly shown by figures at some meeting in the future.

It is surprising to see the amount of skepticism which exists in regard to this subject and among those who have had the most extended experience, which, probably, has been brought about as much by the numerous unsuccessful "rattle traps" that have been designed and constructed for the purpose of accomplishing the lubrication of car journals as from any other cause.

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**A Railway Official with a Soul.**

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An occurrence of recent date in Cleveland, being of a nature to illustrate the reverse of the oft repeated assertion that street railways, like all corporations, have no souls, is worthy of note.

November 2nd Peter Fox, very much under the influence of liquor, was standing on the front platform of a St. Clair street car, and while the car was in motion fell to the ground. One leg lying across the rail was twice broken, the bone badly splintered and crushed, the wheel having stopped upon it. When taken out he was too much intoxicated to know he was hurt. Upon being taken to the City Hospital the surgeon in charge at once arranged for amputation in the presence of the medical students from the college at a certain hour next morning.

President Hathaway arriving at once upon the scene, ordered the company surgeon, with instructions to avoid amputation if there was the slightest chance of saving the limb. A hard struggle of several weeks ensued, but the man came out all right, with two good legs, and is, or soon will be, in the employ of the company about their barns. The injured man having no friends in the vicinity, and though no responsibility or blame could attach to the road in the matter, owes the preservation of the limb to the timely efforts of Mr. Hathaway, by whom also all expenses of medical attendance and board during treatment and recovery were borne.

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FRANK B. SMITH, Superintendent Citizens' Railway Co., North Springfield, Mo., writes to the STREET RAILWAY JOURNAL:—"Enclosed please find \$2. Kindly credit our account accordingly. We esteem the JOURNAL highly, and cannot get along without it. Am glad you have advanced the price of same, believing it is well worth the money, and seems to betoken success."



## Cable Railways.

BY WM. H. SEARLES.\*

There are in all about 87 miles of cable road in operation in the United States at the present time, more than one-half of which has been constructed within the last five years. The progress in the five years to come is likely to be much more rapid.

These roads are all built on one general plan, with, of course, some variations in detail. The track is level with the pavement, but is not laid in the ordinary manner. No cross-ties can be used, since they would interfere with the necessary communication between the cars and the cable. In constructing the road a trench is first excavated about three feet deep by two and a half feet wide along the center line of each track. In the trench are placed cast-iron yokes weighing from 300 to 400 pounds each, at intervals of four or five feet. The yokes stand on the bottom of the trench, and by their shape give form to the conduit which is required for the cable, and by suitable arms support the track rails, which are bolted to them. They also carry a pair of slot-rails, so called, which are placed in the middle of the track and form the central cover to the conduit. The slot rails are of rolled iron or steel of a peculiar pattern. The tops are inclined toward each other, leaving between them, at the level of the pavement, a slot or longitudinal opening three-quarters of an inch wide, which extends the entire length of the track. The slot-rails stand 7 or 8 inches high, and their bases are 6 or 7 inches apart. They weigh 50 to 60 pounds per yard each. In some cases the yokes have been made of railroad iron bent to the proper shape and braced with angle iron. These yokes were of less weight, but being more elastic they yielded to the lateral pressure of the trench and pavement, and thus allowed the slot to close, giving a great deal of trouble in the operation of the road. Where the strength of the yokes is not sufficient to keep the slot rails apart, the latter are anchored back to the track rails with half-inch rods. The conduit is built of concrete, requiring 35 cubic yards per 100 feet of single track. The conduit is either oval or rectangular, according to the shape of the yoke adopted. The St. Louis conduit is lined with sheet iron; that in Cincinnati is lined on the sides with plank previously treated by a preserving process, and on the bottom with a coating of pure cement. Plates of iron are employed to cover the spaces between the walls of the conduit and the bases of the slot rails. Carrying pulleys are placed at regular intervals within the conduit to support the cable. They have a face of 4 or 5 inches, slightly concave, with a central groove about 3-8 inch deep for the cable. Their diameter is 12 or 14 inches. (Sheaves of only 9-inch diameter wore out very rapidly.) They are fixed on shafts of 7-8 to 1 1-8 inch diameter, and from 9 to 13 inches long. The methods of mounting are vari-

ous, but the later preference is for steel shafts in boxes of babbitt-metal. The ruder forms of mounting wear out too readily, and consume too much power. The sheaves clear the bottom of the conduit by several inches to allow the passage of water and mud which may get in through the slot. On curves a series of horizontal sheaves are used. These sheaves vary in diameter all the way from 14½ to 42 inches. Sizes from 19 to 29 inches seem most desirable, and on curves of short radii they are placed as close together as possible. The conduit is enlarged to accommodate them, and yokes of special forms are provided; cast-iron covers over them are substituted for the ordinary pavement. The shafts are usually 2 inches in diameter, and are provided with both upper and under bearings in babbitt boxes.

The cables are 1½ inches diameter of steel wire, 19 wires to the strand. The cable is not placed directly under the slot, but a little to one side of it. The length is generally limited to five miles. The St. Louis cable is over 34,000 feet long. The breaking strain, when new, is about 39 tons. A cable in constant use lasts 12 or 14 months, in which time it will run from 85,000 to 100,000 miles. When condemned, it will have lost perhaps 10 per cent of its weight and 40 per cent of its strength. Very much depends, however, on the excellence of the pulleys and other machinery, and freedom from mishaps. The splice of a cable is 19 feet long, one end lapping by the other this distance. It requires the services of several men specially trained for the work, and occupies them three or four hours. When completed, the splice can hardly be detected in a running cable. The cable speed varies from seven miles an hour in Kansas City and seven and a half miles an hour in St. Louis to ten miles an hour in Chicago. The new line in Chicago, in the suburban district, is to have a speed of twelve miles an hour. Motion is imparted to the cable by heavy machinery specially designed for the purpose. The engine house may be located at any convenient point along the line. The highest point of the grade would doubtless give the easiest working, but this consideration seems not to have been regarded on any of the recent roads.

In the new Chicago line the cable, on entering the engine house, passes around two drums, giving a half wrap to each successively until two or three wraps have been made. It then passes to the rear and over a tension wheel, whence it returns to the street to repeat the circuit of the road. The drums are of cast iron, 12 feet in diameter, and have four or five grooves on the face to receive the cable. The grooves are parallel, and each returns into itself. The shaft of one drum is horizontal, but the other is slightly inclined, so that the first groove on one drum may be directly opposite the second groove on the other. Both drums revolve in the same direction, a large gear wheel on each shaft being connected with the other by an intervening pinion. One of these gears

is driven by another pinion on a main shaft, which is in turn geared to the engine shaft. The effect of this gearing is to give the engine shaft about three times as many revolutions as the drum shaft makes per minute. When new, the drums are of equal diameter, and both impart motion to the cable; but if one drum should wear more than the other in the grooves, so much friction and jar would be produced that the intervening pinion must be removed, allowing one drum to act merely as an idler while the other does all the work. This is now the case in St. Louis and Cincinnati. In New York, on the contrary, the machinery is in full gear, yet operates almost noiselessly. In the main engine house of the Market street line, San Francisco, the drums revolve in opposite directions, the cable taking three-quarters of a circumference on each, in the form of a figure 8. The gears mesh directly together with V-shaped teeth, and are driven directly from a pinion on the engine shaft.

On every line duplicate machinery is provided as a reserve in case of accident. In New York, even a duplicate cable is placed in the conduit on separate sheaves. The same arrangement was originally made in Kansas City, but has since been abandoned as too complicated, and increasing the difficulties when an accident occurs.

The tension wheel is designed to take up the slack of the cable, which varies considerably in amount, and to give to the cable as nearly uniform a tension as possible. The wheel, which is twelve feet in diameter, is mounted on a simple carriage, which is free to move on a track laid in the line of the drums. A weight attached to a chain passing over a pulley draws the carriage away from the drums until resisted by the loop of the cable on the tension wheel. When the strain on the outgoing portion of the cable is greater than one-half the weight, the carriage yields until equilibrium is again established. The carriage is thus constantly in motion in one direction or the other. A pair of heavy spiral springs attached to slack chains prevent the carriage from running too far forward, as it frequently would do under a suddenly applied strain.

The engines are of the horizontal non-condensing type, with automatic cut-off of approved pattern. The usual size of cylinder is twenty-four inches by forty-eight inches. The New York engines are twenty eight inches by forty-eight inches, and the new engines in Chicago are thirty inches by sixty inches. The speed is generally from sixty to sixty-five revolutions per minute, while that in Cincinnati makes as high as seventy-eight revolutions. Each engine has a heavy fly-wheel from sixteen to eighteen feet in diameter, and weighing from 3,400 to 40,000 pounds. The engines are rated at from 250 to 300 horse power each. The boilers and furnaces are of various patterns according to the preference of the party ordering them.

There are, of course, various other details of more or less importance connected with the cable system, which time forbids

\*From a paper read before the Civil Engineers' Club of Cleveland.

to be mentioned here. This paper, however, would not be complete without some description of the grip, an ingenious device for laying hold of the cable at will, so as to make it haul the car, and of loosening the hold again when the car is to stop. The grip consists of an iron frame attached to the center of the car, from which an iron plate extends downward through the slot of the track into the conduit. On one side of this plate, near its lower edge, is attached a bar of composition metal called a die, about two feet long, parallel to the cable, over which the cable passes. A little roller at each end of the die saves the cable from abrasion. Another die attached to another plate is made to come down upon the cable, gradually increasing the pressure until the bar begins to move, and finally seizing the cable so firmly that the car is carried along with the same velocity as the cable. The upper die is operated by a lever in the car. To stop the car the lever is reversed, allowing the cable to slip through the dies, and ordinary brakes are applied to the wheels. The grip does not extend far enough down to interfere with the carrying pulleys, nor does it touch the curve pulleys, which are placed a little to one side of the center line. When necessary, the cable can be thrown out of the grip entirely by a lever motion in the car. A number of variations in the design of grips have been patented by different parties. They all serve the same general purpose more or less efficiently. Indeed the grip has been to the cable system, like the point threaded needle to the sewing machine, simply indispensable.

On the whole the cable system has commended itself wherever it has been adopted in our cities. It gives to the public much cleaner and quieter streets than the horse car system can. It affords a more rapid transit, and a more uniform speed in all weathers, at all hours and over all grades. It avoids the distressing spectacle of overstrained horses struggling to start a crowded car, and slipping and sometimes falling in the attempt. It avoids all delay from balky animals. It promptly increases the value of outlying real estate in the vicinity of the line. To the railroad company it gives the advantage of a largely increased business, resulting from greater promptness and efficiency in operating the line—qualities which are quickly appreciated by the public. But it also effects a decided reduction in the current expenses of the road. In the case of the Sutter street road of San Francisco, three miles of which were changed from horse to cable traction, the sworn testimony of the officers shows that the actual saving in expenses was 30 per cent, notwithstanding the fact that the business of the road was increased \$962,375 in the first year of the cable. Other companies have experienced even a greater saving than this, amounting to as much as 36 per cent.

The main objection to the cable system is its large first cost. A double tracked cable road laid in the best manner and supplied with girder rails, will cost, exclusive

of pavement, at the rate of \$65,000 a mile; or, adding \$25,000 a mile for first-class pavement, will bring the cost up to \$90,000 a mile. The necessary buildings and plant may be estimated at from \$60,000 to \$100,000 according to circumstances. The supply of cars will be an additional item. When an existing horse car line is to be altered to a cable line the expense per mile is not much less, since the old track has to be entirely removed and the new road constructed instead. Some of the old material may be available. Among the minor objectionable features is the grip. It takes up considerable space in the car otherwise available for passengers; it confines the car to the track, and prevents the car from going where there is no conduit. The plates soon become worn by contact with the slot rails, and the dies require renewal once a month. The first cost of a grip is about fifty dollars, and the bill for repairs is continuous. It is true that the Lane grip used in Cincinnati may be detached from the car, and occupies no passenger space, being under the car, and operated from the front platform, but it is subject to wear quite as much as any other.

The great desideratum, therefore, at the present time is a cable system of much less first cost, that can be applied to existing horse car lines, that will dispense with the use of the grip. A new line, with which the writer has been for a short time connected, is now under construction in one of our largest cities. It is constructed on an entirely new plan, and is designed to fulfill every one of the above requirements, yet to be operated as cheaply and as certainly as any other cable line. The road will be completed in a few months, and should it fulfill the expectations entertained regarding it, we may look for a speedy revolution in the operation of our horse car lines.

#### DISCUSSION.

In the discussion upon the paper, and in reply to some questions asked, Mr. Searles stated that the saving of 33 or 36 per cent did not include the interest on the cost of the road, but that it was a comparison of the power and wear and tear with horse power; that it had been thoroughly demonstrated that horse power roads were very expensive to maintain. He said that upon some of the cable roads there were horses maintained as relays, but upon the Chicago lines no relays had been required and there had been very little delay on account of breakages.

In explaining the methods of the gearing between the drums, one of which stands upon an angle, he stated that the first drum has a square gear and the last has regular square teeth, with its shaft inclined a little out of the horizontal, and the teeth standing at an angle corresponding to that of the shaft. The cable is lifted, as in the ordinary methods which have been described heretofore in this paper, for the grip to seize it, and in the grips thus far used it has not been possible to raise and lower them. In St. Louis, for instance, they have sharp curves and dare not loosen the

grip, as they could not recover the cable again, and such a device would be very beneficial.

The cable, it will be understood, is supported by the grip, and clears the pulleys by several inches. It also clears the curve pulleys by being a little above them, and also from the fact of their being a little out of the center line. He stated that it required, in a one-eighth mile line, about 11 horse power to move the cable on a tangent and from 12 to 14 horse power on curves, at ordinary speed, but where the number of horses required to operate the cars would be about 500, the horse power required to operate the same number of cars would be about two horse power per car, which includes friction of the cable and of the driving machinery.

Of course, where trains are run, the strain on the grip is greater than that which would be exerted by two horses. The size of the cable, as has been stated, was  $1\frac{1}{2}$  in. diameter, and Mr. Searles said it would wear out in about 12 or 14 months, and was reduced in weight about 10 per cent when condemned. This shrinkage in weight was due to what was worn off from the diameter. He also stated that sometimes the stretch of the cable is so great that they have to take an extra wrap on the drums.

These drums are overhung at the very end of the shaft to admit of an extra wrap being made without splicing. In regard to the Johnson cable, Mr. Searles said that the cable was made of No. 3 steel wire, six wires to the cable. Thus far they have used a hemp center, but in future wish to use a center made of fine steel wires. The cable goes round a 12 foot drum without difficulty and may be even less, down to 9 feet diameter. After passing round it comes out as straight as ever.

It is not a single cable but a double cable. This double cable measures  $2\frac{1}{2}$  in. across by  $\frac{3}{4}$  in. diameter.

They are bound together and the cross bars or stops occur at regular intervals. They are continued in the space between the cables and are no thicker than the cable, so there is no interference with the cables wrapping on the drum or passing any pulleys. The reason for using the large wire is to get rid of the grip. This double cable will go around a sharp curve flat and it is always in the center of the track and within two inches of the surface of the pavement. It is always accessible to the car and can therefore be let go and picked up at any time.—Jour. Assoc. Engineering Societies.

#### Cost of Grinding Feed.

In answer to an inquiry we have received the following data from the Foos Manufacturing Co., in regard to the saving of expense which would be made by street railroad companies in grinding their own feed:

"In regard to the cost of grinding feed about which you ask, we would say that it is practically nothing to a street railroad further than the original outlay for a

grinding mill and horse power, as the work then can be done with from six to eight horses and by one or two hands at odd times. We refer now, of course, to stables that have no arrangement for grinding feed, cutting straw, hay, etc., by steam; but where they have such power, of course, that is more profitable to use and could be done with very little expense, as the quantity ground would depend upon the power used. As far as economy of feeding is concerned, we think we are safe in saying that at least 50 per cent is saved by feeding ground grain, over whole, and a further inducement for stables to grind their own feed, we would add what is already known, that there is more or less uncertainty in buying anything in the way of mixed feed, for the reason that there is so much adulteration used and it can be used so successfully that it is impossible to detect it."

While we do not know that the broad claims made by our correspondent can be substantiated by actual practice, at the same time there is no doubt whatever that any street railway company which has the power on its own premises can grind its feed more economically than it can be purchased in that condition and at the same time be sure that its horses are eating exactly what has been paid for. This matter of adulteration of ground feed is so extensively practiced that it is well for any street railroad to look carefully into it in order that its horses may receive the best of nourishment and not be injured by adulterated food.

Mr. H. C. MOORE, largely interested in the San Jose street railroads, said to a reporter of the Los Angeles Times with regard to the Daft Electric road in operation in Los Angeles:—

"I was surprised at the success and smoothness of your road. I have ridden over it, and must say it is the smoothest-riding road I ever rode on. You actually cannot tell, unless you watch some stationary object, just when you start and when you stop. It is a wonderful thing. Now, the Market-street road in San Francisco is the finest cable road on earth. It cost hundreds of thousands of dollars a mile. Your electric road is built very cheaply on an ungraded street whose soil is like ashes when dry and like mortar when wet; and still, for comfort and smoothness, it is perfection. It is as much ahead of the Market-street cable road as the Market-street road is ahead of a horse railroad. I am more than satisfied with its workings."

There are a great variety of forms used in letter writing, each of which is preferred by some, but in writing to a supply firm it is very proper to say, "I saw your advertisement in the STREET RAILWAY JOURNAL." This is a sort of familiar password to one in the supply trade, and it will serve to put you upon an easy and familiar footing with him. The JOURNAL is not so modest as to be at all averse to being mentioned in that connection.

### Notes and Items.

#### Amsterdam, N. Y.

AMSTERDAM ST. R. R. Co. has increased to 4 cars and 11 horses, and has added an extra switch.

#### Ann Arbor, Mich.

ANN ARBOR ST. RY. Co. Secretary King writes us that it is doubtful whether the road will ever be opened. Thus far the company has been unable to get a franchise from the city.

#### Appleton, Wis.

APPLETON ELECTRIC ST. RY. will add more cars this spring. They report 4½ miles of track, of 4 ft. 8½ in. gauge, 33 lb. rail, 5 cars, 5 motors.

#### Ashtabula, O.

ASHTABULA CITY RY. Co. Some three years ago John N. Stewart, of Cleveland, O., obtained the right of way and a franchise to build between the town and the harbor, a distance of 4 miles, to take the place of a stage line then running between the points. Travel on this line has increased from its opening until now it seems almost to justify the double tracking of the road, and such a move is contemplated. Ashtabula is one of Ohio's most important Lake ports, and the coming season promises the handling of more coal and iron than any other port.

#### Athens, Tenn.

ATHENS MINERAL LAND AND IMPROVEMENT Co. are ready to receive bids for a new street railroad which they will build.

#### Atlanta, Ga.

METROPOLITAN ST. R. R. Co. has obtained leave from the Council to run its cars by electricity, and will make the change from mules in a short time.

WEST END & ATLANTA ST. R. R. Co. will soon put on a dummy engine.

#### Beaver Falls, Pa.

M. L. KNIGHT, President of the Beaver Falls road, reports the addition of a new Clark groomer, which he says gives excellent satisfaction and saves one stable hand for 35 horses.

#### Binghamton, N. Y.

PARK AVE. R. R. Co. is leased by S. M. Nash.

#### Birmingham, Ala.

WEST VALLEY ST. RY. Co. is a new company, with a capital stock of \$50,000. Work will be commenced within the next two months and the road completed within three or four months. It will be 4 miles long, of 4 ft. 8½ in. gauge, 24 lb. rail, with 6 cars, and horse power will be used at first, 20 mules being required. J. C. Westbrook is President, W. E. Berry Vice President, and S. Torrey General Manager.

#### Boston, Mass.

BOSTON CONSOLIDATED ST. R. R. Co.'s stables and car house at Malden were burned April 3, with 50 horses, 40 tons of hay, 43 sets of harness and some rolling stock. Loss, about \$15,000. Extensions will probably be made the coming season in Somerville, Malden and Medford.

#### Brooklyn, N. Y.

BROOKLYN CITY R. R. Co. President Lewis says he will try an electric motor on the road very soon. The gross earnings of

this company for the quarter ended March 31 were \$534,653, against \$506,382 for the same time last year; and net income, \$45,193, against \$35,193.

BROOKLYN HEIGHTS R. R. Co. has been incorporated, with a capital of \$150,000, for the purpose of running a street railroad along Montague street, from Court street to Wall Street Ferry. The thirteen directors, the majority of whom are residents of the Heights, some of them living on Montague street, are John J. Pierrepont, Charles L. Fincke, George W. Chauncey, William A. Brown, S. B. Chittenden, A. C. Barnes, Robert J. Kimball, F. Allen, S. Ammerman, D. B. Thompson, Otto Wille and Joseph E. Brown. S. B. Chittenden is President and G. W. Chauncey Secretary. Mr. Chauncey says it has not yet been decided whether the road will be operated by a cable or by electricity. The consent of property owners, he says, will be secured at once, and then the road will be pushed to completion. Montague street is only 30 feet wide. President Chittenden says that the rails will be laid at a distance of 8 feet on either side from the curb, and that passengers will be carried from the City Hall to Wall street for 5 cents. It is thought that this will divert a great deal of Wall street and lower Broadway travel from the bridge. Some of the men who are prominent in the new scheme were bitterly opposed to the Montague Street Railway Co., which was incorporated in 1885 for building a cable road over the same route, and it has been suggested that the new scheme is simply designed to head off the old one; but on the other hand Montague street had not one-half the business places on it then that it has now.

BROOKLYN RY. SUPPLY Co. are manufacturing stable and street brooms, and by importing their own stock propose to make and sell all styles and sizes as cheap as it is possible to furnish brooms made of good material.

#### Buffalo, N. Y.

THE RAILWAY REGISTER MANUFACTURING Co. report their business in bell punches never was so brisk in the history of their company as at the present time. It would seem that the bell punch, especially where different fares are used, is increasing in popularity.

#### Chicago, Ill.

CHICAGO PASS. RY. Co., not hitherto reported in full in our Directory, has 21 miles of track, 52 lb. rail, 60 cars, 500 horses. Harvey T. Weeks is President and Austin J. Doyle Superintendent. The transfer of this road to the West Division Co. was consummated March 24 by the purchase of three-quarters of the capital stock of the former company. The sale was made on the basis of \$1,500,000, being the present value of the stock, and the purchasers assumed the indebtedness of the company, amounting to \$400,000.

No. CHICAGO CITY R. R. Co. Work was resumed on the cable system of this road March 24, Judge Tuley of the Circuit Court having refused to grant the injunction

asked for to compel a stoppage of the work.

#### Cleveland, O.

EAST CLEVELAND RY. Co. is about to extend its line on Garden street through to Lincoln avenue, on account of the increasing trade on Cedar avenue.

WOODLAND AVE. & WEST SIDE line has some of the finest riding cars we know of in this country. They have spring seats and the Worswick box, and the Haycox door fastener is one of those little things that add very materially to the comfort of a car. The woodwork is mahogany and the general finish is in keeping.

#### Columbus, Miss.

COLUMBUS ST. RY. Co. has been organized.

#### Dalton, Ga.

A NEW COMPANY has been organized here for building a street railway, and the stock has all been subscribed.

#### Denison, Tex.

DENISON ST. RY. Co. contemplate a 1-mile extension and an addition of 10 mules. Since their last report to us they have increased to 7 cars and 25 mules. J. J. Campbell is now Superintendent and General Passenger Agent.

#### Detroit, Mich.

FORT WAYNE & ELMWOOD RY. Co. are extending their tracks from Croghan street down Elmwood avenue to Lafayette street, and thence along Lafayette to the Boulevard, comprising in all a distance of some 5,000 feet. They are also building a two-story brick car shed at a cost of \$12,000. Four palace closed cars and 4 open cars of the Brill make are being added. The Cambria Iron Co. furnish the new rails.

#### Duluth, Minn.

DULUTH HIGHLAND CABLE RY. Co. Details of this new scheme have not yet been decided upon. The old company, the Duluth St. Ry. Co., has exclusive privileges; but, unless they go ahead within a reasonable time after notice and build to the hill top, they will forfeit their franchise on the streets named, and then the new company will take hold of it. H. W. Bradley is interested in the new company.

#### Fort Smith, Ark.

TWO NEW COMPANIES have been chartered for building street railways in this town.

#### Framingham, Mass.

THE TWO RIVAL COMPANIES are still trying hard to obtain their franchises. At a hearing before the Selectmen it was stated by the counsel for the Framingham Center Ry. Co. that they proposed to use electricity, and whichever company was granted the franchise he hoped they would be restricted against the use of the T rail. He understood that \$18,000 had been pledged to build a road from South Framingham to Saxonville. Samuel B. Bird told how he became interested in the New York company by a letter from ex-Governor George D. Robinson, introducing to the former gentleman Mr. Haines, and he was willing to take Mr. Robinson's indorsement. He was opposed to the home company because the organization of the New York company was honest, square and up-

right, and objected to having the franchise granted to the new company, because there was another company's pending.

#### Gainesville, Fla.

GAINESVILLE CITY & SUBURBAN RY. Co. will build 8 miles of road at once.

#### Grafton, Mass.

THE GRAFTON DUMMY ROAD is relaying its tracks, widening to standard gauge, and putting in 40 lb. rails.

#### Greenwich, Conn.

GREENWICH HORSE R. R. Co. A numerous signed petition from the townspeople, asking for the incorporation of this company, has been presented to the Legislature. The line is to run along Putnam avenue from Mechanic street to Greenwich avenue and Steamboat road to the steamboat dock, with a spur from the main line extending along Railroad avenue to the station of the New York, New Haven & Hartford R. R. The capital stock is \$30,000. The road must be in operation by July 1, 1889. The company propose to run 4 cars. The Delano-Richardson syndicate are back of the scheme.

#### Harrisburg, Pa.

HARRISBURG CITY PASS. RY. Co. increases to 75 horses, and has now 42, 47 and 50 lb. rail.

#### Helena, Ark.

HELENA ST. R. R. Co. has been organized, with a capital of \$30,000.

#### Hudson, N. Y.

THE NEW ROAD will be built just as soon as the necessary authority is granted, and it is thought that cars will be running by the Fourth of July. It will cost something in excess of \$20,000. Mr. Hadcock's amended project is to start from the Hudson River Railroad depot and go up South Front street to Warren, turn into Warren and run its entire length to Prospect avenue, then over the avenue to the head of Columbia street and down Academy hill to State street and the Boston & Albany depot, and then across town on Seventh street to the main line on Warren, forming a belt line in the upper part of the city.

#### Jacksonville, Fla.

JACKSONVILLE ST. RY. Co. increases to 8 miles of track, from 10 cars to 22, and from 36 mules to 93. J. M. Lee, of Savannah, is now Treasurer of the company.

#### Jersey City, N. J.

JERSEY CITY & BERGEN HORSE R. R. Co. At the annual election for directors these gentlemen were elected: Charles B. Thurston, William Keeney, Edmund Smith, Alfred L. Dennis, F. Wolcott Jackson, Edward F. C. Young, Henry D. Welsh, James B. Vredenburg, John P. Wetherill, William Brinkerhoff, N. Parker Shortridge.

#### Kansas City, Mo.

KANSAS CITY ELECTRIC RY. Co. uses 70 lb. girder rail, with 2 miles of track and 4 motor cars. John C. Hervey is Superintendent.

#### Keypport, N. Y.

THE ACTION OF THE LEGISLATURE in passing the bill providing for the granting to turnpike companies the right to lay horse railroad tracks on their roads, is very fav-

orably received here. The people of this place have been fighting for some time for a horse railway, and it now looks as if their efforts, which were stubbornly fought by the people of Matawan, are likely to result favorably. The company which is interested in the laying and operating of a horse railway here promises to build at once.

#### Knoxville, Tenn.

KNOXVILLE & EDGEWOOD RY. Co. is the name of a new company with a capital stock of \$26,000 that will build at once, and it is the expectation that the road will be opened this fall. It will be from two to five miles long. The company have several proposals from other contemplated lines to join them, and it will depend upon which they accept what mode of propulsion and what car and rail will be used. President, William Caswell; Vice President, E. C. Camp; Secretary, Arthur Swan; and Messrs. F. A. Moses, A. N. Jackson and S. R. Rogers are also prominently identified with the project.

ALL THE OLD STREET CAR COMPANIES of Knoxville have been merged into one organization, says a press report. A number of the old directors resigned, and among the new ones elected are William Morrow, S. B. Luttrell, J. C. Luttrell, J. S. Vangilder and Representative Jones. Mr. Vangilder was elected President of the entire system.

MABRY BELL AVE. & HARDEE ST. RY. Co. send the following revision of officers: President, John S. Vangilder; Manager and Treasurer, T. L. Beaman.

#### London, Eng.

A NEW SUBTERRANEAN LINE is being built in London, near London Bridge, and is nearly completed. Glass sleepers will be used for the tracks for the purpose of insulating the rails, as electricity is intended to be used as a motive power.

#### Los Angeles, Cal.

SECOND ST. CABLE R. R. Co. will double track their road in the course of the next year. They have now 1½ miles, of 3 ft. 6 in. gauge, 16 lb. rail, 6 cars and 6 grips. The officers are: President and Treasurer, James McLoughlin; Secretary, H. W. Davis.

S. O. BROWN, engineer, is about to construct a road 6½ miles long from Glendale to Los Angeles.

#### Louisville, Ky.

LOUISVILLE CITY RY. Co. is building a new line in the southern portion of the city, on Jefferson street, from Twelfth to Twenty-sixth. This will give through cars on nearly every principal street as far back as Broadway. A correspondent says that Louisville will then have the most complete railway system in the country, the perfection of the system being due to the liberality of the Council in granting so many franchises.

#### Long Island City, N. Y.

RIKER AVE. & HUNTER'S POINT R. R. Co. This new road is over half finished already, and will be opened on the 1st of June. It is 2 miles long, 4 ft. 8½ in. gauge, 47 lb. steel rail. It will have no cars of its own, but will be operated by the Steinway &

Hunter's Point R. R. Co. Horses will be used at first, afterwards electricity. The road is located half in Long Island City and half in the township of Newtown, running along Bowers Bay beach. Capital, \$20,000, all paid in. President, J. H. Hempstead, Yonkers, N. Y.; Secretary and Treasurer, Oscar R. Steins, 107 E. Fourteenth street, New York.

#### McKeesport, Pa.

MCKEESPORT PASS. RY. Co. will commence work this spring, and the line will be 6 miles long. President, J. C. Smith; Secretary and Treasurer, E. F. Woods.

#### Meriden, Conn.

MERIDEN HORSE R. R. Co. This road commenced running 8 cars March 21, and up to the present time traffic has been good. The barn is being enlarged, to contain 100 horses, when 12 cars will be operated on ten minutes headway. Some of the turnouts are misplaced, owing to the fact that each division was lengthened, after they had been placed. Mr. H. J. Hutchinson is making the changes, and Mr. Rufus Martin has been looking after this and other work on the road.

#### Milford, Mass.

IT IS UNDERSTOOD that this town is to have a street railroad.

#### Milwaukee, Wis.

CREAM CITY R. R. Co., having obtained the long delayed franchises from the City Council, work on the extensions has already begun, and the cars will be running by the Fourth of July. The North Chicago Rolling Mill Co. furnishes 50 tons of steel rails. The new line will intersect the East Water street line at Huron street, and will cross Huron to Clybourn, to Second, thence through what was formerly an alley, but which has been widened to the width of the street, the turn-table to be located at the east end of the depot. It is intended to make this point the terminus for what are now known as the "hill cars" — meaning the Farwell avenue line. The company has ordered for this line five open cars of the Pullman build, which, it is said, will be superior to any open cars now in the city. They are to have cross-seats, and will have sliding curtains worked with pulleys, in place of the flapping curtains now in use. As soon as the new line is finished, work will be commenced on the extension from the present terminus of the East Water street line at Pleasant street north two blocks, on North Water street to Brady, thence east on Brady eight blocks to intersection with the Farwell avenue line. A branch will be built north on Racine street, from Brady to Highland place. Besides the extensions, the company will relay with steel rails parts of its tracks on East Water, Jackson and Clinton streets.

MILWAUKEE CITY RY. Co. are building new stables just north of the city limits, at the end of the Third street line, to relieve the crowded condition of the West Water street barns. This company will extend their line east from Third street, across State street bridge to Broadway, south on Broadway to Michigan street, thence east on Michigan street to the Lake

Shore depot. The company has also an extension of the Walnut street line on Fond du Lac avenue to build. Since its last report to us this company has increased its number of mules from 410 to 513.

WEST SIDE ST. RY. Co. have the rails on hand for the extension from Wells street south on Twenty-seventh street to Clybourn, thence west to the city limits, work on which will be commenced within a few weeks.

#### Minneapolis, Minn.

MINNEAPOLIS ST. RY. Co. will build a line on Second street N. E. from Broadway to Twenty-seventh avenue, thence to Four-and-one-half street N. E. It is thought ultimately a motor line will be built to Friedley, where prominent capitalists have recently been purchasing largely of real estate. The ordinance authorizes the use of animal, steam or other power, but after five years the City Council may authorize the removal of steam motors. The extension to Twenty-seventh street will be completed by fall, and regular service thereon will then be commenced.

MINNEAPOLIS WEST SIDE ST. RY. Co. has filed articles of incorporation. It is to build a line of horse railway from Lake Calhoun easterly to the proposed Lake street bridge, and a branch from the main line to the entrance of Lakewood cemetery. The capital stock is fixed at \$200,000, divided into 2,000 shares. The incorporators are Randolph Burgess, John T. Byrnes, A. G. Chamberlain, Henry J. Mitchell and Matthew Walsh, all of Minneapolis.

#### Montgomery, Ala.

CAPITAL CITY ELECTRIC RY. has completed a fine new building, in which their office and machinery will be located. The company will soon operate all their cars by the electric motor system. The engines and motors have been received, and the poles and wires of the entire system have been put up. They have recently laid several miles of new track, connecting Highland Park with the city.

#### Nashville, Tenn.

WEST NASHVILLE RY. Co. has been chartered.

#### Newark, N. J.

NEWARK & IRVINGTON ST. RY. Co. since its last report to us increases from 28 cars to 30 and from 130 horses to 150.

#### New Bedford, Mass.

ACUSHNET ST. RY. Co. has now 150 horses.

#### New Britain, Conn.

NEW BRITAIN TRAMWAY Co., from whom we have not hitherto had a full report, has  $3\frac{1}{2}$  miles of track, of 4 ft. 8 $\frac{1}{2}$  in. gauge, 35 lb. rail, 4 cars. The President is Allston Gerry and the Treasurer Joseph A. Flynn, both of New York City.

#### Newburgh, N. Y.

NEWBURGH ST. RY. Co. increases from 24 to 28 horses during the past month.

#### Newburyport, Mass.

NEWBURYPORT & AMESBURY HORSE R. R. Co. has now 18 cars and 50 horses. It reports 6 $\frac{1}{2}$  miles of 4 ft. 8 $\frac{1}{2}$  in. track, 35 lbs. to the yard. Charles Odell is President, G.

H. Stevens Secretary, A. G. Reynolds Treasurer, and W. Ferguson Superintendent.

#### New Haven, Conn.

STATE ST. HORSE R. R. Co. The only change is that J. E. Emery is Secretary and Treasurer, in place of C. C. Blatchley, deceased.

#### New Orleans, La.

NEW ORLEANS & CARROLLTON R. R. Co. has now 14 miles of track. Joseph Hernandez is President, Walter V. Crouch Secretary, and Chris. V. Haile Superintendent.

#### New Rochelle, N. Y.

NEW ROCHELLE & PELHAM R. R. Co. increases to 10 cars and 45 horses.

#### New York, N. Y.

HOUSTON, WEST ST. & PAVONIA FERRY R. R. Co. has now 12.3 miles of track, and reports 440 horses.

TWENTY-THIRD ST. RY. Co. increases from 102 cars to 122 and from 692 horses to 764. Isaac Hendrix is Vice President of this company.

HUMPHREYS & SAYCE report a very brisk business this spring, and mention, among others, orders for rails, spikes and fastenings to roads in the following localities: Tusculumbia, Ala.; Savannah, Ga.; Birmingham, Ala.; Port Huron, Mich.; Springfield, Mass.; Pasadena, Cal., and various other points.

RUFUS MARTIN & Co. report numerous sales of Brill's patent reversible sign castings, which greatly facilitate the reversing of signs on the ends and sides of car roofs.

THE FIRM OF BEADLE & COURTNEY, heretofore general agents of the Railway Register Manufacturing Co., has been by mutual consent dissolved. Mr. Edward Beadle, with headquarters as heretofore at 1,193 Broadway, has been made manager of the Railway Register Manufacturing Co.; Mr. John F. Courtney, with headquarters at 423 Walnut street, Philadelphia, in general agent.

RICHARD VOSE reports business very brisk in street railway springs. He has orders on his books for some four or five hundred sets, including 175 sets for the fine new cars now building by the Chicago City Railway Co.

THE JOHN STEPHENSON SHOPS present the usual lively appearance. We learn of the following orders now on their books, and in the course of being filled: 25 cars for the Cincinnati Cable; 16 for the Mt. Adam & Eden Park road, Cincinnati; also cars for South Africa, Toronto, Queensland, Rosario, S. A.; Durango, Mexico; Hartford, Brooklyn, Rome, Jersey City, Sioux City, St. Joseph, 10 cars for the new Yonkers road, Lincoln, Neb.; Stoneham, Mass.; Indianapolis, Norwalk, Richmond, Lowell, Chattanooga, Washington, La Crosse, Baltimore, Syracuse, Brunswick, Louisville. We notice a number of one-horse fare-box cars building with the new swivel seat.

#### Niagara Falls, N. Y.

NIAGARA FALLS & SUSPENSION BRIDGE RY. Co. has 12 cars and 41 horses, and reports 2 $\frac{1}{2}$  miles of track. H. Nielson is now Vice President of this company.

**Norristown, Pa.**

**CITIZENS' PASS. RY. CO.** This new road will be 4 miles long, and will connect the hospital, Montgomery cemetery and railroad stations.

**Oakland, Cal.**

**BROADWAY & PIEDMONT R. R. Co.,** not hitherto reported in our Directory, has 3 miles of track, of 5 ft. gauge, 30 lb. rail, 18 cars, 46 horses. Walter B. Carr is President and Montgomery How Secretary.

**Omaha, Neb.**

**OMAHA & SO. OMAHA ST. RY. Co.** ask for authority to build cable lines on about fifty streets and to such points as the streets may hereafter be extended. Capital, \$1,000,000. Incorporators William A. Paxton, John A. Creighton, Peter E. Her, Meyer Hellman, John A. Bossler, S. W. Alerton and Isaac E. Corydon.

**OMAHA & COUNCIL BLUFFS RY. BRIDGE Co.** has filed articles of incorporation. This company is to construct, operate and maintain a bridge across the Missouri river between Omaha and Council Bluffs and also a steam, electric motor, horse, elevated, cable or other railway across it, with termini in the two cities. The capital stock is to be \$600,000, with an authorized capital of \$1,000,000. Guy C. Barton, J. H. Millard, Frank Murphy, T. A. Evans, John T. Stewart and George F. Wright are the incorporators. These men are identified with the Omaha Horse Ry. Co.

**OMAHA HORSE RY. Co.** Arrangements are being made to extend this company's line out on Cuming street to Lowe avenue and on to Walnut hill. This extension will possibly be a cable road. The company has begun building its Farnam street extension, and when it is completed cars on the Farnam and Twenty-fourth street lines will make five-minute trips. It has also been decided by the company to build a line from Twenty-fourth street to Creighton college. It will be finished by mid-summer. A strong effort is being made by residents and property owners on Leavenworth street to induce the company to change their St. Mary's avenue line at Twentieth street and run it west on Leavenworth street. The company has not yet considered the proposition. Twenty new cars are on hand ready for use.

Dr. S. D. MERCER has received from the County Commissioners a right of way for a street car line. The power is to be either horse, electricity, steam or a noiseless engine, and the work must be commenced within ninety days. The route is from the military road north of Walnut Hill south to Thirty-sixth street, thence to F street in South Omaha to the county line. The firm does not get any franchise. The road will run west to McArdle precinct and south to Millard, thence east to the Stock Yards.

**MOTOR LINE TO BENSON.** About a hundred men are at work building this line, and it is nearly finished. It is now definitely settled that the Baldwin Noiseless Smoke Consuming Motor will be used, the same as are in use at Kansas City and Minneapolis. These motors are as rapid and noiseless as a cable car.

**Orange, N. J.**

**ORANGE CROSSTOWN & ORANGE VALLEY ST. RY. Co.** A gang of men, headed by President Eppley of this new company, stationed sentinels at midnight, March 26, and laid horse car tracks over the New York & Greenwood tracks at Washington Street Crossing, Orange. In the morning the New York & Greenwood Lake people tore up the tracks.

**ELECTRIC RAILWAY.** The first car was started April 13 over the experimental electrical street railway in Scotland street, and the trip was successfully made at the rate of eight miles an hour. The experimental section is half a mile in length. It is expected that the entire cross-town line will be operated by electric motors.

**Orlando, Fla.**

**ORLANDO & WINTER PARK RY. Co.** Work has already begun, and the road will be opened by the Fourth of July. It will have 6 miles of track, of 4 ft. 8½ in. gauge, 25 lb. rail, 4 cars, 2 steam motors. Capital stock, \$100,000. President, J. R. Mizell; Secretary, George R. Newell; Treasurer, J. S. Capen; Superintendent, J. H. Abbott.

**Ottumwa, Ia.**

**OTTUMWA ST. R. R. Co.** is offered for sale, owing to the death of President J. M. Hedrick. For further particulars see "Special Notices."

**Passaic, N. J.**

**PASSAIC ST. RY. Co.** are about to construct a road from Garfield to Passaic through Clifton, a distance of 3 miles, and if the Paterson Main street road construct their line to the race grounds the new company will also build their line to meet them. The new company will be supported by Bradstreet & Curtis, of 35 Pine street, New York, who are largely interested in street railways in this country and Mexico.

**Paterson, N. J.**

**PATERSON CITY RY. Co.** reports 10 cars and 40 horses. They will this season build new and larger stables, put on 10 more cars, and double the number of horses.

**BOMBS UNDER A STREET CAR.** A third attempt to blow up a street car by placing torpedoes on the track was made April 3, but no damage was done beyond shattering the trucks of a car.

**PATERSON & PASSAIC R. R. Co.** has now 30 horses. Ambrose T. King is made Manager and Superintendent, and has appointed Townsend Rider Assistant Superintendent.

**Pawtucket, R. I.**

**PAWTUCKET ST. RY. Co.** increases from 100 horses to 124 since its last report to us.

**Peoria, Ill.**

**FORT CLARK HORSE RY. Co.,** which has not heretofore been reported in full in our Directory, has 8 miles of track, of 4 ft. 8½ in. gauge, 20 and 38 lb. rail, 32 cars and 80 mules. President, J. H. Hall; Secretary, H. W. Wells; Treasurer, H. Detweiler; Superintendent, J. H. Hall.

**CENTRAL CITY HORSE RY. Co.** will build 1 mile additional track this season.

**PEORIA HORSE RY. Co.** will build ½ mile more track this year.

**Philadelphia, Pa.**

**SECOND & THIRD ST. PASS. RY. Co.** is of 5 ft. 2½ in. gauge, 43 to 55 lb. rail. It increases from 669 horses to 675.

**PEOPLE'S PASS. RY. Co.** The only change is that D. C. Golden is now Secretary and Treasurer.

**THIRTEENTH & FIFTEENTH STS. PASS. RY. Co.** The track is laid with 47 lb. rail; 48 cars are reported, and 520 horses, being an increase of 68 in the last item.

**LEHIGH AVE. PASS. RY. Co.** Work on this road was begun March 23, and will be rapidly pushed. It is hoped that in a very short time cars will be running up Lehigh avenue from Second street to Ridge avenue and directly to East Fairmount Park. The road will occupy a field hitherto wholly neglected, and in some respects will be the greatest improvement that could be made in the northern section of the city. The charter was secured in 1873, but the project was allowed to sleep until last year, when a new company was formed, with Joseph T. Bunting as President and these directors: William Rotch Wister, John Wister, Langhorn Wister and James P. Booth. Among the other large stockholders are William Wharton, Jr., and William L. Elkins. The gentlemen named, control a majority of the stock outside of Mr. Elkins, who, however, is largely interested in the new road, though his holding is said to be not sufficient to give the Traction company power to use it. The capital stock of the corporation is \$600,000, divided into 12,000 shares of a par value of \$50. All the capital is paid in. Five-cent fares are made obligatory by the charter. The work is being done by Mr. Wharton. The road will be double track from end to end. It is understood that at first the tracks of the Fifth & Sixth Streets line will be used from Second street to Sixth and Lehigh. The greatest difficulty will be to get over the Reading Railroad tracks at Broad street and over the Connecting Railroad about Twentieth street. Permission has already been secured to build a bridge over the Reading tracks and to go under the Connecting Road. This may delay the track laying west of Broad street a short time, and the company during the time may only operate that portion between Broad and Second. The western terminus of the line will be directly at the entrance of Laurel Hill Cemetery. The permanent depot will probably be here, but temporary stables may be built at Broad street pending the completion of the road. Horses will be used at first, but more improved appliances are contemplated.

**Pittsburg, Pa.**

**PITTSBURG, ALLEGHENY & MANCHESTER PASS. RY.** increases from 261 horses to 278.

**PITTSBURG & WEST END PASS. RY. Co.** will lay about four miles of steel rail track this spring, in extensions. They have now 14 cars and 74 horses.

**FEDERAL ST. & PLEASANT VALLEY RY. Co.** increases to 6 miles, of 5 ft. 2½ in. gauge, 45 and 47 lb. rail, 22 cars, 168 horses.

**PEOPLE'S PARK PASS. RY. Co.** The only

change is an increase in horses from 75 to 80.

#### Plymouth, Mass.

PLYMOUTH & KINGSTON ST. RY. Co. No part of the road has been built, but it probably will be next year if electric motors are perfected. The grant of location expires in the fall, but it could be renewed.

#### Providence, R. I.

UNION R. R. Co. has now 277 cars, an increase of 47, and 1,400 horses, an increase of 100. They report 53.8 miles of track.

#### Port Huron, Mich.

PORT HURON ELECTRIC RY. Co., which we have not hitherto reported in full in our Directory, has 4½ miles of track, of 4 ft. 8½ in. gauge, 16 and 25 lb. rail, 8 cars, 4 motor cars. They are now building a 2-mile extension to Gratiot and Huronia Beach. William F. Botsford is President, John F. Talbot Vice President, J. H. Talbot Secretary and Manager, and Charles A. Ward Treasurer; and these gentlemen are the directors, with S. L. Ballentine.

#### Portland, O.

PORTLAND ST. RY. Co. Joseph Holladay is now President of this company.

#### Pueblo, Col.

PUEBLO ST. RY. Co. contemplate more track and cars, and report that their town is booming. They have now 5 miles, of 3 ft. gauge, 22 lb. iron rail, 8 cars and 28 horses. President, J. B. Osman; Vice President, J. K. Moore; Secretary and Superintendent, J. T. Clark; Treasurer, J. N. Carlisle.

#### Reading, Pa.

READING CITY PASS. RY. Co. increases its capital stock from \$50,000 to \$75,000, and will build large extensions this year.

PERKIOMEN AVE. PASS. RY. Co. reports 4½ miles of track, of 5 ft. 2½ in. gauge, 38 and 45 lb. rail, and increases the number of cars from 13 to 18, and of horses from 41 to 75.

#### Richmond, Ind.

RICHMOND CITY RY. Co. expect to build 2 miles of track this year and put on more cars. They have now 3 miles of 3 ft. track, 20 lb. rail, 13 cars, 30 horses. President, J. C. Shaffer; Vice President, D. F. Miller; Secretary, H. I. Miller.

#### Richmond, Va.

RICHMOND CITY RY. Co. will in the course of the next 30 days extend their present line to Reservoir Lake. Ties and rails are being put in place along Main and Mulberry streets. The work is under the supervision of Major Selden. The City Council recently saddled upon a franchise which they granted this company, a provision that the company should be taxed 2 per cent of its gross receipts.

RICHMOND UNION PASS. RY. Co. has received from the Council permission to run their line up Clay street. They are to pay in taxes 1 per cent of their gross receipts for the first five years and 2 per cent thereafter.

#### Roanoke, Va.

ROANOKE ST. RY. Co. has been chartered. Capital, \$100,000.

#### Rockford, Ill.

ROCKFORD ST. RY. Co. increases to 52

horses and 26 mules. H. H. Robinson is now Secretary.

#### Rock Island, Ill.

ROCK ISLAND & MILAN ST. RY. Co. reports 12 miles of track, of 4 ft. 8½ in. gauge, 20, 30 and 40 lb. rail, 8 passenger and 8 freight cars, 7 horses, 2 motors. Bailey Davenport is President and Superintendent, E. C. Hurst Secretary, and J. F. Robinson Treasurer.

#### Rome, N. Y.

ROME CITY ST. RY. Co. The new road is to be completed by July 1st. The John Stephenson Co. of New York is building the cars. The road is being equipped with the girder system of rails, made by the Johnson Steel Street Rail Co. Large and commodious stables will be built, with 500 feet of car sheds, hospital for horses, blacksmith shops, etc.

#### Rondout, N. Y.

KINGSTON CITY R. R. reports 2.777 miles of track. George Coykendall is General Manager; and the other officers are as we last reported them.

#### Rutland, Vt.

RUTLAND ST. RY. Co. John N. Woodfin, late Secretary of this company, has been elected a director and President in place of M. Quinn, resigned. George H. Cheney has been chosen Secretary.

#### Salem, Mass.

NAUMKEAG ST. RY. Co. has bought the Salem & Danvers road.

#### San Antonio, Tex.

PROSPECT ST. RY. Co., not hitherto reported in our Directory, has 1¼ miles of track, 1 car, 2 horses. President, Sam. Maverick; Vice President and General Manager, P. J. Moss; Secretary, Leonardo Garza; Treasurer, L. William Menger. This road is run simply for the benefit of Mr. Maverick's suburban property on Prospect Hill.

#### San Francisco, Cal.

POWELL ST. RY. Co. is to have a cable road, work on which is now in progress, and which will have 11 miles of track. Contracts have been let for the construction of a \$50,000 engine house at the corner of Mason and Washington streets. It will have three stories, the upper part being used for offices. The machinery will consist of two Corliss engines of the Reynolds type, 22 by 48, and the steam will be supplied by six tubular 16-foot boilers. The engines will be of about 1,200 horse power, and will move the cable both on Powell street and on the main road on Jackson and Washington streets at the rate of about eight miles an hour. The chimney will be 150 feet high. Experienced gripmen only will be employed, as their cable will pass under the cables of seven other lines. The Market street people have withdrawn their objections and will allow the Powell street line to run their tracks on the disputed blocks.

SUTTER ST. R. R. Co. will build an extension over Polk street and Pacific avenue to First avenue. Representatives of the company offered no opposition to an amendment to their franchise making it necessary for them to expend \$40,000 in the next six

months. They stated that this amount would be expended in a contract for rails immediately.

THE FRANCHISE asked for by J. B. Stetson, J. H. Goodman, Robert Walt and others from California street and First avenue to Sixth avenue, to Lake street, to Twenty-fourth avenue and to the beach, has been reported favorably to the Board of Supervisors. Mr. Stetson would not state what the route would be after it left the street, in order to get to the beach. The road has permission to use steam dummies for a term of ten years, but is restricted to the use of smokeless coal. The company is to expend \$25,000 in the first six months after receiving the franchise, the date for completion being two years.

CLAY ST. HILL R. R. Co. asks permission to lay a cable from Kearny, at the terminus of its present road, to East street, on Clay, and from Van Ness avenue to Gough street. Before the Board of Supervisors committee Thomas Magee opposed the granting of the franchise, as his road was to run over the same route on Clay street. His company desired a double track, but the other road would not listen to it, owing to the narrowness of Clay street. He intended to make good time—two-minute runs—and said his road would be a most useful one, owing to the variety of directions it pursued. Those he represented were constructing their road as rapidly as possible, and now the Clay-street people were desirous of building and getting in their way. He expressed the opinion that the statute of limitation should run against it, as during all the years the Clay street had been in existence it had made no effort to build from its termini. President Britton of the Clay-street road said his plan was to run a horse-car, but he would and could run a cable all the way to the ferry on a single track with a transfer at Kearny. If this were not permitted he asked that the company be allowed to follow the track of the other road.

OMNIBUS R. R. & CABLE Co. ask permission to construct a double line cable road along East street, from Market to Howard, and to build a turn table at the ferries adjoining the stand of the City Railroad Company.

#### Santa Barbara, Cal.

SANTA BARBARA ST. R. R. Co. reports 2¾ miles of track, 3 cars and 12 mules. They expect to extend their track 1 mile this year.

#### Savannah, Ga.

CITY & SUBURBAN R. R. reports 12½ miles steam line, 6 miles street line, 5 ft. gauge, 35, 38 and 42 lb. rail, 40 street cars, 12 steam cars, 130 horses, 3 engines. President, J. H. Johnston; Secretary, A. L. Hartridge; Treasurer, E. Schmidt.

#### Scranton, Pa.

THE SCRANTON SUBURBAN people have made the final payment to the Van Depoele Electric Co. for the electric plant just put in there, and from all we can learn we should judge they were enthusiastically pleased with the results of electricity.

#### Seattle, Wash. Ter.

SEATTLE ST. RY. Co. has 25 and 30 lb. T.

steel rail for 2½ miles and 35 lb. flat steel rail for 2 miles, 6 cars and 20 horses. Dexter Horton & Co. are Treasurers.

#### Sherman, Tex.

SHERMAN CITY R. R. Co. increases from 7 cars to 9, from 32 mules to 54, and has added ¾ mile track, making 4 miles. President Batsell expects to put down about a mile of additional track this spring, and reports that Sherman is on quite a boom.

#### Sioux Falls, Dak.

SIoux FALLS ST. R. R. Co. A special session of the City Council was held March 24 to entertain two propositions for building a street railway line in Sioux Falls. A charter was given by a unanimous vote of the council to L. F. Pettigrew, representing the above company, for 20 years. The company consists of L. F. Pettigrew, L. L. Dunning and S. L. Tate, of Sioux Falls; James Creighton, of Chicago, and Elnathan Sawtelle, of Evansville, Wis. Capital stock, \$150,000. The company is placed under \$5,000 bonds to have two miles of road equipped and running by the 1st of November and to build a mile each year for five years thereafter.

#### South Bend, Ind.

So. BEND ST. RY. has now 56 horses. Lucius Clark is Treasurer and General Manager.

#### South Chicago, Ill.

So. CHICAGO CITY RY. Co. has 6 miles of track, of which 3 miles are laid with 40 lb. Johnson girder rail, 1½ miles with 35 lb. tram rail, and ½ mile with T rail. They have 7 cars and 30 horses. President, Douglass S. Taylor; Secretary and Superintendent, Andrew Krimbill. They are now laying a mile of double track on Ninety-second street and Commercial avenue, using Johnson rail.

#### Springfield, Ill.

CITIZENS' ST. R. R. Co. report 8½ miles of 3 ft. 6 in. track, 20 and 36 lb. rail, 31 cars, 100 mules. President, J. H. Schuck; Secretary, Charles Herrman; Treasurer, Frank Reisch.

#### Springfield, Mass.

SPRINGFIELD ST. RY. Co. will build about 4 miles of track this season, having ordered 230 tons of Worcester steel rail, 130,000 ft. of kyanized spruce and 250 cars of cobble stone. They will carry about 200 horses and 46 cars. The new cars are being built by J. M. Jones' Sons and equipped with the Bemis improved gear. They report at present 40 cars and 162 horses.

#### St. Catharine's, Ont.

ST. CATHARINE'S, MERRITTON & THOROLD ST. RY. Co. write us that they intend to substitute electricity for horses as a motive power.

#### St. John, N. B.

ST. JOHN ST. RY. Co. John F. Zebly, of John F. Zebly & Co., Room 39, Drexel Building, New York, is Treasurer of this company.

#### St. Joseph, Mo.

UNION RY. Co. will lay 125 tons new rail and equip 1 mile of track in the suburbs with the Sprague electric system, using overhead wire.

#### Stoneham, Mass.

STONEHAM ST. R. R. Co.'s stock has been bought by a syndicate, consisting in part of capitalists in Lynn, and it is proposed to extend the track through Melrose, Malden and Saugus to Lynn. This would give a total of 15 miles or more of track. The business relations between these towns are close, Stoneham being largely engaged in tanning and Lynn in shoe manufacturing. It is also in contemplation to extend a spur track from near Lynn or Saugus direct to Revere Beach, in which case a bountiful patronage during the summer season would be assured. Later advices state that the extension to the beach, 7 miles, is decided upon, and that dummy engines will probably be used.

#### St. Louis, Mo.

JEFFERSON AVE. RY. Co., of which P. C. Maffitt is President, Wm. D. Henry Secretary and John Scullin Manager, reports 5 miles of 4 ft. 9 in. track, 56 lb. rail, 21 cars. These statistics have not hitherto been reported in our Directory.

MISSOURI R. R. Co., not hitherto reported in full, has 11½ miles of track, of 4 ft. 10 in. gauge, 44 lb. rail, 50 cars, 488 horses. P. C. Maffitt is President and William D. Henry Secretary.

BADEN & ST. LOUIS R. R. Co. increases to 10 cars and 23 horses.

THE ST. LOUIS CAR Co. is a newly organized company for building street cars. Their officers are: President, William Lefmann; Secretary and Treasurer, Julius Lefmann; Manager, P. M. Kling.

#### St. Paul, Minn.

ST. PAUL CITY RY. Co. write us that they will build 1½ to 2 miles cable this year. Since their last report they have increased from 37 miles to 52, from 82 cars to 128, and from 600 horses to 650. The City Council has ordered the building of an additional mile of track from the present terminus on Ramsey street to Oakland, thence on Oakland to Grand avenue, and on Grand to Dale street; and it is likely that a line will be built from East Seventh street to Bradley, north to Bedford, thence to Decatur, and Payne avenue to Sims street.

#### Terre Haute, Ind.

TERRE HAUTE ST. RY. Co. increases to 6 miles of track, of 4 ft. 8½ in. gauge, 38 lb. rail, 16 cars, 8 horses and 76 mules. Jos. Collett is President, C. W. Mimshal Vice President, J. R. Paddock Secretary, W. R. McKeen Treasurer and Joseph G. Elder Superintendent.

#### Tuscaloosa, Ala.

TUSCALOOSA & CASTLE HILL REAL ESTATE & MFG. Co. will build a dummy line to their pleasure resort at the lake in the suburbs. W. W. Hill is General Manager.

#### Waco, Tex.

WACO ST. RY. Co. will extend their line.

#### Waterloo, N. Y.

SENECA FALLS & WATERLOO R. R. Co. reports 5 miles of track, of 4 ft. 8½ in. gauge, 40 lb. rail, 5 cars, 2 dummies. The officers are: President, S. R. Welles; Vice President, A. H. Terwilliger; Secretary

and Treasurer, A. G. Mercer; Superintendent, Albert Jewett.

#### Watertown, Dak.

THE CITY COUNCIL has given Charles Joscelyne a very liberal franchise, allowing him to construct a street railway, using any streets in the city, provided he shall construct and operate in connection with such street railway a motor line, connecting the city of Watertown with Lake Kampeska, and shall commence the work of constructing the motor line within sixty days. At least one mile of the street railway must be in operation before May 1, 1888. Either horse, steam or electric motors may be used.

#### Westport, Conn.

WESTPORT & SAUGATUCK HORSE R. R. Co. will add 1 new car and are relaying part of their track. They report 6 horses.

#### Wichita, Kan.

WICHITA CITY RY. Co. A new organization bought out the old company, whose capital was \$25,000, and they will increase to \$1,000,000 capital. They have now 18 miles completed and in operation, and will build 10 miles more. Gauge, 3 ft. 6 in.; rail, 20 and 25 lbs. to the yard; 50 cars; 300 horses and mules. President, G. L. Rouse; Vice President, B. H. Campbell; Secretary and Manager, G. M. Dickson; Treasurer, J. O. Davidson.

THE WICHITA CONSTRUCTION & SUPPLY Co. has commenced business here. J. W. Hartzell, formerly of Rock Island, Ill., is managing the business, which includes the construction of cable, dummy and street railways and the supplying of miscellaneous merchandise. This latter department is a branch of Rufus Martin & Co. of New York.

#### Wilmington, N. C.

WILMINGTON ST. RY. Co., the new company to which we referred last month, propose to lay about five miles of track, and construction will begin as soon as the iron rails are received. The route selected, say from Oakdale cemetery as an objective point, is along Miller and Campbell streets to Fourth, along Fourth from Swann to Red Cross, on Front from Red Cross to Castle, on Castle from Front to Seventh, on Seventh from Castle to Campbell, and on Market from Front to Seventh.

#### Yankton, Dak.

THE CITY COUNCIL has granted a street railway franchise to Sioux City and Yankton parties, stipulating that two miles of the road shall be constructed and in operation within six months.

#### York, Pa.

YORK ST. RY. Co. began running Sept. 30 on 1½ miles completed road. Extensions will be commenced this season, and the length of track when completed will be 4 miles. The authorized capital is \$50,000, but not all of this has been subscribed. The gauge is 4 ft. 8½ in., 38 lb. rail. They have 6 cars, which they expect to increase to 10, and 11 horses, which will be increased to 30. W. H. Lanus is President, D. K. Trimmer Secretary, and C. S. Weiser Treasurer.



## Notes and Items.

Received too late for classification.

**Brooklyn, N. Y.**

THE LEWIS & FOWLER MANUFACTURING Co. are busy in nearly all departments of their extensive business, especially in the manufacture of alarm registers and track castings.

THE BROOKLYN RAILWAY SUPPLY Co. are making up a stock of different sizes rattan brooms for stable, track and street use, importing their own materials. Being outside all combinations they are able to offer first-class goods at low rates.

**Buffalo, N. Y.**

BUFFALO ST. RY. Co. have given an order for 12 new cars, 6 to be built by Jones and 6 by the J. G. Brill Company.

**Chicago, Ill.**

THE PULLMAN Co. are building for the St. Louis Cable & Western Street Railway 3 grip cars, 10 closed cars, each 33 feet long, and 12 open cars of the same length, mounted on the Diamond truck, a design specially adapted to cable roads. For the Cream City road of Milwaukee they are building several open cars. They furnish the Lima (O.) road with closed cars to be run by the Van Depoele electric system. Some very handsome closed cars are building for Middletown, O. Have recently shipped 10 cars for Rochester City & Brighton Railway, Rochester, N. Y. At the Detroit shops they are building cars for the Highland Park Railway.

THE VAN DEPOELE Co. report the electric railway business as increasing rapidly. The large plant at Montgomery, Ala., is nearly completed, and work is being pushed forward on the equipment of the roads at Lima, O., and Binghamton, N. Y. Contracts have been taken for the equipment of four roads in the vicinity of New York and two at the South.

**OUR CHICAGO LETTER.**

This portion of the street railway world wags much as usual. It is true, at least so our city papers have it, and Superintendent Cregier says that newspapers sometimes know more about such things than other people, that some \$1,000,000 or \$1,500,000 of the Chicago Passenger Railway Co.'s stock has been transferred (for safe keeping, I suppose) to the West Division Co.; and the North Chicago cable road is being pushed to completion in spite of Mr. Storey's attempted injunction; and one or two electricians have solved the question of motive power by coming forward with new motors; and some minor things have occurred. Yet we have nothing approaching a sensation to chronicle, such for instance as there would be were we able to announce that there was an L road constructing or something of that sort.

**EXTENSIONS AND IMPROVEMENTS.**

Street railway men, however, are busy—yes—quite so. The North Chicago cable road is being pushed as fast as possible, but it is wholly uncertain how soon it will be completed.

The West Division Co. will shortly connect the north and south city limits, build-

ing some five miles of new track. New cars are being added as fast as their extensive shops will turn them out. By the recent transfer of stock this company will virtually control the Chicago Passenger Railway Co., though it is understood that each company will retain its individual organization.

The City Railway Co. have commenced operations on the Hyde Park cable extension, and will push the work right along. Mr. Windsor, the genial Secretary, has just completed the publication of a neat little book in pamphlet form, descriptive of the cable system as operated by this pioneer projector of cable roads in Chicago. It is called "Souvenir," and is to be had free at the office of the company.

**ELECTRIC MATTERS.**

The Van Depoele Co. are busy night and day turning out apparatus to equip their many roads now under construction. The road at Scranton, after being thoroughly tested, has been accepted, and its practicability fully indorsed. They expect to have the Binghamton road in operation May 1st. An office is to be opened in New York soon, on account of the increase of business.

By invitation your correspondent was present and witnessed the successful running and lighting of the experimental car near the lake front of the Bidwell electric system. Mr. Bidwell is confident that he has the problem in his grasp, and informs me that contracts have been made to build at least two plants, one of which is in a city of some 40,000 people, all of which is an argument in his favor.

Mr. Bain has a new electric motor which he guarantees to run a street car and—well, more anon.

So on the whole, you see, Chicago is not far behind in the matter of electric motive power.

The Pullman Co. are very busy designing new patterns for cars and filling orders in all parts of the country—St. Louis, Milwaukee, Ohio, Rochester, N. Y., for both their open and closed cars, which I am told are of very handsome design, more of which I expect to have to say in the future. P.

**Columbia, S. C.**

COLUMBIA ST. RY. E. M. Cole is now President, Edward Benedict Secretary, and W. de L. Benedict Treasurer, all of 32 Liberty street, New York.

**Milwaukee, Wis.**

THE WEST SIDE road has adopted the Small automatic fare collector.

**Minneapolis, Minn.**

THE MINNEAPOLIS ST. RY. Co. has bought the motor line to the lakes.

**New Orleans, La.**

ST. CHARLES ST. R. R. Co. has now 260 mules.

**Newton, Kan.**

NEWTON CITY ST. RY. Co. will be 5 miles long, of 3 ft. 6 in. gauge, 20 lb. steel rail, 8 cars, horses or mules. Capital stock, \$60,000. Work is to be commenced at once, and 3 miles will be completed and opened as soon as men can do the work. Cars and ties are now on the ground, and 5 cars of rails have been shipped.

**New York, N. Y.**

NEW YORK & HARLEM R. R. Co. Charles Reed is now Purchasing Agent.

CHARLES D. HAINES reports having secured several new franchises recently.

THIRD AVE. R. R. Co. increases from 2,100 horses to 2,190 since its last report to us.

THE SALE OF FRANCHISES for the line connecting the down-town ferries and for the Twenty-eighth street cross-town line will take place April 28.

EIGHTH AVE. R. R. Co. Gross earnings for the quarter ended March 31 were \$143,723, against \$158,986 for the same time last year; but the net income increased from \$6,863 to \$11,902.

NINTH AVE. R. R. Co. Gross earnings for the quarter ended March 31 were \$44,013, against \$47,586 for the same time last year; and the net income shows a deficiency of \$2,784, against \$5,273.

**Paris, Tex.**

PARIS RY. Co. are prepared to buy iron for 1½ miles of extension this spring.

**Rochester, N. Y.**

THE ROCHESTER CITY & BRIGHTON road has adopted the Small automatic fare collector. Ten 16-foot cars building for the road by the Pullman company are to be fitted with the automatic collector, and the Lewis & Fowler alarm register.

**St. Louis, Mo.****OUR ST. LOUIS LETTER.**

Cable and electric matters continue to monopolize the attention of street railway men. The most important news is that Julius Walsh has closed a contract for the California cable system for his Citizens line. The Cambria Iron Co., through Meysenburg and Soderer, have secured the contract to furnish the rails (the Johnston rail), and a St. Louis company, I understand, are to furnish the castings. The work will begin immediately.

President Maxon, of the Lindell Railway Co., has not been able to try the Julien motor yet, but will probably do so next week.

Mr. P. C. Maffitt is now East looking into the merits of the Main River and Rail Electric Motor Co., a Washington concern which seems to be full of promise; but, unless something tangible is developed by the first of next month, Mr. Maffitt will lay down a cable.

Mr. Terry, the inventor of the Terry grip and surface cable system, has laid a section of about 600 feet, on and over which a car has been operated. The cable runs just over the ties, and seems to work very well. Mr. Terry says the system will cost only \$25,000 a mile. It is very simple and looks as if it would be durable. The car was stopped on a curve, and started up again without any difficulty. I see no reason why a shallow conduit of this kind, when properly built, should not work.

April 16.

ST. LOUIS.

**San Antonio, Tex.**

SAN ANTONIO ST. RY. Co. reports 40 cars and 150 mules, otherwise no change.

**Sioux City, Ia.**

ST. LOUIS ST. RY. Co. increases to 8 miles of track, 16 cars and 125 mules.

San Francisco, Cal.

SUTTER ST. R. R. Co. since its last report to us has constructed six-tenths of a mile of road (single track) of the cable system. It is of the most substantial character, of iron and Portland cement, no wood whatever being used, and it has cost at the rate of \$100,000 per mile of double track. They have added one pair of engines to their plant, cylinders 20 in. by 48 in. stroke, and expansion cylinder 36 in. by 48 in. stroke. They will build in the near future about two miles of double track cable road to complete the general system, the franchise having just been granted. It will cost about \$100,000 per mile of double track. The company has now 12.3 miles of track, 50 cars and 185 horses.

CORRESPONDENCE.

Street Railway Fares of New York.

In our last issue we published a number of letters from officials of street railway companies of New York City in regard to the history of their rates of fares. We received too late for insertion the following letter from the Third Avenue Railroad Co.:

EDITOR STREET RAILWAY JOURNAL:—

In reply to your enquiry would say that the fare on this road from the commencement to 1878 was 5 cents to Sixty-fifth street and 6 cents for through passengers. Since that time the uniform rate of 5 cents has been adopted.

ALFRED LAZARUS, Sec.

Calculation of Running Time.

EDITOR STREET RAILWAY JOURNAL:—

In reply to the inquiry of "R. A. C.," will say that calculating the running time at 7 miles per hour, (time allowed by law) the distance from center to center of turnout would be 1,540 ft. Figuring by this rule, which will come out right at any rate of speed or headway,

5,280 ft.	1 mile.
7	7 miles.
60)36,960	in hours.
616	in 1 minute.
5	in 5 minutes.
2)3,080	
1,540	2½ minutes.

C.

Windsor Electric Street Railway Co.

EDITOR STREET RAILWAY JOURNAL:—

Yours of 8th duly received, and I have not replied before owing to want of time. We are receiving so many letters of inquiry in regard to electric railways that there must be a great deal of interest all over the country, if other roads are written to as much as we are.

The Windsor Railway was built by Mr. J. W. Tringham last spring. Mr. Tringham recently died, and the road has just passed into our hands. The part of the road constructed extends up the river to Walkerville, a distance of 1½ miles.

We have only one motor, which is put

upon the passenger car, and connected with the axles of the car by chain belts. This motor is of sufficient power to haul an additional car, so that we run a train of two cars, leaving each end of the road every half hour.

The track was laid with common iron strap rail upon stringers, and was very rudely constructed, the whole plant costing only about \$8,000. We are preparing to relay the track with T rail and put on another train, and also extend the line, increasing the length of track largely, and also put in our power station. We are at present renting power from the Electric Light Co., paying \$4.00 per day for it. The car has been running since the spring of 1886, and very successfully.

The dynamo requires but little attention, in fact the road is a perfect success. I don't know the cost of running street cars, but should judge electricity is much cheaper. I have the utmost confidence in the Van Depoele Electric Railway system, and know that the roads are running and giving good satisfaction here, at Detroit, and Port Huron, and every one has confidence in them. Mr. Van Depoele (the inventor of the system we use) formerly resided in Detroit, and was experimenting in electric railways here as early as 1878, and stands high as an electrician and inventor in this community. I will be pleased to answer any further communication, you specifying what points you wish information on.

W. M. BOOMER,  
Pres. Windsor Electric Ry. Co.

New Publications.

ELECTRIC RAILWAYS, by Robert Luce, A. M. Boston: W. I. Harris & Co. 106 pages. Price 50 cents, paper.

The book gives a resume of the progress of electric transmission of power from its earliest stages, with definitions of electric terms, and devotes considerable attention to the theories and operations of electric motors and the history of early transmission.

There is a chapter upon electric railways abroad and the use of storage batteries. Speaking of and comparing electric railways with horse flesh, the author says that besides the saving in first cost and running expenses, electricity will have other important advantages over horse flesh. With the electric motor there are no horses' hoofs to keep wearing out the road. If the motor is in or under a car, there is as much more room in the street as horses would have taken up, and so the chances for blockades are lessened. Electric cars can be joined in trains where desirable, but horse cars must run singly. Electric cars can be reversed and can run backward as easily as forward, often a most desirable thing in crowded streets. On open stretches where there are no houses and but little travel the electric car can make much faster time than the poor car horse can ever make. With the simple electric brake the greater part of the manual work of running a street car is done away with. Noiseless, clean,

cheap, and safe, what better motive power can be asked for on street railways?

The writer then goes on to make a comparison between the actual expenditure for equipping the road with electric cars and horses, as well as the running expenses. In the estimates he states that the equipment of a road to run 50 cars by electricity against one to run by horses would be as \$62,000 against \$50,000, in addition to the regular car equipment, and that the expense of running per day would be as \$49 against \$286.87. The writer then makes a comparison between electric and cable roads, and gives a short sketch of one or two single elevated track roads, and concludes by a direct advocacy in favor of electric motors.

ELECTRIC MOTOR AND ITS APPLICATIONS. By Thomas Comerford Martin and Joseph Wetzler. New York: W. J. Johnson, 1887. 208 p. Price, \$3.00, cloth.

The authors have taken a great deal of pains in compiling interesting and valuable data in regard to the work which has been done heretofore, and which is now being done in the matter of the use of electricity as applied to motive powers, and paying more particular attention to those motors which are especially intended for street railway cars. It is for this reason that the book will be especially interesting to our readers. Starting with the first chapter, which they are pleased to call Elementary Considerations, they give a short resume of the early experiments which were made, by which it was demonstrated that electricity, or magnetism, could be used for producing motion, and these experiments show that a certain amount of power could be developed by magnetism which was employed. Passing then to the early motor systems which were experimented upon in Europe, they show various devices and then come to those which were first designed in this country. All of these early motors, or as they might properly be called "experimental apparatus," are thoroughly illustrated and will be interesting, not only to the electrician who wishes to know what has been done, but to the layman who regards the matter as one of pure curiosity.

The Page motor was one of the earliest, if not the earliest, to be applied to the propulsion of a car, and in 1851 a trial trip was made with this electro-magnetic locomotive on the tracks of the Baltimore & Washington R. R., using a locomotive of 32 horse power and employing a hundred cells of Grove electric battery. Another one was experimented upon the same year by Mr. Hall of Boston, and a small locomotive with a car capable of carrying two passengers was exhibited at the Charitable Mechanics' Fair at Boston. From these small beginnings and with the expensive apparatus which was employed as motive power the authors carry us on through the various developments where the motor was used for driving fans and doing such light work, coming down to the present more perfect systems of adapting the electricity as developed from the steam engine by means of our modern dynamos to the va-

rious commercial usages to which it is now put. After this first resume of what had been done in the early days of electrical experiments, the authors give us a digest of the principal features of most, if not all of the various electrical systems which are now put upon the market, and for which commercial advantages are claimed.

The book is written in what would be called the style of popular science. It is not filled with complicated mathematical calculations which are designed more to confuse the novice than to convey any idea what they mean, but it is written in an earnest, straightforward manner, showing in plain language what can be done and what is claimed for the various systems represented. It cannot fail to be an interesting guide book for all street railroad men who care to investigate electrical propulsion for their cars, and is certainly a most valuable addition to electrical and street railway literature.

### Horse Power on T and Grooved Rails.

BY F. SERAFON.

On a road laid with T rails that are well put down, the traction that is required to haul a ton on a straight and level track is usually put at 11 lbs. On a road that is laid with grooved rails, on the other hand, it is considered that they are covered, to a greater or less extent, with gravel and dirt, so that the traction is put at about 15 lbs. to the ton. Then, other things being equal, whether the rails that are employed are of the T or grooved pattern, it is estimated that for all inclinations of one in a thousand an addition must be made to the traction of about two pounds.

In order to calculate the traction that will be required to haul a ton up a grade it will therefore be necessary to add to the 11 or 15 lbs., according to the rail, twice as many pounds as the grade is represented by one in one thousand. Upon a road having, for example, a grade of 22 in 1,000 the tractive effort required to ascend this grade will be 11 + 44 lbs., or 55 lbs. These figures afford an opportunity of judging of the expense attending grades on a street railway.

The strength of a horse varies, too, according to the method of his action. According to Poncelet and Coriolis, a horse attached to a carriage, and going at a walk, exerts an effort of 140 lbs. which is available as traction. This is at a speed of two miles an hour. In working ten hours per day the animal will pass over twenty miles. According to Delauney, a good horse working upon the road for six days out of the week and which travels about eighteen miles per day and at a speed of two miles an hour, can exert a tractive effort of 100 lbs.

Then as we assign to a horse the capacity of exerting an effort of 100 or 150 lbs., we find that he can haul upon a straight and level track at a walk  $7\frac{1}{2}$  or  $10\frac{1}{2}$  tons.

A horse attached to a carriage and moving at a trot at the rate of five miles an hour, can keep up a continued effort of 70

lbs., and can continue this effort for 4 $\frac{1}{2}$  hours. These figures are according to the tables on animal motors that have been drawn up by Poncelet and Coriolis. In actual practice, however, when a horse is drawing a vehicle upon a road or upon a railway track the results do not come up to these figures. The promoters of the tramway systems in England admit that a good strong horse traveling twenty miles per day upon the macadamized roads can haul one and three-quarter tons at a speed of three miles per hour.

On French roads the figures of 1 $\frac{1}{2}$  tons were all reduced to about 1 $\frac{1}{3}$  tons. It is upon this basis that the large carriers calculated the expense of transportation of merchandise. For passenger service, the owners of the English coaches consider that a load of 1,500 lbs. can be drawn by a horse traveling from six to eight miles an hour, and the French managers of the same class of lines run this load up to a ton on good highways. The figures adopted by these carriers for the work of a horse on a trot are deduced from practical experience, which can also be applied to tramways, as we shall see farther on.

In the public service in large cities the amount of work obtained from a horse is greater than that upon a country highway. This is due to a diminution in speed and a better condition of the roads upon which they travel. In London the omnibuses usually weigh about 7,500 lbs., with 26 passengers, the conductor and driver. This gives each horse a load of 3,750 lbs. The speed is from 5 to 6 $\frac{1}{2}$  miles per hour, and the horses travel about 13 miles a day. The Parisian omnibuses of the old model hold 28 passengers, and weigh, when loaded, about 8,000 pounds. This gives to each horse a load of 4,000 lbs. The speed is about four miles an hour, and the distance traveled by the horses per day is put at from 10 to 11 miles.

Upon the tramway running into the Place de la Concorde, the omnibuses weigh, when loaded, about 14,800 lbs. This gives each of the three horses attached to the car a load of 4,933 lbs. From the Reuil Station to Reuil City line, the tramway cars from Port Marly weigh, when loaded, about 7,000 lbs., and are drawn by one horse. The length of the route, however, is only about half a mile. From Reuil Station to Port Marly, the omnibus which is drawn by two horses weighs, when loaded, 13,000 lbs., or 6,500 lbs. per horse. Upon the lines we have just cited the speed is about eight miles an hour.

The English, in calculating the expenses of exploitation of tramways in cities, consider that a horse can draw three times as heavy a load upon the grooved rails as it can upon the ordinary road. In accepting the figures of one ton as adopted by the carriers we find that a weight of three tons can be drawn by a horse upon a tramway at a speed of eight miles an hour.

These figures are taken from the results of the exploitation of the London tramways, and also of what has been found to be true upon the Reuil and Port Marly line.

When grades do not exceed a length of 150 feet, a slight urging of the horses suffices to keep them up to speed over this grade without any sensible falling off, but this can be kept up for no great length of time. It is necessary to either go on a walk or supply tow horses. Upon the line running from the Place de la Concorde to Rond Point de Boulogne a short grade of 22 in 1,000 presents a tractive resistance four times that which is met upon a level track. The three horses which are harnessed to a car with 52 seats will haul it up this grade at a walk without outside assistance. The same thing is done on a grade of four in a hundred, which is upon the Versailles line that was built by Gibiat & Co.

### Comparison of Electric and Cable Tramways.

In a recent lecture before the Electrical Section of the American Institute of New York, Mr. Thomas Whiteside Rae, after a resume of the early history of dynamos, made the following comparison between the efficiency of the cable and electricity for street railway traction:—

“I call to mind a modern cable road, not very remote, running 30 cars, 15 each way, thereby neutralizing the effect of gradient, which may be reckoned as the total efficiency of 97 tons moved 572 feet per minute, or requiring 45 horse power for traction. The conduit necessitates nearly double the excavation of that required for the electric, and its cable, which must be renewed every eighteen months, could be replaced by an imperishable electrical conductor equal to the same work at less than one-third the present cost. When it is also considered that of the total power of the stationary plant, 84 per cent is consumed in dragging the cable and only 16 per cent in moving the cars, whereas with an electric installation 70 per cent of the total power is available for propulsion, it requires no conjurer to detect that this difference in efficiency must determine the relative sizes and therefore the costs of the said stationary plants. How, in view of this showing, any sane man can advocate the system of cable traction, seems incredible, but there are those who will not be persuaded though one rose from the dead.

“There is something unaccountable to an inexperienced witness in the electrical propulsion of many trains on the same line of rails, and especially when it is not in one direction. There is a certain mysterious aspect in the approaching and receding of two motors on the same track and actuated by the same current, that hardly disappears even when comprehended. An impression is not uncommon that the entire current ought to make circuit through the motor nearest to the dynamo generator, and while influencing that one, leave the others outside the circuit and inert. Analogy often affords the best explanation, and a simple one is to look upon the generating dynamo as an air-pump, and the conductor and track rails as hollow pipes closed at the remote ends. Let the air-

pump be supposed to abstract air from the track rails and to force it into the conductor, thus creating a vacuum in the former and a plenum in the latter. Let it be further assumed that the vehicle running upon this track has the power of tapping it, so to speak, and that the compressed air rushes from the plenum to the vacuum through certain motive gear attached to the vehicle, and in quantity and direction regulated on board of it backward or forward at will of the driver. Each vehicle has the ability to take all the air it needs for any possible speed or load and pass it through its motive gear in any desired direction. If the pipes are large enough and the plenum and vacuum sufficient in degree, each vehicle on the track is at equal advantage. There is no flaw whatever in this analogy, and it may serve to elucidate other obscure features of the subject."

**The Street Railway Patron.**

BY A. M. LANG, TOLEDO.\*

I recall a story heard many years ago, of a sailor, who, after violent theological struggles, decided that among all religious denominations he preferred the Episcopal, for the reason that in all others you had to "take all the jaw, while in the Episcopal you could jaw back."

As a rule the street railway companies are compelled to take all the "jaw," and since it is the prerogative of the street railway patron to comment, criticize, suggest, complain, object, and, if possible, to thwart every move of the company, it would seem that for once we might be permitted to talk back.

The disinterested patron, who is satisfied with the working of the road, has not yet been heard from, nor the man who does not know just how the road should be run to benefit the public, instead of a "grasping monopoly." On the contrary, it would seem that when a man puts his fare into the box he considers himself to be presenting it to the company, who are in existence for no purpose but to get all out of him they can. Another interesting trait of the patron, is his versatile readiness at all times either to defend or to thrash the employees of the company.

He appears in many guises, but discernible through them all, like the ever-recurring theme of an opera, is manifest his character as benefactor. But whether he comes to us as the passenger of many transfers, the lady with innumerable bundles who finds herself on the wrong car, the little maid from school, or the portly alderman, to whose vote we are not indifferent, we cannot do without him. We may meet together each year, and discuss the best method of track construction, the latest approved motive power, and many other practical subjects upon which we may widely differ, but upon this one point there is no chance for argument.

Notwithstanding, however, the uncharitable things which we may say of the

street railway patron, he is often entitled to greater consideration than he receives at our hands. Our patrons are divided into two classes: those who become such of necessity, and those who ride for pleasure or convenience. We give to all the same invitation, but we do not fulfill our highest duty, unless we give to all the best facilities we can afford, viz: speedy transit and clean and comfortable cars. Poor track, irregularly laid switches, and cheap horses are inconsistent with speedy or proper transit; unclean, ill-ventilated, hard seated, poorly lighted and unpainted cars are incompatible with comfort. All these we promise to our patrons, and if not given to them, have they not just cause to complain? If we do not expect to give the public a properly constructed and equipped road, then it should not be built. Once built, no effort should be spared to fulfill all our promises, and meet the expectations of the public.

The vexatious labor, however, is constantly varied by most amusing experiences. Many incidents of the facetious column of the newspaper relate to street railway patrons. Probably many here present could entertain us for hours detailing occurrences which have never been made public.

Not long since a lady, after paying her fare, told the driver that she wanted to leave the car at a certain street where she had an errand to do. She assured him that she would take the next car that passed, and asked if she need then to pay a second fare. He informed her that she would. "But," she argued, "it is only a little errand. I can do it in a moment." As he insisted that she must pay her fare a second time, she concluded to continue on down town without stopping.

Another lady entered a car, and walking up to the box, deposited four cents, and took her seat. The driver opened the door and remarked, "One cent more, ma'am." "That is all I have less than a dollar," remarked the lady. "I can change it for you," responded the driver. "Why, certainly," she said, rising and handing him the dollar, "but I didn't suppose you would care to go to all that trouble just for one cent."

Street railway management affords infinite scope for the display and for the study of human nature. Is it any wonder, then, that our patrons are so dear to us? In the language of Captain Cuttle, "The bearings of this observation lays in the application on it."

**Claims for the Fairchild Cable System.**

The advantages claimed for the Twin Cable System over the "grip systems" are:—

1. Only a shallow conduit is required, so the first cost for the street structure is only about one-fourth that of other systems.

2. As there is no extra wear on the cables in starting, stopping or slowing up, engineers are of the opinion that the cables will last three or four years.

3. The speed of the cars is entirely under control of the brakemen, and can be reduced on the curves and grades to any desired speed, or made to travel twice as fast as the cable on the straight track and moderate grades. By this means each car can be kept on schedule time independent of the others.

4. Vacuum brakes can be used on all the cars, and a slot brake is provided to hold the car on steep grades.

5. The cost of maintenance can be reduced to the ordinary and usual depreciation in machinery due to wear and tear, without special destruction to any one of its parts.

6. The conduit is so shallow that there is no danger of the slot closing by frost pressure.

The three Boston companies which it is reported are about to consolidate—the Metropolitan, South Boston, and Cambridge—have 1,141 cars and 5,941 horses. Hitherto the largest company in the country, in respect to stock and equipment, has been the Chicago West Division Railway Co., with 688 cars and 3,825 horses.

**Quarterly Reports.**

DRY DOCK, EAST BROADWAY & BATTERY.  
For the quarters ended March 31:

	1886.	1887.
Gross earnings.....	\$187,513.57	\$195,279.59
Operating expenses.....	135,317.65	150,457.16
Net earnings.....	52,195.92	44,822.43
Income from other sources..	3,476.25	2,040.87
Gross income.....	55,662.17	46,863.30
Interest on funded debt.....	1886.	1887.
Interest on ctfs indebted's..	\$14,700.00	\$14,700.00
Taxes on property.....	14,000.00	18,000.00
Taxes on earnings.....	6,771.92	5,376.48
Rentals.....	3,576.92	4,303.46
	1,739.85	1,176.00
Total.....	\$44,788.69	\$43,557.94
Gross income.....	55,662.17	46,863.30
Charges.....	44,788.69	43,557.94
Net income.....	10,873.48	3,305.35
Operating cost, 1886, 77.68 per cent; 1887, 82 per cent of earnings.		

GENERAL BALANCE SHEET—ASSETS.

Cost of road and equipment.....	\$3,098,432.67
U. S. Gov't bonds and premiums.....	75,950.00
Supplies on hand.....	61,450.00
Cash on hand.....	50,161.94
Total.....	\$3,386,094.71

LIABILITIES.

Capital stock.....	\$1,200,000.00
Certificates of indebtedness.....	1,200,000.00
Funded debt.....	840,000.00
Loans and bills payable.....	90,000.00
Interest on funded debt due and acc'd..	19,600.00
Interest on ctfs. of indebtedness.....	12,000.00
Profit and loss (surplus).....	24,494.71
Total.....	\$2,386,094.71

BROOKLYN CITY (QUARTER ENDED MARCH 31.)

	1886.	1887.
Gross earnings.....	\$506,332.12	\$534,653.19
Operating expenses.....	432,130.95	452,611.32
Net earnings.....	74,251.17	81,991.87
Income from other sources..	1,652.22	1,530.50

Gross income.....	75,903.39	83,622.37
Charges:	1886.	1887.
Interest on funded debt....	\$10,000.00	\$10,000.00
Taxes on property.....	19,099.02	15,881.67
Taxes on earnings.....	4,625.00	4,013.13
Interest on floating debt....	6,985.59	8,450.00
Total.....	\$40,709.61	\$38,344.80
Gross income.....	\$75,903.39	\$83,622.37
Charges.....	40,709.61	38,344.80
Net income.....	\$35,193.78	\$45,177.57

GENERAL BALANCE SHEET—ASSETS.

Cost of road and equipment.....	\$4,035,163.26
Supplies on hand.....	65,852.95
Cash on hand.....	74,532.57
Total.....	\$4,175,548.78

\* Paper read before the Ohio State Tramway Association.

LIABILITIES. Capital stock \$2,000,000.00, Funded debt 800,000.00, Loans and bills payable 799,400.00, Interest on debts, accrued 18,450.00, Profit and loss (surplus) 567,748.78.

CONEY ISLAND & BROOKLYN (QUARTER ENDED MARCH 31) 1886. Gross earnings \$43,465.23, Operating expenses 39,193.31, Net earnings 4,271.92, Income from other sources 100.00, Gross income \$4,371.92, Charges: Interest on funded debt \$4,215.00, Taxes on property 1,733.46, Taxes on earnings 310.33, Rentals 67.78, Total \$6,326.57, Gross income \$4,371.92, Charges 6,326.57, Net income \$235.01, Deficiency \$1,954.67.

GENERAL BALANCE SHEET—ASSETS. Cost of road and equipment \$843,942.42, Supplies on hand 17,882.46, Due by companies and individuals 7,427.70, Cash on hand 908.35, Excess of annuals paid over apportion 3,817.67, Total \$874,008.60.

LIABILITIES. Capital stock \$500,000.00, Funded debt 306,000.00, Loans and bills payable 5,000.00, Interest on funded debt due and accrued 37.00, Due for wages and supplies 14,472.75, Profit and loss (surplus) 44,285.85, Total \$894,008.60.

Recent Patents.

ISSUED MARCH 22. Car brake and starter. No. 359,880. T. Miller, Jersey City, N. J. Conveyer for street car fare boxes. No. 359,664. G. R. Brownrigg, Minneapolis, Minn. Cable grip for cars. Reissue No. 10,821. T. Kerr, New York City. Device for supporting and operating street cars. No. 359,662. A. G. Bierbach, Milwaukee, Wis. Horse shoe. No. 359,706. W. W. Box, Crayford, county of Kent, Eng., and F. J. Beadle, Erith, county of Kent, Eng. Hane tug. No. 359,871. M. E. Lasher and J. V. Forrester, Champaign, Ill. Temporary elastic horseshoe. No. 359,897. W. D. Shurtz, Baltimore, Md. Cable railway. No. 359,802. E. O. McGlauffin, Minneapolis, Minn. Electric railway. No. 359,607. I. W. Heysinger, Philadelphia, Pa. Cable railway grip. No. 359,859. C. L. Gonell, Belaire, Md. Switch for street railways. No. 359,957. W. C. Wood, New York City.

ISSUED APRIL 5. Cable grip. No. 360,744. R. P. Walsh, St. Louis, Mo. Sanding apparatus for street cars. No. 350,600. J. W. Livingston, New York, N. Y. Locking and delivering device for fare boxes. No. 360,692. A. Herzberg, New York, N. Y., and A. W. Ahnqvist, Brooklyn, N. Y. Stall floor. No. 360,452. A. J. Lansing, Ionia, Mich. Paving blocks for street railway beds. No. 360,780. A. J. Moxham, Johnstown, Pa. Underground railway and pipe subway. No. 360,655. B. F. Carpenter, Roselle, N. J. Cable railway. Nos. 360,742 and 360,743. R. P. Walsh, St. Louis, Mo.

Business Notes.

THE CITIZENS' STREET R. R., of Pittsburg, Pa., C. M. Gornley Secretary, are using Gombault's Caustic Balsam, their last order being for two dozen bottles,

RUFUS MARTIN & Co. have introduced a change belt for drivers which is somewhat larger and stronger than their former pattern, and which holds ten dollars in change. The price of this new belt is \$3.50. The price of the smaller belt remains \$2.

A REPRESENTATIVE of the Empire Protective Union of surface road employees very strongly favors the Lewis & Fowler register as compared with such devices as do not show the count upon the surface. He claims that with the latter the office employees are liable to wrong the conductor.

THE OTTUMWA STREET RAILWAY, which is offered for sale under the head of "Special Notices," is located only two blocks from the Ottumwa Hydraulic Power Co.'s plant, where power can be had to run an electric road, if desired. It would seem that this would form a very favorable opening for some one who desires to run a road with modern motive power.

WATKEYS' ADJUSTABLE CLUTCH AXLE is receiving some very flattering testimonials from railway companies having it in use. A very substantial testimony from the Jersey City & Bergen road is received in the shape of additional orders after giving it a thorough trial. Thorough tests on other roads are being made. We hope to illustrate it fully in our next issue.

W. T. BUTLER, Esq., General Manager Car Track Friction Appliance Co.

DEAR SIR: I heartily endorse all that Pres. Cummings says. We have had a more lengthened experience with the Sand Boxes, and I think I can truth-

fully say that no Street Railway can afford to do without them.

Yours, etc., C. A. RICHARDS, Pres. Metropolitan R. R. Co., Boston, Mass., Apr. 16, 1887.

THE CHAPLIN MANUFACTURING CO., in addition to furnishing roller bearing for cars, supply them also for bicycles, etc., as will be seen by the following extract from the spring price list of the Western Toy Co., of Chicago:—"After long experiments and severe tests, we have found the 'Chaplin Roller Bearings' to possess in a remarkable degree those essential points, ease of running and great durability, and have consequently adopted them for the 'Rival.' In these are combined the best qualities of the ball and parallel bearings."

THE STREET RAILWAY SUPPLY CO., Cleveland, O., are receiving very flattering reports from those who are using the new Worswick box. John Delaury, Superintendent of the Pittsburg & Birmingham Ry. Co., Pittsburg, states that the box is giving entire satisfaction and that he is much pleased with it. The Citizens' road of Fort Wayne, Ind., consider it the best box ever tried on their road. The Albany Ry. of Albany, N. Y., which has been using the box for some time, has had some taken out and examined, and find that not the slightest appearance of wearing or cutting is to be seen. Good results have also been obtained from thorough tests in Toledo, and the company is in receipt of very satisfactory orders.

STREET RAILWAY STOCK QUOTATIONS.

NEW YORK STOCKS.—Corrected by H. L. GRANT, 145 Broadway, New York.

Table with columns: Par., Amount, Period, Rate, Date, Bid, Asked. Lists various street railway stocks such as Bleecker St. & Fulton Ferry, Broadway & Seventh Avenue, etc.

PHILADELPHIA STOCKS.—Corrected by ROBERT GLENDINNING & Co., 303 Chestnut st., Philadelphia.

Table with columns: Par., Amount, Period, Rate, Date, Bid, Asked. Lists Philadelphia stocks such as Citizens, Continental, Frankford & Southwark, etc.

BOSTON STOCKS.—Corrected by R. L. DAY & Co. 51 State st., Members of Boston Stock Exchange.

Table with columns: Par., Amount, Period, Rate, Date, Bid, Asked. Lists Boston stocks such as Metropolitan, South Boston, Boston Consolidated, etc.



# The Julien Electric Company.

OFFICE, 120 BROADWAY, N. Y

FACTORY, CAMDEN, N. J.

## Electric Street Cars on Secondary Battery Principle.

EDMOND JULIEN, Engineer, of Brussels, Belgium, is the inventor both of the Traction System and Secondary Battery System of this company. The present car is the result of six years of unceasing experiments, carried on at his works in Brussels and on the streets of that city, at great cost.

The leading principle of Mr. Julien's System has been the application of an Electric Motor and Batteries to the present existing rolling stock of street railways, and to construct a car so simple in its management that the drivers and conductors at present in charge of horse cars may take to the new service as easily as to the old. Mr. Julien, after running an Electric Car on the Rue de la Loi in Brussels, during the years 1884 and 1885, and ascending a grade of 5 per cent on that street, put his car in service at the Antwerp International Exhibition of Mechanical Traction in May, 1885, and ran it daily a distance of 57 miles, sometimes drawing an ordinary street car, both cars filled with passengers, and in competition with steam and compressed air motors; and the jury, consisting of eminent Engineers from England, Germany, France and Belgium, awarded Mr. Julien the First Prize and Diploma of Honor for the best System of Mechanical Traction for street cars.

At the end of this Exhibition, Mr. Julien placed two cars on the streets of Hamburg, and afterwards added a third. Those cars have now been running since February, 1886. They each make 69 miles a day and in one place over a 4 per cent grade, carrying passengers; and, although the municipal requirements of Hamburg were very exacting, yet the Electric car has so satisfactorily met them, that it has been adopted in that city. Readers are requested to write to Hamburg to satisfy themselves. The batteries used upon these cars were examined by the municipal officers two months ago, and were found in as perfect condition as when they were first put in the cars.

In April, 1886, Mr. Julien closed a contract with all the Brussels street railways, whereby they have agreed to adopt his System and to put 107 cars in use in Brussels. They are now ready to put three lines of Mr. Julien's system in service, if they have not already done so. The street railways at Rio Janeiro have also adopted Mr. Julien's system.

Last June, Mr. Julien placed two of his cars in service on the Champs Elysees under the supervision of ten members of the International Society of Electricians of France, M. Fontaine at the head. They did service between the Place de la Concorde and the Palais de l'Industrie during the entire summer, and, at the end of the Exhibition, were awarded a first prize and Diploma of Honor. Mr. Julien's Batteries were also put in competition there with those of Faure and Plante under the supervision of Mr. Hospitalier, an eminent Electrician; and Mr. Julien was awarded the first prize and a Diploma of Honor. The Faure and Plante batteries received a third prize and silver medal. Mr. Julien's car, which is now exhibited on Eighth Avenue, New York City, is working its way into favor and has been so adapted to the new conditions arising from sharp curves and an irregular track, as to travel easily at a rate of eight and one-half (8½) miles an hour and carrying a full load.

### COST.

The cost of Installation of Mr. Julien's System is about the same as that of horse system. It is, in all probability, less; and, once installed, the expense of maintaining it is, of course, much less. In Brussels, this expense has been found, after an examination, covering a period of nearly a year, by a committee of Street Car men, to be a little over Three Dollars (\$3.00) a day for each car. In this country, the expense will not exceed Four Dollars (\$4.00) per day. From our observations on the Eighth Avenue line, it will be less than that on that line, owing to the favorable nature of the grades. The cost of horse traction is deemed to be at least Seven Dollars (\$7.00) a day. We speak, of course, of two-horse cars.

The manipulation of the System is far easier than that of the horse system. Each car will require about three horse power in the way of steam engine, so that a road maintaining, say, 40 cars, would require three 60 horse power engines, one engine being in reserve. The dynamic power required is the same. Each car will require about three tons of battery; this will enable the car to be run about 80 miles a day with but one change of battery. It requires

about eight hours to charge each battery. The three tons will be divided into two batteries, one being charged while the other is being used on the car. The batteries are ranged on either side of the car on benches; when the car comes in from service and its batteries are exhausted, it is run up between empty benches, which are on a level with the panels of the car, the panels are let down and the batteries are easily drawn out on greased rods. Adjoining the empty benches are the benches with the charged batteries, which take the place of the discharged ones.

Mr. Julien's batteries being made on a new principle—that is, *inoxidizable support plates*—are found to have an unlimited life and to be capable of being run up to a very high intensity without any injurious effect. In heavy grades, and going around curves, the current may be run up to 70 amperes without any fear of injury to the battery. As all Electricians know, Mr. Julien's is the only battery that can pretend to stand so high an intensity. Yet it may be seen every day on the Eighth Avenue road. The motor required for a large car will vary, according to the grades of the road, from 7 to 10 horse power. We do not consider it economical to overcome long grades of more than 5 per cent, though of course the car may be made to overcome much higher grades than this, especially for short distances. Curves should be at least 40 feet radius, although, on the Eighth Avenue road, we are compelled to run around curves of only 29 feet radius; yet there is an element of danger to the gearing of the car in so short a curve.

Next to Mr. Julien's motor, which is especially adapted, by its simplicity, for use on a Street Car, the Electrical Regulator is worthy of admiration. It is placed at either end of the car and controls so effectively and so methodically the application of power that an ordinary driver may learn the use of it with entire success in less than a few hours. Of course, railroads using this Company's cars will be enabled to light their stables with the Secondary battery employed in the service; the cars are, of course, lighted from the same batteries. One company now adopting Mr. Julien's System are undertaking to light the streets along which the cars will run from their stables, thereby reducing the cost of their installation by getting a profit from the City.





# THE RAILWAY SYSTEM OF THE Van Depoele Electric Manufg. Co.

The Harrisburg Morning Call says:—

Our local columns this morning contain a description of the trip made to Scranton for the purpose of examining into the practical workings of the electric motor for propelling street cars, by a number of gentlemen of this city, who returned last night. It will be seen by reading the interviews, that the expressions were unanimous and enthusiastic in favoring that system after the most careful, critical inspection. The Vice President of the road, Mr. Sanderson, furnished valuable information relative to cost, detailed expenditures, working expenses, etc., which, of course, was not intended for publication but is valuable as data on which to base estimates.

Without exception the gentlemen of the party were perfectly delighted with the system and all expressed themselves as being entirely satisfied as to its practicability. On the way home the Call representative, who accompanied the excursionists, secured the following expressions demonstrating the truth of the above expressions:

Mr. PANCAKE—It is better than I thought and good for a long run. The important point is the cost but I believe this is the best plan for operating street railway lines that I have heard of. I am of the opinion that a similar line to Steelton would pay from the word go.

Mr. LITCH, of Steelton—It's a great success and so far as Steelton is concerned I approve of it heartily. I see no objection to the system and it is certainly a great improvement over horses. I see none of the objections noticeable in the Baltimore line in this system. Cars run smoothly and with perfect safety. I bid the Harrisburg project God speed.

CHARLES MASON—I think it is a grand success and hope to see a meeting called and a great stir made. I propose to invest in the Harrisburg enterprise and would take 10,000 shares if I were able. It will be the building up of Eleventh street.

JOSEPH EWING—The Scranton electric road is pretty near perfection. It wastes no electricity, cars run smoothly, runs up grades four feet to the one hundred at a rate of five miles an hour, and on level grade at a rate of fifteen.

T. G. CALDER—I was very much delighted with the way the road was conducted. Electricity will certainly prove to be the motive power of the future.

M. R. ALLEMAN, of Steelton—Was delighted with what I have seen and if the line in operation at Scranton pays, there is no trouble in the world with the Steelton line. I will certainly increase my stock subscription and will assist in securing other subscribers.

C. A. GREEN, M. D.—I believe we should use every effort to start a similar enterprise. I have no doubt that it will pay in a reasonable time.

DAVID C. CUNKLE—The Scranton line runs smooth and is certainly a great enterprise.

A. G. CUMMINGS—I believe the electric system is a good thing, but am not so sanguine as to its paying at the start. There is no question as to the speed, as cars could be run to Steelton at the rate of fifteen miles an hour.

FRANK R. LEIB—I have always been in favor of this scheme and our trip simply verifies what I have preached, viz: That an electrical road to Steelton is the only available and practicable system.

DAVID FLEMING, JR.—Was very much pleased with what I saw. The Scranton line seems about perfect and was very favorably impressed with even the overhead wires. They are in no way objectionable nor an eye-sore as arranged. Yes, I believe it an entire success.

J. W. JONES—While the system is feasible I do not know that it can be called a money making scheme to experiment. Electrical railroading is largely ex-

LAW OFFICE  
OF  
EDWARD B. STURGES,  
119 WYOMING AVENUE.

Scranton, Pa. *March 31<sup>st</sup> 1887*  
Van Depoele Mfg Co -  
A. K. Bates, Esq, Genl Mgr.  
Dear Sir -

Our test on the Electric plant furnished by you in November last expires today - We will, as you know, most exacting in our Contract, and have subjected the system to almost every conceivable difficulty, while there are many minor details to be attended to, as a company, thoroughly satisfied with the success of this plant, and would not have it removed or replaced by any other power for twice its cost. You had certainly succeeded in running our heavy cars on extremely heavy grades, with great regularity, considering the season - and permit me to say that in my opinion you have solved the Street-Car Motor question -

Please hasten the additional motor and generator orders for purchase of our plants - as we need them for our summer business -  
Yours deeply -  
E. Z. Wallower

perimental as yet. It possesses even now many advantages over horse power. The first cost of electrical roads is, of course, more expensive, but will be cheaper in the long run.

JOHN J. HARGEST—It's immense and if a line of that kind won't pay running to Steelton it won't pay anywhere.

JOHN Q. DENNY—This system to me is nothing new. I have examined them all and this I believe to be the best.

CHARLES L. BAILEY, JR.—It is certainly a great success. I see no obstacle in the way of a Steelton line becoming a paying investment.

WILLIAM KNISELY—Count me in favor of electrical railway.

WILLIAM SHEESELY—It's the finest thing I ever saw and I hope the Steelton line will be started.

MAJOR GREENAWALT—I believe it practical and

feasible and see no reason why it should not pay. It is vastly superior to horse power.

JOHN F. KERFER—It is way ahead of anything I ever saw or read about. A company to build a line to Steelton would have a safe thing of it.

H. L. CHAMPLAIN—I was delighted with the working of the road and am convinced that a like enterprise at Harrisburg would be a thing devoutly to be wished for.

EDMUND MATHER—I have examined the practical working of the system with great care and it seemed to me that the mechanical construction and operation was all that could be expected and as reliable as any other form of propelling power.

E. Z. WALLOWER—I think it is a feasible, successful and apparently economical method of working a road between Steelton and Harrisburg.

## The Van Depoele Electric Manufacturing Company

21 NORTH CLINTON STREET, CHICAGO, ILL.

New York Office: 41, 43 and 45 Broadway, and 17, 19 and 21 Trinity Place



# THE SPRAGUE ELECTRIC RAILWAY & MOTOR CO.

16 and 18 Broad Street, New York City.

*This Company is the Owner of Patents 313,247, March 3, 1885; 315,180 and 315,181, April 7, 1885; 324,891, Aug, 25, 1885, and Twenty-six Others, Issued to Frank J. Sprague, for the Transmission of Power by Electricity.*

These Patents are fundamental, and cover the only possible methods of automatically operating constant speed motors on constant potential circuits, and also a complete system of electric railroads, as now being demonstrated in New York. Suits for damages will be promptly brought against infringers.

*The Sprague Motors have been formally adopted for use on the Edison Circuits, and they are being introduced on these and also on Westinghouse, Brush-Swan, Thomson-Houston and United States Circuits, in New York, Chicago, Boston, Des Moines, Elgin, Oskaloosa, Pittsburg, Chester, Williamsport, Lancaster, Shamokin, York, Detroit, Topeka, Cincinnati, Springfield, New Brunswick, Fall River, New Bedford, Milford, Taunton, Lawrence, Woonsocket, Fort Meyer, Waterbury, Annapolis, St. Louis, Abilene, Pawtucket, Syracuse, Canada, the Argentine Republic, Italy, Germany, and Japan.*

This company has recently increased its capitalization, and has ample means to undertake any desirable contract for the transmission of power for any purpose, under suitable guarantees. The company now possess the best facilities for manufacture of any motor company in the world. Arrangements are about to be made with the Edison Machine Works to manufacture and carry in stock large numbers of standard machines, and a special factory—the only experimental factory devoted exclusively to that work in existence—has recently been started in New York, and is equipped with the finest tools that are made.

**At present there are being operated in Boston nearly fifty motors, varying from 1-2 to 15 horse power, and from these motors is derived a revenue to the local Edison Company of an amount equal to 10 per cent of their recent capital, of which four-fifths is profit.**

This is the only company in the United States devoting its entire energies to the various questions involved in the transmission of power, and it is putting into practical use more Motors of and over one-half horse power than all other companies combined.

Correspondence invited, and estimates furnished for complete Central Stations or Special Transmissions up to 1,000 horse power on the basis of limited or exclusive rights.

This company having now perfected a Street Railway System in all its details, is prepared under suitable guarantees of successful operation, to take contracts for equipping new roads with all the appliances, both electrical and mechanical, for operating street railroads, and also for equipping roads now in operation.

This system offers the following advantages:—

*Greatly Increased Traction.*

*Entire Freedom from Disagreeable Noises.*

*Most Compact, Simple and Powerful Form of Motor.*

*Greatest Return for Given Amount of Coal Burned.*

*Absence of all Ropes, Belts, Sprocket-Wheels and Chains.*

*No Useful Room in the Car taken up by the Motor.*

*Use of Single Sets of Brushes for both Directions of Driving.*

*Impossibility of an Accident at any Point of the Line Interfering with the Operation of the Remainder of the Road.*

We are prepared to furnish exact estimates for the cost of equipping and operating any road, provided complete details—on blanks which will be furnished by this company—are supplied to us.

**New York Office, Western Union Cable Building, 16 & 18 Broad St,  
Boston Office, 55 Oliver St.**

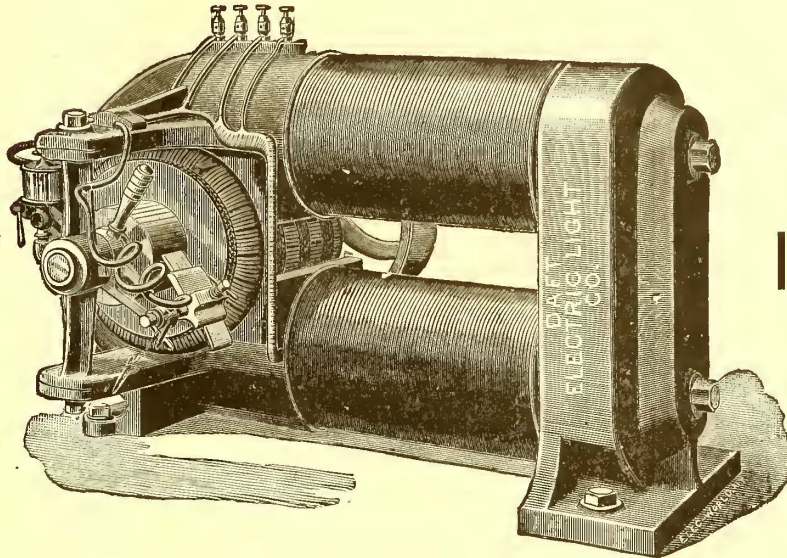


# THE DAFT ELECTRIC LIGHT CO.

Factory:

JERSEY CITY

N. J.



Offices:

115 BROADWAY

N. Y.

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Is now manufacturing the DAFT SELF-REGULATING MOTOR from 1-4 to 50 horse power FOR ALL CIRCUITS, arc or incandescent, with all the necessary appliances for proper distribution from central light or power stations. The motors of this Company are in each case guaranteed to deliver the

## Full-Rated Power Without any Reservation Whatever,

and on circuits of constant potential the regulation is equal to that of any high-class power in the market. To cite a fair case, the 3A machine, 5 H. P., varies less than 1.5 per cent from free speed to full load.

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This Company is also prepared to promptly EQUIP STREET or other ROADS with ELECTRIC MOTORS, SUBTERRANEAN CONDUITS, OVERHEAD CONDUCTORS or ANY OTHER FORM of CONDUCTIVE SYSTEM which local conditions may demand, and IS NOW ENGAGED IN THE EQUIPMENT OF SEVERAL ELECTRIC RAILROADS, HAVING, in one case, GRADIENTS WHICH HAVE NEVER BEFORE BEEN SURMOUNTED by ELECTRIC TRACTORS, and involving a DISTRIBUTION OF GREATER POWER than ANY ELECTRIC RAILROADS YET BUILT, HERE OR ELSEWHERE. The Installations ARE PROVIDED WITH COMPLETE APPLIANCES FOR INSURING SAFETY, ECONOMY AND CONVENIENCE OF OPERATION.

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For Full Particulars and Estimates, Address the New York Office.



E. M. Bentley &amp; W. H. Knight, Patentees.

Rhode Island Locomotive Works, Constructors.

# BENTLEY-KNIGHT ELECTRIC RAILWAY COMPANY.

City and Suburban

Railway and Tramway Equipment.

Dynamamos and Motors of every Variety.

115 Broadway, New York.

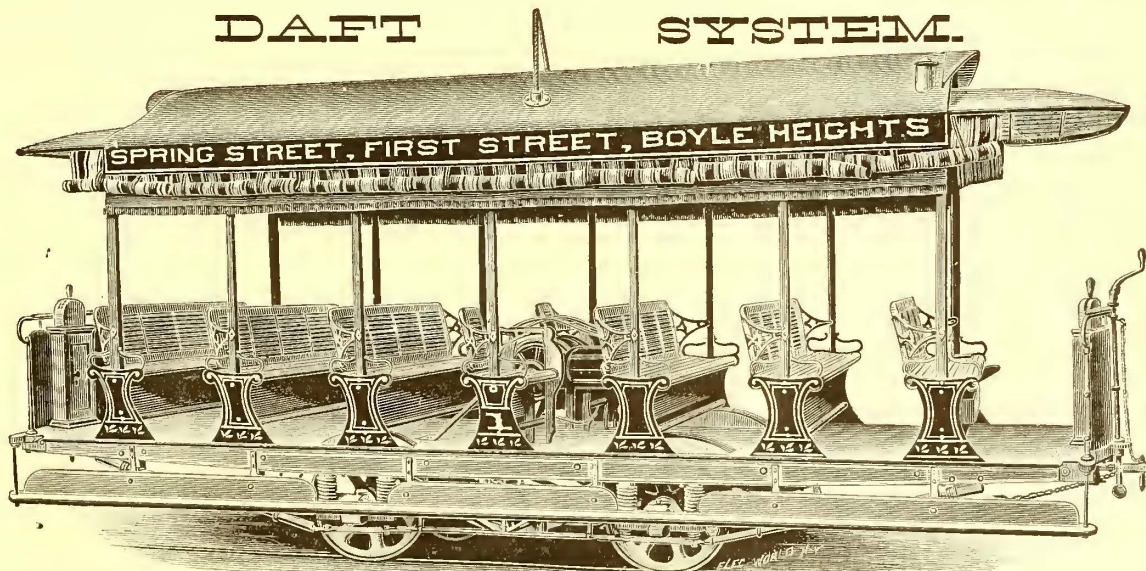
ESTIMATES FURNISHED ON APPLICATION FOR ROADS USING EITHER SURFACE, UNDERGROUND OR ELEVATED CONDUCTORS.

## SAFETY ELECTRIC RAILWAY & POWER COMPANY.

Electric Railway Motors, Separate, or Attached Directly to Street or other Cars.

ELECTRIC LIGHT AND POWER MACHINES. ELECTRICAL CONDUCTORS.

DAFT SYSTEM.



We are prepared to equip railways with our electric system and supply Power and Light machines at the shortest notice. The **ONLY** street railway in practical and economical operation by electricity in America is run by our system. We guarantee the successful operation of our system. Heaviest grades no obstacle. We are now building, in the city of Pittsburg, a road which will cost \$120,000. This road has a 14 per cent grade, and has overhead and underground conductors, and five motors. The cost of electric power per car per day on the Baltimore road, operating our system, is \$4.00. Fifty or more cars could be run at an average of \$1.50 per day. The grade on this road is 350 feet per mile. Average speed, eight miles per hour. By horse power the speed was only four miles per hour, and the cost under the old system was \$6.50 per car per day. **SEND FOR ESTIMATES.** On receipt of full particulars of your road, or of power wanted, we will send you exact estimates for equipping and operating it by our system. **SEND FOR CIRCULARS.**

Office, 41 and 43 Wall Street, New York.

Factory, Greenville, N. J.

Campbell, Sec. Edw. Walsh, Jr., Supt. M. J. Moran. Office, 2900 Cass ave. c

Citizens Ry. Co. —m, —g, —lb r, —c, —h. Pres. Julius S. Walsh, V. Pres. J. P. Helfenstein.

Forest Park, Laclede & Fourth St. Ry. Co. 5½ m, 4-10 g, 44 lb r, 20 c, 190 h. Pres. C. H. Turner, Sec. H. B. Davis, Man. P. C. Maffitt. 2

Jefferson Ave. Ry. Co. 5 m, 4-9 g, 56 lb r, 21 c. Pres. P. C. Maffitt, Sec. Wm. D. Henry, Man. John Scullin. Office, Gravoys & Jefferson aves. 5

Lindell Ry. Co. 13½ m, 4-10 g, 45 lb r, 75 c, 407 h. Pres. John H. Maxon, Sec. & Treas. Geo. W. Baumhoff. Office, 2307 Washington ave. c

Northern Central.

Missouri R.R. Co. 11½ m, 4-10 g, 44 lb r, 50 c, 488 h. Pres. P. C. Maffitt, Sec. Wm. D. Henry. e

Mound City R.R. Co. Pres. John Scullin, Sec. & Treas. C. M. Seaman, Supt. Jas. Sullivan.

People's Line. Pres. Chas. Green, Sec. John Mahoney, Supt. Patrick Shea. 5

Southern Ry. Co. 7 4-5 m, 4-10 g, 35-52 lb r, 49 c, 250 V. Pres. E. R. Coleman, Sec. J. S. Minary, Man. W. L. Johnson

St. Louis R.R. Co. 11 m, 4-10 g, 38-44 lb r, 58 c, 375 h. Pres. C. Peper, Sec. & Treas. R. B. Jennings, Supt. Chas. Ischer. 2

St. Louis Cable & Western Ry. Co. Pres. M. A. Downing, V. Pres. F. M. Colburn, Sec. & Treas. E. F. Claypool, Man. Geo. F. Branham. 3

Tower Grove & Lafayette Ry. Pres. Chas. Green, Sec. John Mahoney, Supt. Patrick Shea. 5

Union Depot R.R. Co. —m, —g, —lb r, —c, —h. Pres. John Scullin, V. Pres. & Treas. C. M. Seaman, Supt. Jas. H. Roach. 2

Union Ry. Co. 8 m, 4-10 g, 52 lb r, 40 c, 290 h. Pres. Julius S. Walsh, V. Pres. J. P. Helfenstein, Sec. & Treas. C. N. Duffy, Supt. Michael Moran. 2

ST. PAUL, MINN.—St. Paul City Ry. Co. 52 m, 4-8½ g, 45-52 lb r, 128 c, 650 h. & mu. Pres. Thos. Lowry V. Pres. C. G. Goodrich, Sec. A. Z. Levering, Treas. W. R. Merriam, Supt. A. L. Scott, Auditor & Cashier G. C. Edgings. Office, cor. Oak, Forbes and Ramsey sts. a

ST. THOMAS, CAN.—Stoneham St. R.R. Co. 2½ m, 4-8½ g, 28 lb r, 11 c, 30 h. Pres. A. F. Breed, Treas. F. H. Monks, Supt. G. F. Jones. Office, 35 Congress St. Boston. k

STILLWATER, MINN.—Stillwater St. Ry. Co. STILLWATER, N. Y.—Stillwater & Mechanicsville St. Ry. Co. 4½ m, 4-8½ g, 25-30 lb r, 4 c, 6 h. Pres. W. L. Denison, V. Pres. Lyman Smith, Gen. Supt. Peter Van Veghten, Sec. & Treas. Edw. 1. Wood. k

STROUDSBURG, PA.—Stroudsburg Passenger Ry. Co. 1½ m, 4-8½ g, 28-30 lb r, 3 c, 10 h. Pres. & Treas. J. Lantz, Sec. Jacob Houser. 4

SYRACUSE, N. Y.—Syracuse & Onondaga R.R. Co. 2 3-5 m, 4-8 g, 28-47 lb r, 9 c, 18 h. Pres. Peter Burns, V. Pres. Chas. P. Clark, Sec. & Treas. Lyman C. Smith, Supt. W. B. Thompson. 2

Central City Ry. Co. 2½ m, 4-8½ g, 47 lb r, 12 c, 42 h. Pres. Daniel Pratt, V. Pres. Jonathan C. Chase, Sec. & Treas. James Barnes, Supt. George Crampton. 4 Syracuse Savings Bank Building. h

Fifth Ward R.R. Co. 2½ m, 4-8 g, 35-56 lb r, 8 c, 30 h. Pres. P. B. Bratton, V. Pres. John D. Grey, Sec. & Treas. O. C. Potter, Supt. Hugh Purnell. Office W. Washington st. 2

Genesee & Water St. R.R. Co. and Fourth Ward R.R. Co. 4 m, 4-8½ g, 18-30 lb r, 10 c, 35 h. Pres. Robt. G. Wynkoop, V. Pres. Wm. H. I. Smith, Sec. & Treas. Geo. J. Gardner, Supt. W. J. Hart. Onondaga Savings Bank Building. 4

New Brighton & Onondaga Valley R.R. Co. 1½ m, 4-8 g, 16-35 lb r, 2 c, 6 h, 1 dummy. Pres. Matthias Britton, Sec. T. W. Meacham, Treas. J. H. Anderson, Supt. Arthur G. Markham. Office, 58 W. Railroad st. f

Seventh Ward Ry. Co. Pres. E. F. Rice, Supt. R. Purnell. 2

Syracuse & Geddes Ry. Co. 2½ m, 4-8 g, 30-45 lb r, 8 c, 35 h. Pres. R. Nelson Gere, Sec. & Treas. Rasselas A. Bonta, Supt. Wm. J. Hart. Gen. offices, 7 Onondaga Co. Savings Bank Building. a

Third Ward Ry. Co. Pres. W. B. Cogswell, Sec. & Treas. W. S. Wales. 5

TAMPA, FLA.—Tampa St. Ry. Co. 2½ m, 3-3 g, 25 lb r, 7 c, 2 engines. Pres. C. A. Martinez Ybor, Sec. & Treas. G. T. Chamberlain, Supt. C. E. Parcell. e

TAUNTON, MASS.—Taunton St. Ry. Co. 4 m, 4-8½ g, 14 c, 45 h. Pres. Wm. C. Lovering, Treas. Henry M. Lovering, Clerk, Orville A. Barker, Supt. Geo. C. Morse. f

TERRE HAUTE, IND.—Terre Haute St. Ry. Co. 6 m, 4-8½ g, 38 lb r, 16 c, 8 h, 76 mules. Pres. Jos. Collett, V. Pres. D. W. Mimsah, Sec. J. R. Paddock, Treas. W. R. McKeen, Supt. Jos. G. Elder. Office, 101 N. Ninth st. c

TOLEDO, OHIO.—Toledo Consolidated St. Ry. Co. 21 m, 4-8½ g, 42 lb r, 50 c, 255 h. Pres. & Treas. J. E. Bailey, Sec. A. E. Lang, Supt. John Gilmarthin. a

Metropolitan St. Ry. Co. 10 m, 3 g, 28-35 lb r, 31 c, 101 h. Pres. & Sec. Jno. J. Shipperd of Cleveland, Treas. H. E. Wells of Cleveland, Gen. Man. T. F. Shipperd Supt. Jno. A. Watson. 2

The Central Passenger R.R. Co. of Toledo, O. 9 m, 8 g, 27 lb r, 17 c, 80 h. Pres. F. E. Seagrave, Sec. C. F. Parkis, Treas. A. R. Seagrave, Supt. Joseph Murphy. a

TOPEKA, KAN.—Topeka City Ry. Co. 9 m, 4 g, 25-48 lb r, 25 c, 90 h. Pres. Joab Mulvane, V. Pres. D. W. Stormont, Sec. & Treas. E. Wildes, Supt. Jesse Shaw

TORONTO, CAN.—Toronto St. Ry. Co. 60 m, 4-10½ g, 30 lb r, 180 c, 850 h. Pres. Frank Smith, Sec. James Gunn, Supt. John J. Franklin. Offices, 94 & 96 King st., east. 2

TRENTON, N. J.—Trenton Horse R.R. Co. 3 m, 5-2 g, 43-48 lb r, 10 c, 33 h. Pres. Gen. Lewis Perrine, Sec. & Treas. Lewis Perrine, Jr., Supt. Thomas S Morris City Ry. Co. 10 m, 5-2½ g, 35 lb r, 24 c, 108 h. Pres. Adam Exton, V. Pres. W. H. Skirm, Sec. H. B. Howell, Treas. & Mang. Director Chas. Y. Bamford. Office, 264 Clinton ave. a

TRINIDAD, COL.—Trinidad St. Ry. Co. 1½ m, 3-2 g, 14 lb r, 2 c, 8 mu. Pres. S. H. Jaffa, Treas. T.

B. Collier, Sec. R. L. Wootton, Supt. R. L. Pearson. c

TROY, N. Y.—Cortland & Homer Horse R.R. Co. 4 m, 4-8½ g, 25-30 lb r, 2 c, —h. Pres. C. H. Garrison, Man. Troy, V. Pres. E. A. Fish, Cortland, N.Y., Treas. J. M. Allen, Cortland, Sec. S. E. Welch, Cortland.

Troy & Albany Horse R.R. Co. 3.33 m, 4 8½ g, 35-45 lb r, 10 c, 41 h. Pres. Thos. A. Knickerbacker, Sec. & Treas. Theo. E. Haselhurst, Supt. W. R. Bean. Office 1 First st. 2

Troy & Lansingburgh R.R. Co. 2¼ m, 4-8½ g, 45 lb r, 95 c, 420 h. Pres. William Kemp, V. Pres. Charles Clemenshaw, Sec. & Treas. Joseph J. Hagen, Asst. Supts. L. C. Brown, and C. H. Smith, 205 River st. a

URBANA, ILL.—Urbana & Champaign St. Ry. Co. 2 m, 4-8½ g, 33 lb r, 4 c, 20 h. Pres. Wm. Park, Sec. & Treas. Frank G. Jaques, Supt. W. Park.

UTICA, N. Y.—Utica, Clinton & Binghamton St. R.R. 12 m, 4-8½ g, 43-56 lb r, 17 c, 82 h. Pres. Isaac Maynard, Sec. & Treas. Robt. S. Williams, Supt. Roger Rock. a

Utica & Mohawk R.R. Co. 3¼ m, 4-8 g, 47 lb r, 8 c, 11 h. Pres. Jas. F. Mann, V. Pres. R. W. Sherman, Sec. Wm. E. Lewis, Treas. Geo. D. Dimon. Office, 26 Union Bldg. 4

Utica Belt Line St. Ry. Co. 8 m, 15 c. Pres. J. Mather, V. Pres. J. W. Boyle, Treas. Chas. W. Mather. 2

VALEJO, CAL.—Valejo St. Ry. Co.

VICKSBURG, MISS.—Vicksburg St. Ry. Co. Hill City R.R. 2

VINCENNES, IND.—Vincennes St. Ry. Co. 2¼ m, 4-8½ g, 36 lb r, 2 c, 24 h. Pres. & Treas. Fredk. Graeter, Sec. Geo. W. Graeter. Office, Fair Ground ave. 4

WACO, TEX.—Waco St. Ry. Co. 5 m, 4-8½ g, 18 & 20 lb r, 15 c, 55 h. Pres. E. Rotan, Sec. & Treas. W. R. Kellum, Supt. J. W. Sedbury. f

WALTHAM, MASS.—Waltham & Newton St. Ry. Co. 3 4-5 m, 3-8½ g, 36 lb r, 7 c, 20 h. Pres. R. E. Robbins, Treas. & Supt. Henry Bond. 2

WASHINGTON, D. C.—Capital, No. O St. & So. Washington R.R. 13½ m, 4-8 g, 35 lb r, 45 c, 176 h. Pres. C. White, Sec. & Treas. W. E. Boughton, Supt. Andrew Glass. 2

Anacostia & Potomac River Ry. Co. 3 m, 4-8 g, 37 lb r, 9 c, 24 h. Pres. H. A. Griswold, Sec. & Treas. J. B. Picher. Office, Anacostia, D. C. f

Columbia R.R. Co. 5 1-2 m, —g, —lb r, 23 c, 71 h. Pres. H. A. Willard, Sec. & Treas. Wm. H. Claggett, Supt. Elbert Claggett. Office, 15th st. and Boundary N. E. 4

Metropolitan R.R. Co. 19.44 m, 4-8 g, 38 lb r, 110 c, 445 h. Pres. George W. Pearson, V. Pres. A. A. Wilson, Sec. & Treas. Wm. J. Wilson, Supt. L. W. Emmart Office 2411 P St. N. W. f

Washington & Georgetown R.R. Co. 20 m, 4-8½ g, 42 lb r, 175 c, 850 h. Pres. H. Hurt, Sec. & Treas. C. M. Koons, Gen. Supt. C. C. Saller. a

WATERBURY, CONN.—Waterbury Horse R.R. Co. 5 m, 4-8½ g, 40 lb r, 13 c, 100 h. Pres. D. S. Plume, Sec. C. R. Baldwin, Treas. E. T. Turner. Office, 4 Bank st. g

Seneca Falls & Waterloo R.R. Co. 5 m, 4-8 g, 40 lb r, 4 c, 2 dummies. Pres. S. R. Welles, V. Pres. A. H. Terwilliger, Sec. & Treas. A. G. Mercer, Supt. Albert Jewett. 5

WATERFORD, N. Y.—Waterford & Cohoes R.R. Co. 2 m, 4-8 g, 45 lb r. Pres. Thos. Breslin, Sec. & Treas. C. C. Ormsby. (Leased by the Troy & Lansingburgh R.R. Co.) Supt. E. A. Bradley. 2

WATERLOO, IA.—Waterloo St. Ry. Co. 2 m, 3 g, 20 lb r, 2 c, 1 baggage wagon, 9 h. Pres. Wm. I. Hartman, V. Pres. & Supt. J. A. Poye, Sec. & Treas. T. N. Kellogg. 2

WEST HAVEN, CONN.—New Haven & West Haven R.R. Co. 6½ m, 4-8½ g, 60-60 lb r, 24 c, 115 h. Pres. Geo. R. Kelsey, Sec. Sam'l L. Smith, Treas. W. W. Ward. c

WESTPORT, CONN.—Westport & Saugatuck Horse R.R. Co. 1½ m, 4-8 g, 40 lb r, 3 c, 6 h. Pres. A. S. Hurburt, Sec. & Treas. B. L. Woodworth, Supt. E. S. Downey. c

WHEELING, W. VA.—Citizens Ry. Co. 10 m, 5-2 g, 45 lb r, 16 c, 60 h. Pres. Dr. Geo. B. Caldwell, Sec. Frank P. Hall, Supt. Michael I. outus. 2

Wheeling & Elm Grove R.R. 7 m, 4-8½ g, 30 lb r, 12 c, 4 Baldwin Motors. Pres. J. D. DuBois, Sec. E. J. Rutter, Supt. C. Hirsch. Office, 16th st. a

WICHITA, KAN.—Wichita City Ry. Co. 18 m, 3-6 g, 20 & 25 lb r, 50 c, 300 h & mu. Pres. G. L. Rouse, V. Pres. B. H. Campbell, Sec. & Man. G. M. Dickson, Treas. J. O. Davidson. Office, 121 N. Market st. k

WILKESBARRE, PA.—Wilkesbarre & Kingston Pass. R.R. 3 m, 5-2 g, 30-45 lb r, 10 c, 22 h. Pres. & Man. Wm. J. Harvey, Sec. & Treas. A. J. Davis. a

Coalville Passenger R.R. Co. 2¼ m, 4-8 g, 20-34 lb r, 3 c, 12 h. Pres. Geo. W. Kirkendall, Supt. A. S. Orr, Sec. & Treas. Geo. Loveland. Capital, \$62,675. a

WILLIAMSPORT, PA.—Williamsport Pass. Ry. Co. 3½ m, 4-8½ g, 36 lb center bearing r, 7 one h c, 26 h. Pres. Robt. P. Allen, V. Pres. Henry C. Parsons, Sec. R. J. C. Walker, Treas. and Gen. Man. S. A. Filbert. Office, 907 W. 4th st. a and j

WILMINGTON, DEL.—Front & Union St. Pass. Ry. Co. 1½ m, 5-2 g, —lb r, 7 c, 22 mu. Pres. Geo. W. Bush, Supt. Sam'l A. Price, Treas. E. T. Taylor. Office, Front & Union sts. e

Wilmington City Ry. Co. 6 m, 5-2½ g, 45 lb r, 20 c, 80 h. Pres. W. Canby, Sec. & Treas. John F. Miller, Supt. Wm. H. Burnett. Office, Delaware ave. & Dupont st. f

WINDSOR, CAN.—Sandwich & Windsor Passenger R.R. Co. 12

Windsor Electric St. Ry. Co. 1½ m, 1 motor, 2 cars. Van Depoele system. Pres. W. M. Boomer, Sec. & Treas. A. H. Joseph. Office, 19 Sandwich st., W. 6

WINFIELD, KAN.—Union St. Ry. Co. 1½ m, 4-8 g, 28 lb r, 2 c, 8 mu. Pres. A. J. Thompson, Sec. J. R. Clark, Treas. John A. Eaton. Capital, \$25,000. a

WINNIPEG, MANITOBA, CAN.—The Winnipeg St. Ry. Co. 5 m, half single, half double, 4-8½ g, 35 lb r, 15 c, 15 selghs, 100 h. Pres. Jas. Austin, Sec. & Mang. Albert W. Austin, Supt. Geo. A. Young. 2

WINONA, MINN.—Winona City Ry. Co. 4 m, 3-6 g, 27 lb r, 10 c, 39 h. Pres. B. H. Langley, Sec. & Treas. C. H. Porter, Supt. L. Marlon. f

WOBNUN, MASS.—No. Woburn St. Ry. Co.

2½ m, 4-8 ½ g, 40 lb. r. 5 c, 4 h. Pres. & Treas. J. R. Carter, Supt. Dexter Carter.

WORCESTER, MASS.—Worcester St. Ry. Co. 7¾ m, 4-8½ g, 43-45 lb r, 32 c, 150 h. Pres. Geo. H. Seeley, Treas. H. S. Seeley, Supt. J. N. Akarman, Ass't. Supt. I. B. Chapin. Office, 15 Market st. a

Citizens' St. Ry. Co. 7¾ m, 4-8½ g, 45 lb. r. 19 c. 100 h. Pres. Chas. D. Pratt, Sec. & Treas. H. S. Seeley, Supt. J. N. Akarman. 2

WYOMORE, NEB.—Wymore and Blue Springs Ry. Co. 3½ m, 3-6 g, 4 c, 10 h. Pres. J. H. Reynolds, V. Pres. Ben Reynolds, Sec. & Treas. E. F. Reynolds, Jr., Supt. A. N. Bradfield. 3

YONKERS, N. Y.—Yonkers R. R. Co. 5 m, 4-8½ g, 42-49 lb r, 10 c, 70 h. Pres. D. N. Stanton, Sec. John P. Brennan, Treas. D. Perry Stanton. Office, 89 Main st. a

YORK, PA.—York St. Ry. Co. 1¼ m, 4-8½ g, 38 lb r, 6 c, 11 h. Pres. W. H. Lanlius, Sec. D. K. Timmer, Treas. C. S. Weiser. Authorized capital, \$50,000. a

YOUNGSTOWN, O.—Youngstown St. R.R. Co.

ZANESVILLE, O.—Zanesville & McIntire St. Ry. Co. 3 m, 3-6 g, 38 lb r, 12 c, 51 h & mu. Pres. F. M. Townsend, Sec. W. C. Townsend, Treas. O. H. Townsend. a

### CABLE RAILWAYS.

BROOKLYN, N. Y.—Brooklyn Cable Co.

CHICAGO, ILL.—Chicago City Ry. Co.

CINCINNATI, O.—Mt. Adams & Eden Park Inclined R. R. Co.

DENVER, COL.—Denver Tramway Co.

KANSAS CITY, MO.—Kansas City Cable Ry.

LOS ANGELES, CAL.—Second St. Cable Ry. Co. Temple St. Cable Ry. Co.

NEW YORK, N. Y.—Third Ave. R. R. Co. Line on Tenth ave.

OMAHA, NEB.—Cable Tramway Co. of Omaha. Cable line to be built.

PEORIA, ILL.—Central Horse & Cable R. R. Co.

PHILADELPHIA, PA.—Phila. Traction Co.

SAN FRANCISCO, CAL.—California St. Cable R. R. Co. Market St. Cable Ry. Omnibus R. R. & Cable Co.

### ELECTRIC RAILWAYS.

APPLETON, WIS.—Appleton Electric St. Ry.

BALTIMORE, MD.—Union Pass. Railway Co.

LOS ANGELES, CAL.—

DETROIT, MICH.—Dix Electric Ry.

KANSAS CITY, MO.—Kansas City Electric Ry.

MONTGOMERY, ALA.—Capital City Electric St. Ry. Co.

SCRANTON, PA.—Scranton Suburban Ry. Co.

WINDSOR, CAN.—Windsor & Walkerville Electric Ry. Co.

### NEW ROADS.

ALLEGHENY CITY, PA.—Allegheny Rapid Transit Ry. Co. 2

ATHENS, TENN.—Athens Mineral Land & Impt Co. are ready to receive bids for a new railroad which they will build. 5

BAITIMORE, MD.—Baltimore, Brooklyn & Cedar Hill Ry. Co. 4 m, 4-8½ g, 25 lb r, 16 c, 50 h. Will be running by May 1. S. C. Long, Solicitor. 3

BINGHAMTON, N. Y.—Van Depoele Co. will supply plant for new road; 6 c. 3

BIRMINGHAM, ALA.—East Lake Land Co. 7 m, 4-8½ g, 40 lb steel, 8 c, motor power. Pres. Robt. Jemison, V. Pres. A. A. Clysby, Sec. & Treas. S. M. Hanby. Will build from Birmingham to East Lake. Contract has been let, to be completed by May 1. Rails have been shipped, and 4 steam motors ordered. Capital \$200,000. Office, 2,009 First ave. 4

Birmingham & Jones Valley St. R.R. 6 m, 45 lb steel r. Hefflin & Knox received proposals. Smith & Eastman have made surveys for electric road to run 3 m from the city to their real estate near North Birmingham. 4

Western Valley St. Ry. Co. 4 m, 4-8½ g, 24 lb r, 6 c, 20 mu; but will likely change motive power ultimately. Work to be commenced in 60 days and road opened in 3 or 4 months. Capital, \$50,000. Pres. J. C. Westbrook, V. Pres. W. E. Berry, Gen. Man. S. Torrey. 5

BOSTON, MASS.—West End St. Ry. Co. H. M. Whitney, Asa P. Potter, Eben D. Jordan and others incorporators. About 8 m, 4-8½ g. Pres. H. M. Whitney, Treas. G. D. Braman. Hope to use electricity as motive power. Begin work 'this spring, and hope to operate a portion of their road this year. 2

Suburban St. Ry. Co., proposes to lay tracks through Park, Beacon, Arlington and Marlboro streets to West Chester Park. 3

BROOKLYN, N. Y.—Annex St. Ry. Co. in progress, to be completed in spring of 1887. Pres. F. M. Delano, New York, V. Pres. H. H. Adams, Brooklyn, Treas. Philip Richardson, N. Y. Office, 204 Montague st., Brooklyn, N. Y. 1

Brooklyn & Suburban St. Ry. Co. To run from Bedford ave. through Flatbush to Flatlands, with a branch to the Cemetery of the Holy Cross. Will use either horse or cable power. Geo. Malcom. Wm. Ziegler, Wm. J. Gaynor, Henry H. Adams, Jas. Ryan, Peter Sutter and Patk. McCanna, Directors. Paid-up capital, \$100,000. 4

Union Ry. Co. of the City of Brooklyn. 11

Brooklyn Heights R. R. Co. Capital, \$150,000. To build along Montague street from Court street to Wall Street Ferry. Will use either cable or electricity, and will build as soon as the consent of property owners is obtained. Pres. S. B. Chittenden, Sec. Geo. W. Chauncey; and the other directors are J. J. Pierrepont, C. L. Fincke, W. A. Brown, A. C. Barnes, R. J. Kimball, F. Allen, S. Ammerman, D. B. Thompson, O. White and J. E. Brown. 5

BRUNSWICK, GA.

CHARLESTON, W. VA.—Glenwood Co. will lay out a town near the city and ultimately construct a road 2½ m long. Supt. Benj. Brown. Capital, \$55,400. 4

CHARLOTTE, N. C.—Charlotte St. Ry. Co. 2 m, 4 c. Manager, F. W. Dixon. 3



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**PUBLIC BENEFACTORS.—Burlington Free Press and Times.**

**ACCOMPLISHING WHAT FEW MEN WOULD UNDERTAKE TO DO.—Rutland Herald.**

**THEIR REPUTATION AS BUILDERS OF STREET AND SHORT LINE RAILWAYS HAS BECOME NATIONAL.—New York World.**

**THEIR WORK IS A GREAT TRIUMPH OF CONSTRUCTIVE GENIUS AND FINANCIAL SKILL.—Syracuse Herald.**

**THEY NOT ONLY MAKE HAY WHILE THE SUN SHINES, BUT THEY SEEM TO BUILD RAILROADS AFTER THE ORB OF DAY GOES TO SLEEP IN THE WEST.—Newburg News.**

**THESE GENTLEMEN, AS THEIR WORK AND HISTORY SHOW, ARE THE MOST EMINENT IN THE UNITED STATES ENGAGED IN THEIR PURSUIT.—Newburg Journal.**



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THE STREET RAILWAY SUPPLY CO., Cleveland, O., Sheldon Beckwith Proprietor, O. A. Foote Secretary, have issued a very handsomely printed catalogue of 49 pages, containing illustrations of the various articles connected with railway line gear which they manufacture, prominent among which are the Higley, Shattuck and Worswick boxes. Sent free on application to any address.

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WANTED—A live man to ascertain among street railways the best system of heating street cars yet devised. Address A. W., care STREET RAILWAY JOURNAL, 113 Liberty street, New York.

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THE SUBSCRIBER has an Automatic Switch for street railways, adapted for horse and motor cars of all kinds. Dispenses with the ordinary tongue switch as in present use. Self cleaning, simple, durable and cheap in construction. Will make liberal terms with manufacturers or others for the introduction of the same. "SWITCH," office STREET RAILWAY JOURNAL, 113 Liberty street, New York.

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WANTED—Capitalist to invest money in the best Cable Grip yet invented. First-class inducements and best of references. RELIABLE, care STREET RAILWAY JOURNAL.

FOR SALE CHEAP.—One Iron Planer, 58" x 46" x 18', good for heavy work; in good order; will sell cheap. One 600 lb. Ferris & Miles Steam Hammer, \$300.00. One 5" Cutting-off and Centering Machine. One Double-Head Bolt Cutter (National), cuts to 1 1/2", in very good order. One Single-Head Bolt Cutter. One Double-Head, horizontal, bar-iron shear, cuts to 1 1/2" square, cuts up more iron than any other make. Two Iron Shapers, 10" and 14", good order. Lathes, Drills, Planers, etc., new and second-hand. Parties wanting machinery please address us before purchasing. One 12 H. P. Nagle Engine, horizontal, with one 15 H. P. upright steel boiler, complete, used four weeks and good as new. Manager for the Star Tool Co., Lathes, etc.; Grant Corundum Wheel Co.; Diamond Emery Wheel and Machine Co. Chicago Agent for the Acme Kerosene Engine, very good for light power, boats, etc. Send for circulars. W. H. ROBERTSON, Machinery Dealer, 48 So. Canal st., Chicago, Ill.

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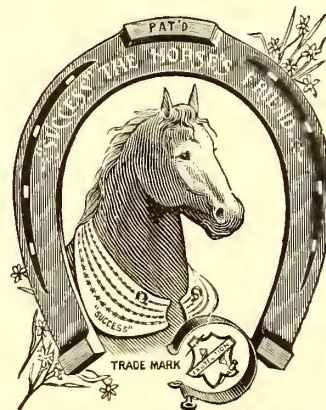
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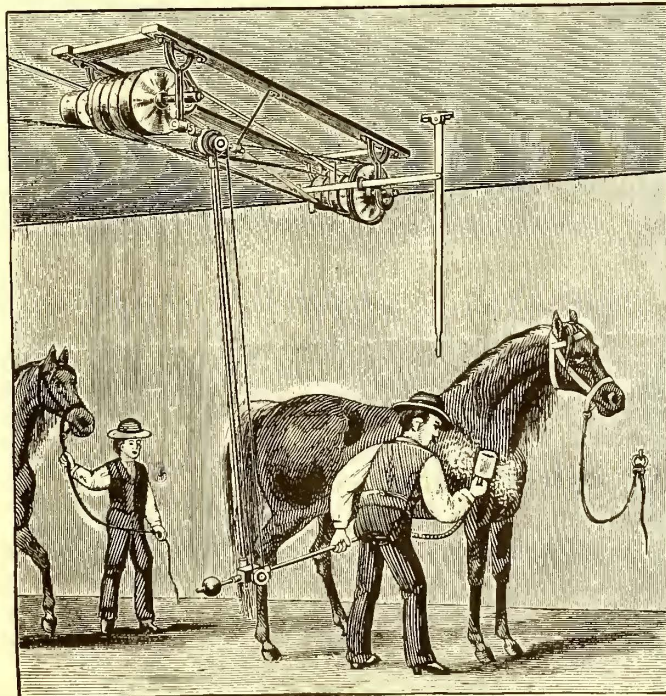
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We now offer this Groomer to the public in confidence, knowing it will be found invaluable in its use in all stables, and especially so wherever perfection in stock raising is desired.

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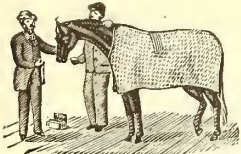
All large stables will have these machines as soon as they can get them after investigation.

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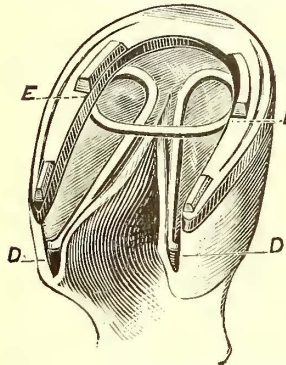
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Which Cures Corns, Contraction, Quarter-Cracks, &c.

It is the best invention for expanding a contracted foot, or keeping a sound foot in its natural shape.

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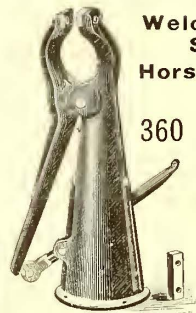
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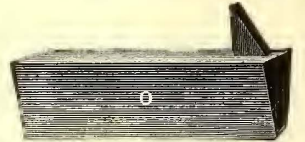
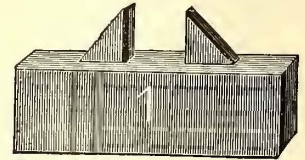


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Champion Horse Nail Co., Appleton, Wis.

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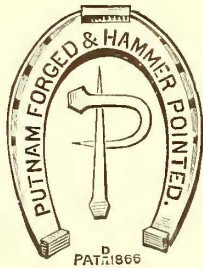


Fig. 1.

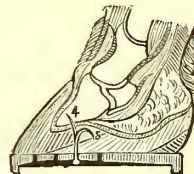
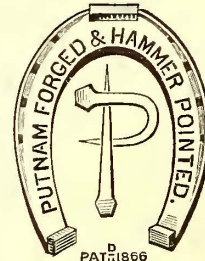


Fig. 2.



Centennial Exhibition.

# HORSES' FEET

These drawings show how many horses are made lame and permanently injured by the use of the COLD CUT and SHEARED-POINTED Nails. This process of manufacture produces lamination, causing the iron to form in layers, and when driven into the foot, the horny fibers of which the hoof is composed cause the nail to separate at the point, and one portion passes INTO the foot.

No. 4 represents one of these nails which was driven into the hoof and SLIVERED in driving, one THIN blade passing into the quick or sensitive sole; No. 5 the THICK blade of the nail passed out of the wall of the hoof for clinching. After a few days the horse was returned lame, and upon the removal of the shoe, a nail similar to the above was broken off, leaving the sliver in the foot: LOCK-JAW ensued, from which the horse died. Upon dissecting the foot a portion of the nail was found to have penetrated through the coffin bone, as seen in Fig. 2, letter A, thus sacrificing the life of a valuable animal.

It requires but little observation and reflection, one would think, to arrive at the conclusion as to the kind of nails to be used in the horse's foot, whether a mangled piece of iron rendered DANGEROUS by the COLD ROLLING AND SHEARING process, or one made from the rod at a welding heat, where all the fibers remain intact and a perfect ONENESS maintained and being pointed by the hammer, rendering such an accident as slivering utterly impossible.

The foot is the MOST IMPORTANT member of the animal's body, to which the greatest care and attention should be directed; for when it becomes injured or

diseased, no matter how perfect the other parts may be, the horse's services are diminished or altogether lost. Hence the value of a horse depends upon the condition of his feet.

The horse at every step brings an immense power and weight to bear upon the foot. The hoof is a *thing of life* and yields to the pressure. The PUTNAM NAIL being forged accommodates itself to the pressure of the hoof. It is far otherwise, however, with stiff rolled and cut nails. They remain rigid and their sheared edges are therefore pressed like sharp knives against the horny fiber. This is what causes the broken and rotten appearance so frequently seen in horses shod with cheap cut nails. Can a horse owner afford to attempt to save a few cents in price of nails and ruin his horse? Surely not, for the old adage is true as ever,

**"NO FOOT, NO HORSE."**

As the remedy lies with the owner of the horse, it is for him to prohibit any cold-rolled or sheared nails being used in his horse's feet.

The only Hot-Forged and Hammer-Pointed Horse-Shoe Nail in the World

that is not cut, clipped or sheared upon the point, and will not split in driving, is  
**THE PUTNAM NAIL.**

Address for Circulars, etc.,

**THE PUTNAM NAIL CO., NEPONSET P. O., BOSTON, MASS.**

# THE BRYDEN FORGED HORSESHOE WORKS, Limited, CATASAUQUA, PENN.,

MANUFACTURERS OF

## THE BRYDEN

Forged Solid Calk

### HORSE AND MULE SHOE.

These shoes are forged into shape under heavy drop hammers, greatly condensing the iron and adding very much to wearing qualities, making it nearly equal to steel in durability.

The distinctive feature of our system of manufacture is, that it produces a *finished* shoe, calked, or plain, ready for attaching to the hoof.

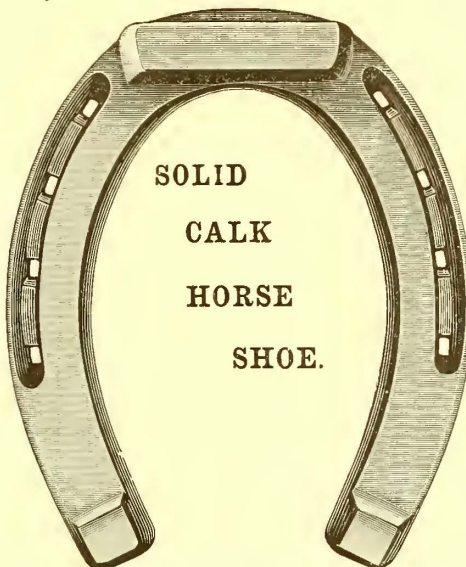
The crease is made low and the nail holes are punched well in and beveled to permit the nailhead to be well driven in, reducing the strain on the nails and insuring a firmly fastened shoe.

The foot bearing of the shoe is level, thus materially aiding in the preservation of the hoof.

It is not ne essay to heat the shoe in order to fit it.

There are no welds in the shoe to break, the calks being solid forged up from the web.

**OUR CALKED SHOE.** A good, strong, reliable shoe to have on hand. The calks will not come off. Always ready to nail on. A handy shoe for the Winter, easily sharpened, and, as the calks will not break, will give as much service as steel. Made in sizes No. 1 to No. 6. Front and hind of steel or iron.



SOLID  
CALK  
HORSE  
SHOE.

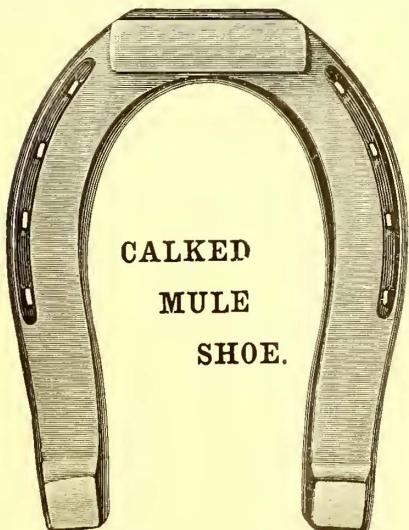


CHICAGO  
"SPECIAL.

The shoes have a good substantial clip drawn up from metal driven outside the regular outlines of the shoe for that purpose. The outer edge of the clip, when drawn up, coinciding with the outlines of the shoe, requires no robbing of the hoof wall to let in the clip.

Among the street railways using our shoes are, the Third Avenue R. R. Co., Eighth Avenue R. R. Co., Broadway & Seventh Avenue R. R. Co. of New York city; Bushwick R. R. Co., Brooklyn City and Newtown R. R. Co. of Brooklyn; Philadelphia Traction Co., Citizen's Passenger R. R. Co., Second & Third Street R. R. Co. of Philadelphia; Metropolitan R. R. Co. of Washington, D. C.; North Chicago R. R. Co., Chicago City R. R. Co., West Division R. R. Co. of Chicago, Ill.; New Orleans City & Lake R. R. Co. of New Orleans, La.

We present illustrations of some of the many designs of shoes manufactured by us.

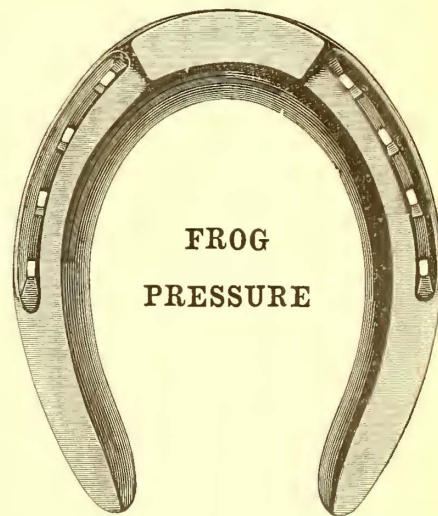


CALKED  
MULE  
SHOE.

**OUR FROG PRESSURE SHOE.** The advocates of the frog pressure system of horseshoeing have in this shoe the very thing they want. The best shoe made for curing corns or contracted feet. Made in sizes No. 1 to No. 6. Front and hind, iron, or steel.

**OUR PLAIN SHOE.** "The best railroad shoe made," so says one of the largest consumers of horseshoes in New York city. This shoe is used by the largest street railroads in New York city and Philadelphia. Made in sizes No. 1 to 6. Front and hind.

**OUR CHICAGO SPECIAL.** Designed to meet the wants of many of our western customers. Extensively used in Chicago, on the principal railroads and for custom work. A light calked shoe for shoeing trotting and driving horses. Made in sizes No. 1 to No 4 of iron or steel.



FROG  
PRESSURE

**OUR CALKED MULE SHOE.** Just the thing for street railway and coal mining work; solid calks. Made in sizes No. 1 to No. 5 in iron or steel.

**J. B. WHITE, Manager Sales Department.**





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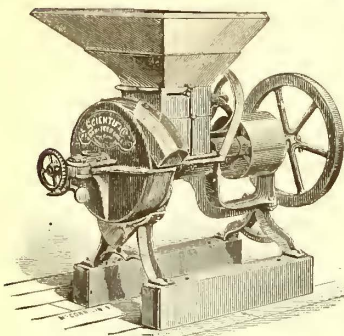
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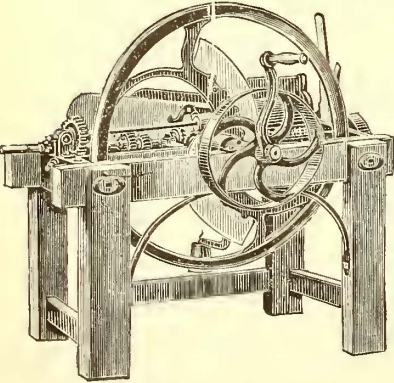


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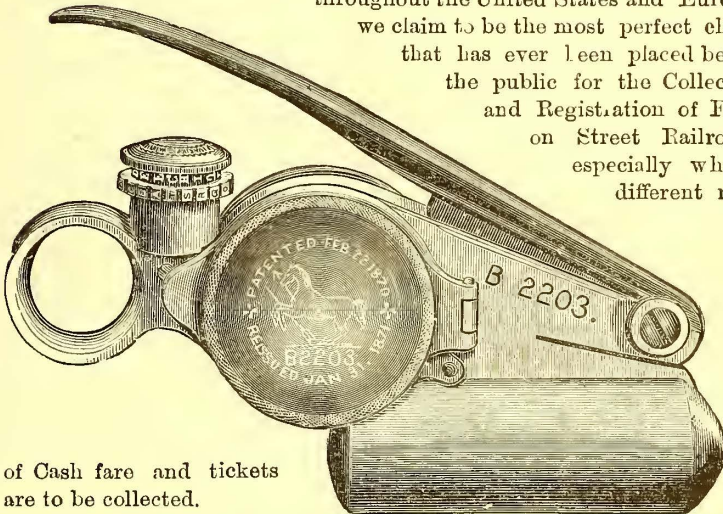
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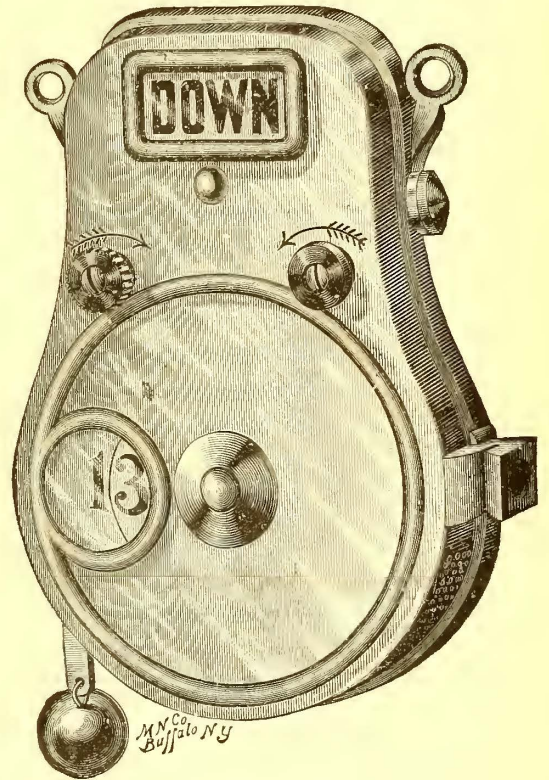
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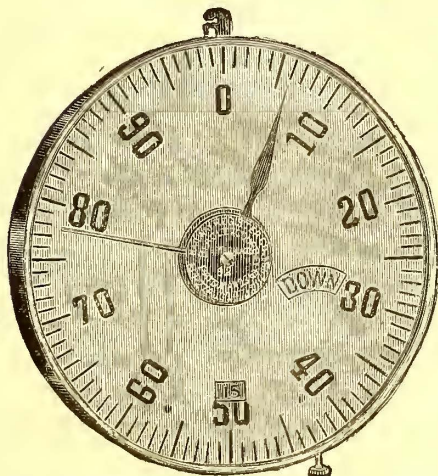


of Cash fare and tickets are to be collected.

### Benton Register.

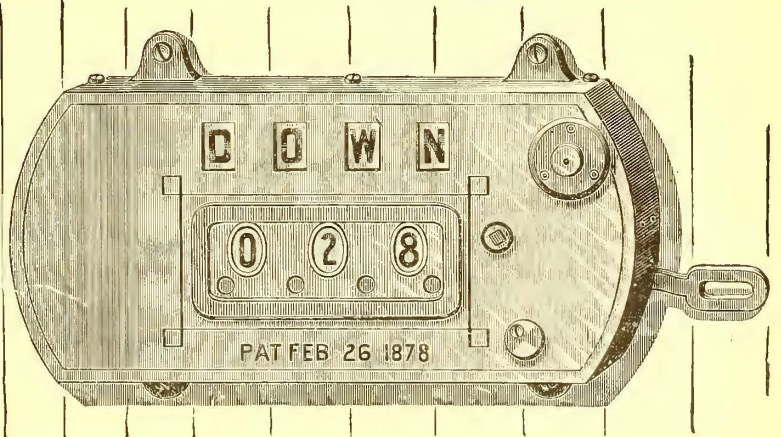


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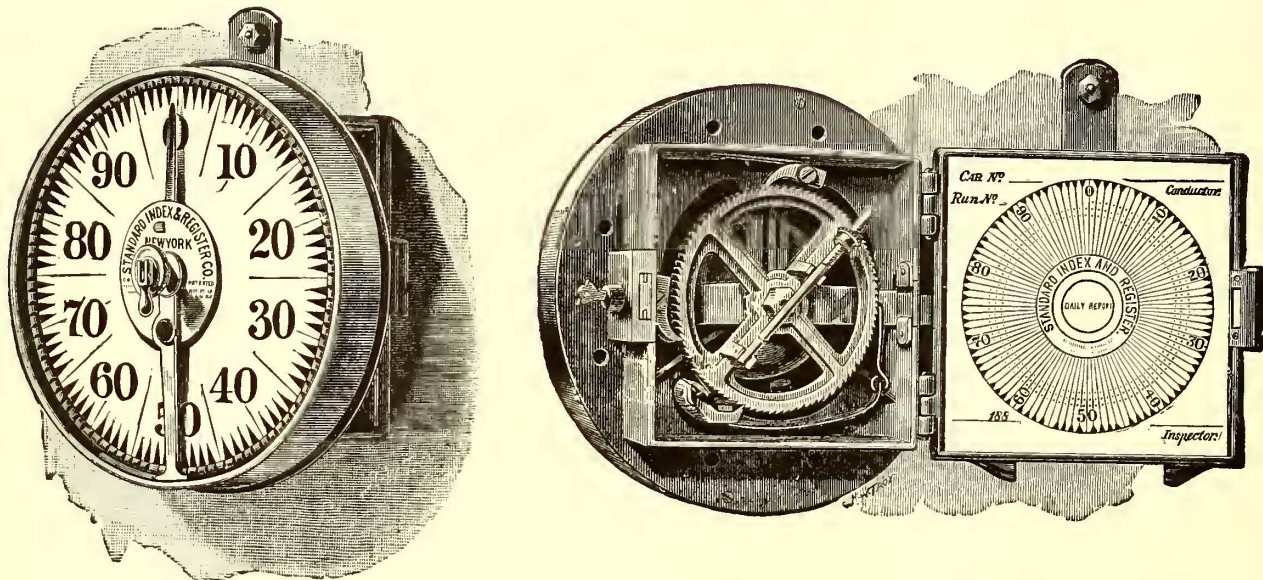
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# THE STANDARD INDEX AND REGISTER COMPANY,

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## IMPORTANT DECISION.

The Standard Register is now free from all claim of infringement, and can be used by the Railroad Companies without fear of suit.

TO STREET RAILWAY OFFICIALS:

The improvements in the Standard Index & Register which have been applied to those in use on various railroads of the United States during the past year, and which have met with so much favor, particularly the apparatus for setting the trip-hand to zero, have been the subject of another action by the Railway Register Manufacturing Co., who claimed that the last mentioned was an infringement of the Benton Patent of July 4, 1882, and thereupon moved in the United States Circuit Court for a decision accordingly. Arguments were heard by the court in this city, on the 9th March, resulting in a decree on the 12th March in favor of the users of the Standard Index & Register.

We give below the decision of the court in full.

Yours respectfully,

STANDARD INDEX & REGISTER CO.

UNITED STATES CIRCUIT COURT SOUTHERN DISTRICT OF NEW YORK.  
 RAILWAY REGISTER MANUFACTURING COMPANY  
 vs.  
 BROADWAY & SEVENTH AVENUE RAILROAD COMPANY. } IN EQUITY.

A permanent injunction has been granted in this cause against further infringement of the plaintiff's patent No. 260,526 dated July 4, 1882, and granted to John B. Benton for an improvement in fare registers. The patented invention is a combination which includes a tell-tale hand to indicate any failure to re-set the triphand of the register at zero at the commencement of a trip, 26 Fed. Rep., 523. The tell-tale hand of the patent is moved with the trip hand in re-setting; and if they are re-set at zero moves with it in registering fares until they are again re-set. If they are not re-set at zero the tell-tale hand remains at the place at which they are re-set when the trip hand moves forward in registering fares, and indicates that registration was begun at a wrong place. The tell-tale hand of the infringement moves the trip hand forward in re-setting, and is left by it when registration begins, and as that is begun at any place other than zero it indicates that fact. Since the injunction the defendant has commenced using another re-setting device which the plaintiff claims is an equivalent of the tell-tale hand in the combination, and a colorable attempt to evade the injunction. The plaintiff has moved for an attachment on account of this use of that device. This device re-sets the trip hand by moving it forward, and has a stop by which it cannot move the trip hand beyond zero. If it is stopped short of zero and registration is begun it can be moved up to zero, when the trip hand has proceeded in registration to that point beyond, and if it is stopped at zero it can be moved back from that point at any time and forward to it again without interfering with the trip hand in registration. It is therefore a stop on moving the trip hand beyond zero, but is not capable of being fixed where registration is begun away from the proper place so as to indicate that fact, or act as a tell-tale at all. Therefore it is not the equivalent of the tell-tale hand in the combination and its use is not a violation of the injunction. The motion is denied.

EDWARD N. DICKERSON, Jr., for Plaintiff.  
 JOHN DANE, Jr., JOHN F. DILLON, for Defendant.

HOYT H. WHEELER.

At a regular term of the Circuit Court of the United States, held in the court rooms of said court in the city of New York, in the Second Circuit, in the Southern District of New York, on the 9th day of March, 1887.

Present:—

The HON. HOYT H. WHEELER, Circuit Judge.

THE RAILWAY REGISTER MANUFACTURING COMPANY, } On motion for an  
 vs. } attachment for con-  
 BROADWAY & SEVENTH AVENUE RAILROAD COMPANY, et. al. } tempt.

This cause coming on to be heard upon the motion of the plaintiff, the Railway Register Manufacturing Co., for an attachment for contempt based upon the proceedings already had, and upon the injunction issued herein, and upon the affidavit of Edward E. Quimby, verified December 10th, 1886, presented on the part and behalf of the said plaintiff; and upon the affidavit of Chandler Hall, verified March 5th, 1887; the affidavit of William H. Kukuck, verified March 7th, 1887, and the affidavit of Arthur L. Baldwin, verified March 8th, 1887; and upon the exhibits produced in court; the opinion of the court on final hearing in this case, and the interlocutory decree heretofore filed herein, presented, read, and referred to, on the part and behalf of the defendants herein, and after hearing the arguments of counsel for the respective parties hereto; and after due consideration thereof, on the motion of John Dane, Jr., Solicitor for the defendants, it is ORDERED, that the said motion for an attachment be, and the same hereby is, denied.

HOYT H. WHEELER.

A true copy.  
 (Seal of the Court.)

TIMOTHY GRIFFITH, Clerk.

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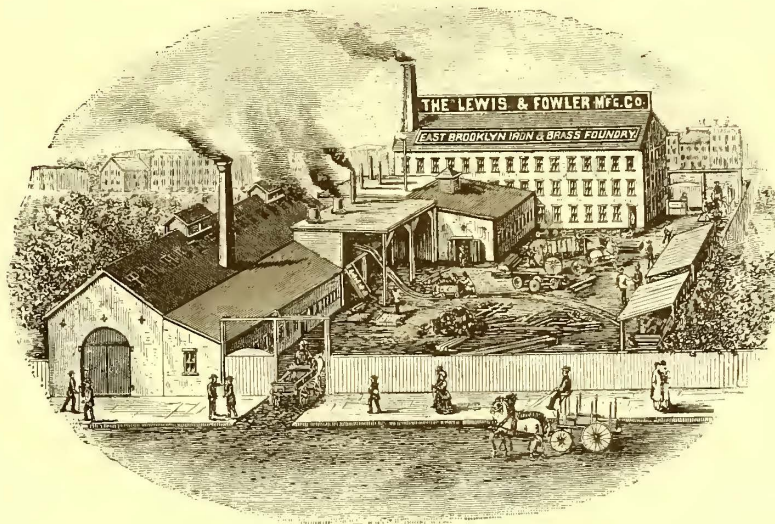
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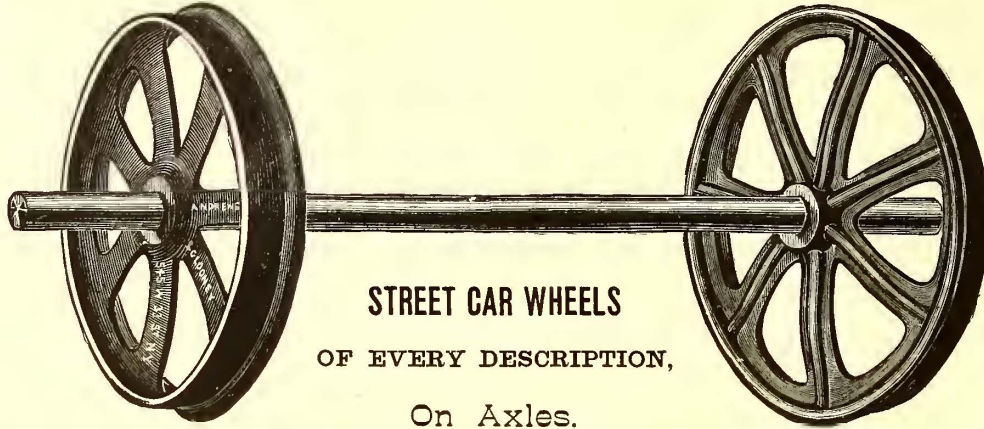
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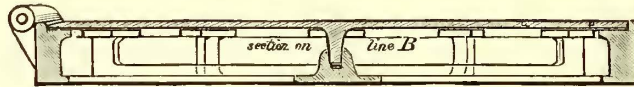
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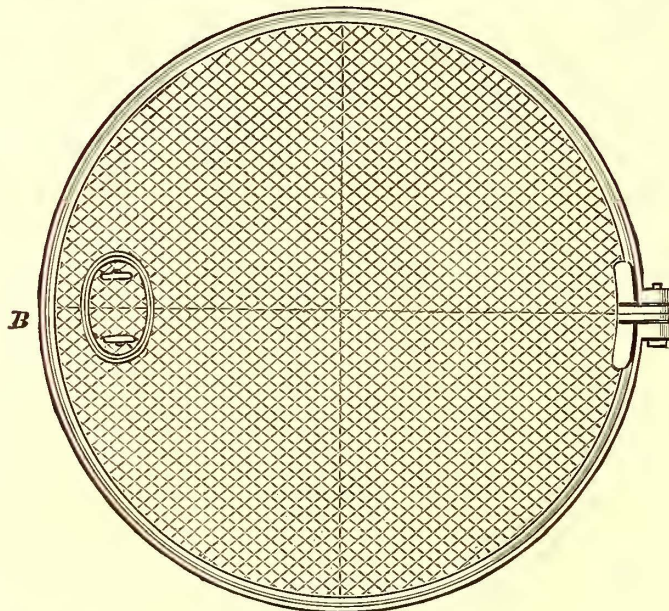
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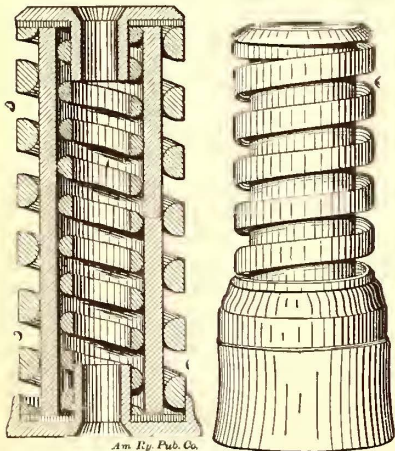
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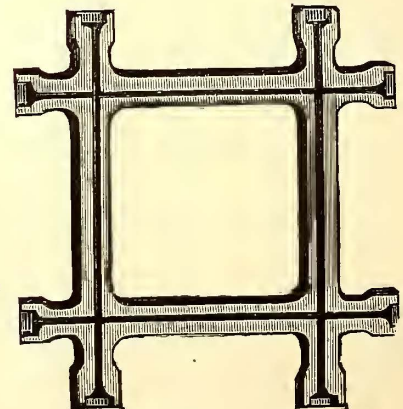
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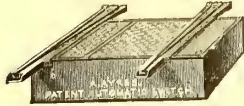
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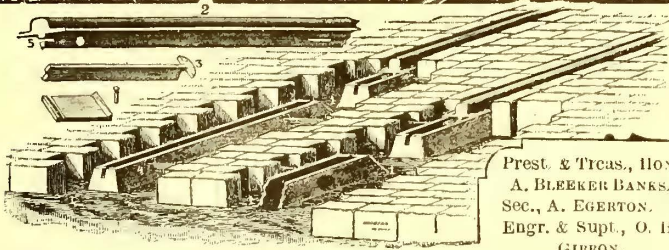
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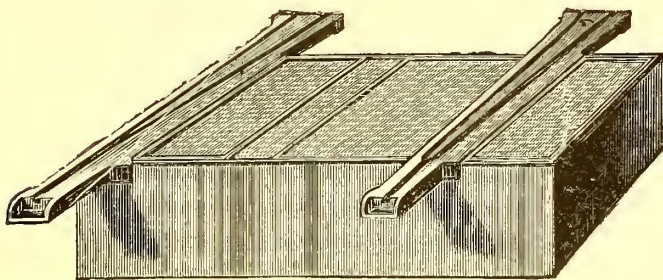
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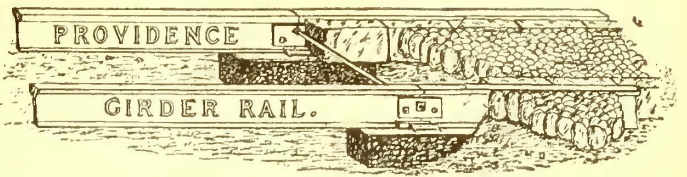
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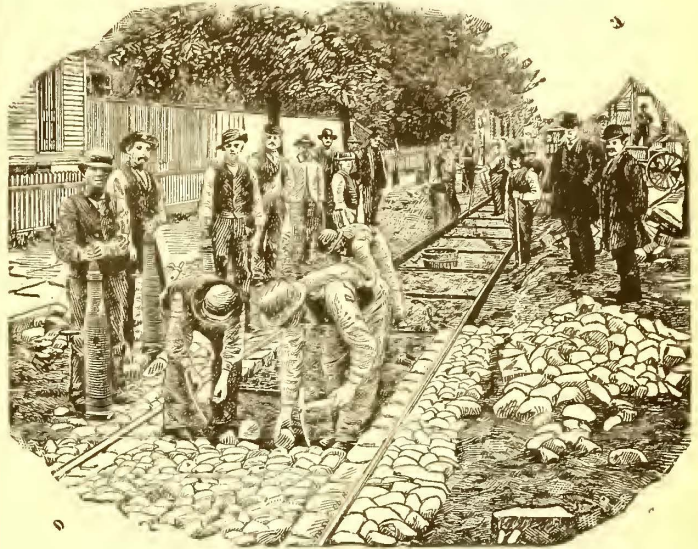
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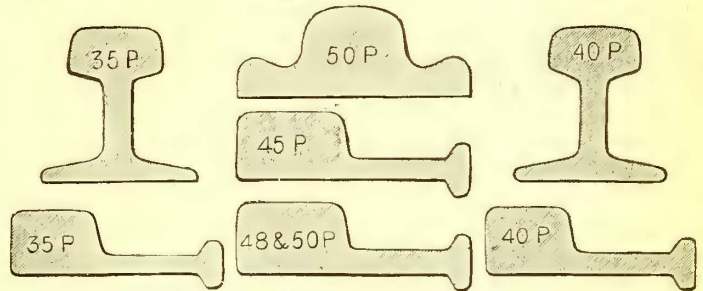
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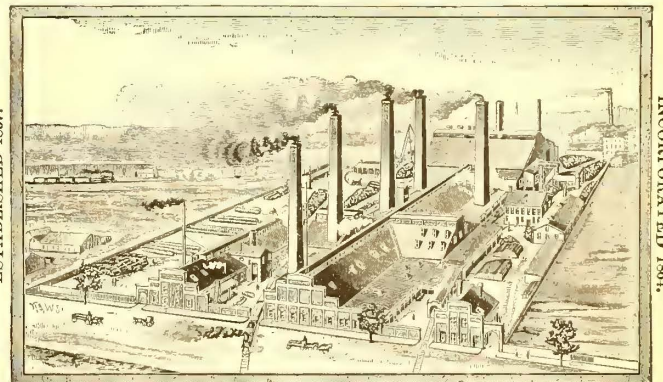
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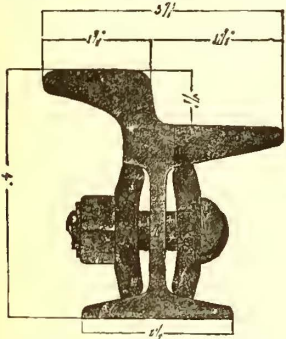
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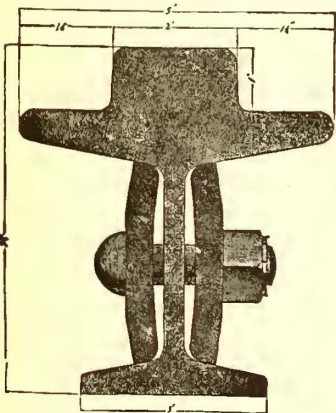
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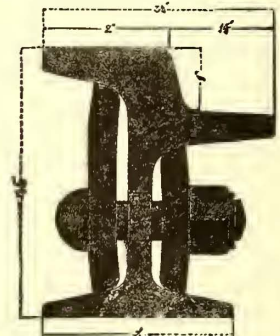
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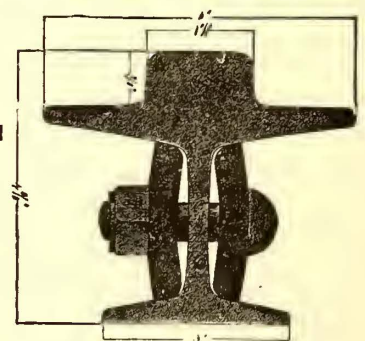
Large Assortment of different Weights and Sections.

Section D. 45, No. 11.



Patented November 27, 1883.

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.

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Pillars, Sills, Sashes, Doors, Curves, Bows, Mouldings, Panels, all patterns.

**CAR IRONWORK.**

Chilled Brake Shoes, Pedestals, Boxes, all patterns of Castings and Wrought Iron, Drop Forgings.

**Bearings & Check Plates.**

Outside Trimmings of Bronze, Grab-Handles, Dish Rail Caps and Ends, etc.

**Car Hardware and Trimmings.**

Brass, Bronze or Plated Locks, Sheaves, Gongs, Lifts, Change Slides, etc. Send for Illustrations.

**Home Bells a Specialty.**

Loop or Solid Shank; Plain or Strapped; Strong and Durable.

**Clipping Machines for Horses and Mules.**

Can be run by Hand or Power. Send for cuts.

**CAR MATS.**

The Folding Mat the Best Made. Also Diamond, Plain, and Co-coa.

**THE CELEBRATED**

**Keg-Shaped Spring for St. Cars**

**FIT ANY BOX.**

Are Elastic and Superior to any Springs yet made.

Trial sets furnished. Prices Low.

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3-Ply, Plain or Perforated, and Frames for Seats; also Rattan and Slat.

**Cotton Duck and Serims.**

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Snow Sweepers and Plows. Fare Boxes, etc.

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

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STREET CARS, RAILS,**

AND EVERY DESCRIPTION OF

**STREET RAILWAY SUPPLIES.**

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**THE JOHNSON STEEL STREET RAIL COMPANY  
JOHNSTOWN, PA.**

**NEW YORK, CHICAGO,  
STEWART BUILDING, ADAMS EXPRESS BUILDING  
Broadway, Reade and Chambers Sts. No. 185 Dearborn Street,  
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ALL SUPPLIES FURNISHED APPERTAINING TO

## Steam & Street Railways.

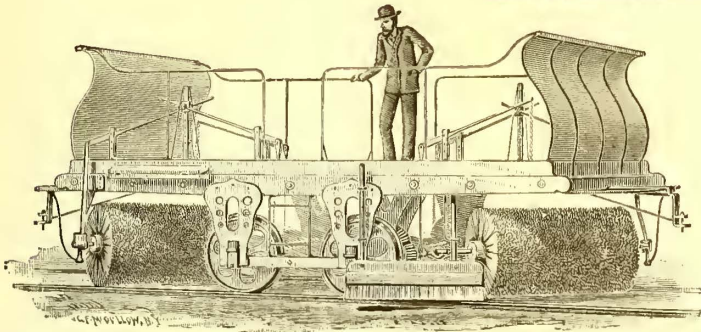
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Blue Prints and Bills Furnished on Application. CORRESPONDENCE SOLICITED.

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**37, 39 and 44 Walworth St., Brooklyn, N. Y.**  
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**RAILWAY  
 SUPPLIES.**

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Simplest, Cheapest and Best in the World. Each Exhibited in Practical Operation.  
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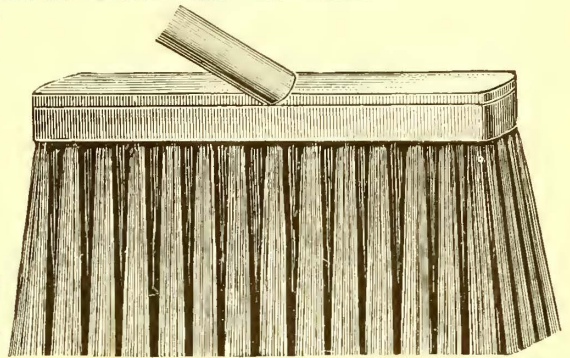
AGENTS FOR THE NEW ENGLAND STATES, THE EASTERN STATES  
 AND THE SOUTHERN STATES OF THE

**BOSS & WALKAWAY**

**SNOW  
 SCRAPERS.**

PRICE, \$100 AND \$150.

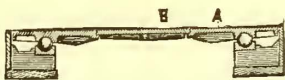
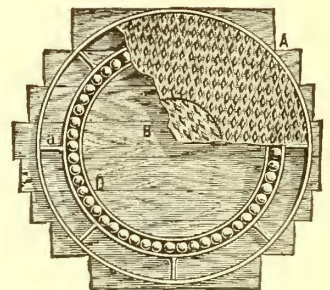
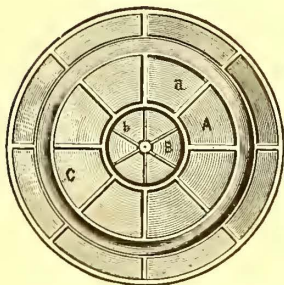
Only Two Horse Power.  
 Cheapest Practical Snow Plow in  
 the World.



All kinds Track and Stable Tools: Picks, Shovels, Rammers, Bars, Mauls,  
 Tongs, Bending Machines at the Lowest Prices.

Latest Improved Snow Sweepers of our own  
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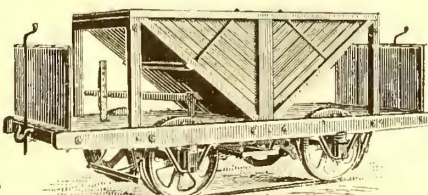
Cylinder Brooms and many other improvements  
 are patented.  
 Rattan for Refilling. Snow Plows.  
 Sand Cars. Sweepers of other makers refitted  
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**BEST QUALITY COIR BRAID MATS TO ORDER 17 CENTS PER SQUARE FOOT.**

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 Upright Brooms. 16 in. 6 row  
 Stable Brooms, \$5.50 doz.  
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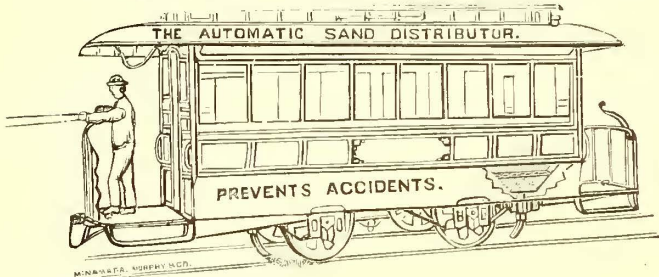
**SECOND-HAND  
 New York Sweeper,**

In Good Working Order,  
**IF SOLD AT ONCE \$250.**

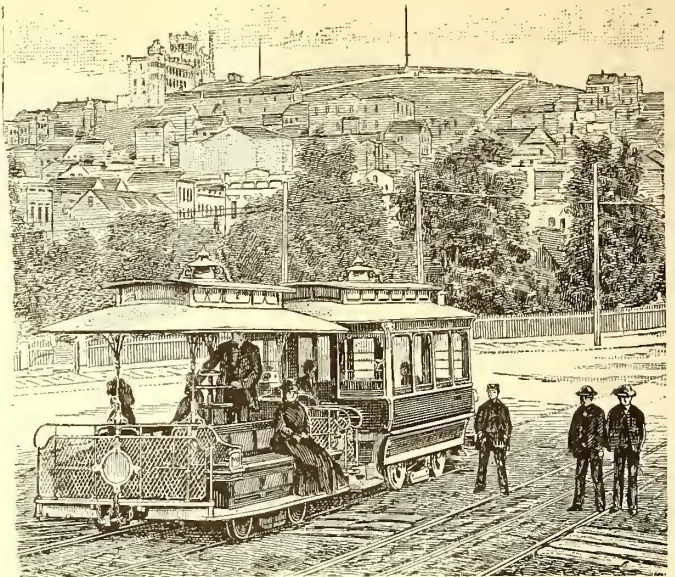
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*For Horse, Cable, Electric and Steam Cars.*  
 Charges the Sand direct on top of rail, in front of wheel, in any quantity, whenever wanted. Acts Instantaneously by foot pressure.  
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Am. System Traction Rope Railway, operated by Independent Duplicate Cables.

FULLY PROTECTED BY PATENTS IN THE FOLLOWING COUNTRIES.

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 234 BROADWAY, NEW YORK.

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MANUFACTURERS OF

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**WIRE ROPE FOR STREET CABLE RAILWAYS.**

SWITCH ROPES.

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# Washburn & Moen Manufacturing Company,

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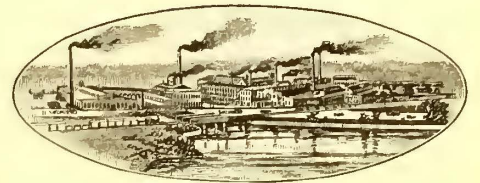


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Every Variety of

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For all Purposes.



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### The Largest Wire Drawers in the United States. WIRE ROPE AND CABLE



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# THE HAYCOX PATENT DOOR FASTENER.

ADOPTED BY  
All Cleveland Railway Companies.

Patented May 5, 1885.

*Fastener detached, made of malleable iron, weight about five pounds.*

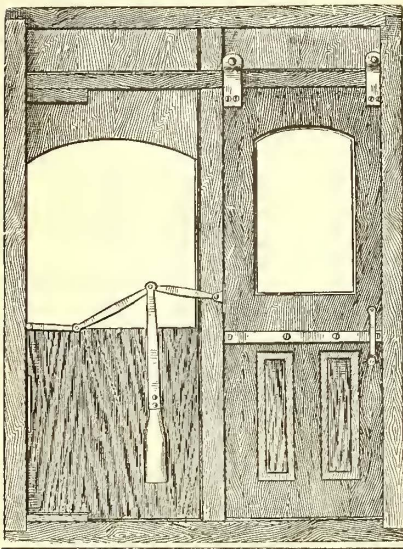
*Especially adapted for Elevator Doors.*

*For further particulars, prices, circulars, etc., address*

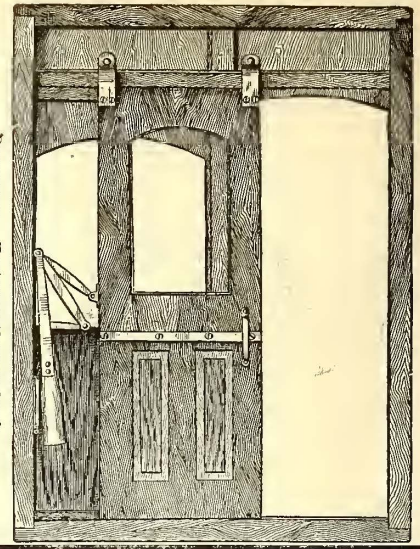
**Haycox Door Fastener Company,**

W. E. HAYCOX, Manager.

1158 Euclid Avenue, Cleveland, O.



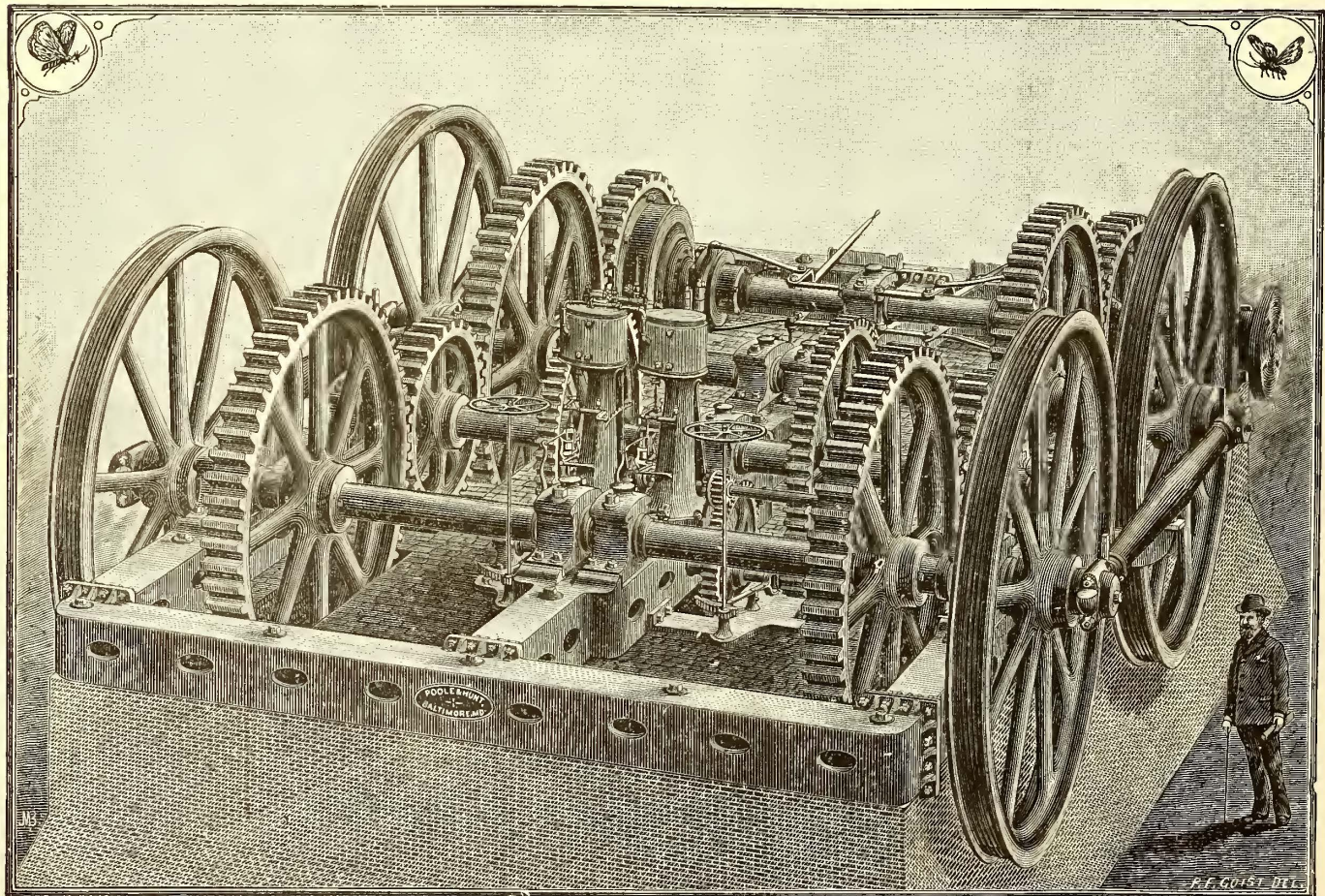
Door closed, fastener in position, weight suspended from the toggle joint, holding it closed.



Door open. Fastener thrown back.

## THE STREET RAILWAY JOURNAL, ONLY \$1.00 PER YEAR.

# POOLE AND HUNT, Baltimore, Md.,



## Manufacturers of Cable Railway Plant, Machine Moulded Gearing for Mills and Factories.

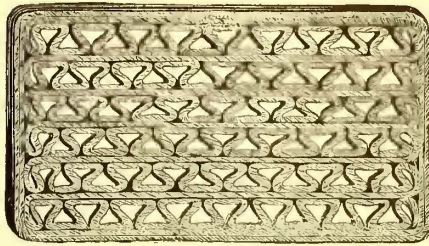
CORRESPONDENCE SOLICITED.

# LYNN & PETTIT,

MANUFACTURERS OF

## Machine Braided Cocoa Car Mats.

707 Market Street, Philadelphia.

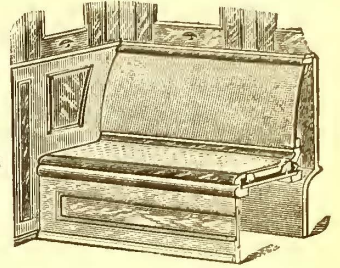


A Sample  
Order  
Solicited.

# THE HALE & KILBURN MANFG. CO.,

Extensive makers of Patented  
**Street Car Seats**  
of every description.

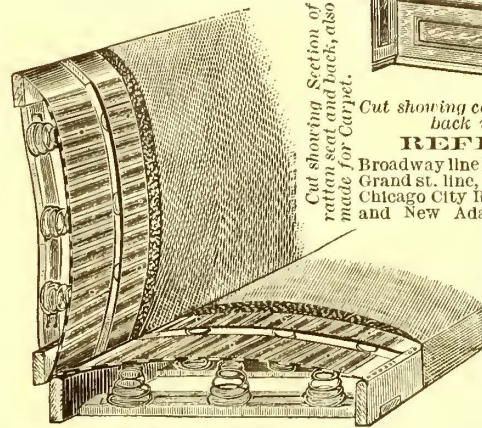
Our Patent Spring Seats covered with Rattan or Carpet are fast being adopted by the best railroads in the country. Seats for Steam Cars a Specialty. Owners and makers of all the Cobb patents



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 durable and economical, for the reason both a Summer and Winter seat is obtained in one.

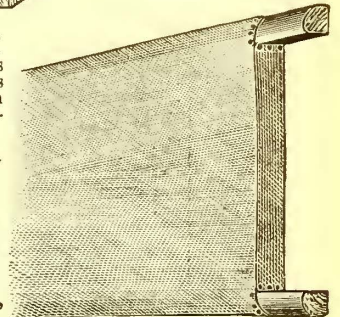
Estimates & Particulars cheerfully given (mention this paper), satisfaction guaranteed

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.



# Ayers' Anti Rattler,

FOR RAILROAD CAR WINDOWS.



The Best and Cheapest

ANTI-RATTLER IN THE  
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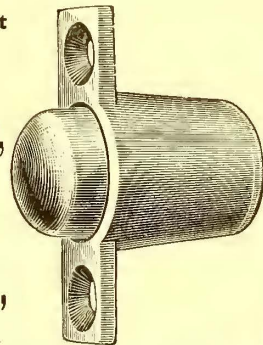
## Ayers' Pat. Sash Holder,

FOR HOLDING CAR WINDOWS AT ANY  
HEIGHT.

Manufactured by the

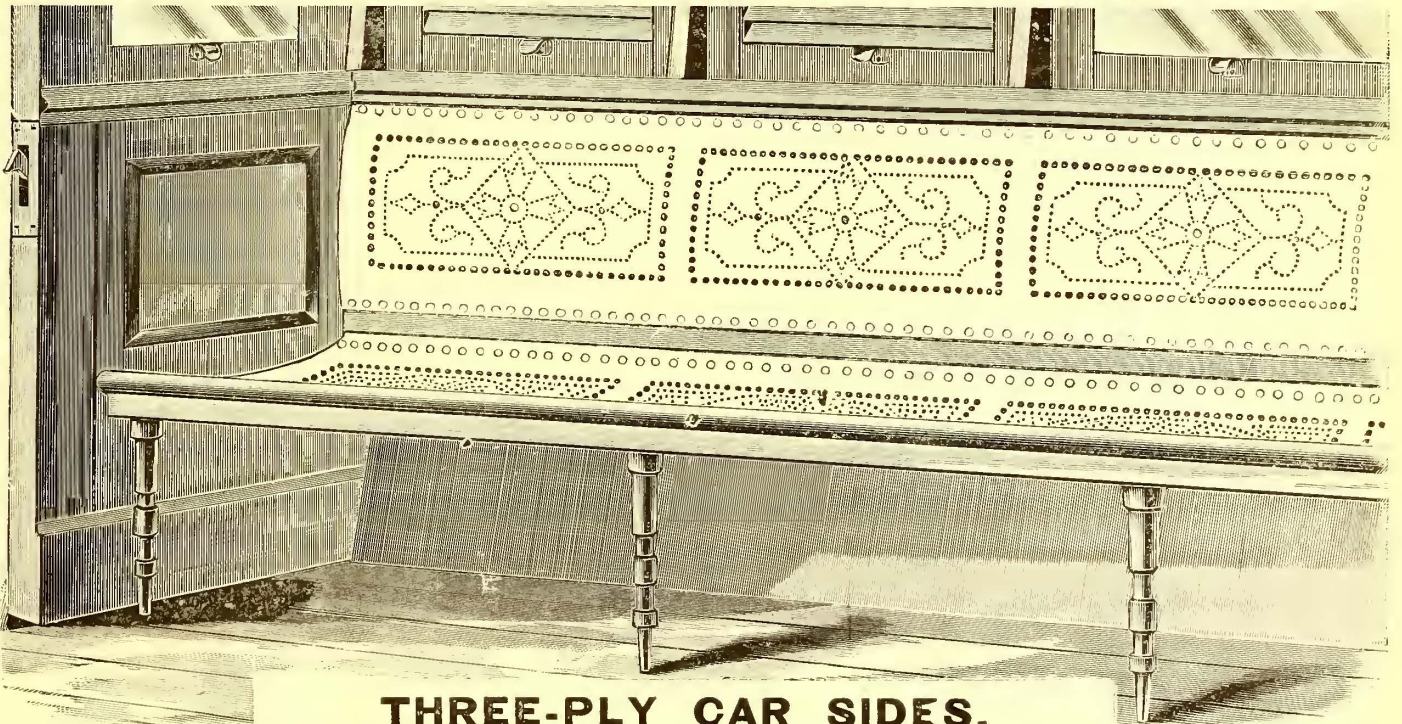
## AYERS' PAT. SASH HOLDER CO.,

Room 242, Broadway & Chambers St.  
STEWART BUILDING, NEW YORK.



Send for Circulars.

# STREET CAR SEATS & BACKS.



## THREE-PLY CAR SIDES.

These seats and backs have been in use a number of years and have given universal satisfaction. They have received such a thorough test and are so well known that they show their good qualities and we need say nothing for them. Our facilities for doing this work are the largest in the world. We own the forest from which our lumber is cut. We cut our own veneer and do our own work in all its departments. We keep laid up in stock, seats and backs and can fill all orders promptly. Our 3-ply white wood car sides, ends and roof add fully 75 per cent to the strength of cars. We can also furnish car ceilings made of any kind of wood desired, plain or decorated. Send for Railroad Catalogue.

# Frost & Peterson, 161 & 163 West 18th St., N. Y.

W. P. SEGUINE, Manager Railroad Department.

# RUFUS MARTIN & CO.,

## 13 Park Row, New York.

MANUFACTURERS OF AND DEALERS IN

# STREET RAILWAY SUPPLIES.

### BRILL'S PATENT DUST AND OIL-TIGHT EQUALIZING GEAR.

This improved running gear needs oiling but twice a year, and the brasses will wear upwards of six years. No waste is required in the box, and the friction is reduced upwards of fifteen per cent. In ordinary running gears, oiling is necessary once or twice a week. Brasses wear out in less than one year, and the boxes require frequent re-stuffing with waste. This is the most comfortable, easy running and lasting gear in the market. It can be had to fit any ordinary pedestals.

Brake shoes, (improved pattern) sold by the pound.

### BRILL'S PATENT RATCHET BRAKE HANDLE.

Made of Bronze and of Malleable Iron. The ratchet enables the driver to adjust the handle to any position, where he can obtain increased leverage and power. This Brake Handle will prove an economical attachment to any car, and can be attached to any shaft.

### BRILL'S PATENT CHANGEABLE SIGNAL LIGHT.

An arrangement for altering the Signal Lights of a car, by which different routes can be designated. The center or stationary lens, or "bull's-eye" is white, and the two changeable lights may be had of any desired color. These lights are used to advantage in connection with the Reversible Signs, described below, and can be easily attached to any car.

### BRILL'S PATENT REVERSIBLE SIGNS FOR CARS.

This is a Wooden Sign, placed on the sides or end of the cars, on the edge of the roof, and is used to designate certain streets or routes through which the car passes. Also to designate terminal points. The castings are sold complete, and it is an easy matter to fit in the board sign. When in place, a simple upward push will turn the sign and expose the reverse side. Done in an instant. Send for sample set of castings.

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### IMPROVED CHANGE BELT.

SINGLE & DOUBLE HARNESS, HALTERS, WHIPS

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Card Signs and Change Envelopes.

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Car Trimmings, Brake Shoes, Fare Boxes.

Wood Mattings, Rubber Mattings and Treads.

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# Wilson Brake Shaft.

ENTIRELY NEW & NOVEL IN CONSTRUCTION.  
POSITIVE AND SURE IN ACTION.

BRAKES SET WITHOUT COMPLETELY TURN-  
ING THE HANDLE.

MADE ON THE PRINCIPLE OF A FRICTION  
CLUTCH.

SIMPLE IN DESIGN.

Saves Room, Adds to Available Braking Power,  
and Gives the Driver the Best Possible  
Control over the Car.

Mordecai M. Wilson, Agent,  
TROY, N. Y.

# The Wiser & Vail Car Starter.

A PRACTICAL DEVICE.

1. Overcomes one-half the draft.
2. When car is going and horses attempt to go faster the starter throws in gear and assists.
3. There is no dead strain on horses at any time.
4. If driver puts on his brake before holding horses back, the spring makes it easy on horses' shoulders.
5. Starter is automatic. Requires no attention more than oiling at time of oiling car.
6. Beneficial for Cable Roads as well as horse power.

FOR SALE Outright, or Upon Royalty, or Will Equip Roads.

**WISER & VAIL,**

277 PEARL STREET, CLEVELAND, OHIO.

WE HAVE REBUILT OUR WORKS AND ARE READY FOR BUSINESS.

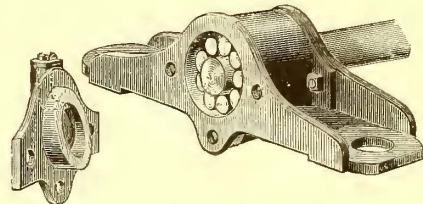
# Street Railway Supply Company,

SUCCESSORS TO

The Higley Car Journal Company, Cleveland, O.,



Sole Manufacturers of the



New Worswick Box.

MANUFACTURERS OF AND DEALERS IN

# Street Railway Supplies Generally.

Wheels, Axles, Springs, Rails, Track Supplies.

The Recent Tests on Locomotive Journals have been so Remarkable as to exceed belief.

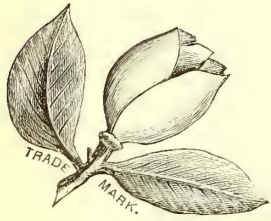
# CHARLES B. MILLER,

—MANUFACTURER—

Put it into any place where Every Other Metal has Failed. Am not Afraid of the Result.  
—TRY IT.—  
SEE FOR YOURSELVES.

# Magnolia Anti-Friction Metal.

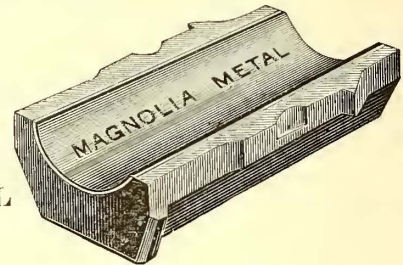
The Invention of SAMUEL SINGLEY, an old Practical Engineer and Rolling Mill Master Mechanic.



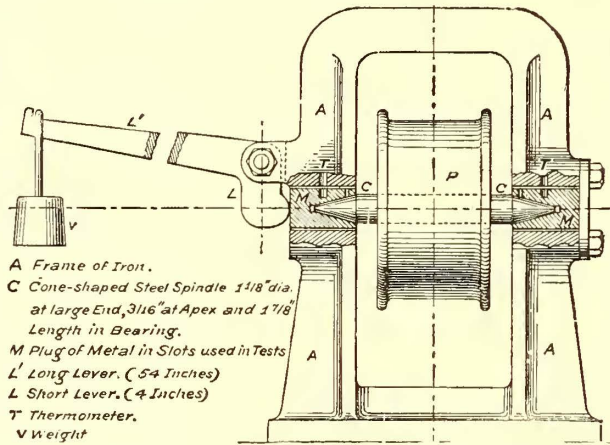
## THE BEST Anti-Friction Compound Discovered

—FOR—

STREET CARS, STEAMSHIP and ALL MACHINERY BEARINGS.



Its use as a Street Railroad Journal Bearing will reduce friction so much that a Car Loaded will run as easy as an Empty Car with the Ordinary Metal.



A Frame of Iron.  
C Cone-shaped Steel Spindle 1 1/8" dia. at large End, 3/16" at Apex and 1 7/8" Length in Bearing.  
M Plug of Metal in Slots used in Tests  
L' Long Lever, (54 Inches)  
L Short Lever, (4 Inches)  
T Thermometer.  
V Weight

It will not Heat, Cut or Wear Journals, but Protect them.

It is a Self-Lubricating Metal, saving a large percentage of oil.

Cut of Machine Used in Tests Magnolia vs. Parsons' White Brass, Hart's Metal and Post's Zero Metal.

The Largest Dry Dock in the United States.  
SHIP YARD, ENGINE AND BOILER WORKS AND ALBANY STREET IRON WORKS, 125 WASHINGTON STREET.  
Dry Docks, Erie Basin, Brooklyn, N. Y. Steamship Repairs a Specialty.  
W. H. JEWELL ESQ. NEW YORK.

OFFICE OF THE HOTCHKISS & UPSON CO., BOLT MANUFACTURERS, CLEVELAND, O., Feb. 9, 1887.  
MR. CHAS. B. MILLER, Manufacturer of Magnolia Anti-Friction Metal, New York.  
DEAR SIR:—Inclosed please find check, \$12.50, for sample of your **Magnolia Metal**.  
I have thoroughly tested your metal and am fully satisfied. Used the metal in our large stock transfer elevator pulley bearings, where the **rapidity** of motion combined with the **pressure** made a **fine** test. In one of the bearings was your **Magnolia Metal**, in the other Babbitt's best 45-cent metal was used. Upon examining the two, found the **Magnolia Metal** had an unworn surface as smooth and bright as polished steel, while Babbitt's was rough and worn.  
In my opinion the **Magnolia Metal** is the **BEST** Anti-Friction Metal yet discovered; experimented ten months with a view of making a similar Anti-Friction Metal without success; therefore **know** the value of **Magnolia Metal**.  
Yours truly, F. A. SMITH, Supt. and Foreman of the Hotchkiss & Upson Co.  
DEAR SIR:—Mr. F. A. Smith's statements are reliable; he is a thorough machinist and mechanic.  
THE HOTCHKISS & UPSON CO.,  
C. A. HOTCHKISS, Pres't.

OFFICE OF HENDREN & ROBINS, PROPRIETORS OF Erie Basin Dry Docks, No. 1 Dock, 510 ft. long, No. 2 Dock, 600 ft. long, 25 ft. Water Over Sill.  
NEW YORK, MARCH 30, 1887.  
DEAR SIR:—We beg to inform you that the samples of **Miller's Magnolia Metal**, sent us by you to be tested, have been subjected to a number of severe tests, and in each trial against the best-known American and English anti-friction metals.  
Among the metals tried against **Magnolia** were Parsons' White Brass, the best English metal and now in general use by the principal steamship lines of the world; Hart's Metal and Post's Zero Metal, the best American Metals heretofore known to us, besides other well-known brands.  
The testing machine was of our own device, one we have used for many years in testing metals, capable of exerting enormous pressure and making rapid revolutions. We enclose cut of the same.  
During all these tests the **Magnolia Metal** has shown itself vastly superior both in point of friction and ability to resist wear, and in **no case** has it failed to melt or burn out all other metals tried against it, and although in many instances abused and overstrained, it has never failed to show a smooth and brilliant wearing surface, and shows no tendency whatever to cut the journals.  
After many years' trial and use of various anti-friction metals in some of the largest steamship journals in the world, we have no hesitation in indorsing **Magnolia** as a most superior metal, and shall adopt it for our own use.  
Inclosed you will find copy of logs showing the low temperature of **Magnolia** as compared with the other metals, and its wonderful ability to resist wear.  
W. D. DICKEY, Superintendent,  
Member of American Society of Mechanical Engineers.

L. PFINGST, MASTER CAR BUILDER, THIRD AVENUE SURFACE ROAD, NEW YORK, JAN. 21, 1887.  
CHARLES B. MILLER, Proprietor of Magnolia Anti-Friction Metal, New York City.  
SIR:—I have taken out the metal given me by you, having placed it under Car No. 85 on our road. I find yours as sound as when put in, and the others entirely gone. This is the invention of Samuel Singley. You can call and see the journal bearings if you so desire.  
I am, yours truly,  
L. PFINGST, formerly with Pullman Car Works.

MAGNOLIA VS. HART'S METAL—Feb. 18, 1887.

Revolutions per minute.	Pressure per square in.	Average temperature.	REMARKS.
Magnolia.....2 000	471 lbs.	118° F.	Hart's Metal fused at 480°
Hart's.....2 000	471 lbs.	270° F.	and struck to journal.

MAGNOLIA VS. PARSONS' WHITE BRASS—Feb. 21, 1887.

Magnolia.....2 000	604 lbs.	119° F.	Parsons' Metal fused at 255°
Parsons'.....2 000	604 lbs.	211° F.	and clogged journal.

MAGNOLIA VS. POST'S ZERO METAL—March 21, 1887.

Magnolia.....2 000	1,000 lbs.	207° F.	Post's Zero melted out at
Post's Zero.....2 000	1,000 lbs.	241° F.	310° Fahr. and clung to journal, while Magnolia was intact, showing 216° temperature Fahr.

MOBILE, Ala., March 18, 1887.  
CHAS. B. MILLER, Esq., 21 1/2 Coenties Slip, New York.  
DEAR SIR:—We have tested 20 lbs. of your **Magnolia Anti-Friction Metal** in the journals of our cotton-seed huller, and it has given perfect satisfaction.  
The huller was run night and day for fifteen days, and the metal was put to the **severest** test that we could give it.  
The pressure on the journals was about 4 000 lbs., and revolutions per minute, 80. The shaft was 2 1/2 in. in diameter, and the journal about 10 in. in length.  
We used **less oil** on the **Magnolia Metal** than we have ever used on any other metal, and used the **very cheapest grade of West Virginia oil**, costing us not over 1 1/2 cents per day.  
With this common oil in use the temperature of your metal did not average over 100° Fahr. We have melted out the best Babbitt metals in these journals with a **better grade** of oil in use.  
The appearance of the shafts on removing the "box caps" was **like polished steel**. The metal has a tendency to wear a journal less than any we have ever seen.  
We judge it to be a **very durable metal**, and after fifteen years' experience in running machinery, using every kind of anti-friction metals known during that time, we pronounce your **Magnolia Anti-Friction Metal** to be the **best in all respects we have ever seen or tried**.  
We consider our test of your metal the **severest** that it could be put to in this section of the country.  
Yours truly,  
(Signed) A. J. REAGAN,  
(Signed) F. W. ROTHIE,  
Engineers in Gulf City Oil Mills, Mobile, Ala.

Magnolia Metal averaged 29 per cent below average of all the other metals.  
W. D. D.  
NEW YORK, April 4, 1887.  
DEAR SIR:—Please deliver to bearer, with bill, 1 ton (2 000 lbs.) **Magnolia Metal**.  
HANDREN & ROBINS.

The foregoing gentlemen are experienced engineers, and their testimony entitled to the fullest confidence.  
(Signed) S. O. NELSON,  
Sec'y and Treas. Gulf City Oil Mills.

INGOTS 2 1-2, to 5, 10, 20 and 30 Lbs. FURNISHED.

# WATKEYS' ADJUSTABLE CLUTCH AXLE.

1. Saves thirty per cent in the wear of wheels and rails.
2. Does away with the severe racking and straining of cars.
3. Reduces the cutting of the ends of journals to a minimum.
4. Enables horses to do twenty-five per cent more work, by sparing them the hard pull in rounding curves.
5. Adds greatly to the comfort of passengers, wholly avoiding the shaking up and jolting now unavoidable, and silencing the unpleasant grating noise incident to turning corners.

Satisfaction Guaranteed

AT A COST SLIGHTLY ABOVE ORDINARY WHEELS AND AXLES.

We use only the best car wheels, cold rolled steel axles of the finest quality, and our work is second to none in the country.

Our axle is now in use on the Jersey City and Bergen Railroad, and in Syracuse, N. Y. We refer to the officers of these lines to substantiate the above claims.

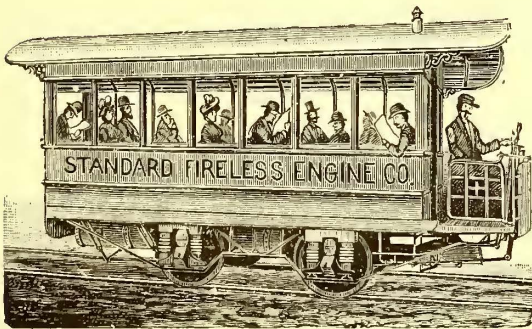
Now negotiating with other leading roads.

MANUFACTURED BY

**THE EMPIRE AXLE MANUFACTURING COMPANY,**  
GEORGE B. HIBBARD, President,  
32 Nassau Street, New York City.

## The Standard Fireless Engine Co.

P. O. Box 1914, New Orleans, La.



Use of Expansive Power of Condensed  
Ammonia as a Motive Power.

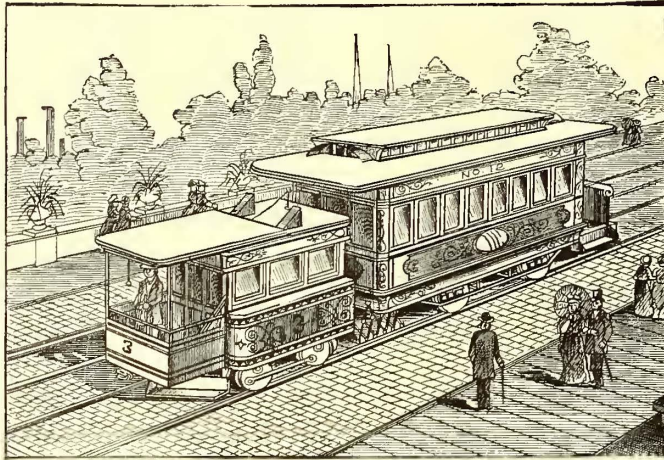
Machinery Simple in Construction, Effective,  
Economical in Action.

Thoroughly Tested and Practical Value Fully  
Demonstrated.

# POLE STREET CAR

Differential Lever Car  
Star'er, Runner & Brake.

Starts easily, Brakes as certainly and effectively as the air or Steam brake.



Standard No. 3 Motor  
Is operated by a  
Specially Designed Low Pressure  
Condensing Engine  
of great power in small space and  
having no escapes on the street.

## MOTOR SYSTEM.

The system can be operated by compressed air and is so recommended where good all-the-year-round water power can be secured to compress the air. Can be operated by storage battery, electricity or soda, ammonia, and other motive powers.

Warranted to climb hills, start on hills, and when the track is so slippery that the driving wheels will slip round under the motor, we still guarantee the motors starting by a system of ground levers.

### WE ARE FULLY SECURED BY PATENTS.

We claim the only motor system capable of starting and going when the tracks are slippery, excepting only the cable motor. Ours is a cheaper outfit.

Correspondence solicited.

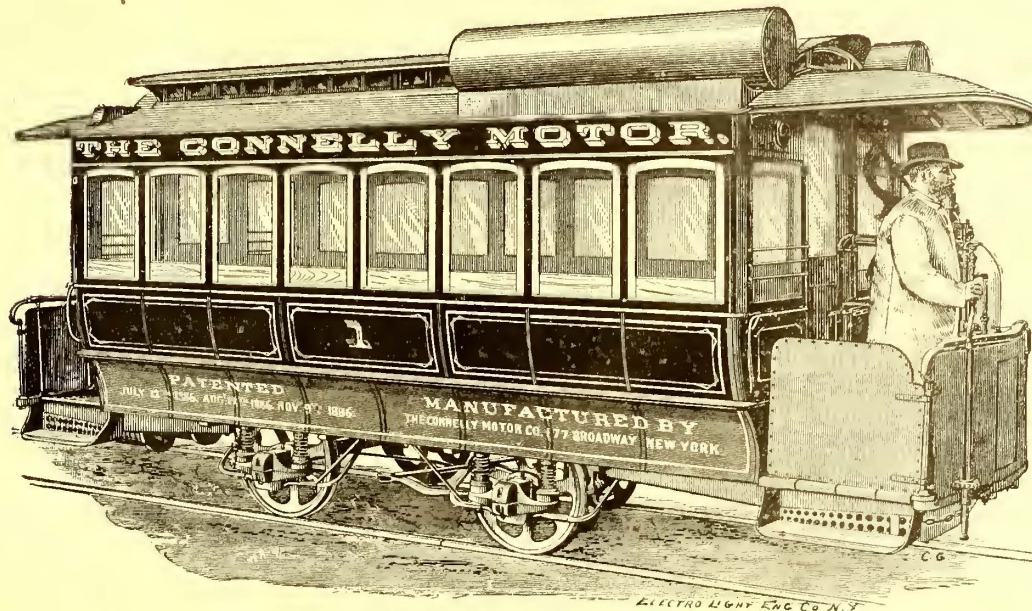
## Pole Street Car Motor System,

310 Chestnut Street, Philadelphia, Pa.



# THE CONNELLY MOTOR.

PATENTED.



**No Fire! No Smoke! No Dust! No Ashes! No Fireman! No Engineer!**  
**Complete within itself! Generates its own Power! Perfectly Independent! Can run on any Track!**  
**No Cables, "grips" or expensive conduits.**  
**No "Central Station" for generating power.**  
**No loss of power in transmission.**  
**No dangerous Electric currents.**  
**No tearing up of streets for repairs.**  
**No suspension of traffic for repairs.**

It excels all other motors in **ECONOMY** and **CONTROLLABILITY**, and stands alone in its **INDIVIDUALITY**.

It carries a supply of fuel for a day's run, and consumes but **ONE GALLON OF NAPHTHA PER HOUR**.

The daily expense of operating a road with these motors **IS IN EXACT PROPORTION TO THE NUMBER OF MOTORS IN USE**, which cannot be said of any Cable or Electric system.

The cost of equipping a road with them is about **ONE-HALF** the cost of any Electric system, and less than **ONE-FOURTH** the cost of any Cable system.

The cost of operating, including Fuel, Lubrication, Care, Repairs and Royalties, will not exceed **\$2.00** per day, being about **HALF** the cost by Cable or Electricity.

Any road can adopt these motors without making any change in their system, without interruption to their business, and without risking any investment in special plant, as a few motors can be put into use along with the Horse-cars, and the number gradually increased.

All companies desiring to abandon the use of horses should examine fully into the merits and peculiar advantages of our system, before making any contracts, as it is the only system that can be applied with equal economy on both large and small roads.

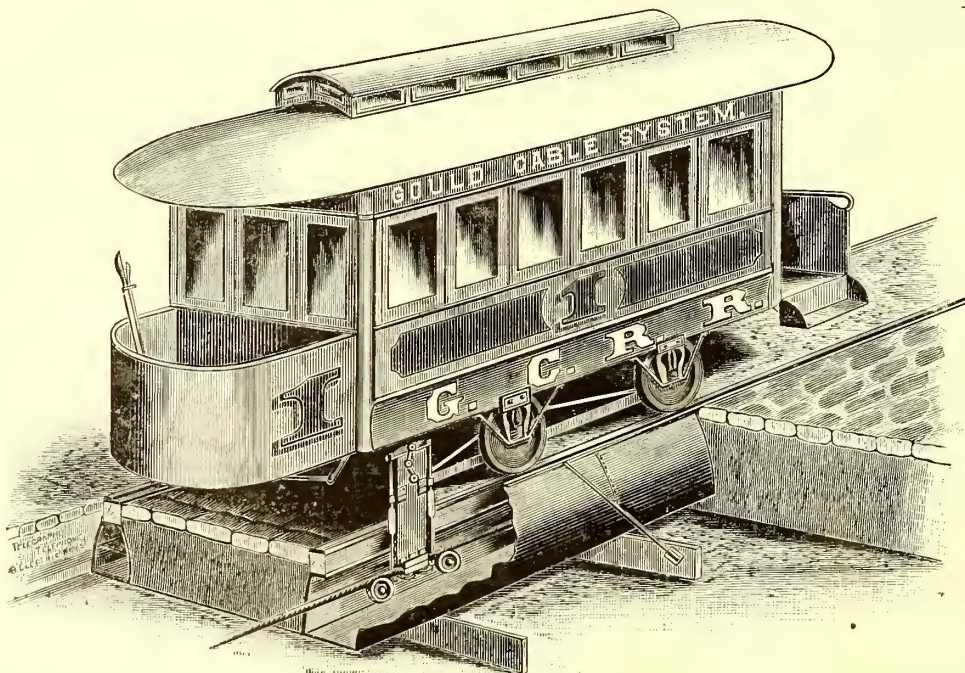
All parties interested in street or suburban roads are requested to correspond with us.

**THE CONNELLY MOTOR CO., 177 BROADWAY, NEW YORK CITY.**

# THE GOULD DOUBLE CONDUIT.

A CONDUIT FOR THE CABLE AND AN EXTRA CONDUIT FOR TELEGRAPH,  
TELEPHONE AND ELECTRIC WIRES, ETC.

**Constant Tearing up of the Street Avoided.**



The Conduit for the Cable is placed at the side, doing away with the Central Conduit entirely.  
A Conduit on the other side is supplied for Electric and Telegraph Wires, Gas, Steam, Etc.

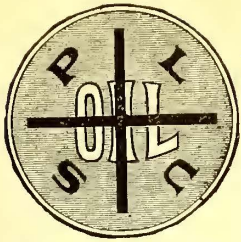
**The Rails are Tied Together at the Surface.**

The Slot which admits the Grip is placed outside the rails. The construction of the Grip is the simplest known.

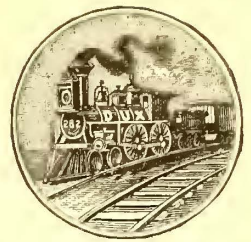
*THE INVENTOR WILL MAKE FAVORABLE TERMS WITH PARTIES WISHING  
TO PUT THIS SYSTEM IN OPERATION, OR TO FORM COMPANIES  
IN THE DIFFERENT STATES OR CITIES.*

Address all communications to

**J. H. GOULD, Ninth and Market Streets, Philadelphia, Pa.**



# DUX LUBRICANT.



The Leading New Grease for Street Railways.

Trade Mark Pat. Mar. 13, 1883.

Trade Mark Pat. Mar. 13, 1883

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.**

## DUX FOR STREET RAILWAYS.

PITTSBURG, ALLEGHENY & MANCHESTER RY. CO., PITTSBURG, PA., Aug. 13, 1887.

Leib Lubricating Co.:

GENTLEMEN—We have used Dux Lubricant for the past nine months. It has given entire satisfaction; in fact, it is the best I have ever used. Think it fully as good as represented.

Yours truly,  
J. C. COTTON, Supt.

OFFICE OF CAMDEN HORSE RAILROAD CO., CAMDEN, N. J., Dec. 14, 1886.

Leib Lubricating Co., 196 and 198 Chicago st., Buffalo.

We have used your "Dux Lubricant" for about two years and regard it as the best and cheapest lubricant ever used by this company.

J. H. HOOD, Supt., etc.

OFFICE OF ACUSHNET STREET RAILWAY CO., NEW BEDFORD, MASS., Dec. 11, 1886.

Leib Lubricating Co., Buffalo, N. Y.:

DEAR SIR—We have used several packages of your "Dux" and like it very much. We can recommend it to any one using axle grease.

Yours very truly,  
A. P. SMITH, Treas.

BYRON WESTON, FIRST-CLASS LEDGER AND RECORD PAPER, }

DALTON, MASS., Oct. 15, 1886.

Leib Lubricating Co., Buffalo, N. Y.

GENTLEMEN—Yours of the 13th inst. received. In reply; we like your Dux

Lubricating Compound very much, and when this is used up that we have on hand shall order more. I find on heavy bearings where no other oil or grease would cool it yours did the work.

Yours truly,  
HARRY W. HITT, Supt.

FAULKNER MILLS.—F. J. HASTINGS & Co., MILLERS.

So. Acton, MASS., Dec. 23, 1886.

Leib Lubricating Co., Buffalo, N. Y.

GENTS:—Your favor of the 17th inst. duly received. In reply we would say, that for several years we had much trouble and annoyance to find a lubricant for our heavy bearings that would stand, and tried various articles on the market without being satisfied, until a friend connected with a large manufacturing concern gave us a few pounds of the Dux Lubricant to try. It worked so much better than anything we had ever had that we ordered enough from you to give it further trial, and as a result have used it ever since, and can truly say it is the best lubricant we ever used. It will stand heat, gives off no drip and is economical, and we are very much pleased with it and do not hesitate to declare that it is our firm belief that there can be nothing ever made to equal it. Our experience on wagons has been equally satisfactory; our first attempt being on a heavy wagon used every day, heavily loaded, ran 21 days when it went into the shop to be painted, and then was in a good condition to run longer. The only thing we regret is that we did not at once try and arrange to sell it in this locality, still one of our townsmen to whom we gave your address, Mr. Littlefield, has since obtained the agency, we learn, and we can obtain it through him.

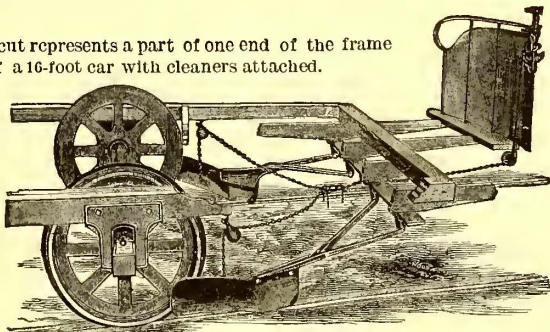
Yours truly,  
F. J. HASTINGS & Co.

MANUFACTURED BY

The Leib Lubricating Co., 196 & 198 Chicago St., Buffalo, N.Y.

## 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.



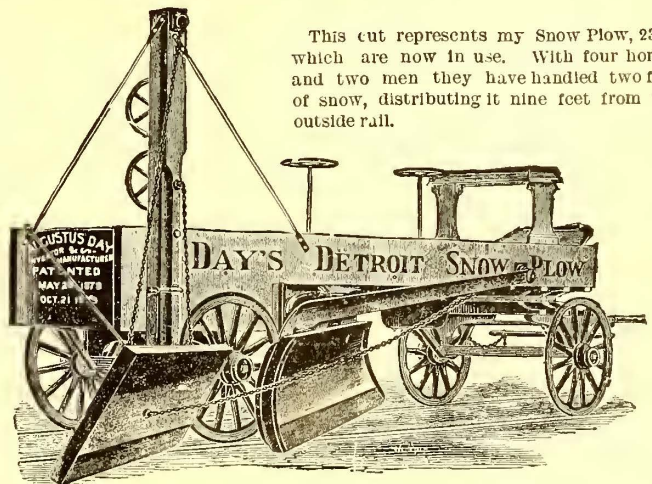
These Track Cleaners need no extended statement of their great superiority over all others invented. The fact of over three thousand pairs being now in use is sufficient evidence of their necessity and utility. Are adaptable to all kinds of rails and styles of cars. Clean Snow, Ice, Mud and Stones from 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	Pairs
Chicago City Ry., Chicago, Ill.....	400	"
Rochester City & Brighton R. R. Rochester, N. Y.....	170	"
Albany Ry., Albany, N. Y.....	75	"
Lynn & Boston R. R., Boston, Mass.....	68	"
Boston Highland Ry., Boston, Mass.....	46	"
Grand Rapids Street Ry.....	48	"
Naumkeag 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 be auxiliary to them. For execution in deep snow, ease, and convenience in handling, it surpasses all others in use. Orders should be given three month 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.

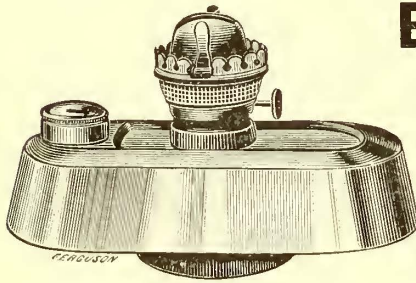
**EDWARD C. WHITE,**  
**Brass & Bronze Works,**  
 531 West 33rd St., New York.  
 Superior Quality Journal Bearings; Car, Locomotive and Machine Castings. Railway Hardware & Supplies.

The "BROADWELL CAR STARTER," having been subjected to practical tests, is now placed on the market at a very low price.

**C. B. BROADWELL,**

169 Laurel Street, - New Orleans, La.

**Clute's Patent Double Bottomed Street Car LAMP,**

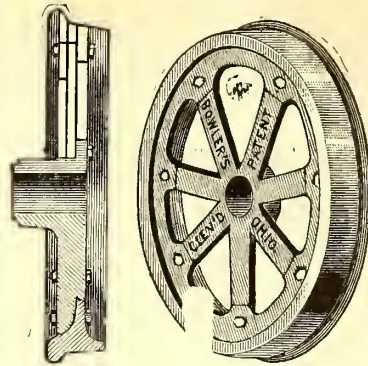


Is one that assures safety, durability, and is perfect in regard to leakage.

GEORGE M. CLUTE, Sole Manufacturer;

Also Dealer in Car Reflectors, Chimneys, Burners, Etc.

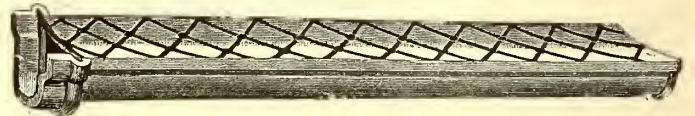
WEST TROY, N. Y.



**Cleveland Foundry,**

Manufacturers of

Car and Locomotive Wheels either Chilled or Steel Tired; with or without axles. Street Railway Wheels, Turnouts and Turntables. Patent Chilled Face RR. Frogs. Engine & Heavy Castings a Specialty.



Graded Stable Cutter with Straight or Curved Cover. Descent 1/4 inch per foot. Pieces 5 feet lengths; short pieces furnished to suit any length. Spouts to connect with sewer.

They control and make N. P. Bowler's Patent Street Railroad Wheel. The tire of this wheel is cast separately from the hub and spokes; the latter is made of soft strong iron, and is perfectly free from strain—therefore can be made much lighter and more durable. The tires and the spokes or center of the wheel are made perfectly interchangeable so that when the tire or rim is worn out another can be put in its place by any employee with no other tool than a common wrench.

**Bowler & Co.** 10 TO 24 Winter St. **Cleveland, O.**

**THE CAR TRACK FRICTION APPLIANCE CO.,**

MANUFACTURERS OF

**THE PAT. RELIABLE SAND BOXES**

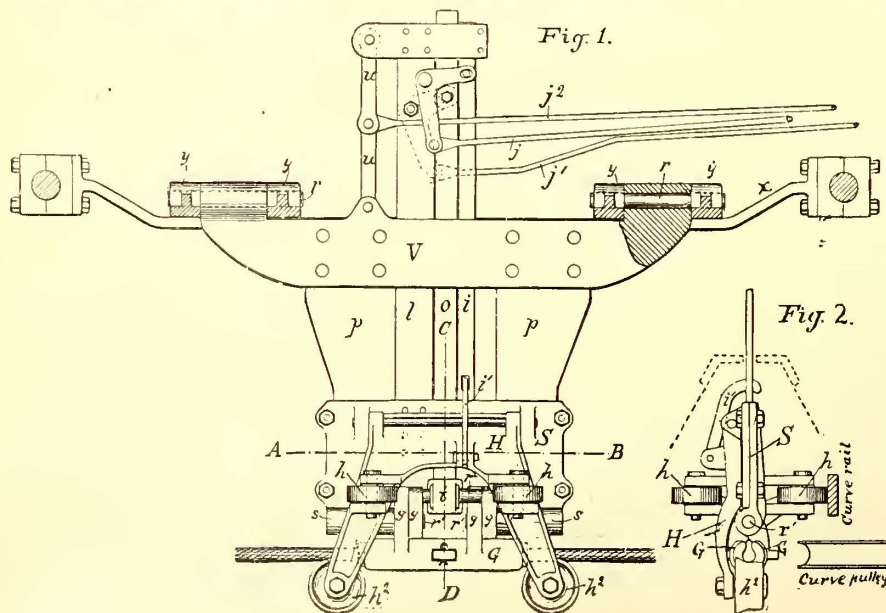
FOR STREET RAILROADS, HORSE, ELECTRIC, CABLE OR STEAM MOTORS.

W. T. BUTLER, General Manager.

No. 19 Tremont Row, Boston.

These boxes are guaranteed to distribute upon the rail SAND, SALT or GRAVEL, WET or DRY.

**ANDERS' CABLE RAILWAY GRIP.**



Simple, Durable, Efficient.

Cable may be dropped and picked up without leaving the platform. The whole under the constant control of the gripman.

Most efficient device in existence for releasing and gripping cable in crossing other roads.

Can be worked from either end of the car.

Mechanism Simple and not Liable to get out of order.

The rope may be dropped at any time to a lower level than the path of the gripping device and again raised into the gripping jaws at the will of the gripman with perfect ease and safety.

**D. B. ANDERS,**

2313 RIDGE AVE., PHILADELPHIA, PA.

# CAR HEATING

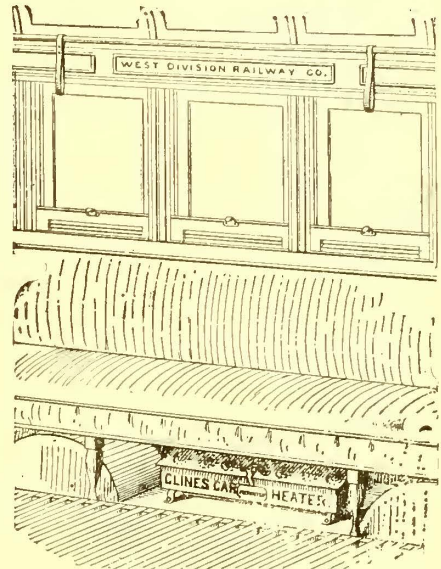
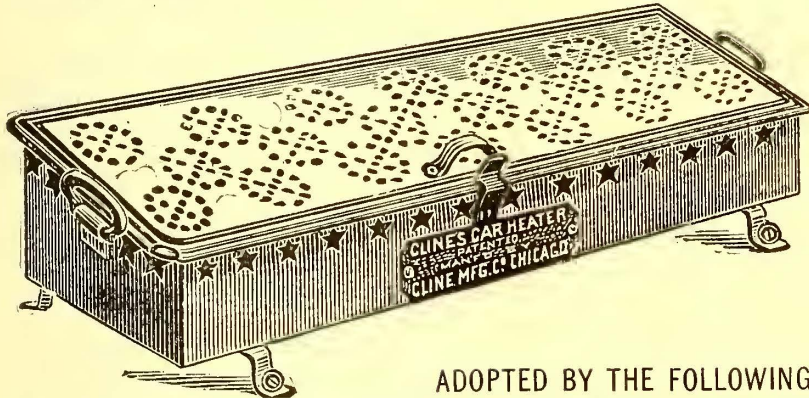
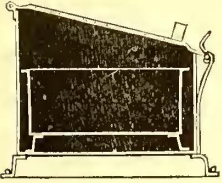
BY

## Aromatic Carbonic Compound Fuel.

Cheap. Convenient. Safe.

Once Filling lasts 18 hours.

NO CUTTING OF CAR TO PUT IN.



ADOPTED BY THE FOLLOWING ROADS:

CHICAGO WEST DIVISION; CITY OMNIBUS CO., Chicago; SOUTH CHICAGO CITY RAILWAY CO.; PEOPLE'S PASSENGER, Philadelphia; PITTSBURG & BIRMINGHAM AND OTHERS.

Cline Mfg. Co., 42 & 44 West Monroe St., Chicago, Ill.

S. M. CARPENTER, Prop.

C. J. LANGDON, Secy.

## FULTON FOUNDRY,

MANUFACTURERS OF

# STREET RAILWAY SUPPLIES,

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

Open Wheels of all sizes and weights. Wheels and Axles of all sizes fitted on short notice.

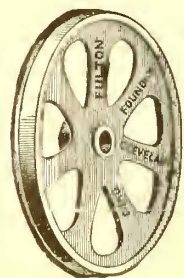
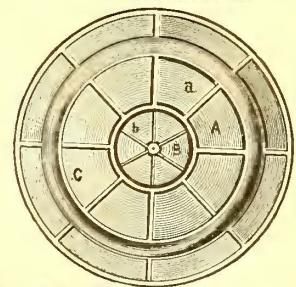
Chilled curve rail, Turnouts, Switches, etc., etc. Blue prints and Bills Furnished on Application. Send for Illustrated Catalogue. Address,



## FULTON FOUNDRY,

202 MERWIN ST.

CLEVELAND, OHIO.



# "PAY HERE."

## Fare Boxes and Change Receptacles

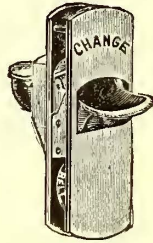
### FOR STREET CARS.

#### OUR NEW FARE BOX NO. 3

Is pronounced by the many Street Car Companies using it to be the best.

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.



CHANGE RECEPTACLE.

Descriptive and Illustrated Circular on application.

Examine the merits of this box and get our prices before buying.



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



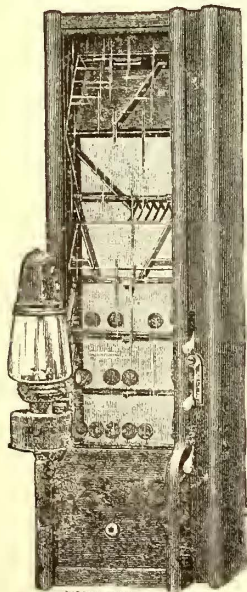
Box No. 3. Front or Passengers' View.

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

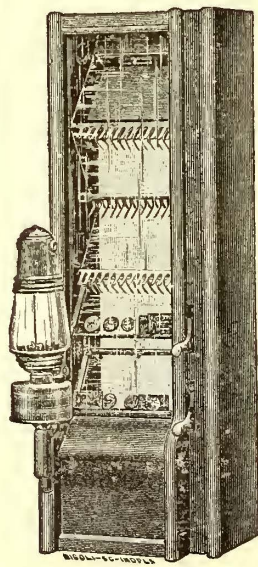
**WALES MANUF. CO., 76 & 78 E. Water St., Syracuse, N.Y.**

# TOM L. JOHNSON'S IMPROVED FARE BOX.

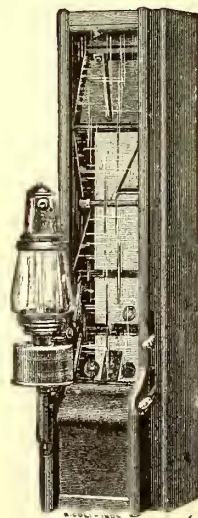
NOW IN GENERAL USE IN CITIES THROUGHOUT THE U. S.



BOX NO. 1.



BOX NO. 2.



CHARIOT PATTERN.

FARES CANNOT BE EXTRACTED OR BOXES ROBBED WITHOUT VIOLENCE.

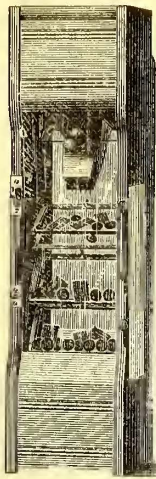
SPECIAL SIZES BUILT TO ORDER.

ROADS EQUIPPED WITH BOXES ON TRIAL, AND IF NOT SATISFACTORY, RETURNED WITHOUT ANY EXPENSE TO THE COMPANY TRYING THEM.

Patented Oct. 14, 1873.

## REDUCED PRICES.

Write for Descriptive Circular and Price List. Address all correspondence to **A. A. ANDERSON, INDIANAPOLIS, IND.**



# THE BEAMAN FARE BOX.

MANUFACTURED UNDER TWO PATENTS OF FEB. 15th, 1887.

## Absolutely Secure, Whether Fastened to the Car, or Not.

No Fares can Possibly be Turned Out or Abstracted by any Known Means.

EVERY CONVENIENCE PROVIDED FOR THE INSPECTION OF FARES.

Easily Cleaned, Simple and Durable in Construction.

The Smallest Detail has been Carefully Designed.

Its many New and Important Features, it is Conceded, place It Beyond Competitors.

For Full Particulars, Address,

### T. L. BEAMAN, Knoxville, Tenn.

# SLAWSON'S PATENT FARE BOXES

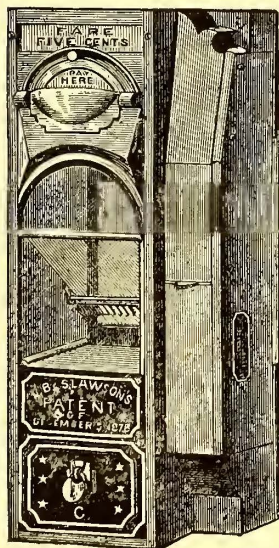
These Boxes are of the latest and most approved pattern, and contain a front door, by opening which all of the glass inside can be conveniently cleaned. This is a late patent, and is a very valuable improvement over the old method of taking the boxes apart for that purpose. They are well made and not 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.

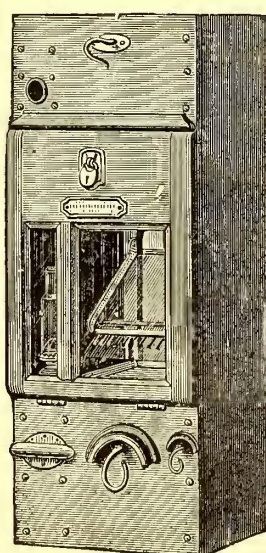
These Boxes, etc., are now in use not only in the United States and Canada, but in Mexico, South America, Europe, Asia, Africa and Australia—in fact, nearly all places where street cars are used.



Change Slide. Outside View.



C. Front View.

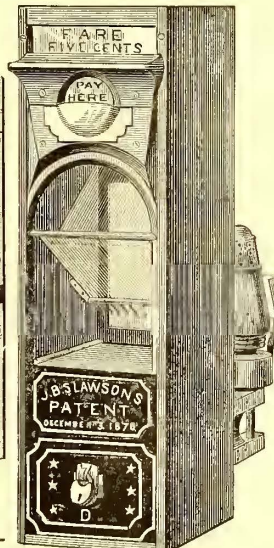


C. Back View.

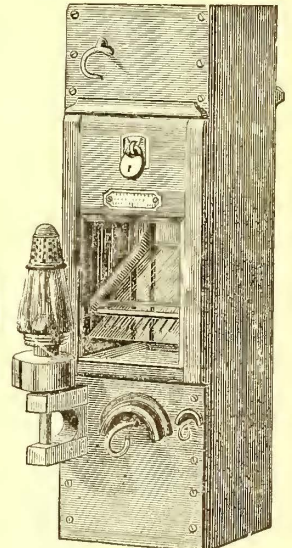


Change Gate. Outside View.

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



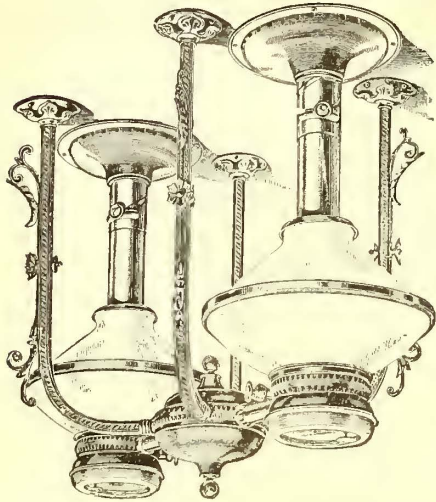
D Front View.



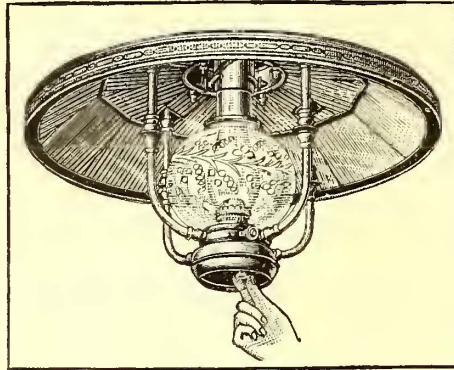
D Rear View.

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

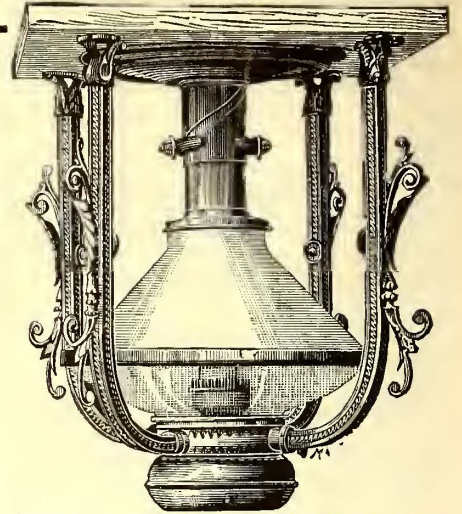
**JOSEPHINE D. SMITH, Successor to the late WILLARD H. SMITH,  
350 & 352 Pearl Street, New York.**



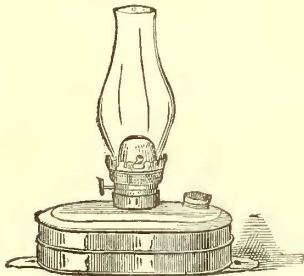
No. 10.—Two-light Car Lamp as used on Tenth Avenue (N.Y.) Cable road.



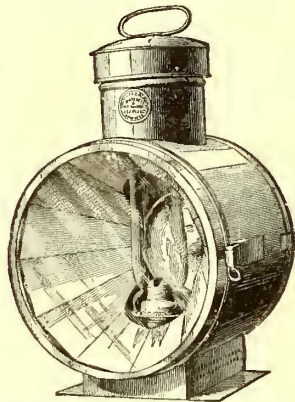
No. 14.—Center Car Lamp.



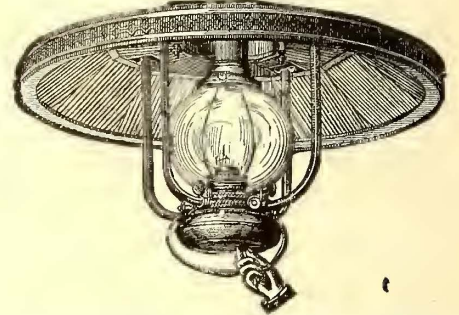
No. 8.—Center Car Lamp as used on Tenth Avenue (N. Y.) Cable road.



No. 3.—Box Lamp with drip cup.



Small Head Light for Grip Cars and Stages.



No. 1.—Center Car Lamp in general use throughout the United States and Canada.

All kinds of trimmings pertaining to car lamps.

**MANUFACTURER OF W. H. SMITH'S PATENT RAILROAD CENTER LAMPS AND REFLECTORS.**

**STREET CAR SEATS & BACKS.**

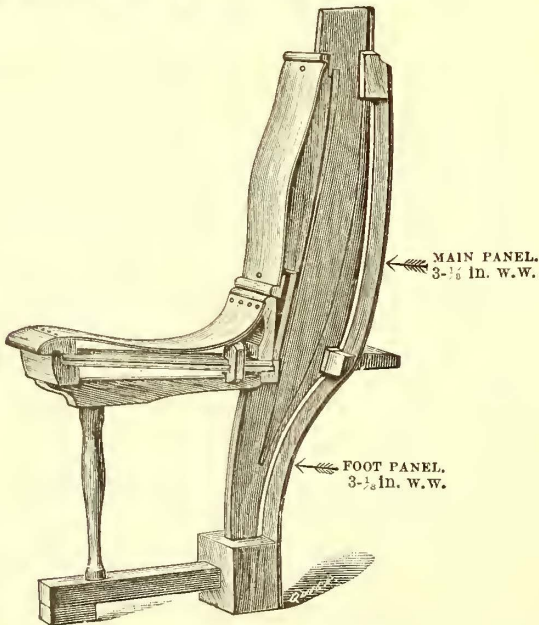
**THREE-PLY CAR SIDES.**

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 1/8 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 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 customers. 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, Birdseye 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.

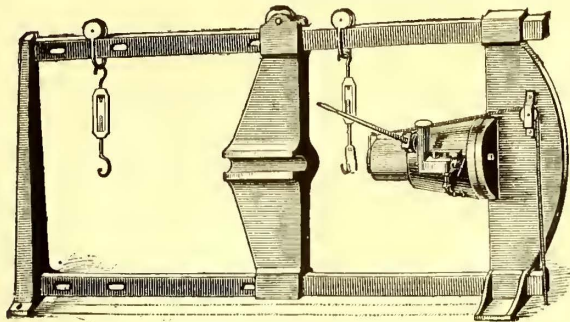
Sample and Salesroom: 206 Canal St., cor. Mulberry.

Send for Catalogue.

Address all Communications to Office.



**HAND POWER, LEVER AND HYDRAULIC PRESSES**



See page 197, July, 1885.

**Screw and Hydraulic Jacks.**  
**Watson & Stillman.**  
 204 to 210 East 43d Street, N. Y.

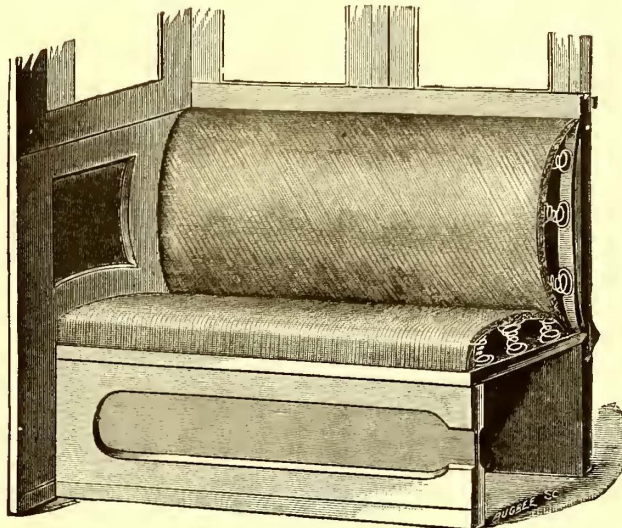
ESTABLISHED 1847.

**A. WHITNEY & SONS,**  
**CAR WHEEL WORKS,**  
 PHILADELPHIA, PENN.

**CAST CHILLED WHEELS,**  
**AXLES AND BOXES**  
**FOR EVERY KIND OF SERVICE.**  
 Street Railway Wheels of all Sizes.

**ROBERTS' PATENT WOVEN-WIRE**  
**Car Seats and Backs.**

Especially adapted to Street Car use.  
 Cleanly, Durable, Economical, Cool, Comfortable.  
 Cannot be Cut, Injured or Defaced.  
 Being entirely of Metal will last indefinitely.  
 Can be covered in Rattan, Carpet, Leather or other material, with less labor in covering and less expense in material than any seat in the market.



Send for Catalogue with Illustrations. Prices and estimates cheerfully given on application to

**THE HARTFORD WOVEN-WIRE MATTRESS CO.,**  
 P. O. BOX 363, HARTFORD, CONN.

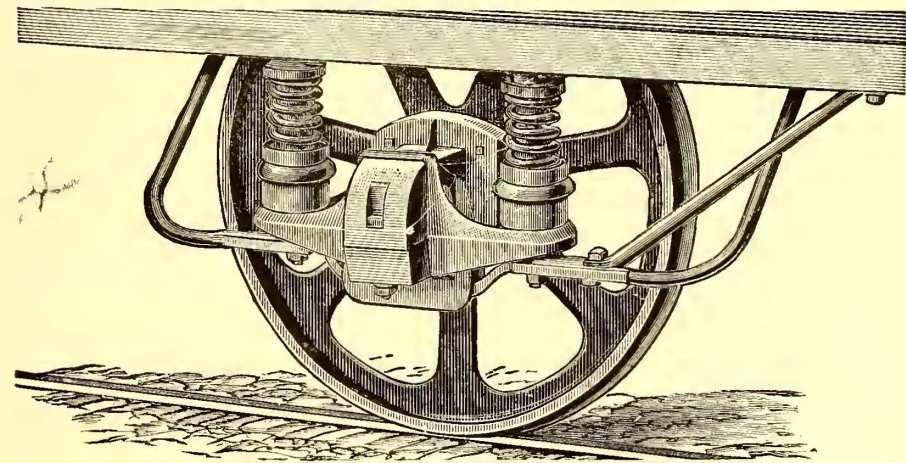
**THE BEMIS CAR BOX COMPANY,**

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.

227 Main St., Springfield, Mass.  
 Opp. Depot,



**—The Chaplin Roller Bearing Tramway—**

**CAR BOX AND GEAR.**

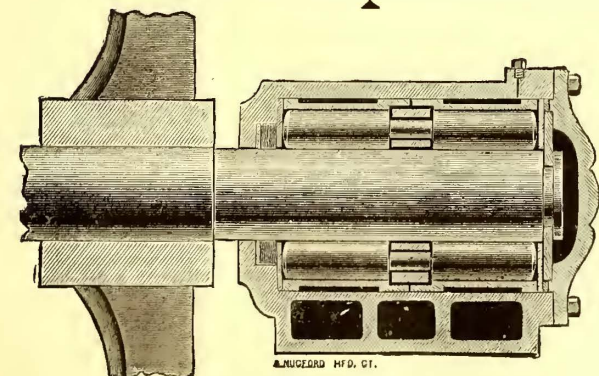
**LIGHT DRAFT EASY RIDING DURABLE**  
**POSITIVELY DUST PROOF AND OIL TIGHT**

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

SUPERINTENDENT'S OFFICE, HIGHLAND STREET RAILWAY,  
 No. 827 SHAWMUT AVE., BOSTON, August 19, 1886.

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 imperceptible, and it is beyond question the easiest running gear in the market.  
 Respectfully, J. E. Rugg, Supt.

SEND FOR CATALOGUE.



**THE CHAPLIN MFG. CO., 69 Wall Street, New York.**

# RICHARD VOSE,

13 Barclay Street, . New York,

PATENTEE AND MANUFACTURER OF

## Graduated Street Car Springs.

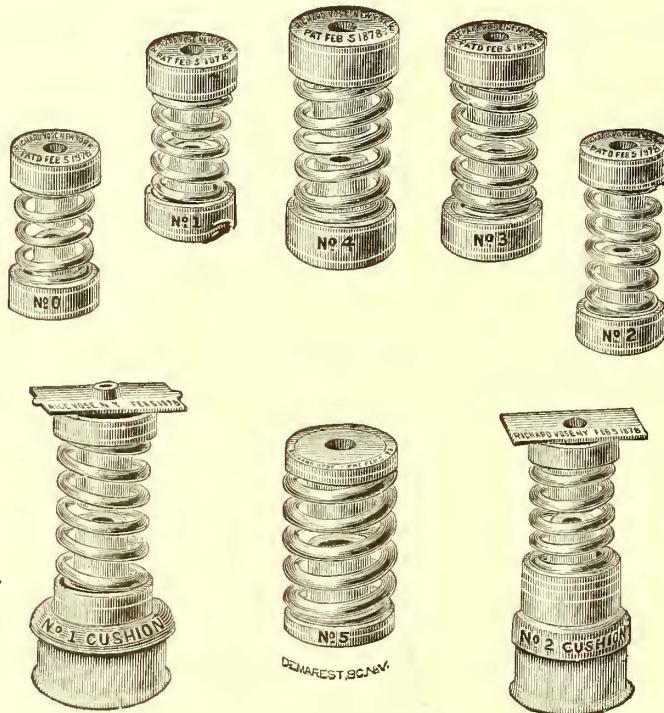
### RUBBER CONE.

Patented, April 15th, 1879.

ADAPTED TO THE

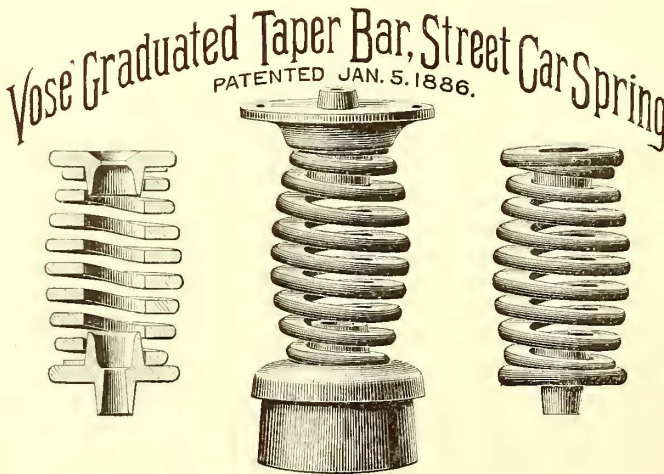
STEPHENSON,  
BEMIS,  
RANDALL,  
HIGLEY,  
BRILL,  
JONES,  
BALTIMORE,  
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CHAPLIN,  
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And all other Boxes.



No. 0, for 10-ft. Light Cars.  
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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.

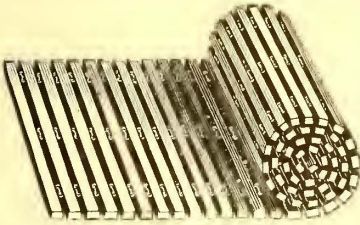
Adapted to all  
Pedestal AND Post  
Gears.



Motion Soft and  
Slow.  
It has no Rapid  
Vibrations.

This Spring is weakest on the ends, and strongest in the center. The bar is coiled on a mandril of equal diameter throughout. Thus where the greatest strength is needed the greatest amount of metal is found. The load first compresses the ends of the coils, and as the load is increased the center of the spring is brought into requisition.

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 MANUFACTURERS OF  
**RAILWAY CAR VARNISHES**



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 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.

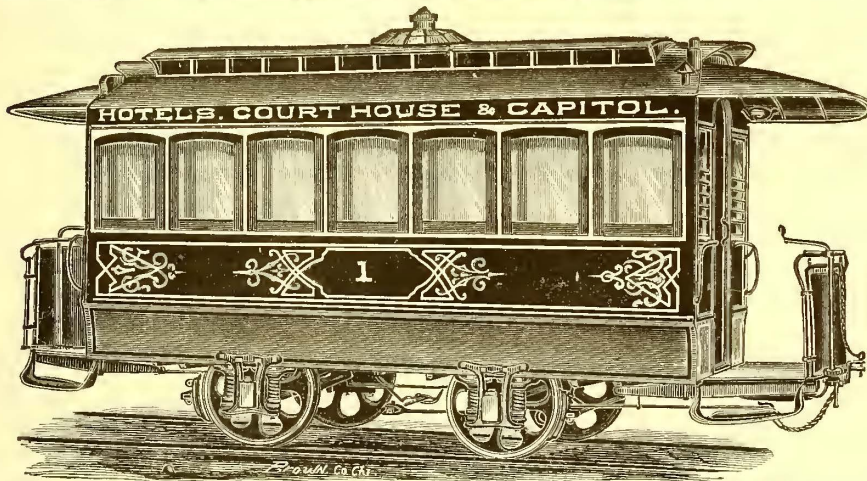


THE REFOR VARNISH  
 USE PARROTT

**Parrott Varnish Co.,**

FINE COACH  
 AND CAR **VARNISHES.**

Bridgeport, Conn., U.S.A.



**ROBINSON & HITT,**

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Manufacturers of all kinds of

**Street Cars.**

BEST OF FACILITIES. COMPLETE  
 MACHINERY RUN BY WATER POWER.

Also builders of all kinds of

**OMNIBUSES.**

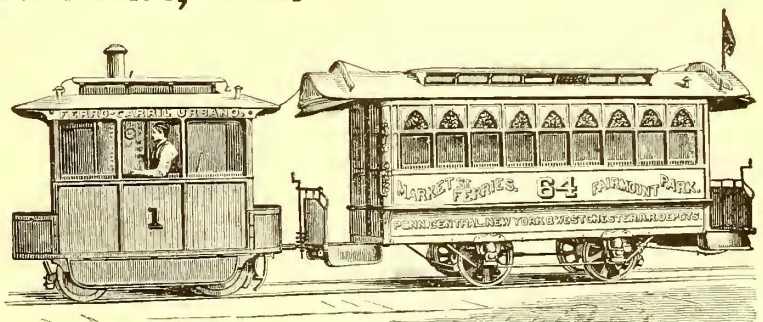
**Baldwin Locomotive Works,**  
 PHILADELPHIA, PA.

Burnham, Parry, Williams  
 & Co.,  
 PROPRIETORS.

Locomotives for every variety of service.

Noiseless Motors and Steam Cars for City  
 and Suburban Railways.

Catalogue Furnished upon Application.



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8 South Fourth Street,  
 ST. LOUIS, MO.

Manufacturers of the

**MALLINCKRODT  
 STREET CAR  
 BRAKE.**

See description on  
 pages 428 and 429 of  
 September number.



JOHN F. MALLINCKRODT Pres.  
 WM. HOFFMANN Treas.  
 ED. L. GOTTSCHALK Sec.  
 EMIL BREUNERT As. Sec.

Established 1856.

Incorporated 1883.

## The Feigel Car Co.,

BUILDERS OF

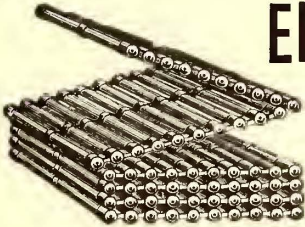
### Cars for Street Railways.

FACTORY

OFFICE

New Utrecht, N.Y.

No. 108 Wall Street, N.Y.



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Sole Manufacturer

OF THE

### Eureka Folding Mat.

The Most Durable, Easiest Cleaned and Repaired Wood Mat ever made.

I would respectfully call the attention of Managers of Street Railways to my latest improved Reversible Folding Mat, made to fit any size car. Sample order solicited.

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INCORPORATED 1875.

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OF EVERY STYLE AND SIZE,

For Horse, Cable or Other Motive Power.

EXCLUSIVE MANUFACTURERS OF

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### COMBINATION CARS

FOR SUMMER AND WINTER SERVICE.

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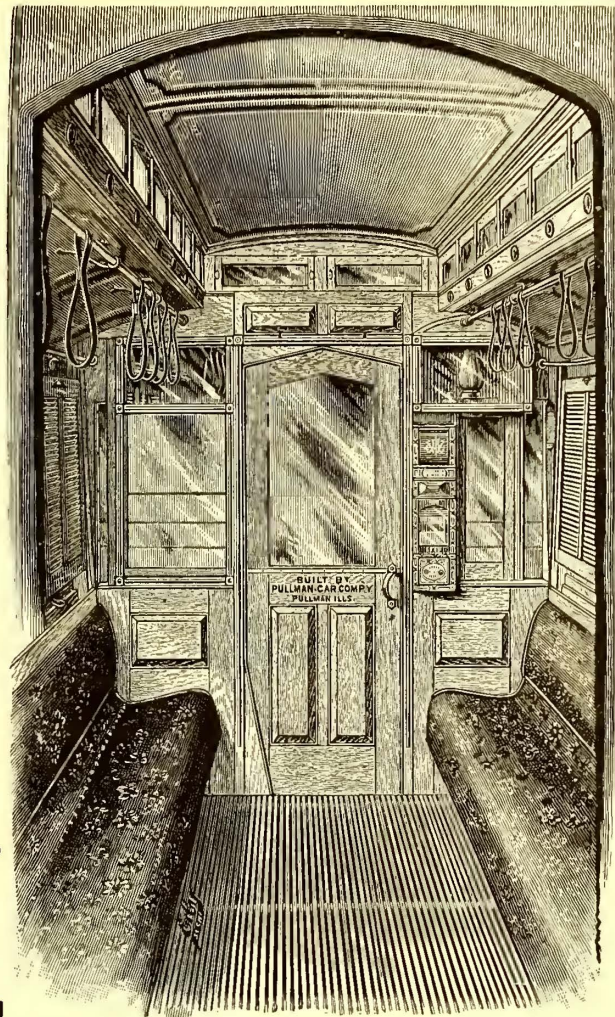
# Pullman's Palace Car Co.,

Manufacturers  
of

RAIL-  
ROAD

CARS.

Pullman, Illinois.

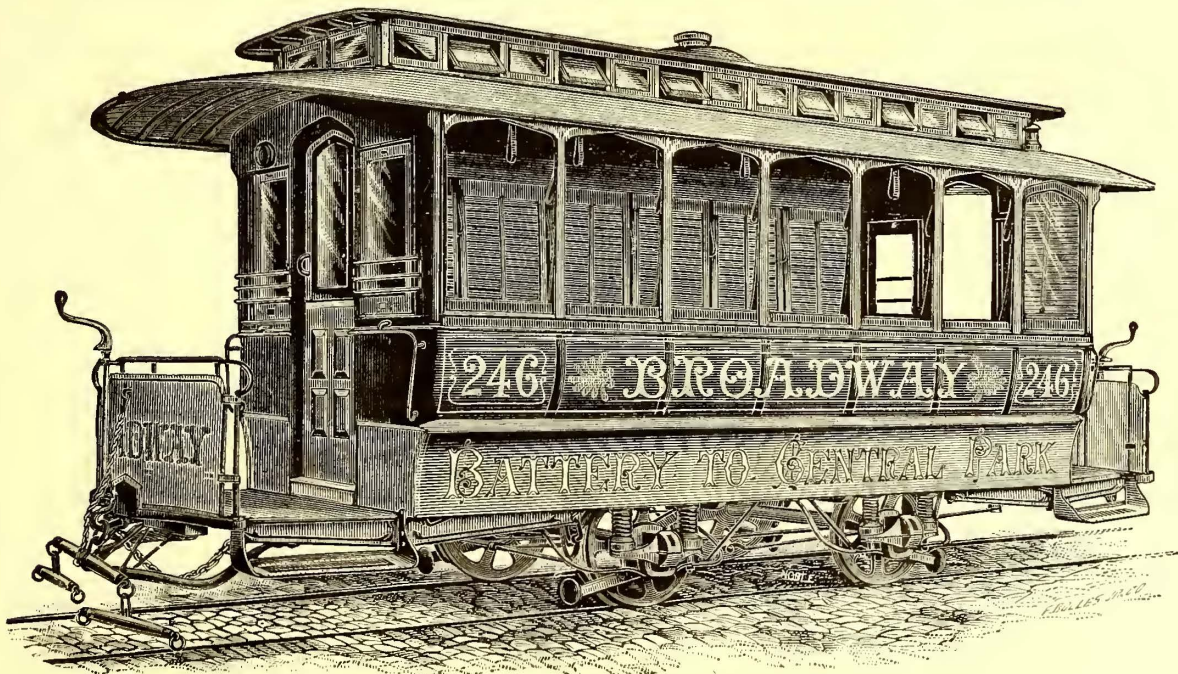


Make a Specialty of

Street, Cable Grip  
& Electric Motor

CARS.

Detroit, Michigan.



Address all correspondence

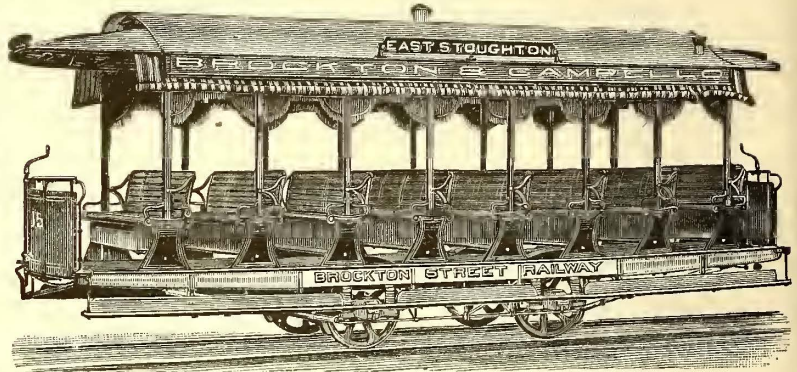
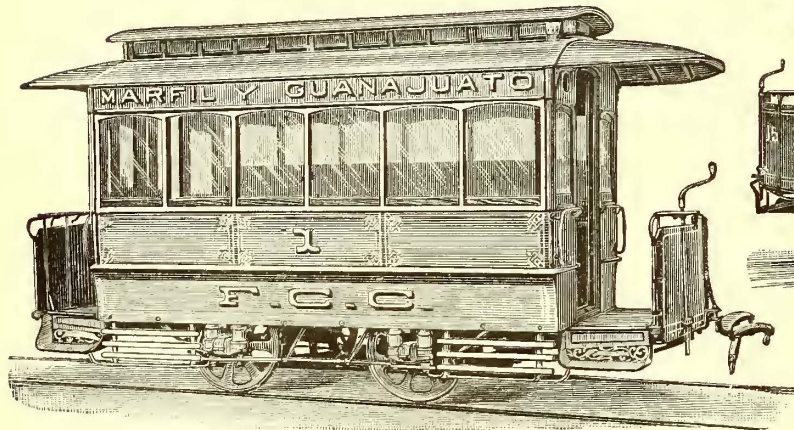
**PULLMAN'S PALACE CAR CO., Chicago, Ill.**

# J. G. BRILL COMPANY,

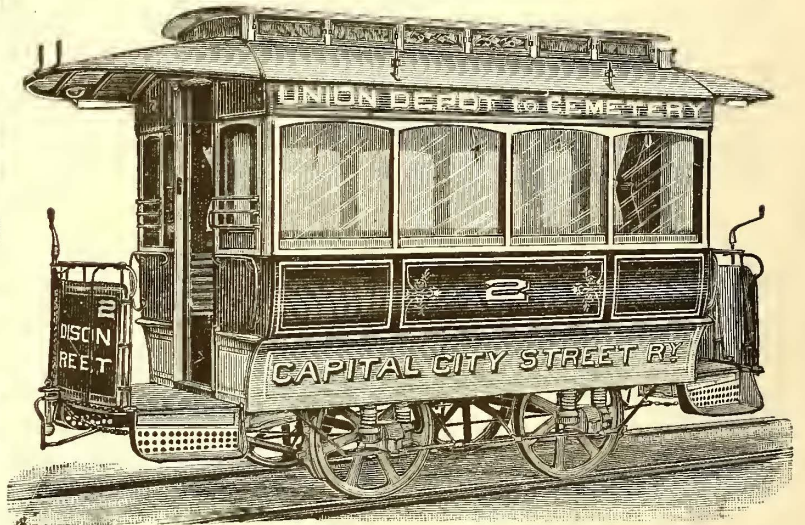
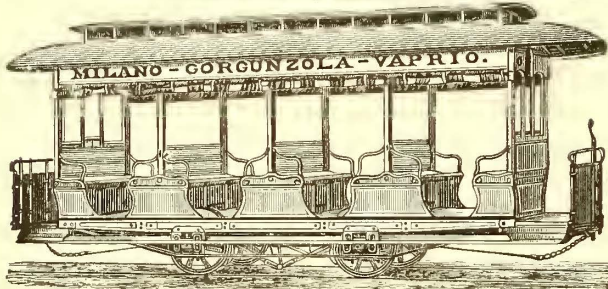
## PHILADELPHIA,

BUILDERS OF

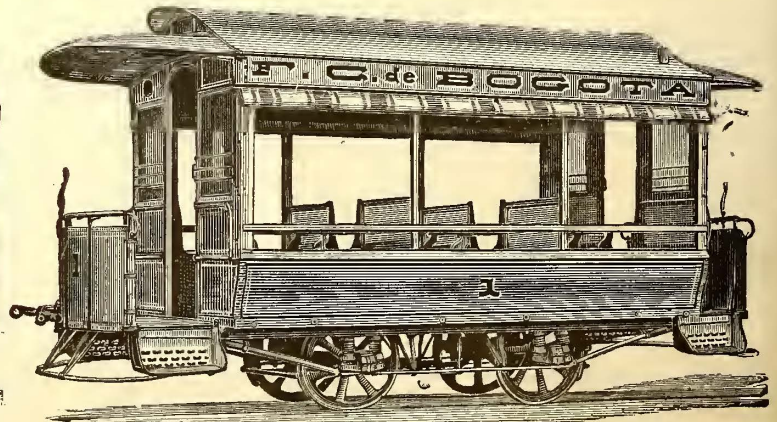
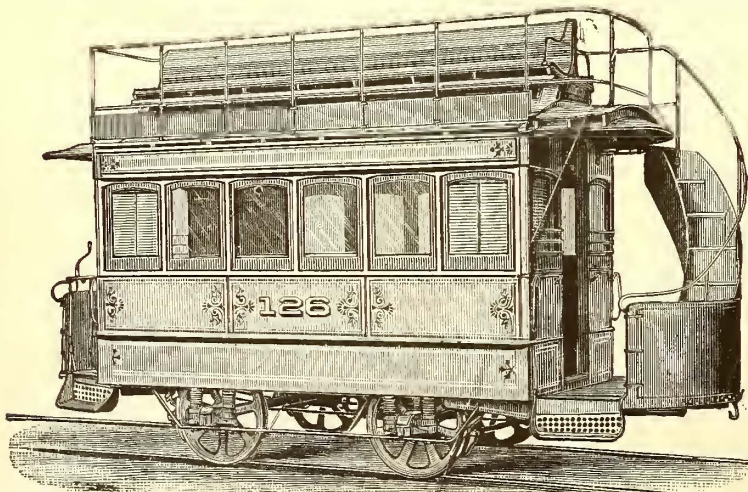
# Railway and Tramway Cars



Gold Medal at Chicago Exhibition  
OF  
1883.



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

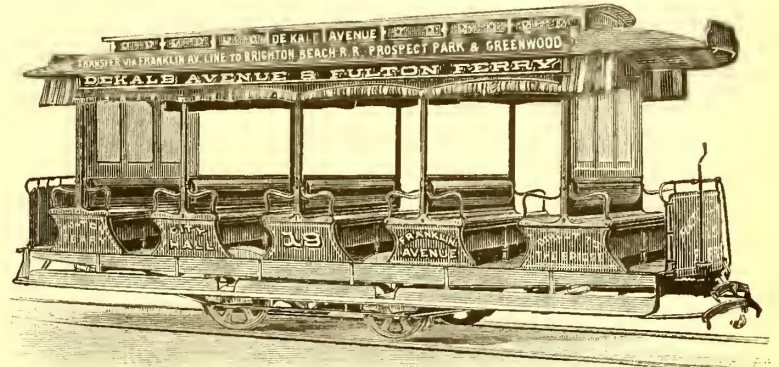
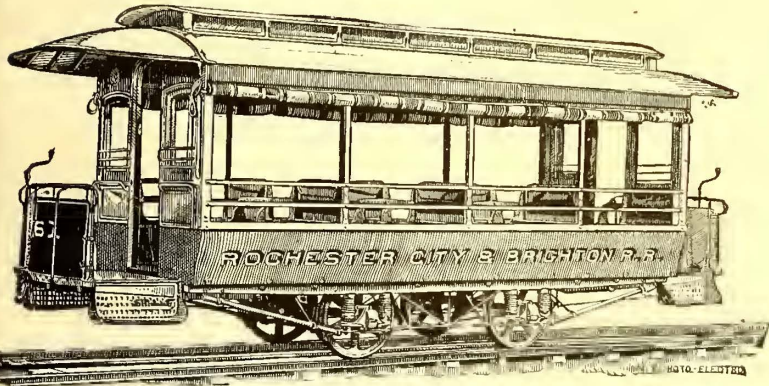


# J. G. BRILL COMPANY,

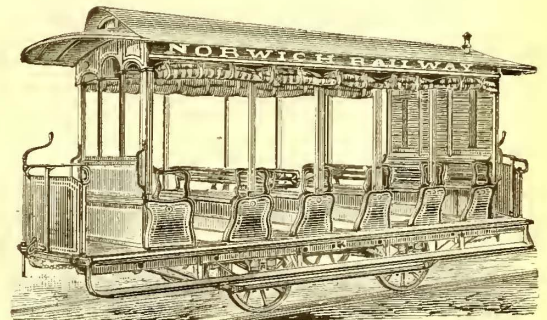
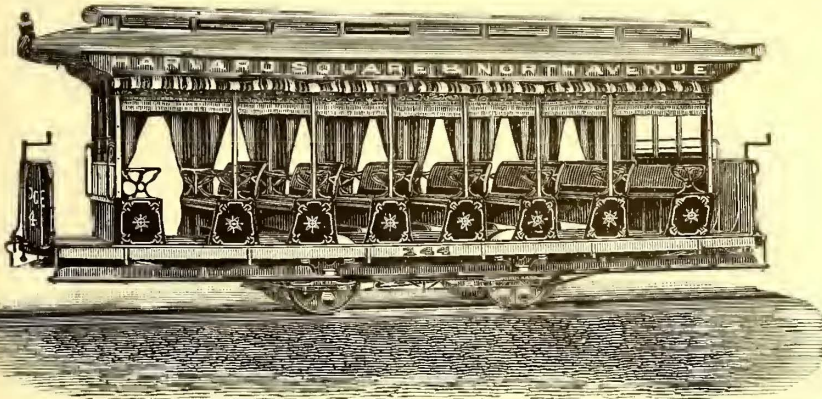
## PHILADELPHIA,

BUILDERS OF

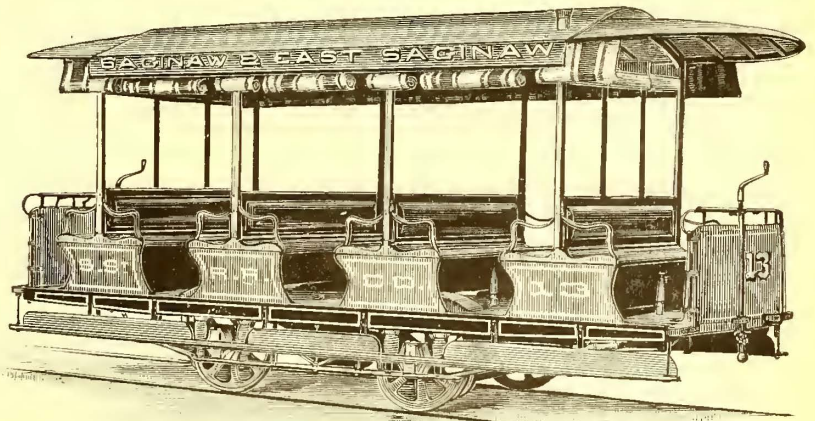
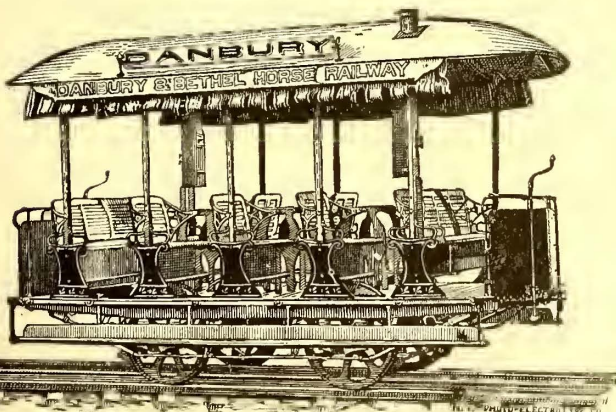
# RAILWAY & TRAMWAY CARS



**Passenger Cars for all Kinds.**



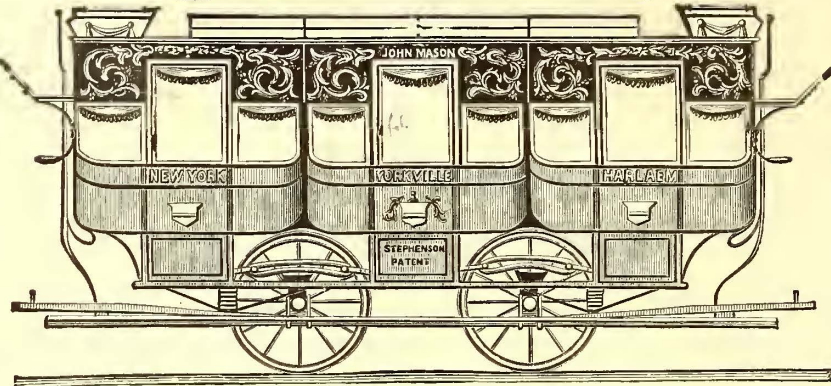
**Light Cars for Suburban Roads.**



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

ESTABLISHED: 1831.

SUPERIOR  
ELEGANCE



LIGHTNESS  
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IN GREAT VARIETY

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ORDERS FOR SUPPLIES PROMPTLY & CAREFULLY EXECUTED  
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