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{ CHICAGO: 8 Lakeside Building. } No. 6.

Demorest's Duplex Fare Register.

The cut shows the style of conductor's daily register report, made internally and automatically by the Duplex fare register,* showing each half trip during the day.

This sheet or dial is turned in at the Receiver's office at the end of the day, to correct any errors made by the conductor in his daily report. It must tally exactly in every particular, in order to relieve him from all responsibility, thus making the conductor his own detective.

It will also be observed, that as the register is being used by the conductors, they are required to sign their names, time used, and the number of passengers the hand indicates on its face, which identifies each man. This is claimed to avoid the necessity of employing men to keep the records, as is the case with the use of other registers. The conductor in resetting

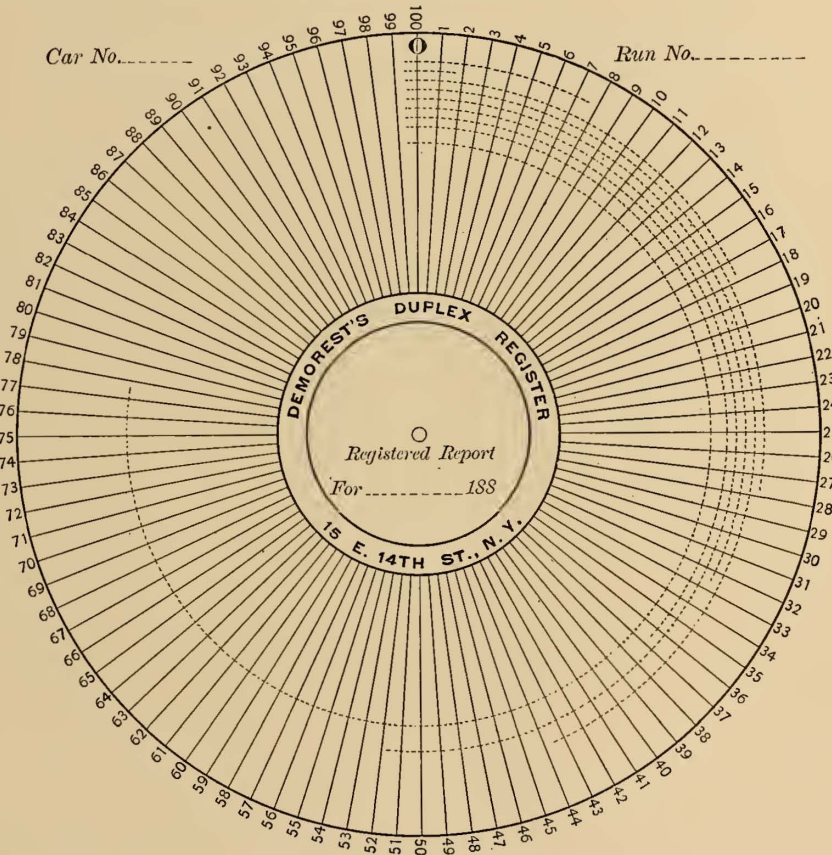
* W. Jennings Demorest, 15 East 14th St., N. Y. C.

this register each half trip, must put the number (indicated on its face by the "index hand") in the place provided on this sheet, which is "duplexed" upon the paper dial.

Referring to the copy of a supposed page register, and to the dial register, our read-

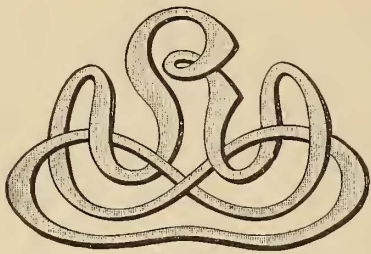
ers will find reported 7 fares short of what the index hand indicates; and we would like to have them determine which conductor did it, and on what trip it was done. To enable them to count or check the Duplexed Record (made mechanically), and the conductor's figures taken from the index

hand, we give the following instructions: Take the first figure made by the conductor, which is 7, then compare it with the radial line which has figure 7 on the outside of the "dial circle;" and if the perforated dots cross the line and do not cross line No. 8 the tally is correct, and so on, until all the trips have been checked. If found incorrect, the conductor is charged with the difference between what he reports and where the perforations stop. By this system the maker claims that you can positively check the man who handles your money, without the assistance of any one else, thereby saving money, and rendering collusion and fraud impossible.



EACH CONDUCTOR MUST SIGN HIS NAME OR NUMBER BEFORE USING THE REGISTER.

Trips.	Time used.			Number of conductor.	Total pass.	Trips.	Time used.			Number of conductor.	Total pass.	Trips.	Time used.			Number of conductor.	Total pass.
E.	5.30	A	M	Haines,	7	E.	9.30	A	M	Adams,	70	E.					
W.	6.00	"	M	"	1	W.			M			W.					
E.	6.30	"	M	Page,	17	E.			M			E.					
W.	7.00	"	M	"	27	W.			M			W.					
E.	7.30	"	M	Riley,	43	E.			M			E.					
W.	8.00	"	M	"	32	W.			M			W.					
E.	8.30	"	M	Jones,	51	E.			M			E.					
W.	9.00	"	M	"	36	W.			M			W.					



American Street Railway Association.

OFFICERS, 1884-5.

President.—Calvin A. Richards, President Metropolitan Railroad Co., Boston, Mass.

First Vice-president.—Julius S. Walsh, President Citizens' Railway Co., St. Louis, Mo.

Second Vice-president.—Henry M. Watson, President the Buffalo Street Railway Co., Buffalo, N. Y.

Third Vice-president.—Edward Lusher, Secretary and Treasurer the Montreal City Passenger Railway Co., Montreal, Canada.

Secretary and Treasurer.—William J. Richardson, Secretary the Atlantic Avenue Railway Co., Brooklyn, N. Y.

Executive Committee.—President, Vice-presidents and William H. Hazzard, President Brooklyn City Railroad Co., Brooklyn, N. Y.; James K. Lake, Superintendent Chicago West-Division Railway, Chicago, Ill.; Charles J. Harrah, President the People's Passenger Railway Co., Philadelphia, Pa.; William White, President Dry Dock, East B. & B. R. R. Co., New York, N. Y.; B. Du Pont, President Central Passenger Railroad Co., Louisville, Ky.

Report of the Convention.—Continued.

STABLES AND HORSES.

Continuing our report of the discussion at the Annual Convention from page 92 of our March issue:

Mr. Patrick: What is the rule among the gentlemen here present, with reference to the number of miles traveled per day, and what is the percentage of longevity on the greatest distance traveled; meaning: First, longevity of horses on a line of any given distance? Second, the greatest number of miles made by the horses of any street line represented here, in a day?

Mr. Clark, of Cincinnati, replied: We have eleven different lines. In one case four teams make seventy-five miles; four make sixty-seven; four, sixty-seven; four, sixty-four; four, sixty-seven; four, sixty-seven; four, sixty-four; four, sixty-nine; four, seventy; four, sixty-eight, and four make seventy-five miles. This represents about eighteen hundred horses. We cannot notice any difference in their length of life. This depends a great deal with the sort of street they travel over. We have boulder, or cobblestones, Macadam and Nicholson pavements. We find those that travel over boulder are longer lived, and in a better condition every way. We use, in nearly all our stables, a clay floor. A rather curious fact with regard to this matter was noticed the last time the epizooty was in Cincinnati. One of our stables represents about six hundred horses. The stable is divided into two parts, with a street about the width of this room between them. The stable with the wooden floor was decidedly affected. The other one was clay, and in this stable there was not a case of epizooty, while in the other there were numerous cases. The horses, as soon as they come in, are taken immediately to the watering-trough, then to the stalls and cleaned off.

Mr. Parsons, of Philadelphia, said: I would like to inquire of the gentleman whether the averages he gave were the stable averages of the horses?

Mr. Clark replied: No, sir; the working

averages. Seventy-five is the largest, and sixty-four the smallest.

Mr. Thurston said: It is a very important question in regard to the mileage of the horses, to know whether they are used only six or seven days in the week. In New York City and vicinity, they use them seven. In many cities they use them only six. Our experience is that fourteen miles per day is sufficient for a horse used seven days a week.

Mr. Clark said: The largest business done in the week is done on Sunday; probably one-third larger than on a week day.

Mr. White said: I would like to ask the gentleman from Montreal a question. He states that the percentage of deaths is two and one-half. I would like to know what his renewal is year by year. That would bring it in better relation with the Committee's report.

Mr. Lusher replied: Out of four hundred, we can get along with a renewal every year of fifty.

Mr. White rejoined: That puts it alongside of our own experience. In New York and Brooklyn, there are a number of roads that run from sixteen to twenty per cent., which would make his renewal fall below and above that average. The average life of a horse in New York and Brooklyn would not come up to the Montreal statement, although there they have much harder roads to work on. The hills and pavement they travel over are abominable.

Mr. Lusher said: When you say twenty per cent., that is one-fifth; the renewal is twenty-five per cent. We have, however, the advantage in climate.

Mr. White said: The question of veterinary attendance has nothing to do with renewal. We have about one thousand one hundred and fifty horses, and have no veterinary. Once in a while we get a case in which we are a little puzzled. We send for a doctor. After we get the benefit of his advice, we are prepared for a recurrence. Mr. Patrick misunderstood one item; the grade of the stalls. It called for slats laid upon the floor at an inclination of one and one-half inches. The common experience is to take nine feet for length of stall, and four feet three inches for width; cutting slats to a feather edge, to bring the heel three inches higher than the shoulder, thereby indicating that the grade for the urine of the horse would bring the stall level, and carry the heels to the same level as the forepart. We have an excellent plan for chaining, which prevents the horse from burrowing into the gutter. We would not be able to maintain a wooden gutter for any length of time, unless the horse was kept on a level. The strip will last six times as long with the three inches at the heel, while the feather edge under the forefeet scarcely shows any service. Our floors are laid with one inch and a quarter cement. We put the floor down on that with about three courses of tarred paper, laid in asphalt. On this we lay and secure the stringers to which we nail the upper floor; the joints at the gutters and where the urine is likely to go, are all calked, and then we run in hot tar. That makes a perfectly water tight floor, and a comparatively sweet stable. As to the

odor of ammonia, there is nothing better as a disinfectant than common plaster, and it should be used frequently in warm weather. The hostler and stable foreman should make it their duty to use it freely. It is neither costly nor offensive; is even more desirable than lime, as it is more readily used. It goes towards disinfecting the manure, when it gets into the pit. When the manure is thrown out, it is sweetened by the the plaster. * * I think our horses on our four lines average about fifteen miles of service a day.

Mr. Patrick inquired: At about what rate of speed do they travel?

Mr. White replied: They travel about six miles an hour. We endeavor to give one day's rest out of seven; we may not accomplish it exactly, but we endeavor to keep enough extra stock to be able to do it.

Mr. Parsons said: I must confess that I have heard a great deal of news in the last hour. One of the most astounding things is that of giving an unlimited quantity of water. We have had a great many horses foundered by giving water when hot. Another astounding thing to me has been this—the small number of miles run. We do not think we are getting any work if we do not get nineteen to twenty-one miles a day. We do not think that our stable average should be less than fourteen or fifteen miles; the entire number of miles run—the entire work done by all. We do not want to get lower than fourteen and one-half or fifteen miles a day. We get an average of four years out of our horses. We make a time-table, absolutely running five miles an hour, including stops. We did drop this to $5\frac{2}{10}$; but we found that the traffic was so great that, in turning in and out, we were really going between seven and eight. The stopping for and picking up passengers, and the stoppage by reason of wagons being in front of them, made it very rapid driving. In all the longevity mentioned, nothing has been said about percentage of extra horses to number employed, nor in regard to percentage of lame horses unfit for work. Eight years is exceedingly long, unless you have a large percentage of extra horses. Ours that do nineteen miles a day keep in good condition; do their work comfortably and conveniently. The loss, out of three hundred and fifty, runs from twenty-five to thirty per cent. When twelve years old, they are unfit for work. The percentage of losses in our stables does not run over five per cent., including deaths from accident or the effects of the sun. In deaths for the year just closed, out of fifteen lost, four are directly attributable to accident; coming in contact with a wagon, or being run into by a fire engine. I should certainly like to know in what this longevity consists; what their percentage of extra horses is in proportion to the number of horses worked, and what is the percentage of horses unfit for work.

Mr. Thurston said: I would like to ask the gentleman who has just sat down, first, the character of his road, that is, the style of pavement; second, the maximum number they carry at a time on a car; third, the maximum grades?

Mr. Parsons replied: Our pavement is the ordinary common cobblestones; grade

comparatively level, and with but slight indentations in the street. So far as the number of passengers goes, taking an average trip, it is difficult to state. It may be said to range from fifteen to ninety. Of the lines of our Company, one is comparatively level. But three have grades, the maximum being seven to nine in a thousand. One has a grade of about six in a thousand.

Mr. Robillard said: Our average laid up is one per cent., including the extra horses.

Mr. Parsons inquired: How many horses do you allow to a car?

Mr. Robillard replied: Some cars have twelve; some ten; some eight. The average number of miles traveled is fourteen. They last fully eight years. A gentleman said awhile ago that he was surprised to hear a great many things. I have been a good deal taken by surprise to hear that horses are not played out doing twenty-one miles a day.

Mr. Parsons remarked: I think the general service is about twenty.

Mr. Wright said: We figured that our per cent. is twenty; on Nicholson pavement twenty-five. On cobble-stones, at twenty. We have about twelve horses to a car, and they drive from fourteen to sixteen miles. Stable average a little less than twelve miles.

Mr. Thurston said: I am now taking out about two miles of Belgian pavement and putting in small cobbles; I think they are the best for the horses.

The Secretary said: I want to call attention to one item touched upon by Mr. White; his arrangement for resting his horses one day in seven. Some two years ago it was seemingly necessary to start building a road in Brooklyn on Sunday [laughter], and to which considerable antagonism was manifested. This developed much discussion and information, statistical and otherwise, in reference to Sunday horse-car running. I do not know but the very nature of our business, deadens our consciences somewhat, and makes it seem to us that our horses should be run seven days in the week year in and year out. I have this to say, however, that I believe from what I have learned on this subject from those who have tried resting their horses one day in the week—not always giving to all of them Sunday, of course, but arranging that out of the seven days, the horse will have one day of complete rest—that the life of the horse will be increased over and above, in actual profit to the Company, from the loss of his services for one day in seven, something like fifteen per cent. Now, if that be a fact—and it is certainly well worth verifying—our horses should all have accorded to them one day's rest in the week.

Mr. Parsons said: I would like to know what percentage the sales of the blind, lame and decrepit horses bear to their purchase money?

The President replied: That depends very largely upon the Company; whether they work their horses to death, or sell them when they can do a day's work.

Mr. Thurston further replied: Our death rate is about fourteen and one-half, our

selling rate about ten, and our purchase rate about twenty.

Mr. Richards said: With what little strength I have left after sitting in this den, I desire to say a few words in a general way upon this Report. I should have spoken an hour ago better than now. If we do not exercise more sense in ventilating our stables than we do this room, we will kill all our horses. I have been very much entertained, pleased, delighted and instructed with all that I have heard. I believe that any man of intelligence, who has sat and listened and reflected upon the different items of information brought forth, must go home from this Convention, feeling that he has learned a great deal. In regard to the horses, the rule which has always governed me in my management of them should govern everybody, because it is based on common sense: Use your horses as you would use yourself. The connection between humanity and the animal life is so near and delicate, that it is misunderstood to a great extent by men who do not reflect upon it. A horse has every disease that a man has, only known by other names. You have simply to give your horses the same remedies in quantities four times as large as you would take yourself. All the debate that we have had has tended to one point, that you should give the horse proper quarters, fresh air and proper food. If you speak of ventilation, if you speak of the different methods of building your stable, of his food or his drink, it simply means that you would do for him as you would do for yourself. We would not construct our houses in such a manner that all the ventilation should remain under the floor; nor would we shut them up so close—except we met at the Fifth Avenue Hotel—that they could get no air. Their duties are like your own, but in a different direction. Would you, when very much heated after a run or other violent exercise, go directly to the water pail; or would you load your stomach at that time, when the organs are not in a proper condition for digestion? Would you then sit down and eat a hearty meal, or sit by and cool off, and allow the heated brain and the rapid pulse to decline, and then sit down and take such refreshment as you needed?

In warm weather, on the streets, when our horses are toiling on heavy roads with large loads, it is very hard on them. I have a plan of stationing molasses tubs with water at different points, which stand open and in the sun frequently, and into it we mix oatmeal, making a little porridge. This is not so much to assuage his thirst, as to help the horse in his faintness. Some men like a drink of whisky; I suppose Mr. Johnson will feel a little that way, but you and I, Mr. Chairman, will take a little porridge. That is the reason we give it to the horses. [Laughter.]

As regards ventilation in stables, or rather cleanliness in stables, I conceived the idea some time ago of taking tar and boiling it and washing the insides of the stalls all over with it, and do this instead of using whitewash. I found it so effectual as a disinfectant, that we now use it entirely in all the new stables. I have built

during four years stables for over three thousand horses; and there is no such thing to use as this tar. It is very cheap; and where it is used a horse will never crib. Use rosin-tar or coal-tar. Common pine-tar is also good. We take it and heat it in the caldrons. Our hostlers can apply it as well as anybody else, simply taking a brush and going all over the stall. If you have a glandered horse or a farcied horse, you are twice as safe. It has an agreeable odor, is healthful, and, on the whole, very advantageous.

Mr. Hasbrouck said: In our city, where the contract requires the manure pits to be emptied every day, they do not quite get to the bottom; they leave a little layer, and it is anything but agreeable. What is best to throw into the pit to disinfect that? Many say carbolic acid. I have a friend with whom carbolic acid is a hobby; he holds that it should be used all around everybody's stable and everybody's house. He took a barrel of it down to Greenwood Cemetery, and gave it to one of the men to try. He said, I will come down here next week, and I want you to tell me how it works. He used it freely in a receiving vault. A week afterwards my friend went down and said: "How do you like the new disinfectant?" "Well, sor, to tell ye the truth, I like the old smell best!" [Laughter.] There are various new-fangled disinfectants brought to our notice, and they are continually asking a trial of them.

Mr. Johnson said: There seems to be two schools, one in favor and one against the free use of water. We are greatly in the minority; but we have this advantage: we have tried it, and have educated our horses. The merit of the case is in educating them to it. You who are opposed to it have not tried it; therefore, your negative theory or idea does not amount to as much as our positive assertion of fact. It is one of those things you cannot force people to adopt; but in time, our system of watering will be adopted by a great many. Mr. Richards says treat your horses as you would treat yourself; but he did not carry it out in his own case when he gave them oatmeal. As to his insinuation about water and whisky—I am a Kentuckian, and we don't believe that water improves whisky down there. [Laughter.]

Mr. Ladd, of New Bedford, said: The question we have been discussing about the life-time of a horse has not been as definitely answered as it might be. The Metropolitan Railroad has some three thousand horses; they knew what the valuation of those horses was on the first day of October, 1883, and how much they spent on that valuation since that time up to the last day of September, 1884. That would give the actual percentage of the money spent on renewals and the number they got.

Mr. Richards replied: I can only give approximately the figures. It costs us fifty thousand dollars a year to renew our horses. We have three thousand six hundred. They cost us between one hundred and fifty and one hundred and sixty dollars each.

The President said: Our loss is about twenty-two and a half per cent. per annum.

We run about sixteen or seventeen miles; six miles an hour.

Mr. Robbins, of Baltimore, said: The life of a street car horse depends upon the character of the road he is working on, and the amount of labor. The evidence that we heard is that on some roads the average life in New York city and Brooklyn is five years; also, that in Lansingburgh they last eight years. I would like to ask what is the character of the street that the horse runs on, between Lansingburgh and Troy.

Mr. Cleminshaw replied: It is a cobblestone pavement.

Mr. Robbins inquired: Are you interfered with much by the ordinary vehicles on the street?

Mr. Cleminshaw replied: Not as much as in New York; but we haven't the same number.

Mr. Robbins continued: The question appears to me to be reduced to this: If we get five years' labor out of a horse in the city, it is equal to seven or eight years' labor on a suburban road. It is very hard on a horse in these crowded streets—here and in Boston; frequent stopping and starting, weight of the cars, number of passengers—all make a very severe service compared with any suburban road. I am operating a suburban road, and a road in the city over paved streets, and know there is a quite a difference in the wear of the horses.

My instruction about watering is, while out on the road to give them all they want, or a little feed. Upon what they get on the street will depend how tired they will be when they come in. My instructions are to give the horses whatever they want; to give them water sufficiently frequent, that they will not get very thirsty and take too much. The mule is a different animal; and he is more hardened, more muscular, more vigorous. You can subject him to entirely different treatment from what you can a horse. He will stand a change of driving or of feed. My friends up North do not use mules; but in the South they are pretty generally used. They are very serviceable; when you consider the species of animal they come from, you find a very vigorous animal. In cold climates, especially where there is much snow and ice, in the winter time, when they get on the ice, if they fall down, they get up and stay there. [Laughter.] We have got over that kind of fun. They possess more natural sense than the horse; they are a very much abused animal. I started to use them, prejudiced against them, but have come out in love with them, on account of their intelligence.

Mr. Littell said: The gentleman remarks about mules not doing well in the North. I would like to say something in regard to that. You all know Col. Lowry—if you do not, you ought to. He is the President of two roads; one in St. Paul and the other in Minneapolis. "It snows up there about 365 days in the year." He recently tried mules, and the result was, he bought \$48,150 worth lately in Louisville for use in those cities.

Mr. Robbins rejoined: I'll bet he will have mules to sell next spring! [Laughter.]

Mr. Cleminshaw moved that the report

be adopted as the sense of the Convention. Carried.

Mr. Cleminshaw said: I understand that some of the delegates want to get home as soon as possible; and suggest that we have evening sessions.

The President said: So far as the Chair is concerned, he is here at the service of the Convention. You put me here, and as long as I am here, I will obey your orders.

Mr. Woodworth moved that when we adjourn, it be until ten o'clock to-morrow morning. Carried.

Mr. Cleminshaw said: I was going to refer to a matter which has been customary in the past, and I suppose it will be in this Convention. I make the suggestion whether it would not be well to appoint a Committee on Nominations this evening. Suppose we should only have to-morrow's session and close up. Let us appoint the Committee and give them a certain time to-morrow to report.

Mr. Johnson said: There was quite a number of us that talked the matter over last year, and many have thought it best for the Convention to form itself into a committee of the whole and ballot for the President and other officers. It is a question that all feel interested in. It is a delicate work for the Committee to do. I do not think any gentleman here wants to undertake it. I was once on that Committee myself, and it was a very delicate duty. I believe greater satisfaction will be had by having open nominations and balloting. It is very quickly done; it gives one an opportunity to speak.

Mr. Cleminshaw said: It is for that very reason that I have brought this matter up. It is a delicate question; but it is more delicate for this whole Convention to do it than it would be for a Committee. It has been the practice of this Association, in designating the officers, to look the whole country over; selecting one here, another there, and one at some other point, so that all parts would be represented. I think the system of appointing a Committee is the right one.

Mr. Thurston said: My experience has been, and I have had about half a century of experience in these matters, that if you go into convention and ballot for A, B and C, and you are there to elect men without regard to the different localities, or whether they have held the positions already, or are qualified for them, then this committee of the whole may be all right. My belief is that the Committee appointed to select officers would judiciously discriminate, so that the different sections would be properly represented. I would cheerfully vote for the officers that Committee might recommend. If Mr. Wharton, or any one else, should come to me and say, this is the man, vote for him, I might be induced to do so. I would a great deal rather that the names be submitted to me by some Committee. I believe that the Chair in selecting a Committee to nominate officers, would select those that would present to this body such names that we could consistently vote for.

Mr. Flagler said: I move, for the purpose of getting this matter before the Convention, that the Chair appoint a Committee of seven to report officers.

The vote on this motion stood, thirty-five for, and nine against its adoption. The motion was declared carried.

The Chair appointed the following Committee:

Mr. Charles Cleminshaw, of Troy, N. Y.
Mr. Benjamin Flagler, of Niagara Falls, N. Y.

Mr. Tom L. Johnson, of Indianapolis, Ind.
Mr. C. B. Thurston, of Jersey City, N. J.
Mr. T. C. Robbins, of Baltimore, Md.
Mr. Charles B. Holmes, of Chicago, Ill.
Mr. Edward Lusher, of Montreal, Canada.

On motion of Mr. Lusher, the meeting adjourned until ten o'clock to-morrow morning.

[To be Continued.]

Fireless Locomotives for Elevated and Street Railways.

Between two and three years ago European mechanical papers contained some description of the Lamm-Francq fireless locomotive, Lamm being a New Orleans, La., engineer and Francq a French engineer. The engines were then being used very successfully on the Vienna (Austria), Elevated Railroad.

The last number of *Engineering* to hand enables us to give its subsequent history and data concerning it which, we think, will be of considerable interest to our readers, and especially those interested in Elevated and Street Railways.

These engines are built in Europe, by the Hohenzollern Engine Co. of Dusseldorf and are fitted with the Joy valve gear. The mechanism, wheels, springs, etc., are of the ordinary type, but the fire grate is conspicuous by its absence. The boiler consists of a plain cylindrical reservoir with dished ends and steam dome at top. This reservoir is originally filled within a short distance of the top with cold water and then placed in communication with a high pressure stationary boiler. A current of highly heated steam is thus passed into the reservoir, which gradually heats the water up to boiling point, then fills the steam space and finally raises the pressure until it equals that in the stationary boiler. To heat the water as uniformly as possible, the inlet pipe is continued through the reservoir to the middle of its length, near the bottom, where it joins a horizontal pipe extending the whole length of the reservoir and pierced all over with holes.

The steam escapes through these holes and bubbles up through the water to the surface. When sufficient steam has been introduced and the pressure raised to 250 lbs., the engine is disconnected from the fixed boiler and is ready for work. The steam is taken from the reservoir by a pipe opening high in the steam dome, delivering into a steam expander or special valve chest which reduces the pressure to about 50 lbs., at which it enters the cylinders. The pipe leading from the expander to the cylinders is large in size to form a receiver for the expanded steam and is carried diagonally through the reservoir, whereby the steam is to some extent superheated and completely dried; the object being to prevent the admission of the steam to the cylinders at a high pressure and yet retain a high pressure in the reservoir.

Loss from radiation from the outside of the reservoir during the journey is effectually prevented by a deadening consisting of a thickness of felt and sheet iron with an air space between.

The advantages of the fireless system are summarized, as follows:—

1. By the use of fixed boilers burning cheap fuel, high pressure steam can be generated with much greater economy than is possible in the grate of an ordinary locomotive.

2. No firing being required on the engine one driver is ample. Two firemen will suffice for a pair of boilers capable of supplying four engines each: so that six firemen are saved for eight engines as com-

pared with systems where two men are needed on each locomotive.

3. There being practically no wear and tear in the reservoir repairs are not needed and the stock of engines in reserve may be much smaller than in ordinary cases.

4. There being no fire, there is no smoke, sparks, cinders, etc., to annoy the public, and no danger of explosion, while the exhaust steam can readily be condensed if required.

5. There is no need to spend time and fuel in "firing up" early each morning; the engine being left charged over night, and loses only 30 to 40 lbs. pressure, so that it is ready to make its first trip at any moment. It is thus never allowed to get cold.

6. The large store of energy maintained on the engine can be drawn on just as required, and utilized to keep up the speed when ascending steep gradients, etc., or overcome exceptional difficulties.

This system has been tried on a very extensive scale in Batavia and has given so much satisfaction that it is to be extended.

The Batavia Steam Tramway Co. owns a line divided into two portions, the first from Batavia to Kramat (5 miles). The haulage is effected by 21 fireless locomotives and five stationary boilers. Two of the boilers are at Batavia and three at Kramat, but only one is in use at each station at a time, the others being in reserve. They are worked twelve hours a day and fill an engine every 1½ minutes, during about three hours in the day, and every 10 minutes at other times. An engine charged to a pressure of twelve atmospheres will draw two or three passenger cars from Batavia to Kramat and from Kramat to Cornelis up and down again to Kramat. Part of the line was opened in July, 1883, and from the last annual report it appears that the cost of haulage amounted last year to 14.33 cts. (U. S.) per mile, made up as follows:—

Driving Engines.....	1.88	cents (U. S.)
Heating boilers	0.92	" "
Coal.....	5.60	" "
Packing, lubricating, etc.	0.80	" "

9½ cents per kil.
Or 14.33 per mile.

More recently the cost of haulage has been only 6.80 cents per kil. or 10.84 cents per mile. The price of coal is \$10 per ton. The fuel consumption was at first 21¾ lbs. per mile, but has recently been decreased ⅓.

The repairs to boilers and engines have been ⅓ cents per kil., and have consisted chiefly in re-turning wheel tires and renewing the felt on boilers. Since the completion of the road the monthly receipts have been 22,800 florins; total expenses, 12,800 florins; leaving total monthly profit, 10,000 florins, or \$4,000. The fare is five cents for a 4-mile run or any part of it.

The engines (which are also fitted with the Joy Valve Gear) give every satisfaction. They are in native hands and run constantly with little or no attention and no break downs. Two more have been ordered and will be shipped this month.

W. T.

Compressed Air Motors in Cincinnati.

Mr. Geo. A. Clarke, of Cincinnati, has a project for street car propulsion by compressed air, an outline of which we give below, on the authority of the Cincinnati *Commercial Gazette*:

"Cars are constructed with double metal bottoms for air chambers. Compressed air which is known to be about ten per cent. more efficient than steam at the same pressure, will be utilized to run the car both forward and backward and stop and start it on any grade. By a simple contrivance the motion of the car continually replenishes the constantly exhausting air, but, of course, only partially. Means must be provided for refilling.

"At each end of the line is a simple twelve horse-power engine. The entire length of the line, between the tracks if double, or at the side of a single track, is laid fifteen inches beneath the surface, an iron pipe four or five inches in diameter. This is perfectly jointed, and every piece tested to stand a pressure of one hundred and twenty-five pounds. The engines keep this pipe constantly filled with air at a pressure of about one hundred pounds. At intervals of a square, this pipe will be tapped, and it is estimated that connection can be made with the car and pressure taken on in six seconds time. A pressure of eighty pounds to the square inch in the air chambers of the car will give a propelling force equal to six horses. This will always be sufficient to drive the car through snow and slush, or assist it on the track should it be derailed, and if greater force is necessary, it can be obtained from the pipe to the extent of one hundred pounds pressure, for the air chambers like the pipe will be tested to stand one hundred and twenty-five pounds. Some advantage will be had in running two cars together. Both will be filled at the engine to eighty pounds pressure. One will be allowed to do the work until its force is exhausted. By this time the motion will have increased the pressure in the other car to about ninety pounds. Then it will be allowed to propel the two until exhausted, when the first will have a pressure of perhaps forty or fifty pounds. By doubling cars and the automatic filling, it is estimated that a distance of about three miles may be covered without resorting to the ground pipe for more air.

"The advantages claimed over horses, steam, electricity or cable are considerable. The inventor claims that any line which is now in operation can be equipped with compressed air cars, air pipe line, engines and all complete for less than \$7,000 per mile; that the change can be made without stopping travel for a single hour, or obstruction of the street; that once equipped, the expense of running is reduced to the minimum. No horses to buy and feed, no cable to renew, no stables to rent or stablemen to pay. The engines are so small and simple that any man competent to run a car can tend one. There is no steam to frighten horses, no disagreeable dust, no fire and no smoke; there is no tearing up streets for repairs as with the cable, and expresses and wagons can use

the track as now, which can not be safely done on the cable. There are no electrical shocks during a storm, as is the case on electric roads, to frighten ladies and endanger life. With the compressed air line, there need be no change of cars to go from Fountain Square to the farthest suburban point, as is necessarily the case with the cable. Moreover, the same air that serves as a motor can be so utilized as to warm the bottom of the car, a point which certainly would be appreciated in such weather as we had last week.

"We hear that Mr. Clarke will contract to run any line of street cars and guarantee the company owning it five per cent. larger dividend on the capital stock than they are now paying. This is worth looking into.

"Here are some figures that may be interesting. A cable road will cost to build from \$80,000 to \$100,000 per mile. The cable must be renewed every thirteen months at a cost of \$8,000 a mile. To illustrate the saving over the present system, take a single line running twenty cars. The points of expense in running incurred by the compressed air line, which the horse car line would not have are, for one year:

Two engineers.....	\$1,600
Fuel.....	2,000
Total	\$3,600

"The horse car line will have expenses to meet not found by the air line, as follows:

Horse feed.....	\$8,700
Horse shoeing.....	2,680
Horsemen.....	4,500
Harness.....	600
New horses.....	4,000
Total.....	\$20,480
Total air line expenses.....	3,600
Difference in favor of compressed air line.....	\$16,880

"It is presumed that other expenses, such as drivers, conductors, repairs, &c., will be equal in the two systems. It should be observed, however, that the horse car line is not charged with the continual repair of the track necessitated by the wear of the horses' feet, which the air line will not have. This and other small items will undoubtedly increase the savings to \$20,000 per annum; but suppose it is only \$17,000.

"From these figures some startling deductions are easily drawn. The saving amounts to about \$47 per day, or \$2.35 per car. In a city using three hundred cars, which is approximately the number used in Cincinnati, the saving would be \$705 per day, \$22,750 per month, \$257,325 per year.

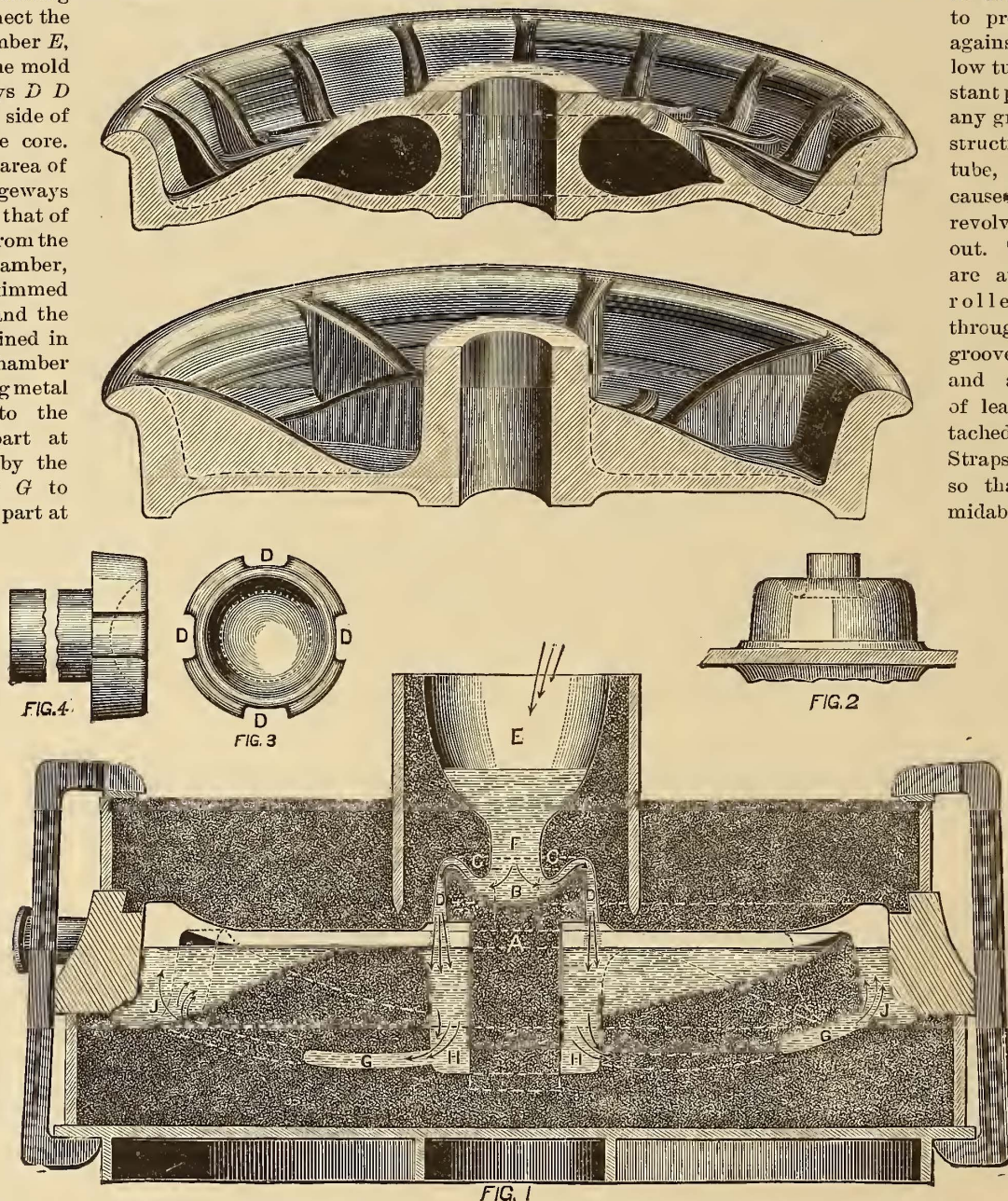
"The amount of additional business which must be done by a horse car line to make its profits equal those of the air line is also surprising. To make up this difference of \$705 per day in running expenses, the old line must carry 17,625 passengers, at four cents each, more than the new line every day, 523,750 a month, and 6,433,125 a year. If the horse car lines of this city were paralleled by compressed air lines, they would find it difficult to compete for the trade."

Casting Chilled Car Wheels.

We show herewith the method employed by the Baltimore Car Wheel Company in casting chilled wheels to prevent tread defects, the ordinary mode of pouring from the ladle into the hub part of the mould and then letting the metal overpour down the brackets to the chill, produces cold shot, seams, &c. In the arrangement here shown the hub core *A* has a concave top *B*, and the core seat *C* is convex, its centre part being lower than the perimeter of the top of the core. Figs. 3, 4, show the core *A* in side elevation and in plain. Fig. 2 is a core point forming a space to connect the receiving chamber *E*, above, with the mold by passageways *D D* formed in the side of the top of the core. The combined area of these passageways being less than that of the conduit *F* from the receiving chamber, the metal is skimmed of impurities and the latter are retained in the receiving chamber *E*. The entering metal flows first to the lower hub part at *H H*, thence by the sprue-ways *G G* to the lower rim part at

get ahead of us on the electric tramway question. We quote from the *Mechanical World* of London:
 "The proposed electric tramway along the esplanade, two miles in length, at Blackpool, is of interest, as the principle upon which it is to be worked forms a new departure from any hitherto used. In the arrangement in question, which is that of Mr. M. Holroyd Smith, of Halifax, engineer to the company, the rails are laid in the usual way, but in addition a central channel is employed through which the electric current is conveyed from stationary engines and dynamos. This channel is formed of

carrier, and for dirt or wet to fall through to a drain space formed of shaped granite or artificial stone beneath. Sump holes connected with the main street drain are formed at intervals, in which any mud that accumulates can be removed. Also hand holes for the purpose of fixing or removing the collecting carrier which collects the electric current from the copper half tubes and by means of a dynamo attached to the car that propels it along. This collector consists of two sets of fluted rollers free to revolve on spindles, which are held by knuckle joints drawn together by springs in such a manner as to press the rollers against the two hollow tubes with a constant pressure. Should any grit or other obstruction occur in the tube, the spiral flute causes the rollers to revolve and throw it out. Two steel plates are attached to the rollers passing through the slot or groove in centre rail, and are by means of leather straps attached to the car. Straps are adopted so that on any formidable obstruction



JJ, being again skimmed at the mouth of the sprue-ways. Thus the rim fills as rapidly as the hub and the metal is of a uniform and high temperature when it reaches the chill.

In the wheels made by this firm, every alternate rib is connected with the rim and runs off to nothing near the hub; the intermediate ribs are attached to the hub and diminish in width toward the rim.

Blackpool Electric Tramway.

It looks as though Europe was going to

two angle irons laid with about $\frac{1}{2}$ in. space between them, being supported at intervals by cast-iron chairs laid upon wood sleepers. The chairs also carry the substitute for the electric cables, being two rows of half round copper strips, hollow in section, like a tube cut in two longitudinally, by means of insulated vulcanite blocks. The ends or junctions of the copper half tubes are joined together by brass clamps which make electric contact, and they are laid about $1\frac{1}{2}$ in. or 2 in. apart and kept quite separate, so that a free passage is left for the collecting

occurring they will break without injuring the car, which will then stop, as the electric circuit which passes by a wire from the collector to the dynamo will be broken. The cars will be driven by one of Siemens' or other dynamos, revolving in the space between the axles of car by means of an endless chain passing round a stud wheel keyed to one of the wheel axles. Although the Blackpool line will be the first on a practical scale on this system, the inventor has already laid down 100 yards of rails on the 4 ft. 8 $\frac{1}{2}$ in. gauge as an experiment in a

field near Manchester, upon which a car has been run. He has also had a small pleasure line at work during last summer at the Winter Gardens, Blackpool, so that the practicability of the arrangement has already been tested to a limited extent. It is proposed to lay the new line, which is to be on the 4 ft. 8½ in. gauge, in time for the summer season, and we understand contracts for the cars, stationary engines, which are of the Robey type, boilers and other necessary fittings, have already been given out."

Chaplin's Anti-Friction Journal Bearings.

Referring to the illustration:—

The axle is surrounded by a series of cylindrical rollers, nearly as long as the hub in which they are placed; at the centre of their lengths, the rollers are reduced in size, forming a neck, the object of the necks being to retain in the proper position another series of anti-friction rollers, which are placed between the necks to prevent the surface of the bearing rollers from coming in contact with each other.

The diameter of the separator rolls is less than the diameter of the body of the bearing rollers, but greater than that of the necks; by this arrangement the circular retaining bands, which are placed both inside and outside of the roller necks, in order to retain all the parts in proper position around the shaft, are supported entirely on the separator rolls, and do not come in contact with the axle, the necks of the rollers, or the inside of the hub, but only on the separating rolls, where the bearings cannot be put on the shaft from the end, the retaining bands are hinged. Thus four independent rolling motions are secured, that at every point at which any weight or pressure is applied a rolling contact is provided, and the bearing becomes strictly anti-friction.

The makers* say that careful experiments have demonstrated that the weight on shaft is always distributed over at least three rollers: also that the pressure on the rollers, is always directly toward the centre of the shaft or axle, consequently the weight of the load does not tend to crowd the rollers together, and the separate rolls and bands are not liable to wear.

* Chaplin Manufacturing Co., Hartford, Conn.

Hoboken's Elevated Road.

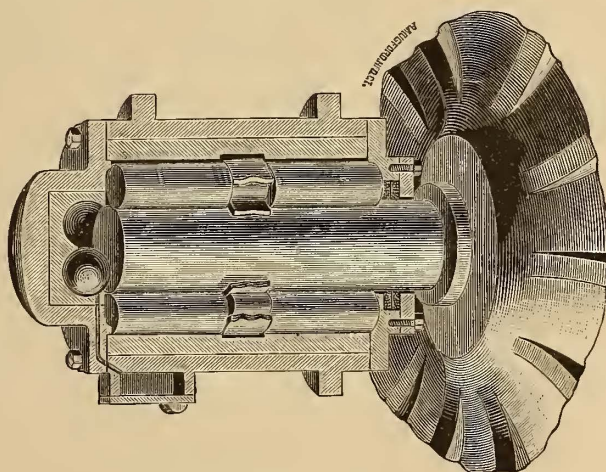
Hoboken is to have an elevated railway; trestles are up, tracks laid, paint on, etc. Everything substantial. North Hudson C. R. R. has the franchise.

Structure all wrought iron, resting on heavy brick piers, built on piles driven ninety feet (in meadows 100 feet). At this point grade very heavy, the highest point ninety-seven feet from ground. Peculiar feature in construction of the iron trestle is the lattice work on every column, beam and girder. It is designed to run cars by trac-

tion cable similar to that on the Brooklyn Bridge. Traction plant built by Poole & Hunt, Baltimore; two 500-H.P. engines been built by Watts & Campbell, of Newark. Both ready for use. Building on Palisade Avenue, top of hill, 120 by 80, will contain engines and traction plant; upper part used as terminal depot.

Here the tracks, which are fourteen feet above surface, will pass over driving apparatus and machinery. Large boiler house been built, solid brick, adjoining depot; four steel boilers, 125-horse power each, put in. One end of boiler house occupied by chimney ten feet square at base and 100 feet high.

At Hoboken Ferry the depot is 170 by 40 feet; tower story a massive brick structure, carrying handsome frame superstructure for elevated station above. Ground floor will be used for offices and waiting rooms. Proposed to have three stations between ferry and hill and to run cars every minutet Pullman & Co. are building cars; not yet received. Company hopes to have road open for travel by June. Engineer Endrus is supervising work, and pushing it as fast as practicability will permit. Although road is not quite a mile and a quarter long, it is estimated to have cost over half a million.



It is said that as soon as road is in operation company will extend to Court House and Union Hill. Intention is to eventually run to Fort Lee, which will afford magnificent view of the Hudson from the Palisades.

Ordinary Stoves for Heating Street Cars.

W. J. Hart, Supt. G. & W. and S. & G. Street Railways, Syracuse, we believe was the first in this country to heat street cars, beginning some nineteen years ago. In reply to a representative of the STREET RAILWAY JOURNAL, Mr. Hart said: "Yes, we have used stoves for heating our cars now for nineteen years and we like the methods better than any other we know of. The excellent ventilation obtained by constantly taking the bad impure air out of the bottom of a car is a very great advantage of the stove. It is a good idea to surround the stove with wire netting to prevent clothing from getting against it and being burned." Mr. Hart is firmly of the

opinion that heating cars pays financially. Thinks that if their stoves were taken out their receipts would fall off at least ten per cent.

Horse Mileage.

A reader desires to obtain, through the STREET RAILWAY JOURNAL, the experience and practice of some of his fellow managers of street railways relative to feeding. He asks, "What is the character of feed?" "How prepared, whole or ground?" "How much hay?" "How cut, long or short?" "Time of feeding?"

These questions are also asked, "How many miles per day do you drive your horses?" and "How many hours?"

We hope each practical street railway man will consider these questions addressed to him personally.

Recent Patents.

- 313,824—Car-starter—C. A. Iversen, Copenhagen, Denmark.
- 313,513—Fare-register—C. A. Neuert, Boston, Mass.
- 314,519—Car-starter—F. Dawson, Sr., and F. Dawson, Jr., Williamsport, Pa.
- 314,299—Car-starter—N. J. Roberts, Battle Creek, Mich.

The National Cable Railway Company.

EDS. STREET RAILWAY JOURNAL:

In answer to your inquiry I beg to state that the National Cable Railway Company is a corporation of the State of New York, organized in July, 1883, for the purpose of exploiting the cable system of traction covered by the patents of A. S. Hallidie and others, for which this company owns the exclusive rights for the United States, east

of the 106th meridian. All the cable railways in the world, now or heretofore in successful operation, excepting only one in San Francisco, have been constructed and are operated under licenses for the use of these patents.

The roads so constructed and operated are as follows:

- Clay Street Railway, San Francisco, operated since Sept. 1st, 1873;
- Sutter Street Railway, San Francisco, operated since Jan. 27th, 1877;
- California Street Railway, San Francisco, operated since April 9th, 1878;
- Gearly Street Railway, San Francisco, operated since Feb. 16th, 1880;
- Presidio Street Railway, San Francisco, operated since Oct. 23d, 1880;
- Chicago Street Railway, Chicago, operated since Jan. 28th, 1882;
- Roslyn Tramway, New Zealand, operated since 1880;
- Highbate Hill Tramway, London, Eng., operated since 1884;
- a road in Liverpool, Eng., operated since 1883.

There are several roads in foreign countries being constructed under contract to use this system, among which is a road in Sydney, New South Wales. The railway

in San Francisco which has not taken out a license to use the Hallidie patents is being prosecuted by the Hallidie Company in San Francisco for infringement of its patents.

The advantages of the cable system of traction are very fully set forth in the report of the Committee upon Motive Power of the Street Railway Association, made at a meeting of the Association, held in Chicago in October, 1883, and the discussion upon the report.

The twelve miles of cable railway constructed in Philadelphia during the past year, which are now being heralded abroad as a failure, were not built under the patents of the company, but, on the contrary, the failure of those roads is directly due to an effort to evade the patents controlled by this company, the cost of which would have been but a fraction of the expense of remedying the mistakes already made, while we regard it as certain that they will infringe our patents even with the imperfect construction which they will have through their efforts to evade them. If the patents of this company had not sufficient value to enable them to control the construction of cable roads, yet the experience gained by the companies that have constructed roads under these patents would be worth more than the cost of a license. Parties occupying the streets of a great city should not be at liberty to experiment upon new devices to their heart's content, tearing up the same streets over and over again when there are devices in existence which ten years' experience has proved to be adapted to their wants, and the use of which can be had by the payment of a reasonable license fee.

The cable railway on the Brooklyn Bridge has been a conspicuous example of partial failure, which we have found has operated greatly to the prejudice of our system. The problem on the bridge is very different from that of building a cable railway in a public street and is much easier of satisfactory solution. The bridge trustees having declined our offer to license them the use of our patents and our later offer to operate the cable cars for a rate of two cents per passenger, adopted other devices which, while they have answered the purpose to a considerable extent, have frequently failed, causing much delay and complaint, which has generally been supposed to be inseparable from the cable system. Had our system been adopted no such vexatious delays need have occurred, and had our proposition to operate the cable at two cents per passenger been adopted when it was made in November, 1883, the bridge would have fulfilled during the year 1884 the object for which it was constructed, which was, not to earn money, but to afford a prompt, rapid and satisfactory means of transit between the great cities of New York and Brooklyn.

The advantages of the cable system where the travel is sufficient to warrant its adoption, have proved to be so great that it appears remarkable to those who have become familiar with them through observation or use, that anybody should object to their introduction. They are:

First.—Greater capacity for traffic when a additional capacity is needed.

Second.—Greater economy in cost, averaging 25 to 40 per cent.

Third.—Greater speed attainable, the only limit being the ordinances of the city relating to surface travel.

Fourth.—Saving in time owing to the ability to stop and start quicker than a horse-car.

Fifth.—The avoidance of the nuisance caused by the voidings of horses in the public streets.

Sixth.—Less liability to accidents causing injury to persons, resulting from the ability to make quicker stops.

There is at present considerable interest exhibited in the subject of cable traction, and inquiries addressed to our company at the office of the President, No. 22 Cortlandt Street, will be promptly answered and the information desired will be furnished if in our possession.

WM. P. SHINN,

President.

NEW YORK, March 21, 1885.

Mr. Hallidie's Affidavit.

GENERAL TERM OF THE SUPREME COURT.

FIRST DEPARTMENT.

IN THE MATTER

of

The petition of the NEW YORK CABLE RAILWAY COMPANY for Appointment of Commissioners.

City and County of New York, ss.:

ANDREW S. HALLIDIE, being duly sworn, deposes and says: I have only arrived quite recently from across the Atlantic Ocean, on the other side of which I went to see the construction of a cable railroad, and I am now on my way to San Francisco, intending to depart for that place late this evening. I am the inventor of the cable system of railroads for the transportation of passengers and freight. The cable system was matured in 1870 by myself, and being a new method with which the public were not familiar it was necessarily slow in being introduced; I found it impossible at first to persuade the public, or those I thought ought to take an interest in the construction of a better system of transit to take an interest in my invention from a lack of faith in the system; it was new, and being new they were unfamiliar with it, and naturally had a great doubt as to its feasibility. Eventually, in or about the year 1872, I organized a company in San Francisco and endeavored to sell stock, got rid of a hundred shares and abandoned that undertaking. I let it rest for about a year, and meantime conversed with several of my friends in whom I had confidence, and two gentlemen who came forward and said if I had enough confidence in that system to join them in the expense of its construction, they would share equally with me the expense; and in connection with them and one other gentleman of San Francisco, I built the first cable road there, costing about \$100,000. The road was completed in 1873, in or about the month of September, and has been running ever since quite successfully. Previous to maturing this system of cable road I had completed another system for the transportation of material and ore over mountainous and difficult roads, and that is now in use throughout the country quite successfully, and is known as the rope-way system. It is used in almost all mountain districts of the

United States where it is impossible to build roads or railroads. As the result of that investigation I gave my attention to a better system of carrying passengers in cities. In San Francisco there are a great many hills; a portion of the city is hilly and the other portion is level; the hilly portion, in passing from one part of the city to another, has to be traversed, and there are three or four blocks on which the horse railroads in the most busy parts of the day had to put on some two or three extra horses to carry the passengers, and frequently the horses would slip and fall and the loaded car carry them in a prostrate position to the street below before the same could be stopped; that directed my attention to this system. I was partly aware at that time of what had been done; I was familiar with the system of mountain railroads and with the Blackwall Railroad in London, entirely different from the cable system, and until that period of 1873, when the San Francisco Railroad was completed, there was no road in existence in the world of that kind. The road in 1873 was about half a mile long and ran up a very narrow street; the street was only forty-nine feet wide between the houses: taking from that the width of the sidewalks, about twelve feet each side, left about twenty-five feet for the roadway; we built there a three and a half foot gauge cable road, and the grade varied from one foot in three feet to one foot in five and a half feet. From 1873 up to the present time that railroad has been running without intermission; I have, of course, worked at and overcome some general defects; from that time until the present it has run successfully. Three years later another road propelled by horses on Sutter Street, about four and a half to five miles long, was converted into the cable system; that road runs through a wider street, sixty-eight feet, but through a very densely populated portion of the city; the horses moved along slowly, and the business was increased so that it was almost impossible for them to carry their passengers on that system, and they converted it to the cable system. They have infringed on my patents, and I have had to sue them, and got judgment for the infringement; during the trial they stated that there was a saving of thirty-five per cent. by the adoption of the cable system; they admitted a saving of 35 per cent. in the operating expenses of the cable road as compared with the horse railroad. The property on the line of the cable road, after it was finished, became at once in demand and the real estate dealers in advertising property on Sutter Street or in its vicinity would generally head it "on the line of Sutter Street cable road," so that the property brought an enhanced value. Just before the building of the Clay Street railroad I purchased on the top of the hill, for the purpose of putting up a residence, a piece of property costing \$3,000, right adjoining "Nob Hill," before it was Nob Hill. Eighteen months afterwards I sold it for \$9,000. That I cite as an instance to show what effect on real estate the construction of the cable road had; and it was so through the whole line of the road.

A year after the Sutter Street road was completed, in or about the month of April, 1878, another road was constructed on the line of California Street, and run through Nob Hill. The people who had fine residences there found that the cable system was so noiseless and unobjectionable, doing away with the use of horses, so certain and regular in its operations, petitioned the Board of Supervisors to build a road there and that road was built. That runs through the most fashionable part of San Francisco and passes the houses of many of the most wealthy men and among others of Governor Stanford, Charles Crocker, Gen. Colton, Mark Hopkins, and others.

That road is about three miles long. There is also a road built on Geary Street, and another on Union Street and Market Street, and on various branches, so that

there are to-day about twenty miles of cable roads with double tracks, and built at a net cost of about \$5,000,000, including the cost of condemnation of property and other things.

The construction of those roads and conversion of the other roads from horse roads to cable roads dispense with the services of about three thousand horses in the City of San Francisco. Of course, when you take into consideration three thousand horses with their natural droppings, and consider the effect they must have on the sanitary condition of a large city, it must at once strike you that the cable system has an immense advantage over the horse system. Moreover, in the cable system there is a better system of management; it is more like managing a locomotive railroad, and you direct your men more like you do an army of soldiers, and besides there is not the demoralization that there is in connection with stables. I have operated a short horse railroad myself, and I know that between the two classes of men employed around the stables and on the cars of horse railroads, and the men around the engine-room of a cable system and on its cars, there is a vast difference. It is more easy to manage those men in the engine-room than the men who have more stable about them and less stability.

The cost of the cable railroads in San Francisco has varied according to circumstances, but I may say, generally, that the road-bed and rolling-stock would cost from \$100,000 to \$220,000 a mile for double tracks. When you spend an amount like that on a street railroad in its absolute construction, it carries its own conviction that you cannot afford to build it imperfectly. The road-bed, the surface of the road, must be better; it must be as perfect as it is possible to build a surface of any road, because the cost of and the finishing of the surface are small as compared to the cost of constructing the underground work and tube.

The roads in San Francisco are run at various rates of speed, but generally at from five to eight and nine miles an hour. That speed could be increased if advisable; but there is a limit under the Municipal Act which prohibits a speed of more than eight miles within the city's limits on the surface.

Now with respect to the control of the cars, the control of the management and the stopping and starting of the cars. That has been tested in almost every conceivable circumstance, and I cannot conceive of any manner of stopping a car and bringing the same to an absolute stop in so short a time as is done under the cable system. The man in charge of the grip takes the place of the man in charge of the horses on horse railroads. A horse has a mind of his own, has a brain and heels, and requires the attention of the man in charge to look after him as well as the brake. In the cable system the gripman looks after the brake and has no horses to look after, and consequently has immediate and absolute control over the starting and stopping of his car. Moreover, he stops it absolutely. When a passenger gets off there is no jerking and grasping hold of the strap to keep his equilibrium, but the car is stopped at once. I have seen on Clay Street, in San Francisco, where the car has been stopped and a tumbler filled with water held in the hand of the superintendent standing in the car, and the car then started without spilling a drop of the water. This shows what control of the motion of the car a man with some experience at the grip possesses.

Now, as to noiselessness. All the clatter of the horses is done away with. The cable car moves along smoothly and quietly and regularly, without jerking or thumping on the grades or anything. In fact, the grade makes no difference, so long as it is not so steep as to tumble the passengers into one end of the car. There are grades in San Francisco on the line of the cable railroads from one foot in five feet, and in the City of Dunedin, in New Zea-

land, the cars are running on a grade of one foot in four and a half feet, and in the City of London they are running over grades varying from one foot in twelve feet to one foot in seven feet.

There is also another point to be considered, and that is with regard to the capacity of the cars and the carrying capacity of the road. This capacity is almost unlimited, because there is no limitation to the number of cars which can be used within the horse-power of the engine, and cars can be added within the range of the engine, so as to meet all the varying demands of travel. Single-deck cars or double-deck cars can be used, which can be run in trains of one, two, three, or four extra cars to one grip car, or can be made up and operated as a single car and grip car which can be run every quarter of a minute, or with just time enough to keep the way clear. Double-deck cars can be made to carry forty-four inside and thirty-two outside comfortably seated, and with this system there should be no difficulty under ordinary circumstances of furnishing a seat to each passenger, so that the capacity of the system must be considered as unlimited.

In my recent visit to England I took particular notice of the style of rail they are using there, and I must say, that on this side we are far behind them on the form of the rail and construction of the road-bed generally on our horse-car lines in the United States as compared with the European countries. The general form there is a kind of V groove, and the whole of the street is flush. There is a foundation of concrete or Macadam, on top of which are the stone blocks, or stone sets, as they are called there, about four and a half inches deep to six or seven inches long, and three inches wide that set along side the rails. The rail is very like an ordinary T rail and has a flange at the bottom. There is no projection, as you find here, in the centre of the rail, offering an obstruction to the wagons crossing it. I suppose you cannot cross safely a railroad track here at a less angle than fifteen or twenty degrees. There the obstruction is so slight that an angle of three to five degrees you can cross over. I would suggest to the Commissioners here and those who are interested in the construction of roads, whether it would not be well for them to consider that in the construction of the cable system; it would be a convenience to the public.

As to the economy of the system. The economy increases in the cable system in proportion to the amount of business done. That applies to all roads, but you can save from sixty to seventy-five per cent. in the cost of operating a cable road as compared with a horse railroad. This means that you can operate your road and carry people at a less fare. That affects the public more than anything else. It means also that if you can build a road at a cost of \$250,000 a mile, the public will be saved the amount of money that is necessary to obtain from it in the way of fares to pay the interest on the enormous amount of bonds for which I am informed the various horse railway companies in the city of New York have bonded their properties and franchises, and amounting, on an average, as I am informed, to something like \$300,000 or \$400,000 a mile. I think that there is no doubt that under the cable system the people could be carried at a fare of five cents, or even less; and there is no question that five cents fare should enable the cable railroad company to let a passenger ride on its road all over the island.

As to the popularity of the system. In San Francisco, as in Chicago, it was found that the horse railroads were not paying so well as they might, and they had to change them to some other system; and some of them were converted into cable roads, and such are now paying handsomely. The Sutter Street road, which prior to its conversion into a cable road had its stock selling for \$22 or a little less, is a successful road, and its stock is selling now at \$100.

They give transfers along their main line running east and west and north and south, parallel with the ocean. The Geary Street railroad, which cost \$37.50 a share to build, to the original stockholders, is selling for from \$97 to \$103. So it is with the other roads. So it is with the Chicago roads; the stock has advanced.

Then with respect to severe winters, such as you have in Chicago; to the cable system they present no difficulty. With a rope attached to a steam engine any accumulation of snow can be removed. It can be put on freight cars or on flat cars and carried away and got rid of, instead of being thrown on each side of the track as is done in the cities by the horse railway companies. It is impossible to prevent the running of the cable cars if proper attention is given to the business. When the horse cars must stop the cable road can run.

Now as to accidents to horses. I have seen a little discussion with regard to horse-shoes being torn off horses by the slot in the centre of the cable roads. In all my connection with the cable system I have known but one case in San Francisco during twelve years where a horseshoe has been detached from the hoof of a horse, and then the driver said it had been loose. There is no need for such occurrences. If the slot is properly constructed there is no need for such an accident. I doubt whether in a great city with good pavement it is proper to allow the use of heavy calks on horses' shoes. It is not allowed in European cities where they keep good pavement. And the question of humanity to the horse arises in that connection which should also be considered, but with which Mr. Bergh has probably more to do than we have.

As to the effect of the cable system on trade, here is an experience with respect to San Francisco. The principal street in San Francisco was Montgomery street. It was the street on which was situated the popular retail stores, jewelry, fancy dry goods stores and other stores of a similar character, which the ladies were accustomed to patronize on their shopping excursions; in fact, it bore the same relations to the city of San Francisco as Broadway does to the city of New York. At the time when the city was becoming converted to the horse cars from the old omnibuses a general railroad act and charter to run horse cars was passed, and an endeavor made to locate a road on Montgomery Street. The residents of Montgomery Street opposed the road, and successfully opposed it, and the road was not built on that street, and the company had to go down to one street below to a street that was occupied by wholesale dealers and warehouses, and was not so prominent. That street was Sansone Street. Kearney Street was shortly afterwards widened, and on that street the railroad company put down a double track. The shopkeepers of Montgomery Street soon found that business was leaving Montgomery Street and going to Kearney Street, where the railroad was running. The fact was that people could ride in the cars, and it was a convenience to step from them into the stores. The Montgomery Street tradesmen sent to the railroad company and invited it to lay a track through Montgomery Street. This was done, and business partially came back to Montgomery Street, but not as it had been previously.

As to operating the cable roads in narrow streets. In London the cable system runs through a street that is very narrow, and in the lower portion of it is about eighteen feet from curb to curb, and then it widens to about forty feet, with varying width, and is quite steep and tortuous. The upper portion has a double track with two tubes, and the lower portion has but one tube, the road converging from the double track into a single track and both ropes running through a single tube, thus requiring switches and sidings and so on. That road has been in operation since May, and is quite an attraction, just as the cable system was in San Francisco and is to-day in Chicago. There

has been spent about \$3,000,000 in converting the Market Street road in San Francisco into a cable road, and wherever the cable system has been constructed there has been a demand for property. The cable road has increased the amount of building in the vicinity, and it has had the effect of bringing back from the suburbs of San Francisco a large amount of population formerly removed into the adjacent villages and towns because of the formerly insufficient accommodations afforded by the horse railroad companies. The cable system has enhanced the value of property in San Francisco fully thirty per cent., and has prevented that exodus of citizens which took place because of the lack of facilities for getting to business from the suburbs to San Francisco when travel by the old horse system was so uncertain.

In the city of Melbourne they are now laying down a very important series of lines under the cable system, and propose to expend seven million of dollars in the construction of it. They have already sold bonds in the city of London, $4\frac{1}{2}$ per cent. bonds, to the amount of two million five hundred thousand dollars, and are rapidly constructing the line. The city of Sydney is at present operated by steam motors, and they have become so obnoxious that it has been determined to supplant them by the cable system. The city of Edinburgh has already entered into a contract for the construction of cable lines there. The City of Glasgow is negotiating for a similar construction there. In Liverpool they are about to change their gauge from 4 feet $8\frac{1}{2}$ inches to 3 feet 6 inches, and they propose at the same time to change their system and put down the cable system. Other cities, Sheffield, Manchester and others, are moving in the same direction. A franchise has also been granted to the Cable Tramways Company to build underground railways in London, and to connect those now operated by steam by the cable system underground. The present system of operating the underground railways is by steam motors, and the result is that the tunnel is filled with gases, and while the people are compelled in order to save time to employ that mode of transportation, they would not adopt it from choice, because it by no means adds to their health. It is now proposed there to introduce the cable system, and to run the cars at about eleven miles an hour, including stops, which is about the speed on the New York elevated railroad, and about equal to the present speed of the several subways in London. That will remove all objections to the underground road in respect to gases, foul air, ventilation, etc. If that is applicable to subways, it is equally applicable to elevated roads. It is intended to expend on this conversion in the subways of London somewhere from £7,000,000 to £10,000,000 sterling.

I don't know that I can add very much more except to state that wherever the cable system has been introduced and tried, people are pleased with it. They feel relieved, from the simple fact that it does away with any anxiety as to trouble with the horses, and they feel they are not imposing upon animals to exert themselves to do all they can and more than they should in carrying them in their daily travel; besides, they are carried surer, quicker, cheaper and more agreeably. It is found by experience that there is less danger in entering and alighting with respect to cable railroad cars. This is a matter of great importance, especially in respect to children, aged and infirm persons; and I have been told more particularly by persons of advanced years, who find it difficult to get on and off street cars propelled by horses, that the cable system has relieved them of the immense anxiety in this respect. This is because the man in charge of the grip has nothing to do but to run that. His business is to manage the grip. His mind is left free except in regard to the grip, and he has complete control of it.

I have no statistics with respect to accidents with me, but from recollection I can state that last year there were nine accidents from horse railroads and seven from the cable cars; but, of course, the number of passengers carried by the cable cars greatly exceeded the number of passengers carried by the horse cars, probably four times as many. The bottoms of the cable railroad cars are guarded by fenders. It is only in cases of carelessness that accidents can happen. The fenders come within two inches of the surface. The fenders, however, do not run alongside the cars in all cases; in some cases they omit them because the companies consider that their use is not necessary, accidents being so few. While the system was new, an accident on the cable road was a great thing, and excited much comment, while an accident on a horse railroad was not considered, that being an old thing. But now we can run at a much higher speed, and with greater safety, than a horse car.

The space occupied in the street under the cable system is less than is occupied by horse railroads, and in the cars themselves, all the space possible is utilized for carrying passengers; everything, in fact, excepting a small space devoted to the grip.

A cable car can be stopped almost instantly. I have seen this incident on the grade of one foot in six feet: three men, apparently miners, had come to the town probably to see the sights, and apparently had indulged in somewhat of a spree, and under those conditions boarded a cable railroad car. It was in the summer time, and they took front seats and enjoyed the breeze, a gust of which lifted off the hat of one of them, who jumped off to get it, in front of the car, and fell within three and one half feet of it, and directly in front. The man with the grip saw him, released the grip from the rope, put his foot on the brake, and stopped the car before reaching the man, while the friends of the man, who had risen up in horror, ran forward expecting to find him mangled.

The capacity in the cable system is almost unlimited, and seats can be provided that cannot be provided in the horse railroad cars; double-deck cars can be run, or single-deck cars, or numbers of cars in trains in connection with one grip car; the necessities of travel can be met as they arise. There is generally a grip car. These vary according to the size; on the heavier grades they are lighter. They are made to run with seven passengers on a seat on each side up to twenty-four on each side. On the small cars where the dummy will seat seven on each side and the car will seat fourteen, I have known as many as sixty-five passengers to ride. Great altitudes can be overcome. In San Francisco the greatest is three hundred and seven feet in a distance of twenty-six hundred feet; it is on Clay Street. The cross streets are level, so that the cars must run up-hill and then level and then up-hill and so on.

I have no connection with the New York Cable Company. I have a small interest in the Cable Railroad Company of San Francisco, which has made some arrangement with the National Cable Company of the United States, but that is throughout the United States, and has no connection with the New York Company.

The Mexican Cable Tramway Company are about constructing cable roads in some of the cities of Mexico—where the temperature runs up to 100° and over in the shade. And in the city of Los Angeles, California, a cable line is being constructed, where the weather is very hot, and I may add that, while the cable system has demonstrated itself of so much value in a cold climate, subject to heavy snows, like Chicago, it has in like manner proved its very great value in extremely hot weather—this you will

realize in this City of New York during some of the exceptionally hot days of summer.

A. S. HALLIDIE.
Sworn to before me this 10th }
day of February, 1885.

JOSIAH W. THOMPSON,
Notary Public,
N. Y. Co.

Mr. Holmes' Affidavit.

STATE OF ILLINOIS,
County of Cook, City of Chicago, } ss.

CHARLES B. HOLMES, being duly sworn, deposes and says: That he resides in the City of Chicago, and has resided in said city for a period of fourteen years; that he is now President and Superintendent of the Chicago City Railway Company, and has been connected with that company for the period of twelve years last past; that the territory covered by said company is what is known as the South Side in the City of Chicago, which embraces a large portion, and almost the entire business portion of said City of Chicago, and that the number of miles under operation by said railway company is eighty-seven (87) miles of track, a portion of which extends south of the city limits of the said City of Chicago; that said railway is operated from Lake Street in said city southward on State Street to Sixty-third Street, a distance of seven miles, with a track also upon Wabash Avenue extending to Twenty-second Street; thence on Twenty-second Street and Cottage Grove Avenue to the city limits, a distance of five miles, and that up to the year 1882 the cars on said street railway had been drawn by horses, and that upon an investigation of the so-called cable system, as it was then in operation, in the City of San Francisco, a cable system was adopted in the City of Chicago by said Chicago City Railway Company, and since the year 1882, and up to the present time, has been in active and successful operation; that the cable system is in operation on said road on State Street, north of the city limits, and on Wabash Avenue, Twenty-second Street and Cottage Grove Avenue, and, in general terms, this affiant says that the cable system has been, both so far as the public and the company are concerned, eminently successful. That for the first few months after said cable system was adopted, it was, to a certain extent, experimental, and necessarily so, and that for the first six months after the inauguration of the cable system the accidents were more numerous than at any other like period of time under the old system of drawing by horses. This affiant states that in all the accidents that occurred during those first six months, there was but one which was not fairly and directly attributable to the carelessness of the parties injured; that methods were immediately devised by said company for preventing such accidents, and that since that period of time, with the application of these methods, the accidents under the operation of the cable system have been less in point of number and severity than under the old system, and under the present management and methods an accident which would be at all serious in its character is almost an impossibility. The wheels are so guarded and protected that it is impossible, even with the utmost recklessness, for a person to get beneath the wheels, and it is practically impossible that an injury at all serious in its character should be suffered by any one in the streets or traveling upon said cars.

This affiant further says, that the rate of speed under the present cable system in the City of Chicago averages about nine miles per hour, and that under the old horse system the maximum rate of speed was six miles per hour. Under the present system, whenever occasion demands it, long trains made up of several cars are drawn, which would be an impossibility under the old method, and that by means

of the automatic momentum brake employed on the roads of which this affiant is president and superintendent, the brake is brought to bear upon every wheel in the train, and the cars can be stopped more readily even than a single car drawn by horses, and the longest train can be brought to an absolute stop within a distance of ten to thirty feet. This statement is not theoretical, but is the result of actual experiment and experience. Ten cars, containing over one thousand people, have been drawn behind one grip and stopped as stated.

In the practical operation of the cars under the cable system, great advantages are found in the rapidity and ease with which cars may be started. They may be brought from a dead stop into a rate of speed of nine miles per hour almost instantly, and without jerking or surging of the cars.

The supposed injury to horses by the slot is imaginary and fanciful, and perhaps that is about all that can be said on that subject. The slot can be so protected that the injury to horses from it is practically an impossibility, by having the top of the irons which form the slot made of an oval shape.

As to the sanitary effect of drawing cars by cable instead of by horses, thus getting rid of the voiding of about twenty-five hundred horses, as is actually done, this branch of the subject may be considered, perhaps, as somewhat theoretical; but, that there is a most substantial difference in sanitary effects from this one cause, is too obvious to require comment. The most superficial observation of those streets where horses are used, compared with those where the cable system is employed, will be sufficient to demonstrate the importance of this consideration as between the two methods.

With regard to the effect upon the values of real estate by the cable system, much more definite conclusions can be reached, and this affiant is prepared to state that such appreciation over the lines operated by the company of which he is the president and superintendent as aforesaid, are very marked and decided. A few instances will perhaps illustrate this branch of the case. A house and lot purchased for \$1,000 two months before the construction of the cable system, was sold within six months after the line was in operation for the sum of \$5,440, a gain of \$4,440, attributable exclusively to the construction and operation of the cable system, and that is only a fair sample of many instances. The whole extent of the appreciation of real estate by reason of the substitution of the cable for the horse system can, with entire safety, be said to be largely in excess of the expense of the entire system itself. The substitution of the cable system in place of the horse method has added to the value of real estate on the lines where it has been operated many millions of dollars, and it is really and substantially so much added to the real and substantial wealth of the city, or that portion of the city wherein the cable system is in operation. The appreciation of real estate is not limited to the mere streets upon which the cable road is operated, but to the cross and parallel streets for quite a distance either way.

Affiant states that with all the experience which he has had under the cable system, he has been unable to discover that there are any objections to it based merely upon the ground that certain streets over which it passes are narrow, but that, where the street is narrow, experience has demonstrated that cable-cars are greatly superior to horse-cars, for the reason that the rate of speed may be absolutely regulated—starting and stoppages are under complete control, and for these reasons the cable system, as to narrow streets, is greatly to be preferred in practical operation to the old method of drawing by horses. In San Francisco many of the streets are very nar-

row, and the cables are operated without difficulty. Any objection that the cable system upon narrow streets interferes with truckage, absolutely fanciful, and the actual experience of this affiant is in that case as stated. This affiant states from observation and theorizing on the question as a matter of actual experience, that, under the cable system, the turning of short corners is as feasible and practicable as under the horse-car system. We know that it can be done, even to so short a curve as a thirty-five foot radius.

This affiant further says that he has passed over the lines of the New York system, as illustrated in the map annexed to the affidavit of A. S. Hallidie, and in the judgment of this affiant, after a careful examination of those lines, the system as applied to and operated upon those lines, is entirely feasible, and can be operated without the slightest injury to any other interest, and with perfect practicability.

Testing the operation of the cable system in the city of Chicago by public opinion, it will perhaps be sufficient to say that the surest way to raise a public clamor is to attempt, when any accident occurs which renders it necessary, the substitution of horses for the cable, and under which the public would have the same facilities precisely as it formerly had. In the city of Chicago, and particularly upon the South Side, in public judgment the cable has become a necessity, and is finally demanded as a right, and nothing draws down upon the Chicago City Railway Company more hearty denunciation and criticism than the substitution of horses for the cable system, even for an hour, whenever the emergency does demand it.

It is proper to state in this connection that there are less break-downs and accidents under the cable system than under the horse system. This statement is made with reference to the running of cars during the winter season; but during any season of the year accidents, of a character which prevent the operation of the cable roads, are very infrequent and of very short duration, and not sufficient to weigh a moment against it as a regular system of transportation.

We have had in our experience under the cable system two detentions of short duration, and during which we were compelled to operate with horses on a portion of the lines, owing to weakness and defects in the machinery, which were promptly and easily remedied. Experience corrects all accidents and evils of this character, and the longer the roads are operated the less and less frequent become such detentions, until finally the system has, with us, ripened very nearly into perfection, and it is safe to say with regard to the practical operation of the cable system in the city of Chicago, that if it were put to vote, not one person of either sex out of ten thousand would cast his or her ballot for the restoration of the old method.

It is proper in this connection to say that the alleged failure of the cable-car system in other cities ought not to weigh against the system itself. In San Francisco and in the city of Chicago the system has been a success, and in the latter city a most marked and decided success, even during the most inclement winters which we have for a quarter of a century experienced.

A cable road operated on a basis of mere cheapness, with defective machinery and with an enforced economy which declines to pay royalties for patents indispensable for the proper operation of the system, cannot be made successful any more than a horse railway system can be successfully operated where the horses are crippled, and an economy attempted to be exercised by the use of poor or disabled horses, simply because they can be purchased for a less price than animals adapted for the purpose for which they were intended. I do not

say that any and all systems of cable roads can be made effective, but I do say that such a system as is in operation in the city of Chicago is effective, and has been so for several years, and both, so far as the company and the public are concerned, useful and remunerative.

It is a notable fact worthy to be here mentioned, that the intense frosts that we have had in the city of Chicago for the last three years have not affected the construction one particle. During the past winter the thermometer has ranged for week after week below zero; great bodies of snow have fallen, and yet the cable roads have been operated without a detention worthy of note or mention. In one instance the machinery was broken after the storm was over. This applied only to a portion of the line. The delay was something over two days, during which time, over the line thus affected, horses were substituted, and the defect was permanently remedied by strengthening the parts which were found upon investigation to be weak.

This affiant further says that if his company were so situated that it could not use horses, or had none to use in case of accident, all contingencies could be well covered by having machinery and cables in duplicate, which would prevent any detentions whatever, with small additional original outlay.

Practical experience has also demonstrated that the system can be operated as effectually in hilly regions as in level ones—such as is the territory occupied in Chicago—and in such regions the cable system possesses great advantages, obvious to the most superficial observer, over the horse-car method. The cable system does not tire; it never becomes fatigued, and operates at fifty per cent. greater speed than is possible with horses, even on level lines.

In point of fact, it is the conclusion of this affiant that the horse-car system must gradually go out of operation, and that it will soon, under the decisive teachings of practical experience, become a scheme and method of the past, especially in large cities.

The most marked and decided effect of the adoption of the cable over the horse system is the improvement in the grade of men employed, and not only an improvement in the grade of men generally, but improvement in the same man, when he is promoted from the driving of a horse to the handling and management of a cable car.

CHARLES B. HOLMES.

Subscribed and sworn to before me }
this 16th day of March, A. D. 1885. }

EDWARD JAEGER,

[L.S.] Notary Public.

STATE OF ILLINOIS, }
Cook County, } ss.

I, M. W. RYAN, Clerk of the County Court of Cook County, the same being a Court of Record, do hereby certify that Edward Jaeger, Esq., whose name is subscribed to the annexed jurat, was, at the time of signing the same, a notary public in Cook county, duly commissioned to administer oaths; that I am well acquainted with his handwriting, and I verily believe that the signature to the said jurat is genuine.

In testimony whereof, I have hereunto set my hand and affixed the seal of said Court, at the City of Chicago, in the said county, this 16th day of March, 1885.

[L.S.]

M. W. RYAN,

Clerk.

SUBSCRIBE.—If you have not already become a subscriber for the STREET RAILWAY JOURNAL it will pay you to send a dollar, and receive the paper regularly. It is the aim of the publishers to make various improvements in the paper.

Car Heating.

EDS. STREET RAILWAY JOURNAL:—

Allow me to give the readers of your journal the benefit of our experience in heating cars. We use a small anthracite stove (made by a New York firm), which is devoid of complication and which takes up the room of but one passenger (a piece of the seat being removed and the stove placed therein). To this stove we had the following objections:

First. The bottom of the stove being round would not permit the use of an ash-pan, and the conductor or driver had to remove the ashes, a small shovel full at a time, into a bucket, which sent the dust all over the car.

Second. The accumulation of foul air, gas, &c.

Third. Passengers spitting on the floor and stove.

Objection first we overcame by having a cast-iron box attached to the bottom of the stove, inside of which is an ash-pan that is emptied from the *outside* of the car, thus promoting cleanliness and saving time.

Objection No. 2 we overcame by taking the glass out of two ventilators on each side of the car and putting in fine screen wire, thus permitting pure air to circulate at all times.

As to objection No. 3, we have partly overcome it by having the following card placed prominently in the cars: "Gentlemen are requested not to spit upon the floor." When an alleged gentleman fails to notice it we call his attention to the same.

There is not the slightest doubt in our minds that the stoves increase

travel, and when properly cared for will be a source of financial gain to any company and a comfort which the traveling public has a right to expect.

C. W. G.

The First American Street Car.

47 East 27th St., New York, }
March 27, 1885. }

MESSRS. EDITORS:—THE STREET RAILWAY JOURNAL of February, 1885 says to its readers:

"Passenger street cars were first used in cities in the United States as early as 1840." See cut herewith of the car "John Mason" which was designed, constructed and used at the opening of the first section of the first street railroad by the New York & Harlem R.R. at that time extending from Prince Street to 14th Street, *via* the Bowery in the City of New York. The writer was there and rode in the car with the Mayor, Aldermen and invited guests of the City of New York.

JOHN STEPHENSON.

Ventilation of Stables.

The following paper, by Mr. Augustine W. Wright, member of the Western Society of Engineers, and Superintendent of Track

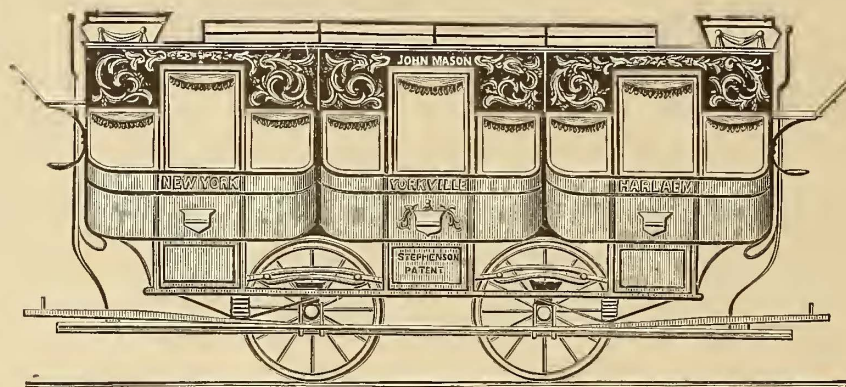
and Construction, North Chicago Railway, was read before the Association on February 3d, 1885. We copy from the *Journal of the Association of Engineering Societies*. It will repay a careful reading:

About six years ago, it became my duty to prepare plans for a stable to contain two hundred horses engaged in the street railway service of this city. These horses spend about twenty of the twenty-four hours per diem in the stable. The horse is a sensitive animal, and his diseases closely resemble many of those under which his master, man, suffers. I enlarged upon this fact in a paper that I had the honor to read before you, entitled "Stable Construction," in July, 1884, and I trust you were so convinced of these facts, that it is not now necessary to say more upon that subject. Realizing the paramount importance of ventilation, I desired to ascertain the proper amount of air to provide for each animal. I turned to my engineering library, and consulted book after book, in vain, for the desired information. I then went to one of the prominent engineers of this city, and asked him "How much air does a horse breathe per minute?"

He said: "Well, I don't happen to remember just now, but about the same

"How much air does a horse breathe per minute?" He said: "He breathes—he breathes (hesitatingly)—well, I don't remember just now." I asked in vain four other physicians, and veterinary surgeons. All *started* to answer the question, hesitated, and finally said they did not remember, but would look it up. This they did in vain. One said he had a friend, a physician, in the country, who was greatly interested in the horse, and no doubt *he* would know; but he could not answer, and I was perforce compelled to assume a certain amount, and made by ventilators 6' x 6' on plan, tapering to 4' x 4', and 20' height, allowing one such for each forty horses. Assuming that air expands $\frac{1}{470}$ of its volume per degree Fahrenheit, and that it is winter weather, the interior of the stable being 15 degrees warmer than the exterior air—for in my opinion the horse enjoys better health if the stable temperature varies only 10 to 20 degrees from the exterior air than he does in a hot stable—the air inside the stable would lose in weight $20 \times \frac{1}{470} = .612$ foot. That is, it would be lighter than the outside air by the weight of a column of air .612 foot high. The velocity with which the outside column would try to get in at the base of this shaft would be governed

by the same law as that of a body falling through the space of this excess of height. The formula for this velocity is $V = \sqrt{2gh}$, *g* representing the force of gravity, here 32 about, and *h* the height or space through which the fall is made; substituting, we have $V = 8 \sqrt{0.612} = 6.26$ cubic feet per second; but we must deduct from this amount the loss by friction of the air against



FIRST AMERICAN STREET CAR.—BUILT BY JOHN STEPHENSON.

amount as a man." I thought it must be greater, and turned to the Public Library, where I examined every book that I thought might contain the information, but could not find it. Not disheartened at my failure, I looked through half a dozen other leading works upon the horse, but could not secure the coveted information, although Stonehenge contained the following: "By common consent, it is allowed that no stable, divided into stalls, should give to each horse less than 800 or 1,000 cubic feet;" and the *Civil Engineers and Architects' Journal*, 1841, page 103: "The committee of the Academy of Paris, to whom the question, What is the quantity of air necessary for the healthful respiration of the horse? was referred by the Minister of War, reported that in a building where the air is properly renewed, and that result is effected by a skillful and efficient system of ventilation, a horse can never suffer so long as he has from 25 to 30 cubic meters of air," 883 to 1,060 cubic feet. These statements did not solve the problem. I had arranged already to give each horse 1,216 cubic feet of space, but I desired to know *how much air per minute* he must have. I now turned to the medical profession, and to a well-known doctor propounded the question:

the sides of one ventilator. Being a straight box with smooth sides, this loss will probably not exceed 0.3 of 6.26 cubic feet, say 1.90 cubic feet. Deducting this amount from the former leaves 4.36 cubic feet per second passing through each ventilator; multiplying by 3,600, the number of seconds in one hour, and dividing by 40, the number of horses supplied by the said

$$\frac{4.36 \times 3,600}{40} = 392.4 \text{ cubic feet}$$

per hour per horse, as supplied under the foregoing conditions. In summer the doors and windows are open; and as most of my stables have light and air from four sides, through many openings, there is no trouble about ventilation at that time of year, I located my gas burners that light the stable under the said ventilators. The part they perform, assisting in the ventilation, is important. There are two four foot burners under each ventilator. The quantity of heat evolved by the combustion of a cubic foot of ordinary illuminating gas is estimated at 700 heat units. The two burners would therefore evolve $2 \times 4 \times 700 = 5,600$ heat units per hour, or 93.3 per minute. The specific heat of air is 0.238 nearly. A

cubic foot of air at 45° weighs 552 grains
552
— = .0789 lb., so that to ascertain how
7000

many cubic feet of air at 45° would be
heated 1° by burning two four-foot burners
93.33
per hour we have — = 49.701 cubic
.0789 × 0.238

feet, or 15.696 cubic feet, the amount pass-
ing through as per above estimate, heated
3.1°. Air expanding $\frac{1}{490}$ [for each 1° of

temperature, we see here additional power
to carry off the impure air. These figures
apply to the ventilator provided to carry
off the impure air. Provision is made to
admit fresh air through flues beneath the
floor, extending clear across the stable,
with an exterior opening at each end, cov-
ered with iron grates, to exclude rats, etc.
Its cover is perforated, so that the air is
broken up and admitted without drafts.
The mangers on each side are boarded up
44 inches high, affording additional protec-
tion to the horse against drafts. The ven-
tilator above the roof was first built with
slats on its four sides, like ordinary blinds,
moved by ropes extending to the first floor
to regulate the amount of opening; but we
found it impossible to prevent downward
drafts, chilling the horses. I then changed
the construction; took out the slats, and
put in a slide with an angle board inclined
at 45° on the four sides. The wind is thereby
deflected upward. These slides are moved
by ropes extending to the ground floor, and
we now have no trouble from a current in
the wrong direction. I would also state
that I built numerous air flues in the brick
walls at first, but had to stop them up, as
the current passed through in the wrong
direction. Instead of going out, cold air
came down, and blowing upon the adjacent
horses, chilled them.

Some months since the Boston *Journal of
Chemistry* opened its columns for "Ques-
tions and Answers" to matters of general
interest. Recognizing the eminent ability
of Dr. Nichols, and believing that amid its
numerous readers were many among the
owners of the fourteen millions of horses
possessed by this country, I propounded
my so often asked question, "How much
air does a horse breathe per minute?" It
was not answered until the January num-
ber of the present year contained an edi-
torial entitled "Ventilation of Stables,"
from which I quote: "According to author-
ities on ventilation, a man makes twenty
inspirations of air per minute, each inspi-
ration being of a volume equal to 40 cubic
inches; so that he requires 800 cubic inches
per minute of fresh air to supply him with
the necessary health-giving pabulum for
his lungs. Each expiration unfits for
breathing twice the bulk of fresh air; that
is, the 800 cubic inches expired per minute
contaminate 1,600 cubic inches of fresh air,
or nearly a cubic foot. Hence, in round
numbers, a man requires a cubic foot of
fresh air per minute, or 60 cubic feet per
hour. * * * A horse or cow is said to
have six times the breathing capacity of a
man; so that it will require 360 cubic feet
per hour. These figures agree quite closely

with the amount I furnish each horse, as
above stated, 392.4 cubic feet.

According to Pettenkoffer, an average
pair of human lungs exhale about 15 cubic
feet of air per hour, but authorities differ
as to the proper amount of fresh air needed
to keep the air in a fit state of purity.
Pécelet, calculating from the quantity of
carbonic acid produced, says 5 cubic feet
per minute per individual. Reid, adding
for an amount to carry off all the contam-
inations resulting from human life, says 10
cubic feet. Arnott and Roscoe, 20 cubic
feet per minute. Worthen allows 3 cubic
feet per minute. Haswell states: "Each
person requires from 3 to 4 cubic feet of air
per minute." Box considers $3\frac{1}{2}$ cubic feet
per minute the minimum quantity neces-
sary for cleanly and healthy persons. Phil-
breck thinks 50 cubic feet per minute the
proper allowance, and Dr. Billings allowed
60 cubic feet per minute in the John Hop-
kins Hospital. Curtis, in his "Fresh Air
in the House," states: "The mean number
of respirations per minute in the case of
1,407 healthy males was found to be
eighteen. * * * Then, if we take 230
cubic inches for the quantity of air neces-
sary to a man of medium height for each
breath and multiply this by the number of
respirations per minute, we shall get some-
thing like the quantity required, and which
will give us 2.39 cubic feet as the fullest
measure." Surgeon-Major F. de Chaumont,
in a paper "On the Theory of Ventilation,"
estimates the cubic feet of air needed per
individual per hour, calculated from Angus
Smith's estimate, that the amount of car-
bonic acid expired per hour per individual
= 0.450, at from 530 to 2,460 cubic feet; by
Dr. Parke's formula, CO₂ = 0.600, from
700 to 3,280; by Pettenkoffer's estimate,
CO₂ = 0.705, from 825 to 3,850. He adopts
Dr. Parke's formula. Seven hundred cubic
feet per hour per individual gives "a very
close atmosphere; 3,280 cubic feet 'fresh,'
no appreciably different sensation from the
outer air." Gen. Morin, by actual experi-
ment, found "different numbers of cubic
meters of air per hour are required for dif-
ferent purposes. In hospitals for ordinary
illness, 60 to 70 per hour, for each patient;
the wounded require 100. Persons suffering
from epidemics, 150. In prisons 50 are
enough. In ordinary workshops, 60. In
barracks—by day, 30; by night, from 40 to
50. In theatres, 40. In stables and stalls,
180 to 200." These figures, being in cubic
meters, must be multiplied by 31.3156 to
reduce them to cubic feet. Having done
this, we find that from 939 cubic feet for
the individual in the barracks to 4,697
cubic feet for the wounded are deemed
necessary for each individual per hour by
Gen. Morin, and from 5,637 to 6,263 cubic
feet per hour for each horse. The English
army regulations at the present time are
said to allow to each horse a space of 1,605
cubic feet, 100 square feet of floor and 2,466
cubic feet of fresh air per hour. Philbreck,
in his admirable work, "American Sanitary
Engineering," states: "The standard of
purity (of the air) must be a conventional
and arbitrary one, fixed by experience and
adapted to the class of occupants by whom
a building is to be used." Applying these
words to stable ventilation, permit me to

affirm that experience demonstrates that
our ventilation is sufficient. R. Atkins,
Superintendent of the Horse Department
North Chicago City Railway, reports:
"The number of horses owned at the pres-
ent time, 1,658; average number owned
during 1884, 1,500; average number unfit
for duty from all causes, $38\frac{1}{2}$; but this in-
cludes a number of new horses (over 150)
purchased fresh from the country to stock
a new line, who suffered from distemper in
being acclimated. Excluding them the
average was 32, or about 2 per cent. Forty-
five horses died during the past year—14
from accidental injuries, 10 from colic, 5
from lung fever, 4 from paralysis, and 12
from 8 other diseases." Deducting the 14
from accidents and 10 from colic, leaves 21
deaths only that might have been remotely
affected by ventilation, or 1.4 per cent.
Surely this experience indicates ample ven-
tilation. Having given so much time to
this matter and believing it to be of general
interest, I take great pleasure in submitting
the same for your consideration.

The "Providence" Rail and Track.

In reply to inquiries we give, on the au-
thority of Mr. Longstreet of Providence,
who controls the steel girder rail track
shown on the front page of our issue of
February, the following estimate of the cost
of material for one mile of street railway:

1. ORDINARY TRAM RAIL CONSTRUCTION.	
	52 lb. steel rail.
82 Tons Rail at \$40	..... \$3,280
352 Joint Plates at 60c	..... 211
6 Tons Knees at \$50	..... 300
3,200 lbs Spikes at $3\frac{1}{4}$ c	..... 100
32 m. ft. Hard Pine at \$23	..... 736
700 Chestnut ties at 35c	..... 245
700 Iron Ties at 35c	..... 245

	\$5,147
2. PROVIDENCE STEEL GIRDER RAIL CON- STRUCTION.—Same wearing head.	
82 Tons Rail at \$48	..... \$3,936
25 Tons Castings at \$45	..... 1,125
700 Iron Ties at 35c	..... 245
60 Bbls. Cement at \$1.30	..... 78

	\$5,384
Less saving in labor over No. 1, at least	..... 300

	\$5,084

MEMO.—The girder rail is figured at \$8 per ton ad-
vance over tram, which will cover extra cost of man-
ufacture and all patent rights.

The St. Louis Cable Railway.

The contracts for the St. Louis Cable
Railway are let, and work begun. The
new road will connect the central business
portion of the city, from near the entrance
to the great steel bridge over the Mississippi,
with the western suburbs, whence connec-
tions are made with the West End Narrow
Gauge Railway, extending some twenty
miles into the country. The route is from
Sixth and Locust Streets, between the Gould
and Barr buildings, west to Thirteenth
Street, thence north to Lucas Avenue,
thence west to Fourteenth, thence north to
Wash, thence west to Leffingwell, thence
to Franklin Avenue, thence west to Grand,
thence south to Morgan, thence west to
the Narrow Gauge Depot. The route down
town will be the same, taking in the new
post office and the new exposition building.

— THE —
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 ROBERT GRIMSHAW, M. E., Editor in Chief.
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BRANCH OFFICES:

Eastern District, 8 EXCHANGE PLACE, BOSTON, MASS.
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Special Notice.

Street Railway officials and others interested, who have not yet subscribed for the STREET RAILWAY JOURNAL, should do so at once, so as to receive the back numbers. An index will be printed at the end of the year, embracing the first twelve numbers—constituting a most valuable fund of information. The price (ONLY ONE DOLLAR) should place it in the hands of every practical street railway man in the country.

Street Railways Public Benefactors.—I.

It is our intention in this paper and the following numbers of the series, to review the relations, past and existent, of the street railways to the public. The number now in hand will be confined to merely a general review of the subject, and in succeeding numbers we shall glance over the history of the institution, its development—showing that it has kept in advance of needs rather than behind them; legislation; improvement in methods, appliances and aids to comfort; closing finally, with a synopsis of the plans, work and possibilities of the National Association in America.

It may be laid down as a broad general principle, that no great enterprise can ever succeed unless there first exists a necessity demanding it. But present success is not always the most important thing to be attained, and often, where no demand exists for a thing, its very creation may awaken such a demand, and its prosperity be thus finally secured. The man or corporation that thus establishes an important device or system, and therewith creates, as it were, a necessity for his invention, is to be honored as a public benefactor of the highest order. And in this category the originator of the street railway—not Outram, whose honor is, after all, but perfunctory, but he who first opened up the streets of a great city to rapid and regular passenger transport—may well be classed.

In the ante-tramway (or, as we prefer to call it, street railway) days, city streets were narrow, foul-smelling, ill-paved, and, at night, dark and dangerous. The lumbering stage coach, indeed, performed its "semi-occasional" journeys from town to town, and the European modification of the Japanese *jin-riki-sha*, or "man-power carriage"—the chair borne through the narrow lanes and alleys of unprogressive cities—together with a few detached hacks or cabs, but poorly represented the service and convenience now performed in every borough of the United States and the rest of the civilized world.

To understand the importance of this modern means of transit to commercial and personal life in cities, it must be remembered:

(1.) That a street railway is impossible without at least passably good road-beds, and good roads almost necessitate fair sidewalks.

(2.) That good drainage is requisite to the maintenance of good roads.

(3.) That a street railway requires something wider than a mere lane or alley, and that wide streets mean light, air, ventilation and health to the dwellers thereon.

(4.) That the regular transit of closed vehicles, which may be used at a cheap fixed price, renders locomotion possible in all weathers without prejudice to health or comfort, and thus improving the facilities for business and social intercourse directly benefits all the inhabitants of a town possessing such facilities, and directly improves the value of properties situated on streets having them.

(5.) That corporations operating upon a large scale and having the special privileges for which only such corporations can offer adequate returns, are enabled to perform at a smaller expense and on a lower percentage of profits, more regular and satisfactory and cheaper services than the enterprises of individuals could possibly offer.

(6.) That success is always dependent upon the acceptable performance of needful services, and that success, in the case of street railway companies, is therefore dependent upon the adequate accommodation of the public, and that the greater the success, the greater, necessarily, the benefits rendered.

On these propositions we shall base our future articles. M

The Car Heating Question.

In view of the fact that our past comments on this subject appear to have misled some of our readers, and placed us in a false light before them, we publish this in explanation of our position.

The question whether cars shall or shall not be heated is, we take it, one which concerns the street railway companies alone, and in its settlement the public has absolutely no right to consideration, save in the light of patrons. It is a matter solely of dollars and cents, and the only problem to be solved is this:—Will it pay better to heat cars or not to heat them? It is, furthermore, a local question, and the fact that car-heat-

ing has proven successful or unsuccessful in one city cannot decide whether it would be profitable or unprofitable in another. If the people refuse to patronize unheated cars, or if a sufficient additional number would use the heated cars, there is no company which would not hasten to supply the desired accommodation, always providing that a practicable method can be found. But in cases where companies refuse to heat their cars, we take it that after canvassing the grounds, they have come to the conclusion that the prospective increase of profits will not justify the added expense. It is usual with unreflecting people to look at such matters from a sentimental or a partisan standpoint. Street railways, like all other enterprises, are purely business ventures, and a passenger has no more moral right to demand of the corporation heat in the car which he patronizes than he has to demand a pound of sugar as a bonus on the pound of tea which he buys of his grocer. "The public," in the eyes of newspaper writers, is a sort of gigantic autocratic monster, to be worshipped and flattered and pampered, like a Burmese white elephant, and possessed of an inherent right to set foot, when the whim moves it, upon a whole detachment of its devotees and crush them out of entity. But the fact is that the public is merely a collection of individuals, each naturally desiring to get what he wants at the lowest price; and the public has no "right" which obligate any corporation or individual to give it something for nothing, or, in other words, to perform an unprofitable service?

If it will pay to heat our cars, let us heat them; if it will not pay, they should remain unheated—now, are we comprehended? C.

Beneficent Monopolies.

Just now (the past year having been an election year), readers of the daily press are condemned to see a great deal of philippic literature directed against "grinding monopolies." In New York and some few other unfortunate states the target of abuse is, at present, the street railways, just as in the far West, the steam roads are made the scapegoat of "near"-eyed grangers and wide-mouthed borough politicians.

It is a rather startling proposition to advance, but has it ever occurred to our readers that in the present age of free competition, there can be no such thing as a "grinding monopoly?"

If a *fiat* law could give to a single man or body of men, the unlimited and exclusive control of one of the absolute necessities of life, that would be a "grinding monopoly;" but in regard to things which people are able to accept or reject, we fail to see how a monopoly can be oppressive.

In the case of a street railway, a body of individuals, under certain just or unjust restrictions, is permitted to erect facilities for performing a certain service, and in return is guaranteed certain privileges. If the services are poorly performed, the road is not patronized, loses money, and, in the natural course of events, finally finds its way into more capable hands. A line in this final condition of successful manage-

ment, catering to the demand it has assisted in creating, enhances the value of adjacent property, attracts investment and settlement, and (*sometimes!*) reaps a handsome reward. Now, why, in the name of logic and common sense, should a successful road of this latter class be considered more obnoxious than an unsuccessful one—or indeed, as much so?

Undeserved success, be it remembered, is next to the problematical "honest man" of Diogenes, the rarest thing in the world; and when a street railway company (or, in fact, any other sort of company) attains the happy position of being able to say heavy dividends, it is nine chances to none that its superior success is due to superior enterprise and merit.

We have been trying to comprehend, but have not yet succeeded in doing so, why a street railway company earning more than a penurious dividend, should be subject to public crimination, newspaper abuse and the hounding of legislative demagogues, any more than a bank or a manufacturing corporation. The anomaly is all the more apparent when it is remembered that there are very few commodities to be had at such a ridiculously low figure as street railway transportation. In Philadelphia, for instance, one may ride something like fifteen miles on a single six cent fare; in New York, five cents will entitle one to ride about fourteen miles; in Brooklyn the same amount will cover about eight miles, while in Chicago for the same price, nearly the same distance may be traveled. These figures are merely approximate, but it will serve to illustrate the general cheapness of this commodity, when it is remembered that steam railway transportation is considered very low at two cents per mile, and that shoe leather costs a constantly walking man at least three dollars per month; all things considered it seems more rational to attack the shoemakers than the street railways.

These points are worth considering, and holders of street railway securities need not fear but that the calm good sense of the community will finally repudiate any action looking to the curtailment of their facilities or the crippling of their resources, in spite of the biassed pleadings of interested politicians. M.

Some Features.

It will be observed that this issue of the STREET RAILWAY JOURNAL is considerably enlarged, and we trust our readers will find it also materially improved. This enlargement will be permanent, at least to the extent of four pages increase over our past editions; while we hope to make each number more acceptable to our readers than the one preceding. Our object is to represent in every sense of the word, the street railway interests of the Americas, and (as far as they care for our assistance) those of other lands. To this end we invite assistance and co-operation. Tell us what you want and we'll try to furnish it; tell us what is least valuable to you that we may know what we can afford to omit. Our sole aim is to be useful to you,

and so merit your hearty support; and to this end we shall always esteem frank criticism even more highly than frank commendation. If any of our articles displease you, tell us so, giving your reasons; for we are privileged, by the rules of rhetoric, to consider silence as giving assent.

In this number will be found considerable cable railway matter, which should be of interest at the present time, and with other interesting articles and notes, a specially valuable paper on stable ventilation, by Mr. Augustine Wright, M. E., of the Chicago North Side Railway. We hope in the future to have a first-class "horse" department, and until we can secure the proper organization for its thorough conduct, will try to give hints and notes in that line, which shall not be without value.

Now, can we rely on our readers for hearty assistance?

Concerning an "Equine" Department.

Several very good friends of the STREET RAILWAY JOURNAL (friends in words, in deeds and in dollars) have urged upon us the great desirability of a veterinary, or more properly speaking, an "Equine" department. The more we think of the suggestion, the better we think of it; the horse is at present the important factor of both profit and expense in the street railway business, and it is a perfectly safe assertion to make, that less is generally known about the animal (physiologically and psychologically) than about anything else connected with the business. How little is known definitely, for instance, about feeding—the proper food for certain work, or the proper variations of food with the changing seasons. This is ignorance of equine hygiene, and ignorance in matters of equine pathology is even more striking. Yes, we are convinced that an "Equine" department would be valuable, and we promise our subscribers such a department as soon as we can arrange for its conduct by a competent specialist—for it demands a specialist to make such a department of permanent, practical value. Meanwhile, the following notes may be found useful by some of our readers:

Anthrax or *Charbon*: This disease—common in some portions of Europe, where it becomes, at periods, a veritable plague, is, fortunately, rather rare in this country. Pasteur, and other eminent microscopists, have demonstrated it to be a "germ" disease, communicable only by direct infection, but very virulent. In one district of France, it was shown that earthworms, by carrying the germs from buried cattle which had died of the disease, to the surface, spread the contagion through the grazing herds of an entire district. Dr. R. S. Finlay, V. S. (Veterinary Editor of Wilkes' *Spirit of the Times*), says of it in that paper:

"Anthrax (called by some *charbon*, from the fact that the tissues diseased are of a black color; also termed splenic apoplexy, gloss anthrax, carbuncular fever, miltzbrand, black leg, black quarter, splenic fever, Texan fever, etc.) The same indica-

tions for treatment are manifest, with slight modification, according to seizure. Symptoms: An animal that has been thriving well is suddenly found feverish, with rapid heart's action increased to 100 to 120 pulsations per minute, mouth hot and dry, conjunctiva deeply injected, with, in many cases, petechial spots visible. In a short time swellings are noticeable in the quarters or loins, tender to the touch, with stiffness in moving, lies down a good deal, with unwillingness to get up, appetite lost, rumination suspended, bowels constipated, urine scanty and very highly colored, almost blood-like. Second stage: The swellings increase and lose their sensibility to touch, become dead, gases form in their interstices, producing crepitation when handled, from their breaking down and decomposition; absorption of the putrid substance occurs, resulting in blood poisoning, delirium and convulsions or the opposite condition, coma, with failure of the heart's action, and death in some cases, in a few hours. Post-mortem appearances are those of tarry-colored extravasations of blood found in every organ, with petechial spots in the bowels, and, in some cases, ulceration. Pasteur thinks well of vaccination with a modified virus. His experiments are published, and are worth while perusing. He has proven the existence of a specific virus, communicable from one animal to another. We are of the opinion that a timely adoption of a strict quarantine, with isolation and the administration of sulpho-phenol, alternated with ammonia-phenol, will check the incubation and invasion of the disease."

He also says that he has frequently found "following in the trail of 'epizootic,' certain structural changes in the membranous lining of the respiratory passages," which produce symptoms showing difficulty in breathing, under work, without other marks of disease. As "epizootic" has been epidemic in most parts of this country at some time during the past few years, Dr. Finlay's prescription may be found of value in many places. He says that these cases "require care in feeding to avoid dust or over-distension of the stomach. We would advise the food to be of a laxative nature and as small in bulk as possible. The use of ground flaxseed, as an addition to the feed, would answer the purpose, together with the following powders in the feed and watering a little and often, would be attended by beneficial results:

Acidi arsenicum, 1 drachm.

Glycyrrh. pulv. rad., 4 ounces.

Misce. Sig. Tablespoonful in the feed twice a day."

We Will Try to Deserve It.

Mr. Chas. W. Goodnough, of the Pittsburgh Union Passenger Railway Co., writes us pleasantly:—"We hope your paper will be a success, as we consider it of great value, and believe that it fills a long felt want in the street railway business."

To this we can only modestly return our thanks, and the assurance that we will try right along to deserve the success which our efforts so far have obtained.

"The Demon Varnish."

Following up some remarks in the JOURNAL OF RAILWAY APPLIANCES upon the cussedness of inanimate objects, as especially exemplified in varnish,* the discussion which had led to one or two animadversions against contract work, brought to his feet one gentleman who said:—"I am one of those contract fellows they talk about. I have tried this board method. I have tried the half and half method. The board method did some good, although I have seen some differences in boards I have used. I had rather hear the railroad men in regard to that matter, but any additional light I can offer I shall be very pleased to do so."

("The board method" consisted in painting a board and varnishing one half of it with one varnish, and the other with another. The "half-and-half method" consisted in varnishing one half of each side and of each end of a car with one varnish and the other with another varnish.)

It will be seen that even "the smallest worm will turn, being trodden on."†

It does not appear, however, that the "railroad men" who were so free to criticize the contract system, cleared their own skirts at all; for they in no wise showed where and why the contract system was wrong, nor how it could be bettered. This is all that was said in response:—"Mr. Stines: 'I think it is nothing more than fair to give those varnish men a chance.'" In other words, the railroad men knocked off the contract men's hats, and cut and ran.

But the ultimate result was that one varnish maker who had the good sense not to think that he "knew it all," got up and said:—"I would like to ask the gentlemen what they think the best varnish, that which dries with a strong tack, or one that dries without any tack with a hard surface at once."

This was "carrying the war into Africa." Customers growled, and he wanted to know what they were growling about, and what they wanted. He added:—"I have been a practical varnish maker for over thirty years, and my experience is that the varnish that dries on the surface will never stand as well as that that dries with a strong tack. If you take a microscope of ten power and look through it at the side of a car you will notice that the surface of the car is full of holes and still every one of these holes takes in the atmosphere, and in a little while that takes away the power of adhesion that is in the oil."

But even this gentleman, one "of the guild," could not resist this fling:—"Some varnish men pretend to say that they have got a varnish that will dry from the bottom up. I don't believe it."

Hit 'im again, he has no friends! He continues:—"When a varnish is dry it is composed of oil and gum, or ought to be. You will find that all varnishes crack from the surface, and paint cracks from the bottom."

Now what we want to know is why is it impossible for varnish to dry from the bottom, and yet possible for paint to crack from the bottom?

But the speaker adds something worth noting:—"If you could put on two coats of varnish rub it a very little and then polish it and close up all the pores, you would have a job that would last longer than any work we have at the present time."

He then adds, what we cannot agree in:—"The ammonia in the atmosphere is what destroys varnish. The presence of that ammonia in the atmosphere is what gives more trouble than anything else."

How about salt air? No ammonia in salt. But perhaps the next statement atones for the heterodoxy on the ammonia question. "I think that after a while you will all come to rubbing varnish with the hand. You thus fill up all the pores and the work will last longer than with two or three coats of finishing varnish without rubbing. I think it is better to rub in the first coat."

A member replies:—"You make them come together by the force of adhesion. Now by rubbing this surface off you scrape up this varnish on the same principle that the plasterer scrapes up his wall before putting on the second coat. The only objection I can see is to closing up the pores."

Here we have one man complaining that the pores do the damage, and another asserting that to close them up would be injurious. It reminds us of the two roads to Heaven, described by a darky preacher:—

"One am a broad and narrer way dat leads to destruction, and de udder am a narrer and broad way dat leads to perdition." "In dat case," ejaculated one of his sable hearers, "dis nigger take to de woods."

The pertinacious varnish maker, however, says in reply:—"I speak from experience. I have had for twenty-two years a customer who varnishes coach bodies. He has never used a particle of finishing varnish. He polishes up a coach with his hand and then sends it out as finished, and his coaches are not revarnished for five years. They last longer because he closes up the pores."

He adds as a parting shot against rival houses. "One man will send you a varnish that is half turpentine. It must get out and there is nothing for the paint to do but crack."


"Hits bleedzed ter be so" says Uncle Remus.

Now rises up a champion for the much berated varnish and says:—"I heard a theory advanced here this morning that varnish will crack paint. I never knew a varnish to crack paint, I have known varnish to crack, but that was the fault of the paint."

The last speaker of all leaves the matter about where it all started, on the border line between uncertainty and lack of definite knowledge:—"I think that the time a car should run before revarnishing is not a matter before the meeting to be determined; we cannot control it. I know some roads that allow their cars to run and never wash them, they let them run until they get so

dirty that they have to bring them in and paint them. I know others that wash their cars once a year. We wash our cars twice a year with soap and water. I find that a car washed in this way won't stand more than three washings before it needs revarnishing. We all know cars need washing before repainting. Another thing, the wear of varnish will depend upon the weather. A car run out now will wear longer than one run out next spring. To run them out of the shop and let them stand in the hot sun is worse than letting them run all the time, but as I said before, I do not think it is a matter we can decide. Our passenger cars will average two years before revarnishing, and they look as well as cars that have been revarnished in sixteen or eighteen months."

Double Lip Joint Plate.

A wrought iron continuous double lip joint plate* for 5-inch base centre bearing rail, to which our attention has been called, is approximately  shape in section; is reversible, and should in great measure protect the timber from the wet, between joints, and prevent it from rotting.

* A. Ayres, 625 Tenth Av., N.Y.

The Metropolitan Street Railway Co. of Boston is building thirty new summer cars, to be finished the first of May. The company will then have seven hundred and twenty full-size cars running on its road. It is introducing B. L. Randall's Eureka brake, which is considered a benefit both to the car and driver, giving him complete and easy control of the car at all times. It is also using Eaton's patent loose axle, in which each wheel acts independently, thus saving much friction in turning curves.

E. L. B.

IN LONDON the great Hughes Locomotive Works broke down by reason of their prolonged efforts to force the use of steam upon street railways and do away with horses.

THE PIONEER CAR is the "bobtail," but it soon gives way to the two-horse car. Three-fifths of all the cars now running in the U.S. are of the bobtail persuasion.

Power to Run the Brooklyn Bridge Cars.

Mr. A. H. Mathesius states that the "26x48" engines on the Brooklyn Bridge cable, working under 60 lbs. initial cylinder pressure, develop a maximum of 270 indicated horse-power; of which 56 H. P. (or about 20 per cent.) are needed to drive the machinery and cable. The minimum is 54 H. P.; mean, 162 I. H. P., got with a coal expenditure of 3 lbs. per hour per I. H. P. The "cabled" part of the run is 5,600 feet; grade, 3¼ per cent.; speed, 10 miles per hour, say 900 feet per minute; weight of train and load, 26 tons. Mr. M. thinks that if four-car trains were run, under the present distribution, they would run away with the machinery.

* See page 98 of our issue of March 2.
† Henry IV., Part III., ii., 2.

Personal.

MR. J. B. SLAWSON, President of the Central Cross-town R.R., N.Y., and Treasurer of the John Stevenson Co., is just recovering from a severe attack of pleuropneumonia.

A THOUSAND FRIENDS of Mr. Bidgood, General Superintendent of the 6th Ave. (N.Y.) line will learn with regret that he has resigned his position and gone south to regain his shattered health. Mr. Moore has succeeded to his position.

MR. ABRAM L. SMITH, late General Superintendent of the Dry Dock E. B. & B. R. R.R. Co. (N.Y.), has succeeded Mr. Wiley as General Superintendent of the 42nd Street, Manhattanville and St. Nicholas Ave. R.R. Co.

Notes and Items.

THE contract for wire cable for the St. Louis Cable Railway, has been given to Jno. A. Roebling, Sons & Co., Trenton, N. J. It is of steel wire, endless, 1½ in. diameter, 34,000 feet long, weighing 75,000 pounds.

We have trustworthy information that the Citizens' Railway Company of Pittsburgh has leased the Transverse Railway Company's line, to take possession April 1st.

THE BROWNELL-WIGHT CAR MANUFACTURING COMPANY, St. Louis, received the contract for the rolling stock for the new St. Louis Cable Railway, consisting of 24 passenger and 15 grip cars. Cars must be run at intervals not exceeding five minutes, and the fare will be five cents.

THE NEW ALBANY RAIL MILL COMPANY received the contract for the conduit of the St. Louis Cable Railway, requiring 1,900 tons of iron.

THE SMITH, BEGGS & RANKIN MACHINE COMPANY, St. Louis, took the contract for engine and boilers for the St. Louis Cable Railway. There will be one Corliss engine, 24x48, sixty-nine revolutions, and three boilers, 60 inches diameter by 20 feet long, giving a capacity of 250 horse-power. Foundations for duplicate sets of machinery will be put in.

THE FULTON IRON WORKS, St. Louis, received the contract for the winding machinery, pulleys, sheaves, drums, etc., for the new cable railway in that city.

THE ATLANTIC AVENUE RAILWAY COMPANY, of Brooklyn, has (as we previously noted), recently purchased the Bergen Street Railway, and will connect the two at several different points. The contracts for the switches and other appliances for these connections, has been given to Mr. David W. Binns, of Walworth St. (27 to 39), Brooklyn.

ECONOMICAL STEAM TRAMWAY. — The Dewsbury, Batley, and Bristol Steam Tramways—the first ever constructed in England—worked by Merryweather 7-in. engines, show in the half-year's working accounts that the total cost of the running of the engines is 2.57 pence per mile, and the total expenses of the whole establishment, including locomotive charges, 5.16 pence per mile. This is one of the most economically worked lines in England.

LOUISVILLE CITY RAILWAY COMPANY.—The stockholders held their annual meeting March 12th, and elected as directors: Major Alex. H. Davis, Syracuse, N.Y.; H. B. Hanson, Saratoga Springs, N.Y.; St. John Boyle, E. C. Bohne, Theodore Harris, Alex. P. Humphrey and H. H. Littell, all of Louisville, Ky. The directors organized and elected Major Alex. H. Davis, President; St. John Boyle, Vice-president; H. H. Littell, Superintendent; R. A. Watts, Secretary and Treasurer. A dividend of three per cent. from the earnings of the past six months (payable April 1st) was declared.

AMOS FREE has been made Superintendent of the Watervliet Turnpike and R.R. Co., vice M. C. Foster, resigned. Mr. Free was stable foreman. The office of president of that company is at present vacant.

ALFRED EGERTON, Superintendent of the Albany (N.Y.) R.R. Co., is investigating the various systems of cable traction, with a view to adopting one of them. He invites correspondence on the subject. A few cars and some track will be added this spring.

THE TORONTO (CAN.) STREET RAILWAY Co. is extending its line and has ordered a lot of American cars, we understand, of West Troy make.

CHARLES HATHAWAY, President of the Superior Street Road, Cleveland, has purchased the St. Clair Street line, and will devote his personal attention to its development.

The consolidation of the West Side and Woodland Ave. roads in Cleveland has been consummated, and a number of cars are being added. They are built by Jones, West Troy.

THE DETROIT CITY RAILWAY Co. is changing its one-horse cars on Woodward Avenue line, for two-horse cars built by Jones.

THE NORTHAMPTON (MASS.), STREET RAILWAY Co.'s line extending to Florence, has a very fine equipment, and being compelled to compete with a steam road, cars are run to make time regardless of several heavy grades. The equipment consists of eight men, twenty-four horses and six cars. Some additions will be made this season.

WORK will begin as early as the weather will permit on the College City Street Railway of Galesburg, Ill.,—a city of fifteen thousand—heretofore without anything of the kind. Mr. E. O. Flood, of Dallas, Texas, is President.

THE RACE & VINE ST. COMPANY (PHILA.), has just put into service two new cars (Nos. 24 and 40), built in its own shops. Five new summer cars are also being pushed to completion in the company's shops.

MR. J. E. RUGG, Superintendent Highland Street Railway, Boston, Mass., writes us that "the Highland Street Railway Co. have added eight new cars to its different lines during the past winter, all having the Higby gear and Everett sash, and made by J. M. Jones' Sons, West Troy, N. Y.

ANDREWS & CLOONEY report that they are "running overtime in their works on wheels, axles and railroad castings, and automatic and plain switches. Business is steadily increasing, they having just closed some large contracts for material for sev-

eral new roads, have orders for 100 sets of our new Andrews and Clooney rubber centre spring, which has met with great success."

SEVERAL CAPITALISTS ON STATEN ISLAND have incorporated the Richmond County Railroad for the purpose of running horse cars from the shores to the interior of the island. The line is intended to make accessible a locality where elegant residences are being rapidly constructed. The capital stock of the company is \$30,000. The road will be in operation within three months.

MR. WM. P. CRAIG is to furnish the material and build about six miles of street road in New Bedford, Mass., using the Johnson steel girder rail. He writes that his prospects are good for building several more roads in the eastern states, using this rail. He has contracted to build an extension to the Bushwick Road, in Brooklyn, E. D., comprising about 2½ miles of track. He also expects, in a few days, to commence work on laying the curves and switches connecting the cable road on Tenth Avenue, New York, with the depot, and this road is expected to be running as soon as this work is completed.

THE SECOND AVENUE R.R. of this city tried for seven years to introduce steam upon their line, but finally abandoned the idea.

THE VENERABLE JOHN STEPHENSON, of New York, who has spent 54 years in the manufacture of street cars and omnibuses, says that omnibus lines have nearly gone out of date, being supplanted by street cars. In all this time he has never had a strike in his shops. Last year the John Stephenson Company did the largest amount of work of any in his experience, but the prices were low and profits not commensurate with his increased business. They are now completing, with other orders, a lot of seventeen cars for the 4th Avenue road of this city, which are to have all the modern convenient and elegant appliances.

AFTER an experience of five years, and exhaustive tests of twenty-one different systems, the Paris Tramway Company has abandoned the use of steam and reverted to the use of horses as a cheaper and, in all respects, more satisfactory motive power. Scarcely a week has passed without some accident on the steam line, which proved costly to the company and led to complaints from the public. At last the authorities forbade the use of steam, and the company was entirely ready to acquiesce.

IN CHICAGO the Cable Road Company have expended some hundreds of thousands of dollars in constructing divergent lines from the main lines, which they have not utilized.

MEN of large experience in street railway affairs assert that no motor can now be practicable which depends for its propulsive power upon the revolution of a wheel upon the vehicle.

THE 42D STREET, MANHATTANVILLE AND ST. NICHOLAS AVENUE RY. Co. (N.Y.) will open its road, through the boulevard, to Manhattanville about the middle of May. A depot is erecting for the company at 129th Street and Eleventh Avenue.

AN experience of half a century has practically demonstrated the fact that surface street cars cannot with safety be run at a greater rate of speed than six miles an hour. This rate is also the legal limit of fast driving of any kind of vehicle in most American cities.

WHAT is required in a mechanical motor for street cars is that it shall work well under all circumstances. Nothing has yet been found to meet this requirement.

THE BALDWIN LOCOMOTIVE WORKS of Philadelphia spent much time and money in the effort to apply steam motors to street railways. They were not successful, but the experiments upon the Market Street lines developed two facts—first, that the cars were under better control than with horses; and second, that horses in the streets were not as much frightened as was expected.

THE WALES MANUFACTURING CO., Syracuse, N.Y., is bringing out a new fare box. Shipments of boxes have recently been made to Mobile, Mo.; Columbus, O.; New Orleans and Elmira.

THE TROY AND LANSINGBURG R.R. will this spring erect a new barn on their "Blue Line," which may involve some changes in running arrangements.

THE BROOKLYN CITY RAILROAD REPAIR SHOPS.—The rapid growth of the Brooklyn City Railroad has been such as to necessitate more commodious quarters for doing repairs. The new shops situated on Myrtle Avenue are very complete. The receiving shop will hold thirty-five cars, the wood shop twelve and the paint shop twenty-two. The blacksmith shop with seven fires, and all other departments are supplied with the latest improved machinery for car building, and can run through the shops five cars per day. Mr. A. W. Dickey, the superintendent,

has taken great pains in making plans for the shops to enable work to be pushed with the utmost despatch. The superintendent's office and draughting-room are nicely fitted up; speaking-tubes being so fitted up that foremen can be called from any part of the building. The president and superintendent are awake to the wants of the traveling public, and there are many things in their management which other roads would do well to pattern after.

THE LEWIS AND FOWLER CO. has just finished for the Oriental Metal Co., of Boston, a finely executed *basso-relievo* plaque of a horse in metal. It is handsomely framed on a mat mounting of black velvet, and is a very tasteful piece of work.

JOHN STEVENSON, among other work now in hand, has orders from Lisbon, Portugal, where the original supply of street rolling stock was supplied by him in 1873.

THE LEWIS AND FOWLER M'FG. Co. have the sole agency in the U.S. for the Oriental Metal M'fg. Co., of Boston, for their goods as used in street car journal bearings.

THE OLD TIME HACKS that ran from the Grand Central Depot (N.Y.) to the 6th Avenue elevated cars have been replaced by the cars of the 42d Street line, which run every minute.

THE 42D STREET, MANHATTANVILLE AND ST. NICHOLAS AVENUE (N.Y.) line will, when completed, have upwards of 16 miles of track. Cars are now running to 72d Street only, but the track is laid to 110th Street, and as soon as the frost is out of the ground rails will be laid to the up-town ends. It will be one of the longest roads in New York.

NOTHING has yet been devised in electricity which is applicable and practical as a motor for street cars, and nothing stands

nearer to the front than the cable system at present.

WHEN asked his opinion of the cable system, Mr. John Stephenson said he had spent ten days in examining the cable road in Chicago, and the sense of his convictions was that for use under all circumstances the system was open to some objections, which time and experience would probably overcome, and that it had not yet passed entirely out of the realm of experiment as to its superiority to horses. He thought, however, that it was in advance of any other system or device which had been suggested as an alternative for horses, and was especially applicable to hilly ground.

MR. LEWIS, of Lorimer Street, Brooklyn, says: "the balmy days of spring are blossoming out" for him more orders for his wood mattings for street railway cars than he can fill.

APRIL 1st the former Superintendent of the Rochester City & Brighton R.R. Co., Thomas J. Brower, after a rest of two years, resumed his old position of Superintendent, which he has held, with this exception, for the past fifteen years.

WANTED.

By a first-class mechanic, a situation with some Street Railway Co. as foreman in Paint Shop at contract prices or day's wages. First-class reference given as to ability, &c.

Address, "PAINTER,"

STREET RAILWAY JOURNAL,

8 Lakeside Building, Chicago, Ill.

STEEL STREET RAILS.

The Pittsburgh Bessemer Steel Co., Limited.
48 Fifth Ave., Pittsburgh, PA.

Section No. 17
46 lbs. per Yard

ORIENTAL METAL MANF'G CO.

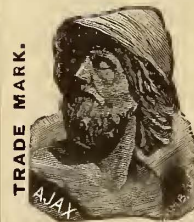
48 CONGRESS ST., BOSTON, MASS.

C. L. VAN WORMER, President.

A Trial of Our Street Railway Journal Bearing solicited.

THE AJAX METAL CO.

WE CLAIM FOR AJAX METAL.



25 to 50 per cent. more mileage.
33 1-3 " greater tensile strength.
100 " greater crushing strength.
20 " less friction and wear upon journals.
85 " less hot journals than any known Bronze named or unnamed.

Costs no more than copper, and tin or gun metal.

AJAX METAL CO.,

2040 No. Tenth Street, PHILADELPHIA, PA.

HALE & KILBURN MANUFACTURING CO.,

48 & 50 North Sixth St., Philadelphia, Pa.

EXTENSIVE MAKERS OF PATENTED CAR SEATS AND SPRINGS.

SPECIAL PATTERNS FOR STREET CARS.

Also manufacturers of General House and Office Furniture of the Most approved patterns and designs. Estimates, circulars, and samples furnished on application.

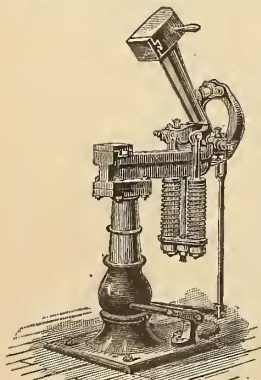
**STREET RAILWAY WHEELS AND TURNOUTS.
Graded Stable Gutter with Straight or Curved Cover**



Descent 1/8 in. per foot. Pieces 5 feet lengths. Short pieces furnished to suit any length. Spouts to connect with Sewer, &c.

BOWLER & CO., Cleveland, Ohio.

THE STANDISH FOOT-POWER HAMMER



Is specially adapted to making light forgings, for welding in dies having impressions cut to the shape of the work required. They are superior to power hammers, as the hammer is under as perfect control as the Smith's hand hammer, and are used in the carriage business for welding Dashes, Shifting Rails, Top Props, shaping and forming ALL SMALL WORK equal to drop forging, and are in use by the principal manufacturers of the United States. Send for circulars. Address.

**The Capital City Machine Works,
COLUMBUS, O.**

Patented July 10, 1883.

Envelopes For Street Railway Companies.

The subscribers beg leave to inform all purchasers of

ENVELOPES FOR STREET RAILWAYS

that they are largely engaged in manufacturing

Envelopes of All Kinds,

especially those used for

C H A N G E .

They have recently introduced a new style, making each denomination of a *different colored paper*, thus more easily distinguished by the driver. All well made and gummed.

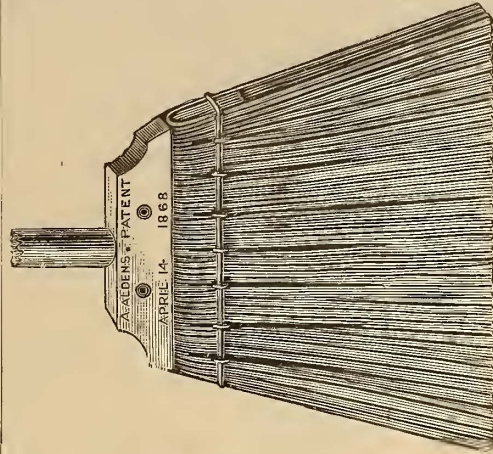
Samples sent when requested.

SAMUEL RAYNOR & CO.,

117 WILLIAM ST., NEW YORK.

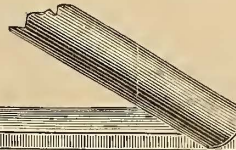
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SEND FOR PRICE-LIST.



Railroad Push Broom.

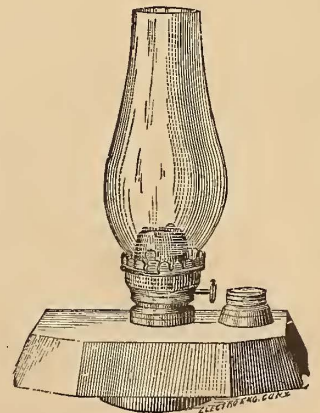
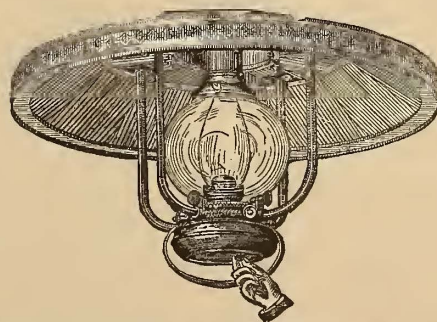
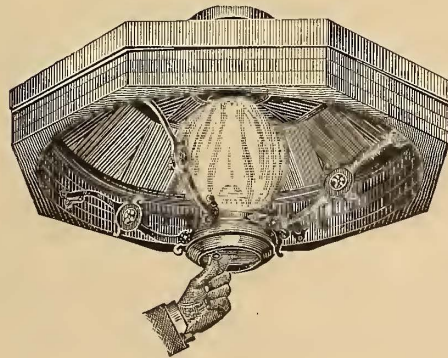
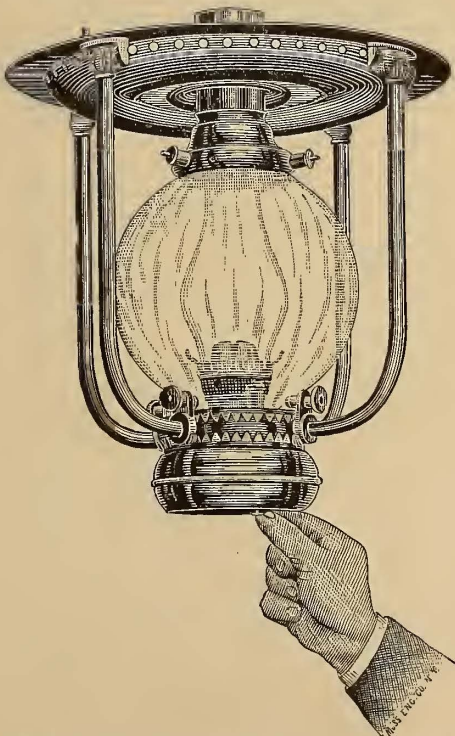


JOSEPHINE D. SMITH,

Successor to the late WILLARD H. SMITH,

350 & 352 Pearl St.,

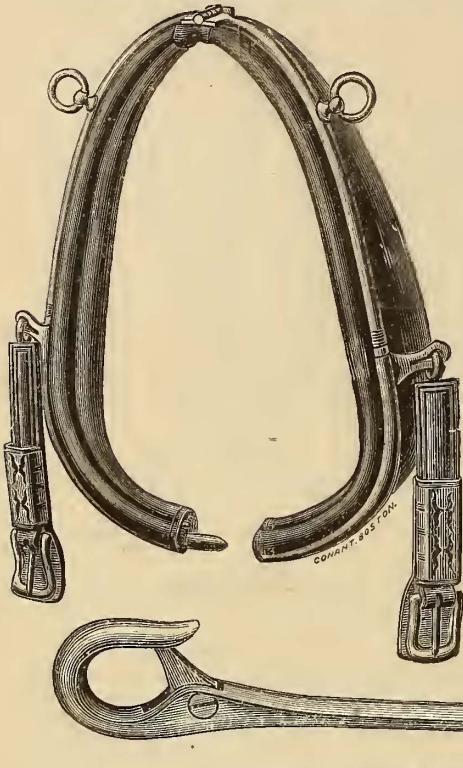
New York.



Manufacturer of RAILROAD CENTRE LAMPS AND REFLECTORS

AND ALL KINDS OF SHIP AND MARINE LAMPS.

BERRY'S PATENT HAMES.



Lightness, Strength,
Durability, Quick-
ness and Sim-
plicity.

They have the advantage of easy adjustment. No buckles or straps are used. They can be applied in an instant, being fastened to the collar. The collar is divided and there is no strain upon the collar or the eyes of the horses.

In case of accident the whole harness can be removed at once.

They are adapted to the use of Fire Departments, Horse Railroads, Express Wagons, Teams and Light Carriages, and are in use in over one hundred cities and towns in the United States and Canadas.

WE ALSO MANUFACTURE THE

REGAN PATENT SNAP.

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

CHARLES E. BERRY, Cambridge, Mass.

IMPORTANT.

We insert this advertisement for the purpose of impressing upon Street Railway Companies the importance of adopting the

DEMAREST DUPLEX REGISTER.

Should the officers and directors of your company conclude to discontinue the use of a portable register and adopt in its stead a permanent register (a wise conclusion), the first question which would arise, would naturally be—What system of registering is the best for our use? Do we desire one that is continuous and visible, so that the conductor may, at all times, see and read the state of the register? Or one that indicates and duplexes each trip or half trip for the day, upon a paper dial, to be returned into the office at night for inspection?

We propose to solve these questions by showing that Railway Companies who use the DEMAREST DUPLEX REGISTER, have, in its adoption, combined both systems of registering, in such a way, as to do away with the objections against either system; and, in fact, have at their command, as they may prefer, both methods of registering.

Our ringing device (which is very simple) is so arranged that the Duplex system of recording each half or whole trip for the day, upon a paper dial, can be easily discontinued whenever desired, and in its place can be put a visible continuous register reading up to 10,000, in such a way, that, as each fare is registered, the figures change consecutively, and can be distinctly read without mistake.

In justice to ourselves and the inventor we call attention to the fact that our improved continuous visible register is positive: that is to say, it has no springs or traps to get out of order. One is not compelled to look at several places on the dial to find out what the reading of the register is, but only to look at one place and get the facts.

It will, therefore, be understood that Railway Companies adopting the DEMAREST DUPLEX REGISTER have successfully met all objections now raised and all questions as to which is the best system are at once answered, for IT COMBINES BOTH. Our Fare Box and Register Combined is also subject to the same change. In ordering, all that will be necessary is to state what system your directors wish to try first, as the other method may be substituted in the same instrument, as your experience may prompt you or the necessities of your road demand.

We will place any number of our Duplex Registers (with or without the Fare Box, according to the kind of car), upon trial for any time desired, at a very slight cost. Our terms of purchase are quite reasonable. A trial is solicited.

Address the proprietor,
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Of **T** patterns, weighing from 16 to 76 lbs. per yard.
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Fare Boxes and Change Receptacles

MADE BY

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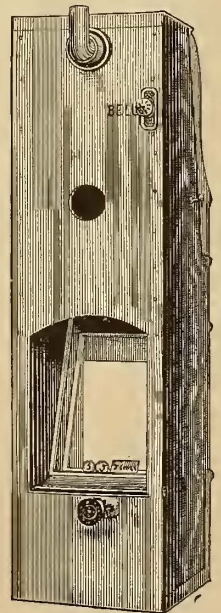
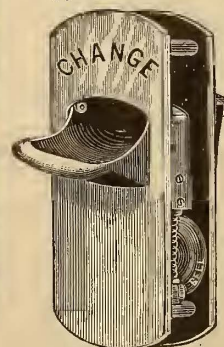
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Our Street Car Fare Boxes, for Simplicity of Construction, Cheapness and Practicability are Superior to Anything of Like Character in the Market.

Descriptive and Illustrated Circulars an application.



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Being one of the oldest manufacturers in the business, we have a MOST COMPLETE assortment of moulds.

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Correspondence Solicited.

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CAST CHILLED WHEELS,

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GROUND IN JAPAN.

For these colors we received the highest award, the Gold Medal at the National Exposition of Railway Appliances in Chicago, last year.

SPECIAL SHADES MADE TO ORDER.

We furnish special body colors to Pennsylvania R.R., New York Central New York & New Haven, Lehigh Valley, New Jersey Central and other large Railroads.

FINE VARNISHES AND JAPANS

FOR COACHES AND CARS,

Wood Fillers, Wood Surfacer, Wood Stains, Hard Oil Finish.

Manufacturers of FINE BRUSHES for painting, varnishing, striping, etc.

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Tube Colors, Artists' Brushes, Drawing Paper.

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Illustrated Catalogues of 250 pages and 800 Illustrations on request.

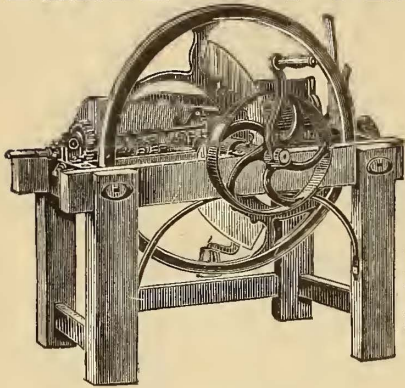
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WHITE LEAD, COLORS IN OIL, DISTEMPER COLORS, PURE READY MIXED PAINTS

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I Manufacture all sorts of Appliances for
STREET RAILWAYS,
 SUCH AS
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BRAKE SHOES, KNEES, SWITCHES AND WROUGHT IRON
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IS THE
Strongest, Most Durable,
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Street Railway,
CONCORDS,
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 Painted and Finished
 as desired.

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Send for Catalogue.

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N. Y.

STREET RAILWAY CONCORD HAMES.

JOSHUA HUNT, Chairman.

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THE BRYDEN FORGED HORSE SHOE WORKS

(Limited),

Catasauqua, Lehigh County, Penn.,

Are making a plain, narrow-webbed shoe, with beveled surfaces for Horse Railroad work. It is "FORGED" from the very best Iron, and is tougher and harder than any shoe heretofore made, and will be sold to consumers at a small advance on the prices charged for ordinary mill shoes. They also make a Calked Shoe with a Square Toe, just the same as hand made, and the company warrants them to wear as long as the very best hand work.

Among others who are using this Shoe, are the

- Third Avenue Railroad Co., New York.
- Eighth Avenue Railroad Co., New York.
- Twenty-third Street Railroad Co., New York.
- Christopher Street Railroad Co., New York.
- Brooklyn City and Newtown Railroad.
- Bushwick Railroad Co., Brooklyn, N. Y.
- Crosstown Railroad Co., Brooklyn, N. Y.
- Coney Island and Brooklyn Railroad Co., Brooklyn, N. Y.
- North Hudson County Railroad Co., Hoboken, N. J.
- Jersey City and Bergen Railroad Co., Jersey City, N. J.
- Ridge Avenue Passenger Railway Co., Philadelphia, Pa.
- Citizens' Passenger Railway Co., Philadelphia, Pa.
- Buffalo Street Railway Co., Buffalo, N. Y.
- New Orleans City and Lake Railroad.

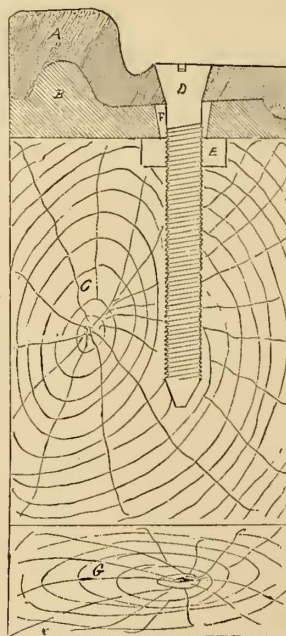
Also fully prepared to furnish any kind, weight or shape of shoe desired. Estimates on cost of producing such special patterns will be furnished on receipt of model, with estimate of the probable number of kegs required.

The Rates of Freight are as Low from their Factory West and East AS THE LOWEST.

A Mild Tough Steel Shoe supplied at a small advance over Iron Shoes.

WRIGHT'S

PATENT JOINT FASTENING.



The accompanying cut shows a cross section through joint. A is the rail, B the joint chair, C the stringer, D the patent screw fastening, E the nut, F a slot in chair allowing rails to contract and expand. The chair cannot settle and the rail ends are held level with each other, preventing the many evils of ordinary construction.

For Further Particulars Address

AUGUSTIN W. WRIGHT,
NORTH-CHICAGO CITY RAILROAD,

CHICAGO, ILL.

WM. P. CRAIG, Street Railway Builder and dealer in Railway Supplies.

OLD ROADS RE-LAID, GRADING, PAVING, &c.

Special attention given to laying Switches, Curves, Turnouts, Connections and Turn-tables; also Building Tracks for Excavation, Grading, Mining and Factories.

Office, 95 LIBERTY STREET, - NEW YORK.

THE STREET RAILWAY LUBRICANT "VICTOR"

Will last FOUR TIMES AS LONG, and is CHEAPER and MORE ECONOMICAL than Oil. Samples free on application.

HENRY F. ROHBOCK,

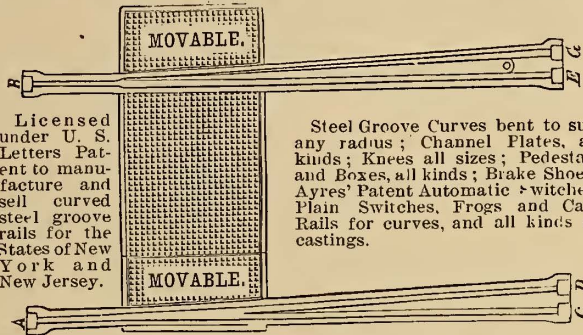
109 WOOD ST., PITTSBURGH, PA.

Used by Pittsburgh Transverse Railway Co.

A. AYRES, Manufacturer and Patentee.

Send me full size section of rails to be used at points A, B, C, D, E, G.

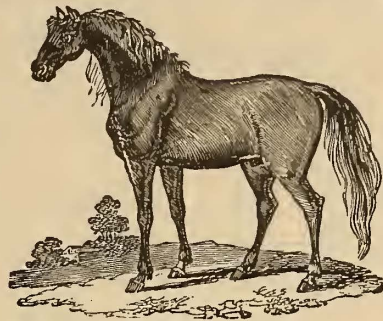
No. 625 TENTH AVENUE, NEW YORK.



Licensed under U. S. Letters Patent to manufacture and sell curved steel groove rails for the States of New York and New Jersey.

Steel Groove Curves bent to suit any radius; Channel Plates, all kinds; Knees all sizes; Pedestals and Boxes, all kinds; Brake Shoes; Ayres' Patent Automatic Switches, Plain Switches, Frogs and Cast Rails for curves, and all kinds of castings.

EUROPEAN COLIC CURE.



A speedy and sure cure for Colic—has saved hundreds of horses where all other remedies have failed. Horse need not be run or trotted around to start the wind. Let him stand or lie down as he feels inclined and he will be ready for work almost immediately after recovery. A cure guaranteed in ninety-nine cases in a hundred. Endorsed by the leading street railway companies of the country, some of which we append.

DECATUR, ILL., Oct. 2, 1884.

MESSRS. JONES & ROACH, Chicago, Ill.

I have used your Colic Cure for my horses and mules on my street car lines and found it the best and surest medicine I have ever used. I have not lost a horse since I commenced its use. It gives relief in a short time after it is taken. I can cheerfully recommend it as a sure relief if given in time. I keep it constantly on hand.

Truly yours,

FRANKLIN PRIEST,
President Decatur Street R. R.

MESSRS. JONES & ROACH:

Gentlemen: I cheerfully recommend your European Colic Cure for horses as being the best that I have ever used. When once introduced no horse owner can well afford to be with-

out it. I hope you will meet with the success your cure deserves.

Truly yours,

VALENTINE BLATZ,
Per H. Lieb, Manager.

OFFICE OF NORTH HUDSON COUNTY RAILWAY CO.
HOBOKEN, N. J., Oct. 4, 1884.

Gentlemen: It gives me pleasure to say that I can heartily recommend your European Colic Cure to all horse owners, from a personal knowledge of its curative qualities. I have used it in our stables, containing about six hundred horses, and have always found it to be beneficial. Yours very truly,

ALBERT SAILLET,
Foreman and Veterinary Surgeon for the North Hudson County Ry. Co.

Sample Bottles Furnished Street Railway Companies Gratis.

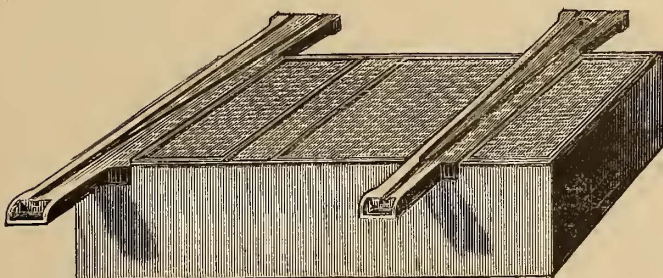
For further information, prices, etc., address

JONES & ROACH, 259 Fremont Street, Chicago.

M. M. White & Co.,

531 WEST 33d STREET,

NEW YORK.



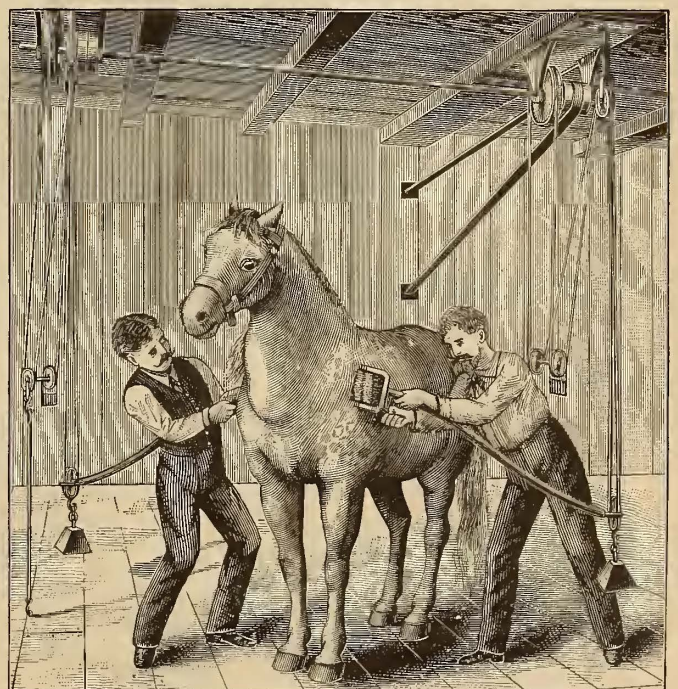
OWNERS AND BUILDERS OF

H. DOUGLASS'

Patent Automatic Switch

FOR STREET RAILROADS.

Pennington's Grooming Machine



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

ELLIS PENNINGTON,

204 Walnut Place,

Philadelphia, Pa.

LAKE & McDEVITT'S Patent ROPE TRACE

For Horse Railways, Omnibus Lines, Etc.

The Advantages

OF THE

ROPE TRACE

are its ready application to Horse-Car service, or to any other purpose where cheap harness is required. It only costs about half as much as leather traces, while at the same time one set of Rope Tugs will (when used on horse cars) take the place of three or more sets of leather traces, as the Tugs remain attached to the car all day, no matter how many changes of stock are made. The relief horses having hooks attached to their hames, all that is necessary is to unhook the tugs from the working team back in the fresh horses, hook on the tugs, and the change is made. Railroad men will at once perceive their adaptability and economy from the above facts. They will also last longer than leather traces, and require but very little care. From their durability and cheapness they are also especially adapted for all kinds of farm use and heavy teaming, as farmers, etc., can easily repair them.

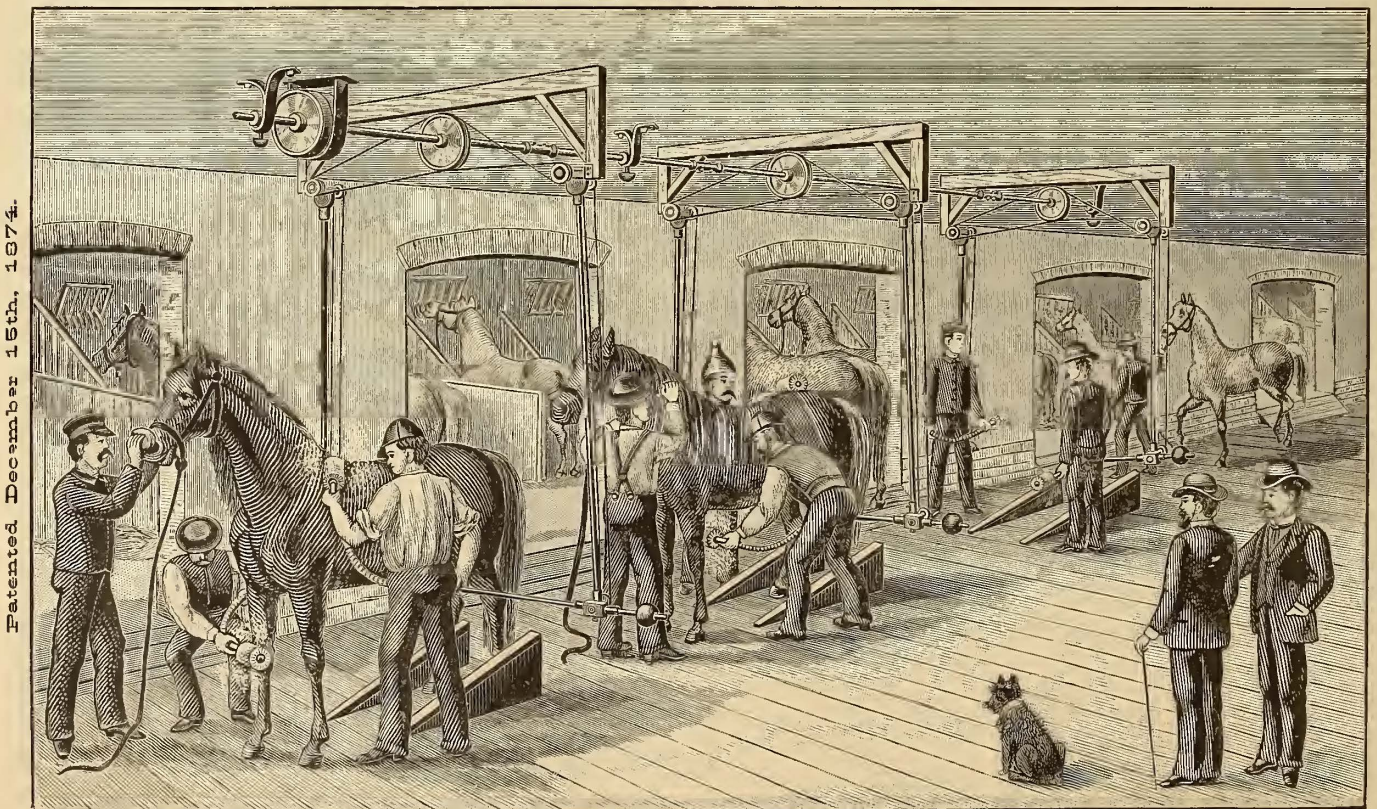


Patent No. 171,232, December 21, 1875.

In use on the Chicago West. Div. R'y.; Louisville City R'y Co.; Milwaukee City R'y; Transverse R'y Co., Pittsburg, Pa.; Citizens Street R'y Co., Pittsburg, Pa.; Pittsburg and Birmingham, Pittsburg, Pa.; Central City R'y, Peoria, Ill.; Grand Rapids R'y; Minneapolis St. R'y Co.; St. Paul City R'y; Houston City R'y, Texas; Superior Street R'y, Cleveland, O.; Cincinnati City R'y Co.; Fifth Ward Street R'y, Syracuse.; Detroit City R'y.; Ft. Wayne and Elmwood St. R'y, Detroit, Mich.; Galveston City R'y; Springfield City R'y, Springfield, Ill.; Toledo St. R'y, Toledo, O.; Adams St. R'y, Toledo, O.; Atlanta Street R'y, and others, in all on about 100 Street R'ys in United States and Canada, and a large number of other prominent Street R'y Companies throughout the Country. Send for descriptive Circular containing testimonials, prices, etc., to

LAKE & McDEVITT, 161 South Robey Street, Chicago, Ill.

CLARK'S PATENT POWER GROOMING MACHINE, SINGLE OR DOUBLE.



TO STREET RAILWAY COMPANIES AND OTHER STOCK OWNERS.

This machine for grooming may be driven by any known power, and can readily be placed for use in any stable or out-building. It can be operated by an ordinary groomer; its work is perfect; its action simple and effective. Stock owners will readily realize the importance of the machine. The perfection and rapidity of its work, and the benefits derived by its use, commend it to those interested in the care and use of all classes of thoroughbred and work stock. The most vicious animal readily submits to its use. Machine Grooming is found to be less expensive than hand grooming, saving in food and medicines, and materially increasing the value of the animal.

The Curry Comb and Hand Process Superseded! Economy of Labor! Perfection of Work!

Three Hundred Head of Stock Thoroughly Groomed with Each Machine every Ten Hours.

This Grooming Machine is in daily use in some of the largest Street Railway Companies' stables, and has always given perfect satisfaction. Among those using it are the City R'y Co., Chicago, Ill.; Detroit City R'y Co., Detroit, Mich.; Central City R'y, Peoria, Ill.; M. W. Dunham, Wayne, Ill.; West Division Street R'y Co., Chicago, Ill.; Lindell Street R'y Co., St. Louis, Mo.; Pleasant Valley R'y Co., Allegheny City, Pa.; Marshall, Field & Co., Chicago, Ill.; Leroy Payn, Chicago, Ill.; Saginaw City R'y, Saginaw, Mich.; Pittsburg and Birmingham R'y Co., Pittsburg, Pa.; and a number of others who have given testimonials as to the perfect working of the machine. For prices, circular and other information apply to

161 SOUTH ROBEY STREET, CHICAGO, ILL.

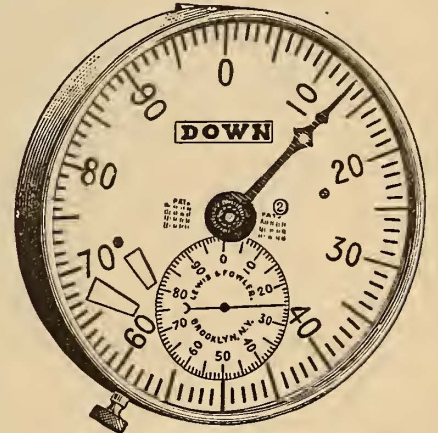
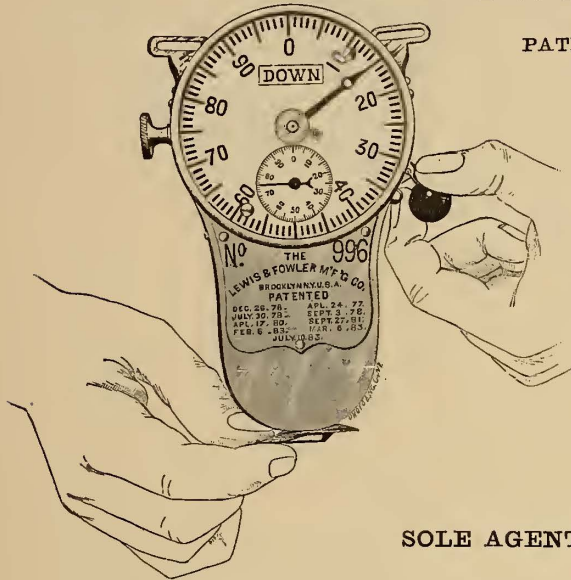
J. W. FOWLER,
President.

DAN'L F. LEWIS,
Treasurer.

THE LEWIS & FOWLER M'F'G CO. BROOKLYN, N. Y.

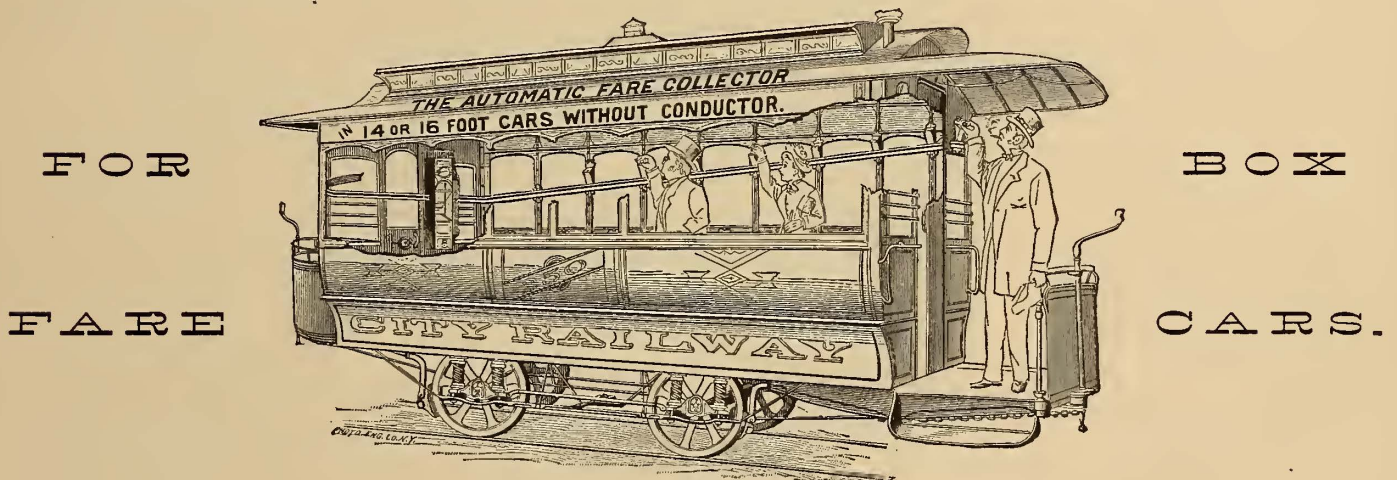
PATENTEES AND MANUFACTURERS OF

IMPROVED
"ALARM"
Passenger Register,
STATIONARY
OR
PORTABLE.



SOLE AGENTS AND MANUFACTURERS OF

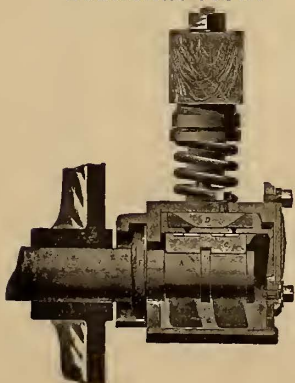
"SMALL'S PATENT AUTOMATIC FARE COLLECTOR"



ALSO

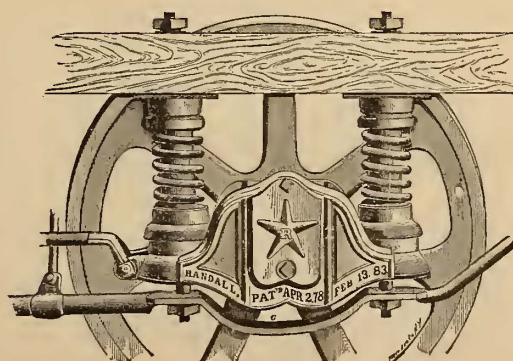
"RANDALL'S" PATENT CAR AXLE AND BOX.

Sectional View.



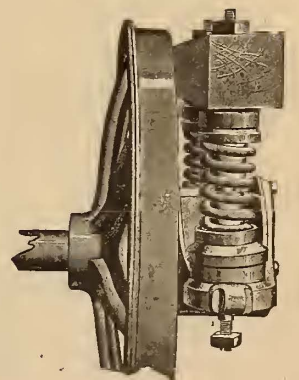
DUST TIGHT.

Front View.



ANTI-FRICTION.

End View.



F. H. ANDREWS.

F. T. LERNED, GEN'L AGT.

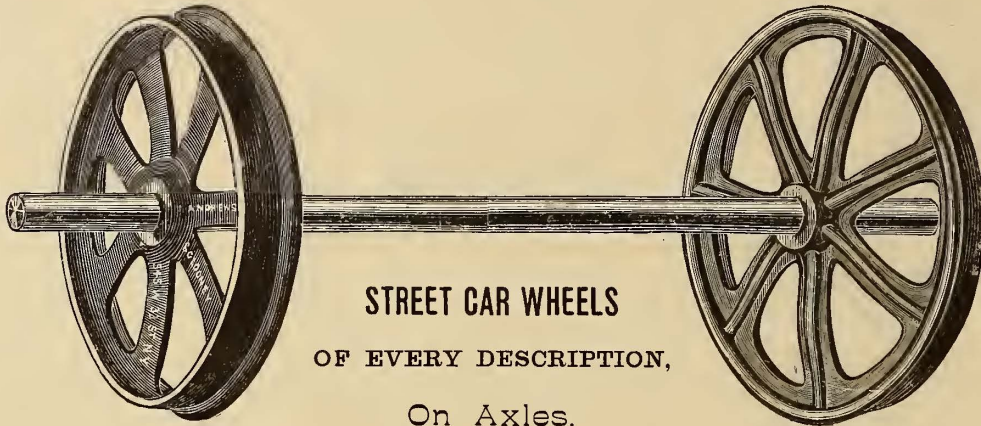
B. A. CLOONEY.

ANDREWS & CLOONEY,

OFFICE :

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W. 33d St.,

NEW YORK.



STREET CAR WHEELS
OF EVERY DESCRIPTION,
On Axles.

WORKS :
535 to 551
West 33d St.,
AND
538 to 552
West 34th St.,
NEW YORK.

Manufacturers of



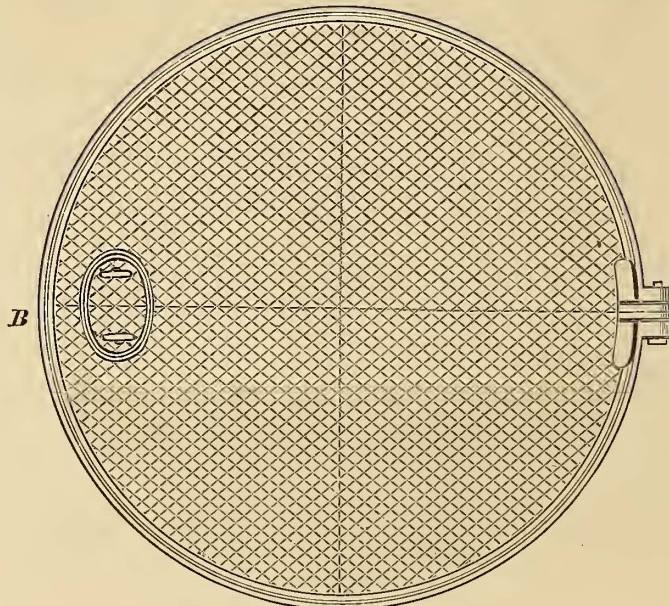
Elliptic, Spiral,

Volute, Car and

Engine

SPRINGS

Of Every Description.



Street Railway Turn-table.

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

of all Descriptions where great
Strength is Required.

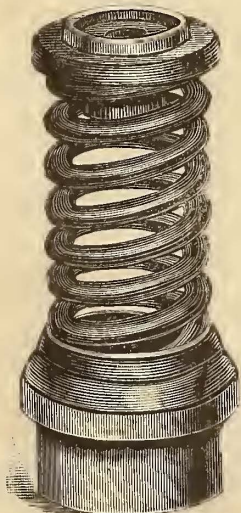
Also,

SWEEPERS, SNOW PLOWS,

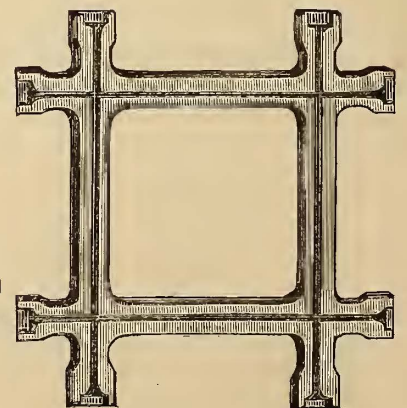
TURN-TABLES,

Track Work, Automatic Switches, Etc.

STEEL GROOVE RAILS AND MACHINERY.



Street Car Springs.



Street Railway Crossings.

SEND FOR ILLUSTRATED CATALOGUE.

RICHARD VOSE,

13 Barclay Street, . New York,

PATENTEE AND MANUFACTURER OF

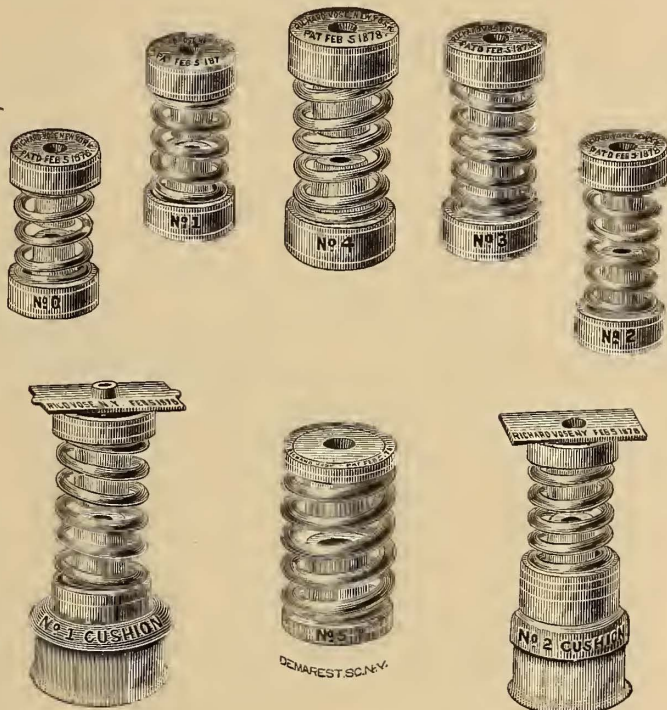
Graduated Street Car Springs.

RUBBER CONE

Patented, April 15th, 1879.

ADAPTED TO THE

STEPHENSON,
BEMIS,
RANDALL,
HIGLEY,
BRILL,
JONES,
BALTIMORE,
—AND—
ALL OTHER BOXES.



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

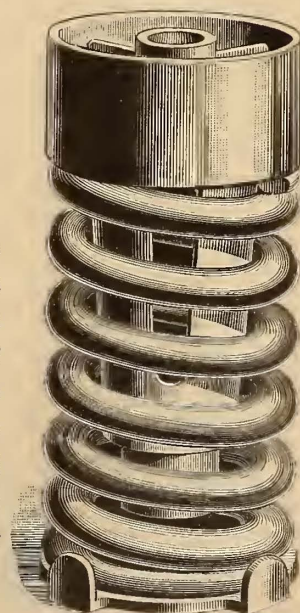
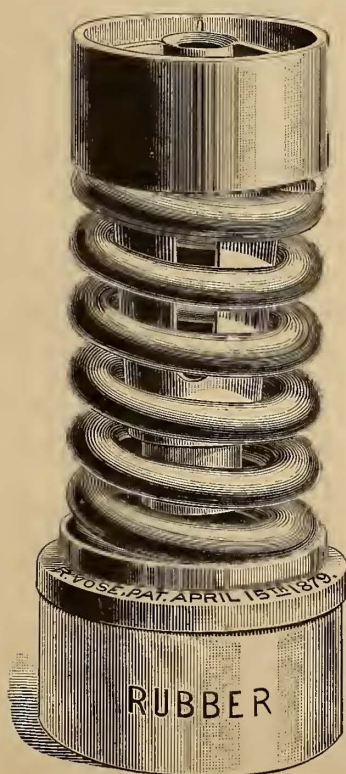
STEEL CONE CITY CAR SPRING.

Patented April 15, 1879—August 5, 1884.

The unprecedented popularity of the

“VOSE GRADUATED RUBBER CONE SPRING”

for HORSE CARS has induced the inventor to bring this class of Springs as near perfection as possible, and after a series of experiments and tests now presents for favor what he claims to be the *MOST PERFECT SPRING FOR HORSE CARS* ever offered. It is exceptionally *SOFT AND EASY* with the *EMPTY CAR* or with the *GREATEST LOAD*. It is believed to be the *MOST DURABLE*, being constructed upon a principle that seems to insure that the Spring must *ACTUALLY WEAR OUT*. The very *Finest Quality of Crucible Cast Steel* will always be used in these Springs.

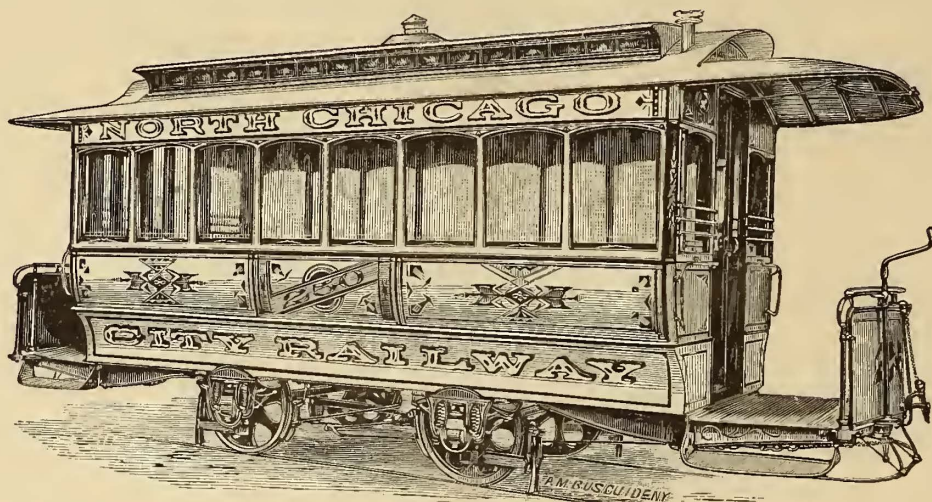


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LIGHT, ELEGANT, DURABLE.

Every Description.

Best Materials.

Minimum Prices.

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All Climates Suited.