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William B. Lewis.

Street railway interests have sustained a severe loss in the subject of our illustration, whose sudden death occurred Oct. 15. William B. Lewis was a fitting type of the street railway manager and useful and respected public man. Born in Brooklyn in 1818, he there resided until, in 1874, his wife's ill health caused him to remove to Plainfield, N. J. His father was Sheppard Lewis, an old Brooklyn resident, but born in Hempstead, L. I.

At the age of seven, William B. was placed in Kingsley's private school, where he remained six years, with such good effect as the result of his studiousness, that the principal said that he could teach him no more. Against the lad's judgment, his father apprenticed him to the mason's trade, to which, as a dutiful son, he applied himself mind and body, learning practically every detail of the business acquirable by the apprentice; serving, meantime, after regular work-hours, as accountant to his father, an extensive and prosperous builder.

Following his trade for a short time, he started on his own account as builder and contractor; thus continuing a few years until drawn into public affairs. As Tax Department Clerk he proved himself an expert accountant, and was instrumental in systematizing the business details of that branch of city government; meantime studying the principles of city and State government, State and national law, history and parliamentary usage.

His activity and intelligence, and his information and interest in politics, attracting the attention of his party, he was elected Comptroller of Brooklyn; serving when that city and Williamsburg were consolidated. His term was a busy one; but his early training with his father, his attention, study, and practice of accounts and finance, together with a stern decision of character

fitted him to fulfill all the exactions of the position, in which he made an enviable record, not yet forgotten.

He was an earnest advocate, in face of much opposition, of the introduction of a public water supply in Brooklyn, and was one of the original Water Commissioners; being at this time Secretary of the Sewer Department.

Municipal interests called him to Albany, where he was thrown into contact with the

Bank Department, in those years of much greater importance than at present, hence his life at that time was one of great activity, labor and responsibility.

In acknowledgment of his satisfactory discharge of the Treasurer's duties, he was re-nominated; but was defeated through lack of party organization. Declining the Police Commissionership of New York and Brooklyn, he retired from political life.

Having during some time previously studied law by himself, he complied with his friends' urgings to be admitted to the bar, but he had only practiced a few months when Hon. Henry R. Pierson, President Brooklyn City R. R. Co., called on him to accept the office of secretary and cashier of that company. In this arduous position he continued until the hour of his death. His son, of the firm of Lewis & Fowler, is his successor as Secretary and Treasurer, and is also prominently identified with tramway interests.

We print below the action of the Directors in reference to the loss which his death occasioned to his family, the company and the community.

A special meeting of the Board of Directors of the Brooklyn City Railroad Company, held October 18th, 1884, to take action upon the death of WILLIAM B. LEWIS, Esq., its late Secretary and Cashier, at which it was ordered that the following minute be entered upon the records of the company:

WILLIAM B. LEWIS, whose death we mourn, was called to the office of Secretary of the Brooklyn City Railroad Company April 1st, 1880. His faithful service in places of honor and trust in our city and State, and his unusual knowledge of the laws governing the railroad interest, peculiarly fitted him for valuable service to this company. From his election he devoted

his entire energies to advance in every way in his power the interest of the company.

While discharging with conscientious care and fidelity the special duties of his office, he gave at the same time most careful attention to its financial interest.

To the general management of the Road, also, he gave thought and was frequently consulted in regard to it.

His judicious counsel has been of great value to the Company. For the eighteen years and a half of most faithful service we here bear testimony, while we regret the death of a faithful officer, we also mourn the loss of an old and respected friend.

For the family of William B. Lewis, we would express our sincere sympathy in their great sorrow.

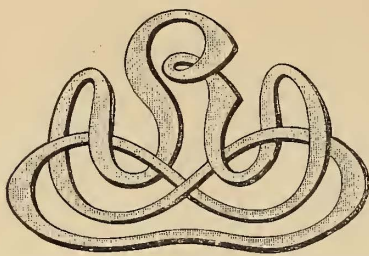
W. H. HAZZARD, President.



THE LATE WILLIAM B. LEWIS.

State officials, who recognized his worth; and during his Comptrollership he was elected Treasurer of the State of New York. During his tenure of this important office he became the intimate friend of Gov. Horatio Seymour, who confided many things to him: the two advising mutually on many matters of State.

His office of State Treasurer made him a member of the Canal and School boards; and also gave him much to do with the



American Street Railway Association.

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Track Cleaning and Removal of Snow and Ice.

[We give herewith the text of the report to the American Street Railway Association, at the recent convention, on the subject of Track Cleaning and the Removal of Snow and Ice. The discussion which ensued thereon was most interesting, and we regret that the lateness of the reception of the official report prevents our giving more than an abstract of a part thereof. The rest will be given in our next issue.]

Mr. President: Your committee for the consideration of "Track cleaning and removal of snow and ice: Is salt necessary? If so, is its use detrimental to the public health; and especially is it injurious to horses?"—having duly investigated the subject, beg leave to submit the following report:

On the 25th of July, 1884, Mr. William H. Hazzard, President of the American Street-Railway Association, addressed a circular-letter to the presidents and superintendents of all the street-railways in America, comprising a full series of questions, in relation to the propriety of the use of salt, in the cleaning of the tracks from snow and ice, and whether any better method could be suggested. The inquiry was very explicit, being intended for an exhaustive consideration of the subject; and to afford a criterion for the future policy of street-railway companies. The points to be determined relate to the necessity of the use in salt in the removing of snow and ice from the tracks, and to its healthfulness, both to the public, and to horses driven over the places where it had been employed.

This matter has been a theme of controversy for many years. It is a fact known to every tyro in science, that a mixture of snow or ice and salt will produce a temperature so low as to cause the mercury in the thermometer to fall to zero, F.; and it has been plausibly argued, accordingly, that the use of salt to melt the snow and ice upon tracks of railroads in large towns would result in the withdrawal of caloric from the atmosphere to an extent that would seriously affect the salubrity of the neighborhood and render those of the population of a sensitive constitution more than usually liable to contract dangerous maladies, as colds, pneumonia, pleurisy, scarlatina, diphtheria, etc. These complaints are frequent in winter, when snow is abundant, and give importance to the conjecture. The usual increase of mortality at such times is a grave matter, and deserves the most careful scrutiny.

It has also been asserted that horses traveling in the snow where salt has been used, are even greater sufferers. The chilliness created from the slush and melting snow disposes them, it is declared, to painful disorders of the chest, bowels and nervous system, and induces certain complaints, which were before hardly known. The feet are said to be specially affected. It is insisted by many that the intense cold produced in the snow in which the animals are driven, speedily benumbs and paralyzes them, and even freezes the hoof, so as often to destroy it entirely. This has been made the occasion for seeking legislative interposition to put an end to the practice of salting the streets. Nor can any man of common humane sentiments object to such a measure, if the alleged injury has occurred, or is likely to occur from this cause. It is of the greatest importance to ascertain the facts, in order to do away with whatever cruelty may be practiced in the case, and to devise any needed remedy which will avert all unnecessary interference with the passenger transportation of this continent.

The American Street Railway Association accordingly directed this inquiry, and appointed a committee to conduct the investigation. Almost every individual addressed has replied, making a vast accumulation of evidence bearing directly on the subject. A synopsis of these answers may be valuable, in the way of enabling intelligent action. If need not, necessarily be long. The conclusions, however, appear to be decidedly in favor of the free use of salt, even to a greater extent than is anywhere practiced.

In the warmer regions of the continent, little snow ever falls, and there is no incommencing experience, which requires extraordinary measures. There may also be objections when the temperature is lower than zero, as the salt will not then melt the snow and ice, but add to the difficulty. In Quebec and Ottawa, in the Dominion of Canada, few attempts are made to remove the snow in winter, but sleighs are put in use instead. The law requires this.

Public opinion somewhat differs in different places. Generally there has been no thought bestowed upon the matter, except by individuals connected with the street railway companies. In several of the larger cities, there exists a prejudice against the use of salt to remove snow. It appears to have its centre in the city of New York, and to radiate in those directions where the sentiment, paramount there, is most influential. Mr. Henry Bergh, president of the Society for the Prevention of Cruelty to Animals, is very decidedly opposed to the use of salt in the streets, and his views are largely shared by excellent citizens. The newspapers in several instances have adopted and advocated them. The Board of Health passed an ordinance against the practice, and it has been prohibited under penalty in the new Penal Code. The same sentiment prevails in Brooklyn as in New York; some are in favor and others opposed. A like diversity of opinion also exists in Boston; and the savants and men of culture are divided like others, some contending that the use of salt in the public streets is beneficial, and others asserting the contrary. In Lowell, the objection is very strong, but appears to be steadily diminishing. The most effectual argument, however, seems to have been made in New Bedford. "People who own carriages do not like it because when the salt comes in contact with varnish, it stains or removes it."

The testimony from other places is equally varied. In Manchester, New Hampshire, the parties are thus set forth: "People that are friendly to horse railroads do not object to the use of salt; the others do." In Baltimore, the people are represented as opposing it, together with everything else in connection with horse railroads, except the cheap fare. In Cleveland, Ohio, the opposition appears to be general, but more decidedly among the owners of sleighs. At Toledo, there is a divided sentiment, but a majority, we are told, would not object to its "reasonable use." The only argument offered, however, is "that it is so considered in other cities"—i.e., detrimental to the public health when used to remove snow and ice. It is evidently only a reflected public sentiment. The same thing ought, undoubtedly, to be said in other cases.

In Philadelphia there exists, perhaps, the greatest prejudice, anywhere known on this subject. The Board of Health added its influence; and the feeling thus created has extended to other cities of the State. The street railway companies are generally prohibited by ordinance from the use of salt on their roads. Mr. John B. Parsons, President of the Lombard and South Streets Passenger Railway Company, explains the cause of the difficulty, as follows: "We had no machinery such as we now have, and, as a consequence, depended solely upon the use of salt to turn the snow into a slush, so that the cars could be drawn by the horses. No particular attention was paid to keeping open the inlets, so that the slush could run off from street-corners and other natural depressions in the streets. As a consequence, the street-crossings were almost impossible, and much complaint came from the citizens. Many diseases were attributed to its use, and public clamor became so loud that the Councils passed ordinances limiting its use to certain portions of the city and prohibiting its use in other portions under a heavy penalty."

Many physicians, however, gave their judgment at the time, that salt was not detrimental, and the general opinion is beginning to change. The public journals of the city are now speaking approvingly of the use of salt, and the companies are beginning to use it again.

There is a strong prejudice against its use in Reading, which is ascribed to the influence of the excitement in Philadelphia; still salt is used, but the fact is not admitted. In Pittsburg there has been talk of applying to the Legislature for a prohibitory statute, on the ground that it spoils the fine "finish" on carriage wheels. Nevertheless, all vehicles seek the railway track in preference, because it is always open. The only opposition to the use of salt, upon which the public seem to agree, is that it benefits a corporation. The majority favor its employment.

In the other parts of the country, where street railroads are abundant and snow is abundant in winter, public sentiment appears to be generally unanimous in favor of the use of salt, because of the facilities which it gives in clearing away a most formidable obstruction to travel. No other method is known which would be more practical, more economical, and more satisfactory. The only thing suggested is a sweeping machine, combining a boiler, to which the snow may be carried and melted. This, it seems, can hardly be feasible, and even though it were, the same objections on the score of slush and detriment to health, would exist, and to a much greater extent.

The testimony appears to be unanimous so far as relates to the entire absence of injury to the animals employed. No precautions are used to protect their health, yet no disease has been observed, which might have been occasioned by the exposure. No special care seems to have been taken of those that traveled in the salt mixture, beyond rubbing them

off when taken from the cars to the stables. The inquiries were very explicit; relating to the effect on the nervous system, the general health, the effect on the feet, legs and bellies, the shell or lamina of the feet, and the frog or soft part of the feet; and the answers were unequivocal that no perceptible injury or hurt had been noticed. One correspondent had noticed scratches, and another mentioned the possibility of harm from too long exposure. Another, however, was of the opinion that the effect of the salt on the animals had been decidedly wholesome in regard to health of limbs and body. Indeed, Messrs. Haller, Beck & Co. of the Union Street Works at Alleghany City, declare that during twenty years, they have used from twenty-five to thirty horses, and never had any trouble on account of the salt. They never had a horse afflicted either with thrush or scratches. Their animals they consider as fine as any in the city. The salt seemed to have been salutatory to them.

Another advantage was generally noticed. The slipping and straining so common in slippery roadways was far less frequent where the snow and ice had been so removed. Less than half the numbers of slips and falls were estimated to occur.

No other method known is so cheap or efficient for the purpose. One or two companies use ashes where the coating of ice is thin, but the result was hardly satisfactory. In Philadelphia, the tracks are cleared by scraping, but at a large cost. One company in Ohio used a heavy iron scraper procured in Detroit, to clear the ice from the rails, but it did not give satisfaction. It is for this purpose that the salt is more generally employed. Many companies use it in no other case, but depend on snow-ploughs and shoveling, but the inference is unavoidable, that if they were prohibited entirely, the street-railways in the northern cities of the Union would be impassable many weeks in each winter.

Careful examination has also shown that there is no ground whatever for apprehension in regard to the public health from this cause. There has been no epidemic or prevalent disorder set in operation or aggravated anywhere by the use of salt on thoroughfares. The rate of mortality has exhibited no alarming increase, nor does this appear to have been anywhere suspected. All complaint is confined to what may occur, some possible or hypothetical result. The slush and pools of water that are liable to be formed at low points in the streets or at the crossings, making pedestrianism unpleasant, and the injury to the paint and varnish on wheeled carriages constitute all the well-supported ground of complaint. It would not be difficult to obviate these, and it ought to be done. The fault lies, however, with the municipal authorities, who have been remiss in regard to furnishing the proper facilities for drainage.

Observations carefully made with the thermometer show that the mixing of salt with snow in the streets makes no perceptible change of temperature. It is no colder in the thoroughfares where it is done, than in others at a distance. This is the only objection which has a plausible foundation scientifically, and it appears to be utterly fallacious.

In conclusion, therefore, the Committee find that the use of salt for the removal of ice and snow from the railway tracks, to be an imperative necessity; and that there exists no reasonable cause for apprehension of injury, or detriment to the public health, or to the health and physical comfort of the animals employed. What objections really exist are easily removed, while the advantages are indisputable.

Indeed, it is evident that the weight of evidence, as well as argument, is on the other side. The removal of snow from the streets is a problem that has taxed the ingenuity of public officials in several of our large cities. Hundreds of thousands of dollars have been expended in New York for carting it away to the rivers, and yet it was found impossible to accomplish more than to clear the more public thoroughfares. It would have been a far greater economy if the City Government had instead, caused all the streets to copiously salted during the snow-storms, and taken efficient measures at the same time to drain the brine and slush immediately into the sewers. We trust that this subject will be taken into consideration at an early day.

The public health, so far from being injuriously affected, will be promoted by the free use of salt in such a way. The brine flowing into the sewers will, in a great degree prevent the decomposition of the various refuse materially which are deposited there from the houses above; and as a direct result, the formation and disengagement of sewer-gas would be arrested, and its discharge into the living apartments consequently prevented. This alone would be a work of sanitation, of which too great an account can hardly be made.

At the present time, the exhalation from fermenting matter in the streets are an active cause of mischief. The air is poisoned, and many of the population if not made ill outright, suffer, nevertheless, from depressed nervous conditions, and lowered vitality. The squalor and misery endured by the inmates of tenement-houses and other abodes of poverty may thus be rationally accounted for. If some provision could be made for preventing this decomposition of refuse matter in the streets, the salutary effect upon the public health would be immediately perceptible. The utility of salt for this purpose is apparent. If it could be applied at stated periods during the warm season, these benefits would be assured.

The accumulation of snow and refuse of all kinds, which occurs every winter in many streets, has been frequently remarked. Every warm day the filthy mixture is thawed and more thoroughly compounded, while its noisome effluvia contaminate the air. This process usually continues till spring has advanced several weeks, and we are often fortunate if the festering mass is removed before the hot days of summer. It is easy to see how all this would be prevented, if the authorities would take the matter into their own hands, and instead of limiting, discouraging the use of salt to clear off snow and ice, would

employ it freely both for that purpose and to sweeten the atmosphere. The action taken by Board of Health in the matter shows rather a conforming to ignorant prejudice, than a proper and intelligent comprehension of the facts. A little scientific knowledge would go far toward the silencing of the clamor.

It is plain enough that the antiseptic virtues of salt are potent above those of many popular disinfectants, in the way of purifying the air. The salubrity of New York is largely to be attributed to the saline elements derived by the atmosphere from the salt water that surrounds it on every side. The analogy must hold good in regard to the same agencies artificially supplied in the manner indicated.

The objections which have been repeatedly offered in various quarters, to the use of salt by the street-railways companies, it will be seen, are not tenable. The more abundant use of it for the purposes in question would be fully justified. Instead of the burden of expense falling entirely upon them, as is now the case, the public ought to bear a reasonable proportion. We would all be the gainers by the convenience afforded from the speedy removal of the great mass of snow, and in addition, by the increased salubrity of the atmosphere. It is in every way advantageous, and to this conclusion the good sense of our people must eventually arise.

A. B. WHITNEY, M. D., Ch.
JOAB MULVANE, } Committee.
WM. HAGENSWILER, }

Stables and Care of Horses.

[The annexed report is most scholarly and practical and deserves the most careful perusal. The discussion thereon revealed wide differences of opinion and practice. We shall give it in our next issue. We hope that our many readers will not consider the discussion by any means closed, but will continue it in our columns.]

To the American Street Railway Association.

GENTLEMEN:—The Committee on Stables and Care of Horses, submits the following:

The importance of information upon this subject is shown by the fact that nearly two-fifths of the investment in street-railways is in buildings and horses; and of the expense of operating, upwards of 35 per cent. is consumed in the maintenance of stables and horses.

The care which the horse receives at the hands of the managers of street railways has much to do with the economy of operating; for it is evident that well-arranged stables, careful attendants, and skillful drivers, with wholesome and sufficient feed go a great way towards prolonging the life and usefulness of the horse in street-car service.

The subject of stables naturally claims attention first, and in this connection it must be understood that, at least, eighteen and, perhaps, twenty hours out of every twenty-four, the horses in this service are confined within the stables year in and year out. Thus three-fourths of the life of the horse is spent in the stable. Considering that plenty of light and pure air are essential to the healthy condition of the horse, to furnish this should be the first object in building a stable.

In selecting material, such should be chosen as will be least likely to absorb and retain the impurities, which will always be found within such buildings. Great care should be taken to have the drainage perfect, and if underground to have the drains so inclined, trapped, and tight in the joints, as to quickly and completely take away whatever is deposited in them. Arrangements should be provided to flush them often with water, and if possible to have all traps and catch-basins well ventilated, so as to carry outside of the stable any foul gases which may accumulate there. The theory of surface drainage for stables has many supporters, and deserves careful consideration from those about to build. If surface-drains are frequently flushed or washed, this manner of draining would seem to call for no objection. The matter of drainage being settled, the next question is light and ventilation.

Arrangements should be made to admit air in sufficient quantity without creating a draught.

Roof ventilation is desirable, but not sufficient, as the air of a stable containing many

horses is heavy and will not rise without a current of air from near the floor to assist. Light can be admitted from high openings in the sides of the building, but these should not be depended upon for side-ventilation as the height renders them insufficient to move the air, and the location, usually over the heads of the horses, causes them to be dangerous as means of a draught.

Doors on opposite sides of the stable connected by a passageway running behind the horses; this passageway having ventilation from the roof is a desirable means of ventilating a stable, as in case the wind blows too strongly in one direction the doors on that side of the building can be closed, while air is admitted from the opposite side.

As a matter of convenience it may be desirable to have all stalls upon the ground floor, but such an arrangement is not practical in large cities, on account of the high cost of land, and horses may be as well established on the second or third floor, provided these floors are constructed properly as regards the drainage, and provided with "runs" leading to the outside in two or more directions to be used as escapes in case of fire.

The stalls should be constructed with a view to give the horse as much freedom as possible consistent with economy in utilizing the space. Experience demonstrates that the width should not be less than four feet in the clear, or the depth less than nine feet. The height of the partition between the horses should be at least four feet, and at the heads, carried three or four feet higher in such a form, as to admit light and air without allowing the horses to bite and otherwise annoy each other. Single stalls are preferable, although double stalls, with swing-bars between the horses, are in favor with many good stable-experts. The floor of the stall should pitch toward the gutter about one and a half inches to the nine feet. A good construction for stall-floors is to lay the surface for about four feet inward from the gutter with close-grained hard wood, like maple, in strips of four or five inches wide and two inches thick, leaving a space between, three-quarters of an inch wide, to allow the urine to pass off without being absorbed in the bedding.

The best form of manger or feed-box, is of cast iron, formed so as to have no square corners for feed to accumulate, and of sufficient depth to prevent the horse from "nosing" his feed out. No rack is needed for loose hay, this can be fed in small quantities from the floor. A passageway, say four feet wide, between the heads, or in front of the stalls for the purpose of feeding is desirable, this should be ventilated by windows or doors at each end, and a flue leading to the roof above. The loft for feed should have a tight floor, so that the steam and ammonia from the stable underneath will not contaminate the provender stored therein. It should be constructed with windows to admit light and air from the sides, and with roof-ventilation at the top. Suitable receptacles should be provided for the manure *outside* the stable, and all refuse and manure should be removed frequently, and before it has had time to heat and steam.

The custom of building stables with cellars to receive the manure is not recommended; and unless there is yard-room enough to pile the manure compactly outside the building, it should be removed from the premises daily. The space allowed for rear floorway between the stalls should be sufficient to permit the removal of horses from one row without interfering with those on the other; for this purpose, ten feet is a fair allowance.

The plan of arranging stalls in sections, so as to have the horses allotted to the care of one man, stand together is a good one; also that of having a separate drinking-trough for his horses. If a common drinking-trough is used, it should be centrally located and supplied with running water.

Twelve feet in the clear is recommended as a good height for each story, although some advise more, and some are content with even less.

Arrangements outside the building to dry and air the bedding are very desirable when straw or hay is used, and if shavings or saw-dust, bins for storage should be provided. If any substance except wood is used for floors, bricks are recommended, as they are easily renewed when worn and less liable to cause the horses to slip than stone, asphalt or cement.

In coming to the subject of the "care of horses," it is suggested that the first care should be exercised in the selection of horses to be purchased. The theory that any kind of a horse that can be had for from \$100 to \$150 will do for Street-Railway use, is a bad one.

The buyer of Street-Railway horses has a somewhat difficult problem to meet from the fact that the horse most desirable to him, usually commands a higher price than he, *i. e.*, the corporation, however, he represents, is willing to pay. A good buyer, will always insist upon the necessary qualities in the horse he buys, without too much regard to price. In the first place, only sound horses should be bought. Although horses unsound in some respects, *may* be used to some advantage, it is never best to buy them in that condition, as every Railroad manager knows that the exacting labor they are subject to, will cause unsoundness in some form or another soon enough. A good disposition and easy gait should be considered as absolutely necessary. The head and general appearance of the countenance will show the disposition, and a trot of fifty feet, will show the gait. Color should have nothing to do in the selection except to cheapen the price, as is the case with white, grey, buckskin, and bald-faced horses. The feet and muscles of the legs should be carefully looked at, as these are the main-stay of a railroad horse.

A flat-footed horse should never be accepted.

The age should never be less than five or over nine years, as a general rule, a horse of twelve years of age, however, if sound, may be accepted at a considerable reduction in price.

After the horse is selected and placed in the stable, the first thing to do is to accustom him to the feed, and break him to the labor. We would never think of putting on a conductor or driver without first instructing him in the duty expected of him, and place him under the direction of an old hand for practice. This rule should be followed with the horse. The first day he should be allowed to rest. After that if he takes his feed well, he may be put to half-work with a careful driver, and should be worked no more than this, for the first six or eight weeks, at least. All green horses should be given in charge of the best drivers, who will take pains to break them in to the work.

The care of the horse in the stable, includes feeding and grooming. Upon the question of feed, perhaps, the first cost or what is termed "economy" has considerable to do.

It is generally admitted that cut hay and corn meal is the cheapest at first cost, of any feed in use; but experience has shown that this feed is too hearty and fattening, and that horses fed upon it for several years without change become more subject to eruptive diseases and also to colic, inflammation of the stomach and indigestion. It is calculated that at least five cents per day can be saved in this feed on each horse, over the cost of feeding oats and long hay, and that the extra loss on horses fed with meal only, will not amount to the sum saved at the end of the five or six years' service of a railway-horse. To the credit of railway managers it is found that this conclusion is not accepted generally; and that while some are found to strictly adhere to what is termed the nat-

ural feed of the horse—oats and long hay—very many compromise the question by giving one such feed daily, or, at least, lighten up the corn meal by mixing bran or wheat middlings, in proportion of about half and half by measure. The mixing or preparing of the feed should be entrusted to as few persons as possible; but the practice of each hostler dealing out the feed to the horses allotted to him, is not objectionable although many stable experts prefer to confine the hostler's duty simply to watering and grooming the horse and the care of his stall, and to provide one man to distribute the feed to each 100 or 125 horses. In general terms, it should be the care of the stable-master to make the horses under his charge as comfortable as possible, while keeping them in condition to do the work required of them. They should be watered frequently and fed regularly, not less than three feeds a day, and thoroughly groomed not less than twice a day. In warm weather, they should be carefully cooled off after coming in from work, and in cold weather well-blanketed. Disinfectants should be freely used; common lime, either dry or in the form of whitewash, is recommended as effective and inexpensive.

As shoeing is a matter of considerable importance of railway managers it is proper that all entrusted with the care of street-railway horses should inform themselves as to the best form of shoe, and the best manner of setting it. There is but little difference of opinion among the well-informed upon this subject, as to the desirability of a light shoe over a heavy one, and that for horses traveling over a paved street, a shoe made of soft iron is preferable to one made of steel, on account of its being less liable to slip. In all cases the shoe should be fitted to the foot and not the foot to the shoe. On the question of hot or cold fitting, W. H. H. Murray may be quoted. He says: "The weight of authority is nearly the same in either scale. The advocates of cold-fitting declare that they can fit a shoe with rasp and file as evenly as the necessities of the case require, and that this can be done at no great cost of time or skill. They, moreover, charge that both reason and analogy are in opposition to burning a horny surface and declare that it honeycombs the wall of the foot, and prevents its natural and healthy growth.

"The disciples of hot-fitting on the other hand, declare that few men can level the foot, or so hammer and file the shoe, that the fit shall be what is required, and that only by burning can the connection between steel and horn be made sufficiently close and solid."

It must be admitted that good arguments can be used on both sides of this question, but in the end both sides bring up with this fact, that whether by hot or cold-fitting the shoe must be fitted evenly and solidly to the foot. As a matter of interest in this connection, an estimate made by a French professor concerning the muscular fatigue resulting from the use of heavy shoes may be quoted.

"If at the termination of a day's work, we calculate the weight represented by the mass of heavy shoes that a horse is condemned to carry at each step, we arrive at a formidable array of figures, and in this way are able to estimate the amount of force uselessly expended by the animal in raising the shoes that surcharge his feet. The calculation I have made possesses an eloquence that dispenses with very long commentaries.

"Suppose the weight of a shoe is 1,000 grams (about 2½ lbs. avoirdupois). It is not excessive to admit that a horse trots at the rate of one step every second, or sixty steps a minute. In a minute then, the limb of a horse, whose foot carries one kilogram (2½ lbs.) makes an effort necessary to raise kilogram after kilogram, a weight of sixty kilograms (132 lbs.) For the four limbs, this weight in a minute is represented by $60 \times 4 = 240$ kilograms (528 lbs.) For the four feet during an hour,

the weight is 14,000 kilograms (30,800 lbs.) and for four hours the mean duration of a day's work in these omnibuses, the total amount of weight raised has reached the respectable figure of 57,000 kilograms (125,400 lbs.)

"But the movement communicated to these 57,000 kilograms represents an expenditure of power employed by the motor, without any useful result, and as the motor is a living one, this expense of strength represents an exhaustion, or if you like it better, a degree of fatigue proportioned to the effort necessary for its manifestation. This calculation is most simple and readily understood. It is to be noted, nevertheless, that I have omitted a considerable factor, which is, that the weights I have tabulated are situated at the extremities of the limbs and that the arms of the levers on which the muscles act to raise them being infinitely shorter than those of the physiological resistance to which these weights are added, the intensity of their action ought, therefore, to be singularly increased.

"But to measure this intensity of action would require a mathematical aptitude, which I do not possess. I will not, therefore, dwell upon this point, notwithstanding its importance, and am content to signalize it. Otherwise the figures speak for themselves, and tell us that the diminution in the weight of horse-shoes is not an unnecessary consideration, so far as the useful application of the horse's strength goes."

After a careful consideration of the above calculation, must not all admit that the lightest possible shoe consistent with the service, should be used upon street-railway horses.

The question of calking the shoe must be settled by the condition of the street over which the animal travels. Many believe that a calk is not necessary on paved streets, except in the winter season, when ice and snow are liable to interfere; and that if a calk is used at all it should be a low one, so as to raise the frog but slightly from contact with the street, and that care should be taken to have all calks of an even height, to allow the horse to set his foot squarely and evenly upon the ground.

Upon the question of nailing the shoe, a quotation from Fleming seems to "hit the nail on the head." "The shoe ought to be attached by nails to those parts of the wall where the horn is strongest and toughest. In the fore-foot, these parts are in front and along the sides to the quarters. There the horn becomes narrow and thin, and the nails find less support, and are nearer to the living textures. This is more particularly the case towards the heels, especially the inner one.

"In the hind foot the wall is generally strong toward the quarters and heel. These facts at once give us an indication as to the best position for the nail-holes. In the fore-foot, nails may be driven through the wall around the toe, as far as the inside quarter and a little nearer the heel on the outside. In the hind-foot they may be driven around the toe and even up to the heels with impunity."

Nails should be turned out as quickly as possible, as the higher they go the less thickness of hoof is found, and extreme care should be used not to prick or press the sensitive part of the foot. Too many horses are made almost worthless from the effect of "blind stabs," which means, driving the nail into the quick and then withdrawing it, and driving it again so close to the wound as to irritate it and cause it to suppurate within the foot and work out at the top. Such cases are the result of careless nailing, and frequently terminate in what is called "foot-rot." The difficulty in tracing the exact cause of such trouble, arises from the fact that the horse does not show lameness for one or two days.

As the feet of horses working only on paved streets and standing continuously upon wooden floors are liable to become hard and dry for lack of sufficient moisture,

it is necessary that the stable-master should adopt some measure of supplying this need. A simple way and one that can be followed in any stable is to furnish each hostler with a pail and sponge, and require him to wet the fore-feet of all his horses, once or twice a day. The water should be applied particularly to the part where the hair and horn meet, and to the heel and frog. A good idea is to dissolve about a half pint of clean salt in each pailful of water used. This plan should be continued daily, and not occasionally. The stable-master should inspect his horses daily, as to their fitness for work, and "lay off," and nurse any that do not "take their feed," or show lameness.

The next care that the horse requires at the hands of railway managers is that of furnishingsuitable drivers. The best stabling, grooming, feeding and shoeing cannot counteract the effects of bad driving. Those men whose duty it is to select and educate the drivers on street cars, should be most faithful and efficient, and no man should be retained as a driver who has not the necessary patience and judgment. Many horses become vicious and balky, by ignorant and careless driving, and a quick tempered driver is liable to be a costly one.

The last care that comes to us in the treatment of the street-car horses is to select or sort out and dispose of those that have become unfit for the service.

This demands good judgment, for the difference between the price obtained for a worn-out horse and a new one to take the place, is considerable, yet it is folly, and worse than bad judgment, to retain and feed horses unable to work, for it does not take them long to "eat their heads off," as the saying goes. All horses should be disposed of as soon as it appears that their capacity for full railroad service is gone.

This report is submitted with the hope that some hint it may contain, will be useful to the members of this association. This subject is an important one, and to be treated fully, would require more space than the limits of this paper will allow, and demand more talent than this committee lays claim to.

As a conclusion to this report, the personal experiences of two members of this committee, Mr. John E. Brown, Sup't. of the Troy & Lansingburg Railroad, Troy, N. Y., and Mr. T. H. H. Robillard, Sup't. of the Montreal City Passenger Railway, Montreal, Canada, are added. Both these gentlemen have had large experience in the care and management of horses, and their views cannot fail to interest this convention.

For the Committee,

J. E. RUGG, Chairman.

The experience of the Superintendent of the Troy and Lansingburg Railroad Company relating to Stables and the care of Horses:

The aggregate length of the three lines operated is 17½ miles. The principal barn on the main line is located near that end of the road from which the travel starts in the morning for the city. The second barn on the main line is located two-thirds of the distance from the main barn to the opposite end of the road. At this barn on each trip, going each way, the driver and team stop and take the next car following, affording from four to six minutes time for watering and rest, under cover as in all cases when standing. This separates the conductor and driver; and gives a conductor three different drivers on each round-trip.

The third barn is located at that end of one of the branch lines from which the travel starts in the morning for the city. All three lines converge and pass the second barn referred to for the purpose before stated.

The barns are of brick, two stories, ceiled with spruce, have twelve feet ceilings, and aisles in rear and between the rows of stalls of fourteen feet. The stalls are five feet by ten feet. On top of the same, and between the heads of the horses facing each other, are wire gratings. In front of the

stalls, there are nine light windows, eight feet from the floor. Each stall is also numbered. There are no mangers, but iron feeding boxes.

The dry hay is eaten from the floor.

The hay and grain are stored in the second story, but there are no openings into the stalls below. The grain is delivered by spouts, the hay is cut above and let down in tight boxes into the mixing room. *Water* is so freely distributed through the barns, that horses cannot go out or come in without passing it.

All the horses can be released from their stalls and the outer-doors thrown open by one movement of a conveniently-placed lever. There is no access to the barns except by passing the office of the superintendent and his assistants.

At a distance of 100 feet from the main barn is the hospital barn, which will accommodate forty horses. The stalls are ten by twelve feet, inclosed with wire. Adjoining these barns, the company have 100 acres of well-shaded pasturage, with some inclosures.

The company owns 425 horses, and runs forty-six double cars. There are no one-horse cars. The length of the trips are eight and fourteen miles. Each horse makes from fourteen to sixteen miles per day, at an average speed of six miles per hour.

All horses are bought by the superintendent, generally in New York City; and each horse is examined by him. He seeks to obtain horses of good disposition, weighing from 1,050 to 1,150 lbs. When received, they are allowed to stand in the barn one day, then given one pint of raw linseed oil, in order to prevent constipation from shipping or long standing.

For the first week, the horse is given light feed and light work; then uated as best suited and assigned to the care of a suitable hostler, according to the disposition of the horse and of the man, much depending upon the adaptation of the man to the horse; and in assigning to a driver the same principle of adaptation is observed. This is done by the superintendent in person.

They stand in the stalls twenty hours out of twenty-four, bedded with straw at all times. This requires 1,040 pounds of straw to each horse per year.

The feed consists of twelve pounds of hay, and fourteen pounds of grain, five-eighths western corn meal and three-eighths wheat-middlings, mixed to weigh forty pounds to one bushel. They are fed as follows, viz.: Morning, four pounds grain and one pound cut hay mixed, and four pounds dry hay. Noon: five pounds grain, and one pound cut hay mixed with no dry hay. Night: five pounds grain and one pound cut hay mixed and five pounds dry hay. The above feeding is uniform the year round with out regard to the weather. For sick and invalid horses, carrots, potatoes and oats are used. The cost of feed per horse last year was $34\frac{5}{100}$ cents per day.

They are never fed salt except in cases of sickness. In hot weather Glauber salts are given after a hard day's work to prevent constipation. Each hostler has the entire care and responsibility of fourteen horses, the feed being mixed for them. Each one is assigned his place in the barn and furnished with a kit of tools which he is responsible for, consisting of a card, curry-comb, brush, wheelbarrow, fork, and two pails and a broom. A horse standing in the barn for more than two days is given one pint of oil and moderately exercised before being put to work. This is to prevent paralysis, now a very common disease.

Every horse is allowed all the water he wants whether heated or not. No limitation or restriction is placed on the watering of horses. On the contrary, a special rule requires any man leading a horse in or out of the barn to lead him first to the water-troughs.

The experience of the superintendent for thirty-five years, in fourteen of which he

was running a stage-line, and twenty-one with this company, in not using salt, and in freely watering horses regardless of weather or the condition of the horse has proved most satisfactory, never having had a horse foundered or sickened by drinking too much water.

Horses going out on early trips are inspected late the *night* before. In the *morning* the whole barn is inspected, and extra horses are assigned to the places of those unfit for work. As they are known only by number, the hitches know by consulting the daily-slate, just what horses to send out, and when, and with what driver. This also provides for replacing any disabled during the day. Each team works the *same hours every day*, and they are assigned to such trips as the work, and their ability warrants. *Pitty* and *low-bred horses*, and those that cannot stand the sun, are assigned early and late trips.

Sick and disabled horses are cared for by the Superintendent and his assistants, the amount paid yearly for veterinary services being insignificant. Very little trouble is had from *colic*, *fevers* or other *sicknesses*. The principal, and it might be said, the whole trouble met with, proceeds from strains from slipping, affecting the *hind legs*, *back* and *kidneys*, producing in many cases *paralysis* from which they rarely wholly recovers. Many, however, recover sufficiently to work on light trips. Necessarily they suffer to some extent from *bruises* or accidental *injuries*, but most of such cases are successfully treated.

Some years since "Farcy" was found in the company's barns, vigorous measures were immediately taken by the destruction of every animal showing symptoms of the disease, and a thorough fumigation of the buildings, stamping it out completely with a loss of only seven horses out of 250 in the barns affected.

The treatment of paralysis, now a common disease, has been most unsatisfactory. The best success has been by stimulating, keeping the bowels open, mustard and penetrating liniments, and rest. There is a short connecting line from the main barn to a branch road, on which weak and partially disabled horses are used while recruiting. Any horses not able to do this work are sold or sent to the boiling-house.

The average period of usefulness of the horse is found to be from six and a half to seven years. The business has increased so rapidly in the last seven years, requiring the purchase of so many new horses, that the average, without question, is lower for that reason.

The company does its own shoeing at the main barn. At the other barns, the shoeing is done by contract, the cost per horse for shoeing for last year was \$19.64. Burden's medium shoes are used.

Experience of the Superintendent of the Montreal City Passenger Railway Company:

J. E. RUGG, Esq.,

Dear Sir:—In complying with your desire of having my views on the general maintenance of street railway stables, I have no hesitation to say that this part of the street railway business is one of the most important. This is very evident when we consider that its maintenance constitutes over one-third of the total operating expenses.

In my opinion, street-car horses should not be purchased younger than five and not older than seven years. Horses about these ages will last here on an average about eight years.

I consider that 30 pounds of feed is little enough for car-horses every day.

The mileage per horse with us, is about 14 miles per day.

We use hay and oats, but no cut feed; I consider that although there is a saving in cut and bruised feed, the extra expenses will counterbalance. Of course, we use no corn; I believe that there is a saving in horseflesh by excluding corn from the feed.

I find that by confining our feed to hay and oats, the average life of our horses is much longer than that of those where corn is used.

Now with regard to stabling. I believe the less wood in the construction the better for the healthy condition of the stables. Wood, in a very few years, will get soaked with all sorts of impurities, so much so, that the proper purifying of it becomes almost an impossibility; and as a matter of course, paralyzes, to a great extent, the proper ventilation.

Ventilation cannot be too perfect. I consider that the usual upper or roof ventilation is not sufficient, unless aided by side ventilation. I have often noticed that side ventilation in most stables is entirely insufficient, being generally too high. The thick atmosphere always charged with stable-ammonia is very heavy, and will rise with considerable difficulty if not aided by an under-current draught.

I consider under-floor drainage very bad. This kind of drainage is more a receptacle for disease-breeding matter, than it is a cleansing arrangement. The drainage should always be from the surface. Floors should be subjected to a thorough washing at least twice or three times a week. Lime and carbolic acid should be used freely.

With regard to shoeing, of course it must vary in accordance with the various systems of roadway.

I believe that on pavements flat shoes are the best. On macadamized, toes and calks are necessary as a protection to the feet. In the latter case heavy shoes are indispensable.

In my experience of several years, I have found that the observance of the above ways has succeeded in maintaining our stables in fine condition.

With regard to our buildings, they are of old construction and do not contain enough of the modern improvements to form a model subject for submission to the coming general meeting.

In my travels and visits I have found that your stables and those of the Sixth Avenue Railroad Company, of New York City, were about the most perfect.

We still groom with the old system of grooming. It appears that opinion is generally divided on the grooming machine.

I believe that hay and oats are by far the best feed for horses, with a small allowance of bran twice a week.

Our speed is about six miles an hour, which I believe quite enough.

The above detail, of course, I glean from my own observations on the working of our roads; but I believe our horses get as much work as any other stable on the continent, and their condition is inferior to none that I have seen. Yours, very truly,

T. H. ROBILLARD,
Supt. M. C. P. R. Co.

DISCUSSION ON THE SALT REPORT.

MR. A. W. WRIGHT, Chicago, said that the N. C. R. R. Co., had baths 48 x 54", 14' deep, 1 bushel salt in each, each horse spending 3 to 6 hours per day in them; strength 1 in 37, or twice that of ocean water. On streets they used 1 bushel salt per mile of single track; used snow-plows and sweepers; proportion of salt in melted snow only 1 in 14 $\frac{5}{100}$.

MR. CLEMINSHAW, Troy, asked the object of the salt baths.

MR. WM. WHITE emphatically agreed with the report, but it was deficient in one thing. In New York the *debris* caused the tracks to be a continuous cesspool in winter, which gave the horses thrush, sore legs and "scratches." Every sidewalk should have salt put on it to melt the snow; every householder should be compelled to sweep the snow to the gutter, and the R. R. Co. to sweep into sewers.

MR. WM. RICHARDSON said, that in Brooklyn they had fought this question so that the city had not passed any ordinance against salting. They had got written testimony of Registrars of Vital Statistics and of Health Officers during 15 years that salting was beneficial; had brought statements of Dr. Hutchinson, Dr. Wm. M. Smith, Health Officer of New York City, and of Dr. Elisha Harris, Sec. State Board of Health Commissioners. They showed that scarlet fever, etc., had been most prevalent in unsalted streets, and from May to November. But after the matter was put in that part of the Penal Code relating to Cruelty to Animals, they had had to fight it.

MR. D. B. HASBROUCK, New York, said that in New York the feeling against salting was most wrought up.

MR. WRIGHT, Chicago, said that their salt baths were to remove soreness and to cause the hoofs to grow; they found this salting feet paid.

MR. ROBILLARD, Montreal, thought salt a good remedial agency.

DR. ELIJAH WHITNEY suggested salting streets from curb to curb, and sweeping into sewers. It was the *debris* that did the damage. Salting all the streets would add 20 to 30 per cent. to the health of New York City.

(To be Continued.)

The Cable System as a Motive Power.

The American Street-Railway Association.

GENTLEMEN:—So completely has the country been flooded with literature pertaining to "The Cable System of Motive Power," that the writer of this report has no hope of offering any new facts; but since the system has acquired such magnitude and prospects, it may be fitting that the archives of the Association should possess some brief record of its beginning and progress.

Climbing the steep hills of San Francisco, the fertile genius of Mr. A. S. Hallidie conceived the idea that transportation, which could not be accomplished by animal power, might be by endless ropes; and to him and his associates, all credit is due for the first successful construction and operation of the system, eleven years ago.

What seems so easy and natural in the retrospect, lay before those men an untried, and, in the opinion of many, a foolhardy undertaking. The money invested was regarded as squandered, and the whole scheme a trifling with the impossible. But through innumerable difficulties and trials, they persevered, until intelligent experiment and dauntless courage wrought success. Clay Street Hill became world renowned for its novel and ingenious railway, the advantages of which, soon caused parallel lines on steep grades to be constructed on Sutter Street, California Street, Geary Street, Union Street, and recently one on the more level line of Market Street and its branches.

After the first four lines had been built, covering short distances and carrying few people, a road was constructed in Chicago in 1881. The latter city claims not one iota of credit for the invention of the cable system, but did undertake the somewhat serious task of demonstrating

First: That the system could be utilized in a region of harsh winters, deep snow and frost, the antipodes of the balmy climate and perpetual summer of California, and,

Second: That it could be expanded into a suitable system for moving the vast population of our largest cities.

The former could not be accomplished by any fragile construction but required great strength and compactness to resist the strains inevitable in a large commercial city, and the powerful pressure of the frost in a Northern winter. The latter could not be accomplished by any mile, or mile and a half, of timid trying; but with unshaken faith in its method of construction and the possibilities of the system, twenty miles of track were constructed, and the daily trans-

portation of 100,000 people attained, with the ability to move five times as many.

In addition to the lines indicated above, cars have been moved by cable for fifteen months over the New York and Brooklyn Bridge; an extensive system is building in Philadelphia; a line in New York, one in Kansas City, and one in Hoboken, and comprehensive systems have been proposed for New York and Brooklyn. Recently under the superintendence of American engineers this purely American system has been introduced and short lines constructed in London, Eng., South Wales and New Zealand.

The construction consists of an underground tube through which the cable passes, (supported by grooved pulleys,) in constant motion and at uniform rate of speed. The tube is provided with sewer connections for drainage, and an open slot on the tops through which passes a gripping device which is attached to a car. The cable is kept in motion, and its speed regulated by a stationary engine or engines. The rope is endless and the splices must possess great strength, but not increased the diameter of the rope, as any enlargement would incur severe and dangerous abrasion. It should be coated with pine tar and lubricated with linseed oil to protect it from rust and the too harsh action of the grips. The drums which impart motion to the cable, and the sheaves which carry it around sharp corners, should have a diameter about one hundred times the diameter of the rope. Of what material the rope should be made to secure the best returns is a question of great importance, affected by climate, the rate of speed it is to run, the frequency of stopping and starting, the character of the gripping device and the manner of applying the same, and the hilly or level character of the road. In cases of sharp deflections from a level, pulleys are required to depress the rope, and as these must be small to allow the grip to pass below them, the wear upon the cable is serious. To meet these conditions, flexibility and toughness, combined with strength and freedom from crystallization are needed.

Another important feature in a cable system is the device for automatically securing the proper tension of the rope. The extent of vibration will depend on its length, amounting in one four miles long, to some five feet, and is caused by the sudden grappling of the cable by a heavily loaded train. As the rope settles some two and a half inches between every two carrying pulleys over the entire road, the sudden tightening and stretching of the cable produces an accumulation. If this were not instantly taken care of, the rope would drop from the carrying pulleys and sheaves and be destroyed; also violent surges of the trains would ensue. Were the rope to be drawn so rigidly as to prevent this settling, the intense strain would soon destroy the cable and the operating machinery. Provision is also made in this device for taking care of the permanent stretch of the cable amounting sometimes to two hundred feet.

The gripping attachment should be prompt and positive in its action, and, in the most successful forms yet devised, consists of an upper and lower jaw, between which the cable is seized by the movement of a lever, one pound of pressure on the handle of which produces four hundred pounds pressure on the cable. A small sheave is placed at each end of the jaw, upon which the cable rides while the car is standing. Provision is also made for throwing the cable out of the grip and entirely free from it at any time or place. Exigencies may arise when this is of the utmost importance. The length of the grip is such that it passes some three inches above the carrying pulleys and does not come in contact with them. The cable is brought into the open jaws by an elevating sheave placed at an angle on one side of the tube. The metal used for lining the grip performs 2000 miles of service, when it requires renewal.

In Chicago a speed of eight and a half

miles an hour is attained over one half the lines, and nine and one-half miles over the other half; except in a few places where the speed is one half the above rates and can be made as much less at any point as may be desired. To operate at this speed with safety, the cars are provided with ample guards which prevent any one from falling under the wheels, and powerful brakes, can be applied to every wheel in the entire train by the easy movement of a lever in the hands of the driver.

The system possesses special advantages in heavy snow-storms, as the power is not derived from friction on the rail, but the appliances for clearing and sweeping the track are drawn swiftly and at short intervals by an untiring power. More power is required during a snow-storm, but in ordinary conditions, the operation of twenty and one-fourth miles of cable in Chicago has required 477 horse-power; of this 389 was used in moving machinery and cables, and 88 to move the 240 cars and their passengers. The cable and its coating weighs about 270,000 pounds, and is doing work which would require 2,500 horses.

In hilly sections where horses and locomotives would be useless for the purpose, the cable system can move cars as quickly and swiftly as on a level road; and on level roads it is found to be only one-half as expensive in operation, as the ordinary horse-railway system, while its capacity for moving vast numbers of people is practically unlimited. It is the only system yet devised, which satisfactorily meets the uneven pressure for transportation with the least possible increase in expense. No difficulty is experienced in turning corners, either with main cables or auxiliaries.

As regards humanity for horses and consideration for the nerves of passengers, it commends itself to all. In point of cleanliness, a system which saves the use of thousands of animals in a city is of great sanitary value, and the comparative quietness of its operations is highly appreciated by those who reside beside it.

The speed at which it runs, and the quickness and ease with which it starts and stops adds to the comfort and well-being of its patrons; and when equipped with the present safeguards and appliances, is found to be far more safe to the general public than the ordinary horse-car. It has no will of its own to thwart the will and efforts of the faithful driver.

The increase in the value of real estate along the street where it operates, and on parallel and cross streets for several blocks each way, is many times the cost of its construction, being from 50 to 200 per cent. in a single year.

The cost of construction is much greater than that of an ordinary tramway, but the economy of operation far outweighs this objection, as it saves more than the interest on the increased cost.

In Chicago, the cost was perhaps greater than would be necessary in most cities, owing to the nature of the ground, reaching \$105,000 per mile of single track. Too much stress cannot, however, be laid upon the importance, *the absolute necessity*, of a substantial and durable structure which will not be broken or displaced by heavy trucks or by the pitiless frost. If all the parts and appliances are well and permanently built with ample safeties in point of strength, and vigilance attends its operation, it will prove a great and unalloyed blessing to any city, and bring satisfaction and recompense to its owners.

The limits of this report will not allow allusion to the manifold improvements made and making in many quarters, in its construction and appliances, but what has been accomplished in so short a time is ample guarantee that vast good is yet to come from "The Cable System as a Motive Power." In behalf of your committee, this report is respectfully submitted.

C. B. HOLMES,
Chairman.

CHICAGO, October 15th, 1884.

Labor and the Graduated System of Compensation.

GENTLEMEN:

Your committee on "Labor and the graduated system of compensation," beg leave to report as follows:—

The labor system of street railway companies has this peculiarity, viz.: it is intimately connected with metropolitan society, and is, consequently, much exposed to disturbing influences; it is also distinguished by the fact, that the entire income of the corporation is collected in small amounts by a numerous set of employees. These features render its regulation a matter of considerable perplexity, and make it all the more important that it should be systematized on simple, practical principles. Street railways are public carriers running through dense populations, their relations to the public being determined in a large measure by their employees. Hence it is, that at the outset of an inquiry as to the best means of regulating their labor system, arises the obvious necessity for mutual good-will between the companies and the labor they control.

In the acquisition of experience in managing street railways, and in closely watching the details of their operation, the stronger is our conviction that the best guarantee of the labor employed lies in the fidelity, competency and honesty of the men, rather than in any ingenuity of mechanical checks, or other protective or detective arrangements.

This conclusion may be regarded more as a sentiment than a safe tale of business, and others may question the practical economy of a proposition that savors of sentiment alone, than an enforcement of faithful service by arbitrary methods. From a purely business stand-point, it is true of all forms in which invested capital depends for returns on regular continuous labor, that to awake in the employees an interest in their duties and a personal friendship towards the corporation employing them, is the best basis for permanent profits. The moral average of men is as yet unknown, and wherever a large force is employed, there will always be found a certain per centage of disloyalty, duplicity and dishonesty.

To expect to find in artificial devices a complete substitute for personal honesty or for faithful services willingly rendered is fallacious; and we must look farther and sink deeper.

All appointments to positions should be made from that class which would dignify labor, and avoided from that class, which by habit, training or education are suited to higher avocations; and in no case should any device for safe guard in handling money be used that will blunt moral sensibilities.

The employees of railway corporations cannot properly be classified under the head of "skilled labor." The capital invested and its returns is largely at the mercy of the employees, and in few corporations does loss of money more immediately result from inefficient or wasteful labor, or profit more quickly accrue from intelligent and conscientious effort, than in street car companies. But, nevertheless, the services exacted from conductors, drivers and stablemen are not of such a character as to require an apprenticeship to understand. Any man of average intelligence can discharge the duties, and, although he may not be at first as efficient as an old hand, yet a few days, if he be industrious and attentive, will give all the experience that is really necessary. It is, therefore, unwise for them to represent themselves as skilled workmen, or to allow themselves to fall into the pernicious notion that they are as indispensable to their employers, and as difficult to replace as the craftsmen in specified trades and manufacturers. In presenting this view, it is only for the purpose of more forcibly referring to the vital importance of managing and directing the labor system. Unless employees of lines are faithful, energetic and

economical, it is impossible to obtain substantial success. The neglect or abuse of stock or the running gear of cars, the waste of feed, carelessness or insolence towards the public, and indifference or dishonesty in the collection of fares, are all means by which employees can impair the operations and entail losses upon these corporations.

To fully guard all these openings, to establish a system of checks by which fraud or negligence can be detected or prevented is, we are fully persuaded, almost impossible.

A corporation is an artificial person, existing only in the contemplation of law, but this does not deprive it of a certain individualism; and the employers are governed by a distinctive spirit, that in turn regulates their feeling of the service towards it. Sometimes that spirit is harsh, arbitrary and exacting; sometimes loose and improvident; sometimes strict in the enforcement of rules, but tempered with justice and moderation. Whatever it may be, the employees know it, and their services take color from it; and it is highly important that they should have a clear and definite understanding of the estimate placed on their labor. They should be taught in the first place, that the management does not regard them as skilled workmen; that a "strike" may interrupt, but can in no way stop operations; that if they were all to resign on the same day the company could go ahead the following, not perhaps satisfactorily, but sufficiently so to maintain business, and that but a short time would suffice to obliterate all effects of the interruption. While insisting upon this general feature respecting labor, the men should be made to feel that, if they are not classified as representing skilled labor, neither are they on the other hand regarded as regular day-laborers; that good judgment, promptitude and experience are fully appreciated; that the managements intend and aim to reward fidelity, and that as long as they are trustworthy, they are sure of their places, and that continued conscientious service will be recognized. Promising these general views, there remains to be noticed what in our opinion are the best means of producing the relations mentioned as most desirable.

It should be a settled principle that discharges as far as possible shall not be capricious or without cause, and that promotions will be made on the basis of length of service and personal merit. The labor system of an ordinary line is not sufficiently varied or extensive to embrace a regular scale of promotions, but the principle should be recognized and established, that the management is influenced by the relative merits of their employees; that there is no favoritism tolerated, and that a faithful and efficient man will not be overlooked or unfairly treated. When the men are educated to understand this, an "*esprit du corps*" will gradually spring up and a guarantee of good work secured, obtainable in no other way. In enforcing a system of fair promotions and a strictly equitable treatment of labor, much dependence must, necessarily, be placed upon the reports of other officers. It is, therefore, of essential importance that they should be honorable and just men, as well as energetic and vigilant, and that their reports should be reviewed carefully by the chief executive officer, through whose individuality flows the inspiration of management.

A graduated system of compensation, regulated according to length of service and general efficiency, would also, if judiciously introduced, be productive of beneficial results. Such a system could not be created summarily, but by establishing conditions as to the filling of vacancies and fixing a lower rate of pay for new appointees, and the terms upon which their advancement will take place, a complete system may soon be created, the features of which can be adjusted to suit the particular circumstances surrounding the operation of each particular line. A man who possesses experience, and whom the company has tested and

found reliable and competent, is certainly worth more wages than a comparatively new appointee.

His services are more pecuniarily profitable, and there is a corresponding loss when a new man is placed upon the same footing.

A graduated system of compensation should be based upon a permanent and well-known classification of the men, and by this means there might be, if desirable, a saving of wages and a better recognition of individual merit and demerit. The system once established would tend to promote fidelity and self-respect among the employees; seeing its justice they would cooperate in its maintenance; and at the same time it would improve the relation of capital and labor and give to the men a stronger personal interest in the permanency of their employment.

The use of all kind of registers and other detective arrangements and contrivances simply expresses distrust; all of them represent the same efforts of experience and ingenuity to devise a substitute for personal honesty; all of them are imperfect and irritating, tending to blunt moral sensibilities and foster want of confidence.

It is undoubtedly true that these devices cannot be dispensed with under the conditions that now exist, and the views here expressed have reference rather to general principles of the regulations of labor, than to the details of detective measures; yet we cannot fail to see in their introduction a great disturbing element. We will not, therefore, discuss the relative values of the various contrivances, but insist that were it an established fact, that these artificial means were indispensable, yet, even then, the principles herein set forth ought to control the labor system of street-railways. The losses incurred by strikes, from which we have not been exempt, the ceaseless discussion of the relation between labor and capital, incident to modern lines; and the increasing sensitiveness of capital to social disquiet, all unmistakably suggest, that, so far as possible, corporations employing large forces of men should ground their policy on equity, and avoid unnecessary antagonisms and consequent hostile legislation. We owe this duty to society, and we owe it to the large interests confided to our charge. It may be impossible to prevent occasional disputes, but when they arise, we should not be found evidently in the wrong, and bear the stigma of oppressing labor, or of neglecting wise and just rules for its employment and control.

We feel assured that the application of principles herein indicated will not increase the expense of operation, and will remove much of the anxiety and difficulty connected with the management of street railways.

We recommend no sudden and sweeping changes, because the labor system supporting all industrial investments of capital cannot be summarily altered without confusion or loss. It crystallizes in fixed forms with the passage of years; and changes, even for improvement, should be gradually introduced.

In conclusion, we recommend that the principles of management we have briefly outlined, should be steadily held in view in the treatment of labor, and so far as possible incorporated in the practical operation of railway lines.

Respectfully submitted.

JULIUS S. WALSH,
JACOB REHM,
HARVEY N. ROWE.

The following letter was submitted as a part of the report of the committee:

OFFICE OF THE NORTH CHICAGO }
CITY RAILWAY COMPANY, }
CHICAGO, October 10th, 1884. }

WM. H. HAZARD, Esq., President American Street Railway Association, Brooklyn, N. Y.

Dear Sir:—Having been appointed by you as an associate member of the com-

mittee on "Labor and the Graduating System of Compensation" (as refers to labor employed by street railway companies), I beg leave to report the following on the subject:

For several years our company has divided all of its drivers and conductors into four classes or grades, as experienced hands are of more value to the company than those just entering our service. We require every man in our employ to remain for the space of two months in the first class, receiving a compensation of \$1.50 per diem. After the expiration of two months he enters the second class or grade, remaining therein for four months, receiving a salary of \$1.75 daily for his services. After the expiration of the last-named four months, he advances into the third class or grade, remaining therein six months, and receiving the sum of \$2.00 as a daily compensation for his labor. Having thus served our company for the space of twelve months, and having become thoroughly acquainted with the duties to be performed by him, and fully able to discharge them intelligently, the laborer enters the fourth class, and his wages are advanced to \$2.25, which is a higher sum than any laboring man can earn.

The graduated system of compensation works well with us here, and makes "strikes" an impossibility. No honest and intelligent laborer will "strike" for higher wages, when he knows that by serving through a regular course, he will attain what he cannot possibly get anywhere else.

Any laboring man who enters our service and has been with us for two months is only too anxious to stay, because his wages will be increased for the coming four months. In short, the longer they stay the better is their pay.

Furthermore, this system furnishes us a reliable and trustworthy set of workmen, because the longer they stay the more efficient they become in the discharge of their several duties. Such a wage system secures to us steady and punctual men, who perform their work more cheerfully because they know that their value is acknowledged by the company, which remunerates them for their services with the highest possible wages.

This system of graduating the wages works well here with us. It works somewhat after the manner of a school of probation. After the men have worked through it, they find it to their interest to remain with us. We have all reason to be satisfied with the system, having by it secured a lot of good, steady and reliable men, who generally stay unless discharged for cause. The average hours per man per day is $11\frac{1}{2}$ hours. I have the honor to be,

Your obedient servant,

JACOB REHM,
Vice-president, North Chicago
City Railway Co.

Completed Construction of New Road.

In the construction of street railways, it is evident that while we must endeavor to get the best roadway for the cars, due regard must be paid to the requirements of the general travel, and to the local laws governing the form of rail and other details; so that we are not at liberty to use the best means to accomplish the end desired. In fact, the matter is often so hampered with municipal regulations, that it is impossible to accomplish more than an imperfect and unsatisfactory solution of the question.

The best form of rail for the purposes of the railway company alone is undoubtedly, the "centre-bearing," as the weight of the car wheel in this case bears directly upon the centre of the rail, and is transmitted evenly to the centre of the stringer, so that the track is in the best position to resist the outward pressure which is constantly tending to widen its gauge, and otherwise injure its condition. The spikes with this form are placed alternately on either side of the head, so that the rail, besides having a better bearing on the timber as above stated, is held down equally on both sides. The car wheels run more

smoothly and with less friction than upon any other form, as there can be no possible contact with any paving stones, and the open space provided on the outside has a tendency to keep the head of the rail free from dirt and grit. This is especially the case during cold weather, when one of the most serious difficulties in operating street railways arises from frozen mud, ice or snow getting upon the rails, even when the greatest care is taken to keep the track clear. The centre-bearing is the standard street rail now in use in New York City, and it is used to a considerable extent in Brooklyn and a few other places.

In the next form, known as the "slope-back," the bearing is approximately in the centre, the head being about three inches wide, and beveled or sloped off on the outer edge, so that to a certain extent it gives the advantages above enumerated for the centre-bearing rail, but only to a limited degree.

The "side-bearing" pattern, with its many variations, is that which is most generally in use in the United States; not because it is the best, but because it is the best that the railway companies are permitted to put down, as wagon wheels can readily get on the track, and it gives a good wide-tramway for general travel. This very fact however, is a great detriment, as the general traffic is invited by its smoothness and other advantages to run upon it. Heavy teams going at a slow rate are constantly in the way of the faster moving cars, and the rails are not only worn out by this travel, but the speed of the cars and the general business of the road interfered with. A very serious objection to all side-bearing forms is that the weight of the cars being entirely on the outer side, that part of the rail wears into the stringer sooner than the other, causing the rail to roll out of level and to widen the gauge of the track. All forms in which the head of the rail is narrower than the tread of the car wheel should be avoided, as the wearing surface is too little, and in the side-bearing patterns this is especially the case, for unless the head is as wide as the tread the projecting edge of the wheel will be constantly striking against the paving stones outside of the rail when the track is new, or the pavement is relaid. This will only cease when the paving stones shall have been gradually worn away by the action of the wheels, which is a very objectionable and costly process, or when they shall have been knocked down or otherwise settled below the head of the rail.

Your committee would, therefore, recommend the adoption of the centre-bearing form of rail in all cases that it will be allowed by the local authorities, especially where the streets or avenues are wide enough to provide the general travel of the street a good and sufficient roadway, outside of the space occupied by the railway.

Where the service is heavy, a rail weighing sixty pounds to the yard will be found the most satisfactory and in the end the most economical; but upon roads with lighter travel this is not necessary, though it should always be borne in mind that it is impossible to get satisfactory results when materials of poor quality or insufficient size or weight are used. It is not the first cost that should be regarded altogether, for if the railway is well built with good and sufficient materials the annual wear and tear will be proportionately reduced, so that the profit and loss account from year to year will not be charged with constant repairs rendered needful by poor or scanty construction at the outset.

The spike-holes should be about twelve inches apart, so that when the rails are first laid it will be enough to spike every alternate hole thus leaving new holes with their original countersink to be used when the others shall have become worn too large and be unfit to retain the spikes. The rails should be carefully inspected, and any that are not cut square at the ends or not straight and level should be rejected and returned to the mill.

As the gauge of street railways is almost always established by the local authorities to conform with the legal gauge of the ordinary vehicles of such city, there is in consequence no universal or standard gauge for them. Your committee is, however, of the opinion that from four feet eight inches to five feet two inches gauge will give the most satisfactory results as a general rule.

Where double tracks are laid, there should be ample space for the cars to pass each other on both the straight tracks and the curves without danger of striking. Five feet between gauge-lines, unless the cars are exceptionally large and wide, will be a sufficient distance; and with straight tracks it will also allow a man to stand between the cars while passing each other, which may prevent many accidents.

All joints of the rails should have rolled iron joint-plates not less than eighteen inches long, placed under them. These should have vertical flanges to fit against the sides of the rails, so as to keep them in line with each other and to increase the vertical strength of the joint-plate itself. If the track is laid in cold weather, the joints of the rails should be kept apart three-eighths of an inch to allow for expansion of the rails in summer; and this space should be less when the rails are laid, as the temperature rises, although the ends of the rails should never be laid less than one-eighth of an inch apart even in mid-day of the very hottest weather.

The rail spikes should be five and a half or six inches long, of one-half inch square iron, with countersink heads, to fit into and not project above the countersink in the rail itself. They should be of good tough iron, so that when driven, the heads will not fly off under the strokes of the hammer.

As street-railways are now usually constructed, the rails are placed upon longitudinal wooden stringers, resting upon transverse wooden cross-ties. Where it can be obtained at a reasonable cost, your committee

recommends the use of yellow pine, free from sap-growth, and cut from trees that have not been tapped. As a general rule, the best yellow pine-railroad lumber is brought from Georgia or Florida, and in all cities near the seaboard, at least, the rate of freight is low enough to justify its use for stringers and cross-ties. Of course, this may not be so in cities or towns far inland, and in such cases, other lumber must be used which can be more conveniently and reasonably obtained. The ties should be of equal size, in order to give a uniform bearing and support to the track; for if they are of unequal surface, the track will be better held up by the larges than the smaller ones, thus causing it to be uneven and irregular. For the same reason, they should be placed at a uniform distance apart, five feet from centre to centre, being probably the most desirable. Uniformity of dimensions can be more certainly had if the ties are sawed than if hewed, and in addition to this the stringers will then always have a good flat bearing upon them. The joints of the stringers should never be under the joints of the rails. The stringers should be not less than seven inches deep, and of the same width as the rail which is to lie upon them, unless it should be one of the narrow forms of rail, in which case the timber should project on both sides not more, however, than one half inch. It should then be beveled off on the upper edges to the width of the rail before putting down the pavement. The stringers should be, at least, twenty five feet long, in lengths divisible by five feet, so that there will be no waste in cutting off useless ends to allow the joints of the stringers to come exactly upon the cross-ties. Of course where there is exceptionally heavy service, it may be of advantage to place the ties four feet from centre to centre, and the size of the ties may then be increased to advantage, say five inches high by seven inches wide, although generally four inches by six inches is large enough. The ties should project outside of the stringers on both sides at least nine inches, and the stringers on the outside should be fastened to the ties by cast iron knees not less than six inches high and six inches long, and on the inside by similar knees three inches high and three inches long. The long knees on the outside tend to keep the stringer in a perpendicular position and so to preserve the gauge of the track; for tracks never get narrower, all the conditions of their use tending to press them outwards and to widen the gauge. At all joints of stringers, joint knees should be used on both the inside and outside of the stringers, and they should be broad enough to bear against and be spiked to the contiguous ends of the same, thus keeping them in line. The spikes used for these cast-iron knees should be three and a half or four inches long, and three-eighths of an inch square, with button-heads. The knees should be of good strong iron, so as not to break easily, in case the workman should miss the spike and accidentally hit the knee itself, and all the spike-holes should be carefully drilled out, so that in driving the knee-spikes, they will not wedge in the holes and split the knee.

It is very important to have the ties and stringers well and solidly tamped-up, and a straight line and even surface carefully obtained. This is a matter which is often slighted, but which should be attended to with great care.

A very troublesome and expensive item of repairs is often caused by the wheels of heavy wagons making ruts alongside of the rails, thus causing the track to get out of gauge, and otherwise wrenching and injuring it. This can be, in a great measure, prevented by putting a row of substantial square-shaped paving blocks on each side of each rail, which, after being thoroughly rammed, should be left about one-half inch above the rail, otherwise they will settle down so as to be below the rail, when their efficiency will be greatly lessened.

All the undisturbed bed between the cross-ties should be loosened up with the pickaxe, so that all of the pavement shall have the same bearing, and it will settle alike all over.

The best pavement for the horse path is probably had by using cobblestones about six inches long, about four inches wide and two or three inches thick. These dimensions give stones of moderate size, and of flat, oval form, so that when closely set on end they furnish a very good foothold for the horses, and the pavement can be kept in repair with a very reasonable cost. The horse path should be paved as nearly as possible level, and all crowning or elevation in the middle of the track should be avoided, so as to allow the horses' feet to travel evenly and squarely. The stones should be laid upon a bed of good, sharp gravel or coarse sand six inches deep; they should be thoroughly rammed three times, and left with a covering of the same material about one-half inch deep, from which all stones over an inch long should be raked off.

At proper and frequent intervals, suitable connections should be made with the sewers or with surface drains where sewers are not in use. If this matter is not properly attended to, great inconvenience and expense will be caused, especially in cities where the melting of snow during winter causes a great accumulation of water upon the track, which, if not promptly removed, may, by a sudden change of weather freeze up solid on the track. In any event, no track can be properly kept in order unless the surplus water is promptly and adequately drained off. The general elevation of the whole track should be a little higher than the rest of the street, to aid in draining the water away from the track.

The radius of the curves will be governed by the width of the streets and other conditions, but it is always desirable to avoid curves of small radius. A curve of fifty or sixty feet radius is probably the most desirable when it can be laid down, but in many cities the width of the streets will not permit curves of more than thirty or thirty-five feet radius, which, however, if properly laid, will give all reasonable satisfaction. The curved rails should be of the grooved form on both the inside and outside flanges of the curve, although in curves of large radius it is not necessary to have the outer line laid with grooved rail; in such cases bending the rail used upon the

rest of the track to proper shape. The groove should be about one and a half inches wide, and the inner side or guard of the grooved rail should not be more than three eighths of an inch above the tread. Great care should be taken in laying the curves to have them of regular curvature, uniform gauge, and with no abrupt changes of surface. Ordinarily, a curve laid with the inner and outer rails on the same level will give the best results in service, but there are instances when, from the grade of the streets it will be found necessary to elevate one rail higher than the other. The outer rail may then be elevated a few inches above the inner without any disadvantage, and possibly in some cases to advantage; but the inner rail should never be higher than the outer if it can possibly be avoided, although a slight difference in this respect, where absolutely unavoidable, can be allowed, if the curve is very carefully and accurately laid down. The curves should always be so constructed and laid down that all four wheels of the car will bear equally upon the rails; as otherwise, if any one of the wheels should have its portion of the load removed from it by reason of a depression in the track, it will have a tendency to run off the curve at that point. The curves rails should be, when practicable, in lengths of thirty feet, so as to have as few joints as possible, and a straight guard-rail not less than seven feet long should be attached to each end of the inner line of the curve.

On single track railways where it is necessary to have turnouts or passing places, they should be so constructed as to allow the cars to run easily into and out of the turnout. This can be accomplished by making the curves leading into and out of the turnouts of large radius, say three hundred or three hundred and fifty feet. As, however, in cities the length required for this form of turnout is often inadmissible, it will then be necessary to use curves of shorter radius, and a turnout with grooved rails of seventy-five feet radius will probably be found the most desirable under such circumstances. Where the curved rails of the turnout are of three hundred or three hundred and fifty feet radius, it will not be necessary to use any grooved rails, as the ordinary rails when carefully curved, will be sufficient to guide the car wheels.

The castings for all switches, frogs, and crossings should be made from hard, tough iron, and of substantial size and weight. At each end of the casting there should be a recess or pocket of the right size and shape to support and retain in position the end of the adjoining rail; or, when two castings themselves abut together, the end on to which the cars run should rest in a pocket formed in the end of the other casting. Particular care should be taken to have all castings evenly and solidly bedded upon the timber supporting them, for otherwise they are liable to be broken by the shocks and strains of heavy loads crossing over them. At places where frogs or crossings are required and one of the tracks is used very much less than the other, it will often be found desirable to have the castings so made, as to allow a continuous rail to run through a recess in the casting, thus giving an unbroken rail to that one of the tracks which has much the greater travel, while the occasional cars running on the other track have their wheels so raised up that their flanges pass readily over the top of the continuous rail. "Toe-pieces," or slight projections, should be made on all castings, when, by the size or smoothness of the surfaces exposed, horses are otherwise liable to slip upon them, smooth spaces being left only where the car-wheels run.

The use of turntables should, wherever it is possible, be avoided, but as they will often be found necessary, it is important that those only should be used which will turn easily, present little or no obstruction in the street, and require but a reasonable amount of repairs when in use. They should be set on brick or stone foundations laid below the frost-line, and they should be thoroughly provided with drainage.

Within a recent period, and especially within the last five years, a very radical change has taken place in the manufacture of rails, whether for steam or horse-railroads; the material now used in the construction or repair of railways being almost universally steel instead of iron; in fact it is now very difficult to get iron rails, as the mills that formerly made them have mostly gone out of the business, or have changed their plant to make steel rails instead. The improvements in the manufacture of steel have been so great that there is now no inducement to use the inferior article, as the superior can be had at the same or a less price. The service of steel rails on an average street-railway is, probably, at least three times that of iron rails of equal size and weight, the wear of the steel rails being also more even and regular. One great cause of the rapid deterioration of iron rails furnished for street-railway use, arose from the fact that they would laminate and often split off in pieces of considerable size, so that the surfaces were not only worn away, but actually broken away and splintered off. Steel rails, on the contrary, being of homogeneous and tough material, are not subject to this objection, every particle that is worn off under service coming away by itself, but not dragging with it any other portion of the mass.

Before closing, we must not omit to refer to the various forms of girder rails introduced within the last few years to a considerable extent, by which wooden stringers are altogether avoided. One great advantage that they give is that a perfectly secure and level joint can be had at the ends of the rails, as fish-plate joints can be used, similar in general character to those in use on steam railroads. The deterioration of the roadway by reason of the decay and wearing away of the stringers under the rails is avoided, as no timber is used with them, excepting for cross-ties, and these are so far underground as to last a very much longer time than the stringers would last, not being exposed as they are to the constant changes of temperature and of moisture and dryness. It is quite possible that the standard street-

railway of the near future will be constructed with steel girder rails set on iron or steel cross-ties, and held to gauge by iron tie-rods.

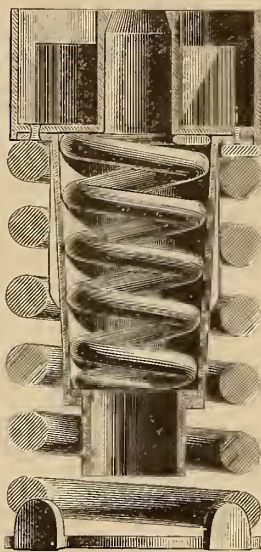
No reference is made in this report to the construction of cable-railways, as that whole subject is comparatively new, and no special system of construction for such railways can as yet be regarded as being proved to be the most desirable one.

WM. WHARTON, JR., *Chairman of Committee.*
President of Cape May and Schellenger's Landing R. Co., Cape May, N. J.

New York, October 15, 1884.

Vose's Graduated City Car Spring.

This is intended to do the same thing for horse cars as the graduated rubber cone spring made by the same firm.* The in-



tention is to make the car ride softly and easily when empty, by putting the weight on only one of the concentric springs, and to bring both in action when the car is heavily loaded.

* Richard Vose, 13 Barclay Street, N. Y. City.

Personal.

F. T. LERNED, formerly of the Baltimore Car Wheel Works, now with Andrews and Clooney, is certainly "to the manner born" as an entertainer. A large number of those in attendance went home with very pleasant feelings toward him and his firm for their efforts for their comforts and pleasure.

Car Starters.

Prof. J. E. Sweet, retiring president, American Society Mechanical Engineers, recently spoke of a car starter that was a "perfect mechanical success," but was condemned and thrown aside because it made balky horses.

Cracking of Varnish.

Can any of our readers assign any reason why varnish should crack across the grain of panels, etc.? Experiments show that the expansion of wood due to moisture is from five times as much crosswise as lengthwise in young ash, to 213 times as in ebony, and yet there are five crosswise cracks to one with the grain. It can hardly be heat that cracks varnish, because it gets elastic with heat; and in fact, in locomotive cabs Scheller has pointed out that all outside and inside surfaces are cracked across the grain, except the ceiling, which is the hottest part, and which has but few cracks except just above the side windows (where the cracks are cross grain).

It is probable that there are more things in paint and varnish than are dreamt of in our philosophy.

Only One Dollar.

That the STREET RAILWAY JOURNAL may be in the hands of every man actively engaged in street railway management, the subscription price has been placed at the very low price of one dollar per year.

Please send in your name at once, and begin with Vol. I, No. 1.

Street Railway Notes.

THE WASHINGTON STREET AND STATE ASYLUM road, Binghamton, N. Y., R. H. Midgley, President and General Manager, is building an extension of some two miles, adding cars and making various improvements.

At the John Stevenson Co.'s shops, New York, we notice a fair number of cars building, and on inquiring, find they are for all parts of the world, including Australia and various parts of Europe and South America.

Items.

THE BROADWAY (N. Y.) SURFACE RAILWAY has secured its new grant of the Board of Aldermen.

W. H. CAMPBELL of the Philadelphia Traction Co., has secured the controlling interest in the Transverse Railway of Pittsburgh. It is understood he will introduce here his traction system.

THE THIRD AVENUE (N. Y.) CABLE RAILWAY is pushing forward its extension from 8th to 10th Avenue on 125th Street.

THE HESTONVILLE & MANTUA CO., Phila. (Race and Vine and Arch St. lines) is adding to its equipment one car per month, built in its own shops, and is rapidly substituting horses for mules as motive power. About twenty horses are substituted for mules every two weeks, and, at this rate, it will not take long to abolish the long-eared hybrid entirely.

THE PEOPLES' PASSENGER RAILWAY CO. (Phila.) is building a new branch, running west from Germantown Ave., along Susquehanna Ave., to 23d St., south to Norris St., and east on Norris St. to Germantown Ave. This line will be a great convenience to the rapidly growing northern districts of Philadelphia. The route was originally projected and partially constructed by Mr. Singerly (Philadelphia Record) under the old Germantown Passenger Ry. Co.'s management. The new management is pushing it to completion with a large force of workmen.

The same company has recently fitted up, in comfortable style, its offices in the second story of the depot building, at Eighth and Dauphin Sts. They include the president's room, a room for the vice-president and directors, and a general business office. This company operates, at the present time, about 42 miles of street track, comprised in five divisions:—Fourth and Eighth Sts., Girard Avenue, Germantown, and Green Sts., and Fairmont Avenue and Calowhill St. The new Susquehanna Ave. line will add a sixth division.

It owns about 105 cars, all of which are being placed in first-class condition as rapidly as possible, and every attention is being paid to thoroughness of detail in every working department. The business of the year just closed shows an increase over that of the preceding one; the business year having amounted to over 20,000,000 passengers carried by the company's cars. The combination which goes by the title of the Peoples' Passenger Ry. Co., forms the largest street railway interest in Pennsylvania, with the single exception of the Philadelphia Traction Co.

G. B. H.

— THE —
STREET RAILWAY
JOURNAL.

MONTHLY, \$1.00 PER YEAR.

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 St. Louis, Mo. W. E. ROSE, Manager.

Publishers' Salutory.

Every important industry needs a representative Journal. Most such industries have them. In the case of Street Railways this want became manifest, and has been expressed by tramway companies and those who wish to supply them.

A single department of the already crowded *Journal of Railway Appliances* having been proved, after 18 months' trial, to be insufficient to the requirements of the Street Railway interests, we have, in view of the fact that encouragement to do so has been plentifully held out, and that we had, probably, the best facilities in the country for doing so, resolved to issue this special trade and technical monthly.

The Street Railway Journal.

At the recent street railway convention, a number of leading men expressed the wish that there should be a journal devoted exclusively to street railway interests. Representatives of the AMERICAN RAILWAY PUBLISHING Co. became aware that this need was felt not only by the street railway managers and employees, as a source of information, and a means of exchange of ideas, but by those selling to them, as a medium of direct communication with their customers.

Seeing this, a careful canvass was made as to the probability of a special street railway journal being supported by readers and advertisers.

The promptness and enterprise of those in the supply trade, in this matter, as shown by our advertising pages, certainly proves a willingness on their part to do their full share towards making a first-class paper. With a similar response on the part of street railways, in the way of subscriptions, the encouragement will be all that we could ask, to make a journal in every way creditable to the street railways of America.

Our Editorial Policy.

The editorial policy of the new STREET RAILWAY JOURNAL will be to make the paper not only interesting and instructive, but *essential*, to street railway men; to avoid puffing and the publication of stale matter and copied items. The phenomenal success of *The American Journal of Railway Appliances* is in a large measure due to the unswerving adherence to such a policy, as announced in its initial number. By making the paper A No. 1 for the subscriber, the advertiser will be benefitted in the long run and even in the short run, more than by running a write-up sheet, with neither news, nor opinions, nor self-respect.

We call upon all interested to help us make the new paper a success; and can promise good-will in return.

Third Annual Convention.

The recent Convention of the American Street Railway Association was emphatically a success. There were able and exhaustive reports of committees on the various subjects assigned, and intelligent discussions on the reports. There was a remarkable increase in membership. The interest manifested was certainly gratifying to those who have the well-being of the association at heart, and who have labored for its success.

Coming Articles.

We have in type or on hand articles as follows:

The National Cable Railway System.*
 Demorest's Duplex Register.*
 Accidents on Cable Railways.
 Resistance to Traction on Tramways.
 Record of a Remarkable Horse, by Aug. W. Wright, C. E.
 Street Railway Joints, by Aug. W. Wright, C. E.
 Mr. I. Watson, President of the Buffalo St. R. Co., has kindly promised articles on Salt or no Salt.

Heating Cars (negative).
 Interchangeability of Tickets (*i. e.*, all Street R. tickets good in any town).
 Mr. Wm. J. Richardson, Sec'y A. S. R. Association, is good enough to promise a communication on Fare Collecting.

Mr. W. W. Hanscom of San Francisco, will have some practical things to say about Cable Railways, and we have good hopes that Mr. Jas. K. Lake, Supt. Western Div. R. R., Chicago, will give us "points" enough to make some very interesting articles.

*Illustrated.

Our Contents.

The lack of variety of matter in this issue of the STREET RAILWAY JOURNAL is due to the large amount of space given to the very interesting reports presented, of the Convention.

Convention Proceedings.

We regret that up to the moment of going to press, the oral discussions of papers and the complete minutes of

proceedings of the convention are not ready for publication, and the only matter which we have been able to get from the secretary is the test of the reports and the discussion on the "salt" report. This annoyance to the secretary and the members is by reason of a misunderstanding in the matter of an official stenographer. The managers of this journal had provided an expert stenographer in the expectation of his being permitted to take notes. The association having decided that all reports should be made by the official stenographer, we relied on the latter.

Owing to the failure of the official stenographer to hand in his manuscript to the secretary, from whom we expected to receive them, we prefer publishing in this our initial number little else than some of the reports, as it is our intention to make the STREET RAILWAY JOURNAL, in its publication of matter coming from, or relating only to, the American Street Railway Association, practically, official, while preserving its complete independence of that body.

Crowding Cars.

There are some managements which have the good sense and keen business perception to see that it pays better to afford passengers at least plenty of room to stand, than to have them packed like herrings in a box; and that to give each passenger a seat pays better yet. Of course, there are times and unforeseen occasions when it is impossible to have a sufficient supply of cars on hand, and this is particularly the case on long lines. But we know of instances of rival parallel lines, running about the same distance and to about the same terminals, one of which lines generally manages to seat all its passengers, and the other does not, although the first line carries nearly double the passengers on extra occasions, and has about the same number of cars. The superintendent of the first line "watches the weather," and inspects the returns for the various hours of the day. He knows about how many people are out; when they will be likely to return in fair weather; and how fast they will crowd in if there is bad weather. His conductors have plenty of time and room to collect all the fares, and the road is made popular.

Choice of Stock.

We would suggest, as a good subject to discuss, the character of stock to be purchased; whether it pays best to buy heavy or light animals; young or old; compact or otherwise, etc.; there is certainly something worth thinking about when we consider the contrast between the magnificent Percheron stallions run by the Tramway and omnibus lines of Paris, or the fine stock between the shafts of the hansoms in London, and the "scrubs" which veterinary surgeons are expected to keep in perfect health and condition in many American street railways. It either pays, or it does not pay, to run good stock; whether it does or not is worth finding out by inspection of the records and comparison of notes and opinions through our columns, and if there are no records the notes and opinions will

have to do for the present. But there certainly should be records; there is too much money at stake for the owners of many horses not to have records of cost, maintenance and performance of each animal. If it pays a steam road to keep a history of each car-wheel from the first time it chews rail-heads until the last moment when the rail-heads rasp off its flange beyond the safety limit and the possibility of making more flange by lessening the tire thickness; then, we say, it will pay a street railway to

into him. This is cold business; shrewd and profitable, and what some people would consider as foolish, or complex, or costly, is bound to bring the ducats.

Power to Run Cable Roads and Resistance on Tramways.

ED. STREET RAILWAY JOURNAL:—

The Mining and Scientific Press, of San Francisco, in its issue of September 3d, 1881, gave the following table:—

RAILWAY APPLIANCES of October 15, on the origin of the word "tramway," I note that the *Mechanical World*, of London, Eng., thinks it proper to scout the popular and widely accredited derivation for a vague insinuation of its own, that it comes from the same root as trammel, and is probably something French.

Now is it not anyway rather splitting hairs to trace a resemblance between a trammel and a tramway?

In the county of Derby, Eng., is the village of Little Eaton, which is the terminus of a branch of the Grand Junction Canal.

NAMES OF ROAD.	CLAY STREET HILL R. R.	SULTER STREET R. R. Co.	CALIFORNIA STREET R. R.	GRAY STREET R. R.
Commenced operating	September 1, 1858.	January 27, 1877.	April 9, 1878.	February 16, 1880.
Length of Road, Double Track.	5,300 feet.	On Sulter st., 13,291 feet On Larkin st., 3,712 "	12,651 feet.	13,200 feet.
Heaviest Grade.	307 feet in 2,800 feet.	167 feet in 4,300 "	265 feet in 2,800 feet.	83 feet in 1,925 feet.
Number of Engines Employed.	Two.	4 on Larkin st., 2 on Cemetery ave.	Two.	Two.
Dimensions of Cylinders	14 x 28 inches.	12 x 24 inches.	22 x 36 inches	18 x 48 inches
Piston Speed per minute	532 feet.	340 feet.	540 feet	368 feet.
Number of Boilers	Two	Six.	Thin fire-box	Thin steel.
Diameter and thickness of shell.	{ 16 ft. x 54 in.,—5-16 thick } { 16 ft. x 48 in.,—5-16 " }	{ 2 each, 54"x16"—3/8 thick } { 3 " 48 x 16 " 3/8 " } { 1 " 52 x 16 " 3/8 " }	57" diameter, 7-16 thick.	{ 52" diameter, 16', 0" long, } { 3/8 thick. }
Number and size of Tubes	{ 42—3-inch. } { 56—3 1/2 " }	{ 53—3-inch. } { 53—3 " } { 58—3 " } { 49—3 " }	81 tubes, 3' dia., 12', 0" long	63 tubes, 3' diameter, steel.
Average pressure in Boilers	67 1/2 pounds.	100 pounds.	70 pounds.	65 pounds.
Pressure necessary to move empty rope.	16 "	40 "	15 "	9 "
Consumption of coal per day, and kind.	3,700 " Wallsend.	24,600 " Seattle Nut.	15,680 " Seattle Screen'gs	11,230 pounds Seattle Nut.
Weight of empty car.	2,800 "	3,000 "	4,000 "	4,000 "
Weight of empty dummy.	2,100 "	2,000 "	3,000 "	4,800 "
Intervals of departure	3 to 5 minutes.	4 minutes average.	5 minutes average.	2 1/2 to 6 minutes.
Average Number Round Trips per day	221	253.	226.	225.
Cars and Dummies employed	7 of each.	14 of each.	14 of each.	16 week-days, 20 Sundays.
Hours run per day	17 1/2	19 1/2	19.	19.
Number of wire ropes in use.	One	4—Sulter st., 3, Larkin st., 1.	Two.	Two.
Lengths of Ropes used.	11,000 feet.	{ 11,587 feet. } { 7,849 " } { 9,800 " } { 8,500 " }	{ 8,840 feet. } { 17,055 feet. }	16,600 feet. 11,000 feet.
Circumference of Wire Ropes	3-1-16 inches.	3 inches.	4 1/2 and 4 inches.	3 inches
Kind of Ropes	Crucible Steel. { 6 strand } { 19 wires }	Crucible Steel, { 6 strand } { 19 wires }	Norway Iron.. { 6 strand } { 19 wires }	Crucible Steel. { 6 strand } { 19 wires }
Speed at which Rope travels.	528 feet per minute.	431 ft. p. min.; 786 ft. p. min.	537 feet per minute.	600 and 650 feet per minute.
Average life of Ropes.	547 days.	204 days.	373 days.	274 days.

keep a record of each quadruped, from the time he first enters the stable until he is carted off in the dead van. How much he cost, his average amount and cost of food, attendance, medicines, shoeing, insurance, interest, taxes, etc.; all those things which pertain to him alone, or differ from the same items for his mate, should be considered in connection with the number of days and miles service, and if possible in connection with the number of passengers whom he has hauled or helped to haul. One horse may be an easy keeper but not equal to hauling on a heavy car over a long route; another horse may be a perfect hog at the feed-trough but never in the sick-box, and so on.

The idea of keeping a record of cost and performance of each horse may be scouted at as involving complications and expense. So does keeping a cost book in a machine-shop or car-shop; but that pays. I have a friend in France, who, in connection with an immense establishment for distilling alcohol from sugar beets, has about 1,500 sheep and neat cattle constantly on hand to be fed on the pulp from which the juice has been expressed. Each animal eats about one-tenth of his weight of pulp daily. My friend buys the leanest steers he can, weighs each one, marks the weight on one of the horns, and weighs each steer twice a week. When a steer has ceased to gain in weight by the time of each successive weighing, he is sold at once. He is regarded as a machine for converting pulp into beef, and when the machine ceases to make beef, not a pound more of pulp is put

Mr. D. J. Miller, the Mechanical Engineer of the Chicago City Railway, in a communication to the *A. R. R. Journal*, March 3d, 1883, stated that the mere power required to operate the cable on that line is as follows:

At 6 p.m., when traffic is heaviest. 215 H. P.
For machinery and cable (no cars running). . . 138 "
For driving machinery and engine (no cable) 23 "

Concerning resistance to traction, Mr. Charles E. Emory made dynamometer tests on curve of 40 radius, and found it 53.57 lbs. per ton. On straighter track level 11.8 lbs. per ton. I presume the latter was on a "centre-bearing rail," the head of which is cleaner than the "step-rail."

In 1880 I made a hundred or more tests with a Fairbans' dynamometer, and found the force required to keep a car in motion at five miles per hour on an old track, 32.3 pounds per ton; on new steel rails, 29.8 pounds per ton.

D. K. Clarke in his work on Tramways, gives 30 pounds per ton as the average for English roads. Henry P. Holt, 22.4 pounds per ton. M. Turner, 22.4 pounds per ton. You quote the experiments of Mr. Hughes.

This force varies between great extremes, depending upon the kind of rail, the condition of track, good or bad joints, clean or covered with dirt, etc., etc.

For steam railroads on "T" rail, clean and level track, this resistance is estimated as slow speed (5 miles per hour) at 6.1 pounds per ton. See Catechism of the Locomotive.

The above figures will therefore convince one that the resistance to traction on our tramways is from 4 to 5 times as great as upon steam railroads.

AUGUSTINE W. WRIGHT.

Chicago.

The Derivation of "Tramway."

ED. JOURNAL RAILWAY APPLIANCES:—
Referring to the article in JOURNAL OF

About seven miles from Little Eaton are the Kilbowra and Derby Collieries, in which, in years gone by, a certain Sir Francis Outram had an interest, and in order to facilitate the transportation of the products of those collieries to the canal he caused to be constructed a railroad, then called an "Outramway," and since corrupted into "Tramway." The trucks to run upon this Outramway had four flangeless wheels. The rails first used were of wood, and were afterwards changed to L shaped iron ones laid on the stone sleepers.

I believe it has always been credited to Derbyshire as having been the scene of the first Outramway or tramway. This tramway is still in use, and any one who cares to follow up the history of it will find it substantially as stated. For nineteen years my home was but 2 1/2 miles from this tramway, and I frequently saw it, and I learned its history from some of the "oldest inhabitants" as well as, like you, having read its history in my "curious youth."

I am yours very truly,

JAMES E. GREENSMITH.

Mason Machine Works.

We thank our correspondent for his communication on the subject of the etymology of "tramway." Our own information that the word was shortened from Outramway was got many years ago, probably from either Bourbaugh's admirable "Gleanings for the Curious" (now, we believe, out of print), or David A. Wells' "Things not Generally Known;" and these more particular data are most acceptable, because, not only confirmatory, but more explicit than our own. The only thing now that we wish to supply is as to the pronunciation of the proper name Outram; whether Ow-tram or Oo-tram; and on which syllable accented. If any one can supply this last-mentioned information we shall be very much obliged.

Only One Dollar.

That the STREET RAILWAY JOURNAL may be in the hands of every man actively engaged in street railway management the subscription has been placed at the very low price of \$1.00 per year. Please send in your name at once, and begin with Vol. I., No. 1.

Items.

THE RAILWAY REGISTER M'F'G Co., Buffalo & New York, have applied an eye signal to their Pond register by which the ringing of the rear bell of the car instead of the register bell is readily detected by the passenger.

THE STEINWAY & HUNTER'S POINT Railway Co. have bought P. J. Gleason's controlling interest in the Dutch Kills & Hunter's Point Railway, excepting the Calvary Cemetery line. Various improvements will be made, including material additions to rolling stock and live stock.

THE DETROIT CITY RAILWAY is being equipped with Lewis & Fowler's alarm passenger register.

ANDREWS & CLOONEY, New York, have just com-

pleted a number of street sweeping machines for the N. Y. Eighth Avenue road, a Pittsburg road and one or two others. They have recently made wheels for parties in South America, East Indies, Australia, England, &c.

THE LEWIS & FOWLER M'F'G Co., Brooklyn, who has recently taken hold of Small's automatic fare collector, have placed it on the Brooklyn & Coney Island Railway, Memphis City Railway, and have substantial encouragement elsewhere. The roads on which the collector was already in use are the Louisville City, Minneapolis Street, St. Paul and Baltimore City railways, the latter having just given orders to complete its equipment.

THE RANDALL GEAR (Lewis & Fowler M'f'g Co.) is being introduced on various roads.

THE CHAPLIN MANUFACTURING Co., of Hartford, is introducing its frictionless roller bearing for street car journals. Tests during the past three years have given excellent results. H. M. S.

THE HOLYOKE STREET RAILWAY Co., Holyoke, Mass., is now operating two miles of track, making forty trips a day on five cent fares.

A new line, for tramway service, is under consideration between Chicopee and Chicopee Falls, Mass.

The Wales Manufacturing Co., Syracuse, is filling an order from New Orleans for its new design street-car fare boxes. It has just issued a tasty catalogue containing street railway statistics. H. M. S.

Some very interesting experiments have been made by the Salnon Water and Steam Heater Co., of Boston, showing economy of fuel and perfect and rapid circulation through the radiating pipes. In street cars this heater occupies no seating room. In steam cars it is placed underneath the car and the draft is regulated, grate shaken, and ashes are dumped from within the car. H. M. S.

Manufacturing Notes.

THE BROOKLYN CITY R. R. has just added 33 new cars built by the John Stephenson Co. They have the Vose spring and the Baker box.

THE RAILWAY REGISTER M'F'G Co., Buffalo and New York, has issued a very neat catalogue.

THE 42D STREET RAILWAY, N. Y., has just added some 35 cars for its extension. They are built by Stephenson and have Andrews and Clooney's wheels.

SCOGGAN HUDSON & Co., Louisville, Ky., sold to the Minneapolis Street Railway Co., 137 mules in March and 235 in June, the last lot being shipped to Minneapolis by special train via Penn. and C. M. & St. P. R. R.'s, making the fastest time on record for stock train. The trip was made in 38 hours, including one stop of 6 hours to feed.

Twice a Month.

\$3.00 per Year.



A PRACTICAL JOURNAL OF

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SAMPLES FREE.

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DAY'S IMPROVED STREET RAILWAY TRACK CLEANERS.

These Track Cleaners need no extended statement of their great superiority over all others invented. The fact of over two thousand pairs being now in use, is sufficient evidence of their necessity and utility. Are adaptable to all kinds of rails and styles of cars. To secure the largest benefit they should be attached to every car in use.

For new catalogue and price list, address,



AUGUSTUS DAY,

74 STATE STREET,

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THE BELLE CITY FEED CUTTER

IS THE

Strongest, Most Durable,

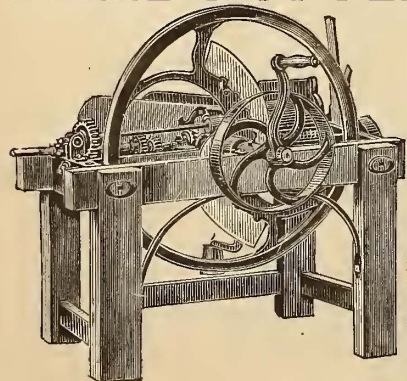
and on the the whole it is the

BEST FEED CUTTER IN THE WORLD.

For Street-Car Barns it has no equal. Write for Reference, Circular, &c., to

THE BELLE CITY M'F'G CO.,

RACINE, WIS., U. S. A.



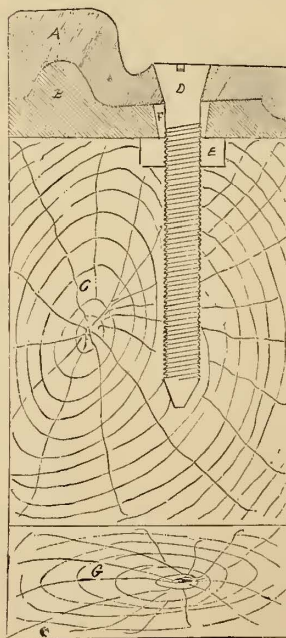
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Hot Forged and Cold Hammered, Pointed, made of best Norway Iron, and warranted. Used on principal Street Car Lines in the United States. Special Patterns for Perkins', Burden's, Goodenough & Brydon's Horse Shoes. Samples and prices on application.

DURRIE & McCARTY, Agents,
97 Chambers St., New York.

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.

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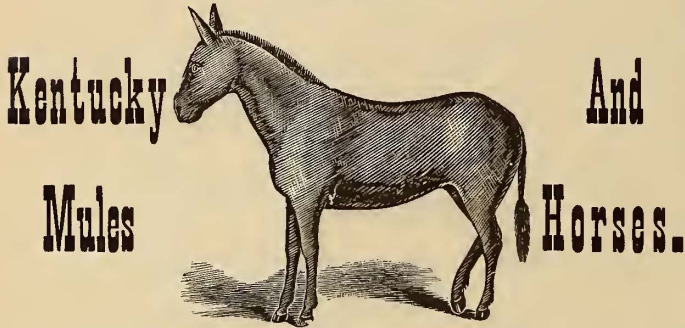
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Having furnished Horses and Mules to the Street Railway Companies of Louisville, Ky., Minneapolis and St. Paul, Minn., New Orleans, La., Pittsburgh and Philadelphia, Pa. Richmond, Va., Atlanta, Ga., Chattanooga, Tenn., and a large number of other towns in the United States, we are thoroughly acquainted with what is wanted, and can fill orders promptly, as we always have

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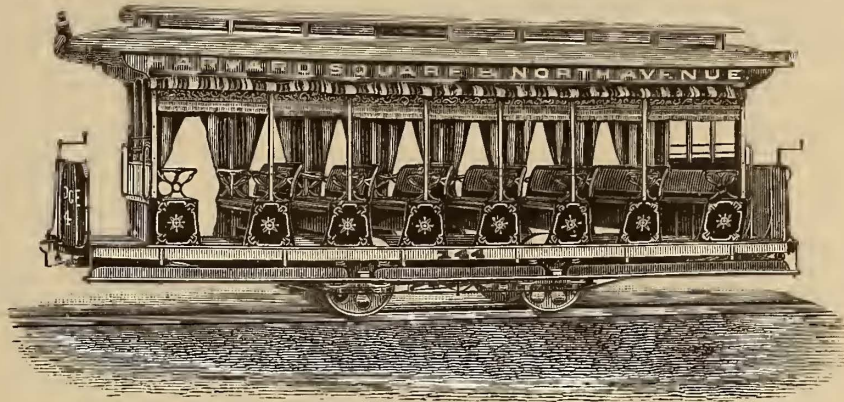
SEPTEMBER, 1883,

A Partial List of Awards Heretofore Given Valentine's Varnishes:

International Exposition, Philadelphia,	- - - -	1876
BRONZE MEDAL AND DIPLOMA.		
Exposition Universelle, Paris, France,	- - - -	1878
SILVER MEDAL.		
Melbourne International Exposition, Melbourne, Aus.,	- - - -	1880
SILVER MEDAL AND FIRST ORDER OF MERIT.		
Adelaide Exposition, Adelaide, So. Aus.,	- - - -	1881
SILVER MEDAL AND FIRST DEGREE OF MERIT.		
American Institute, of the City of New York,	- - - -	1859-1870
SILVER MEDAL AND DIPLOMA.		
Maryland Institute for the Protection of Mechanic Arts,	- - - -	1873
SILVER MEDAL.		
Massachusetts Charitable Mechanics' Association, Boston,	- - - -	1860
SILVER MEDAL AND DIPLOMA.		
Mechanics' and Agricultural Fair Association of the State of Louisiana,	- - - -	1873
DIPLOMA.		
Agricultural Society of New So. Wales,	- - - -	1877
BRONZE MEDAL.		
Mechanics' Institute, San Francisco, California,	- - - -	1877
SILVER MEDAL.		

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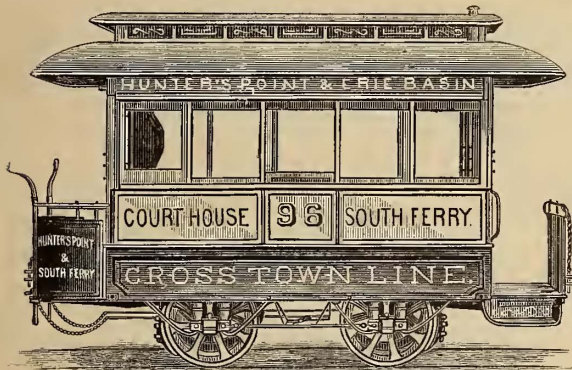
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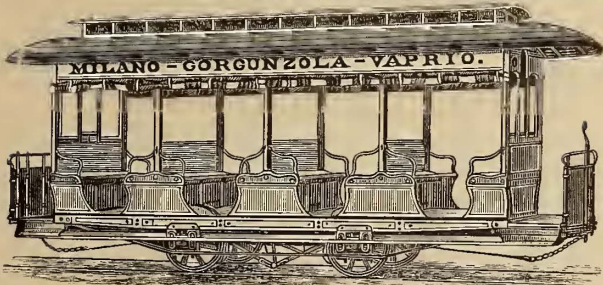
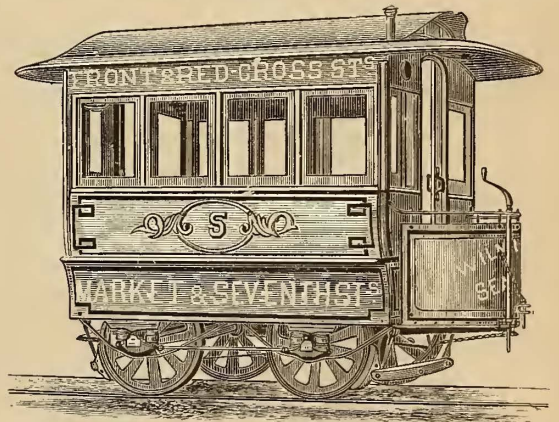
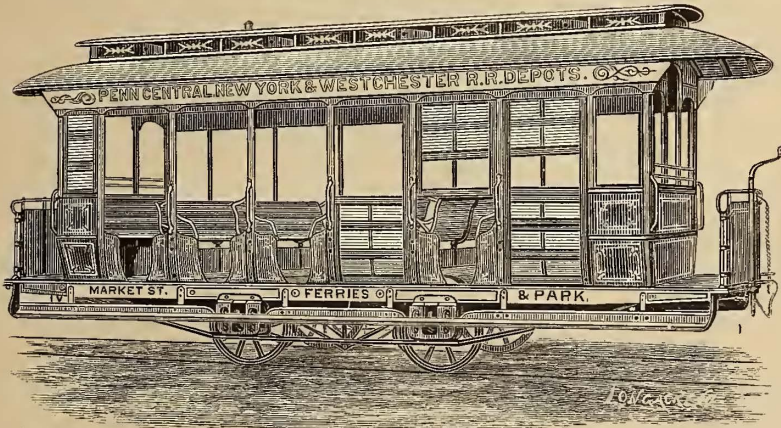
**TRAMWAY
CARS**

— AND —

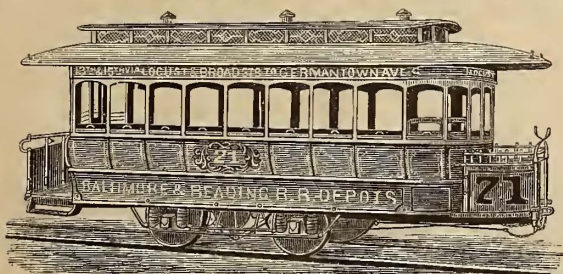
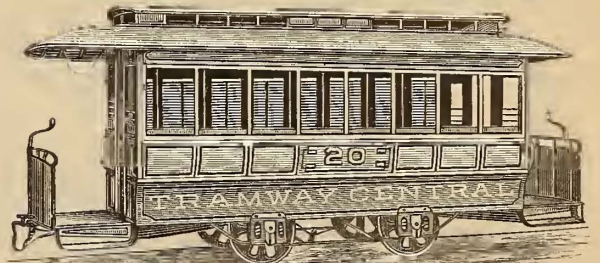
of all kinds.



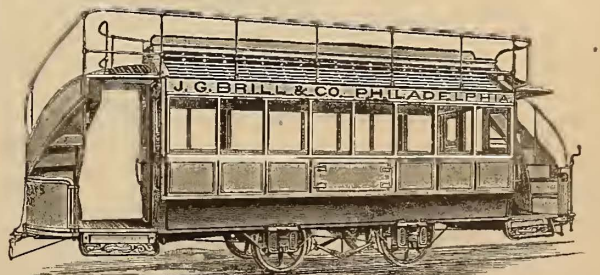
The
Construction
of which we
have brought
to a high degree
of
Excellence.



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BEST
Tram Car,



Chicago
Exposition of
Railway
Appliances,
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For Horse Railways, Omnibus Lines, Etc.

The Advantages

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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 Trugs 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 hoods 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.

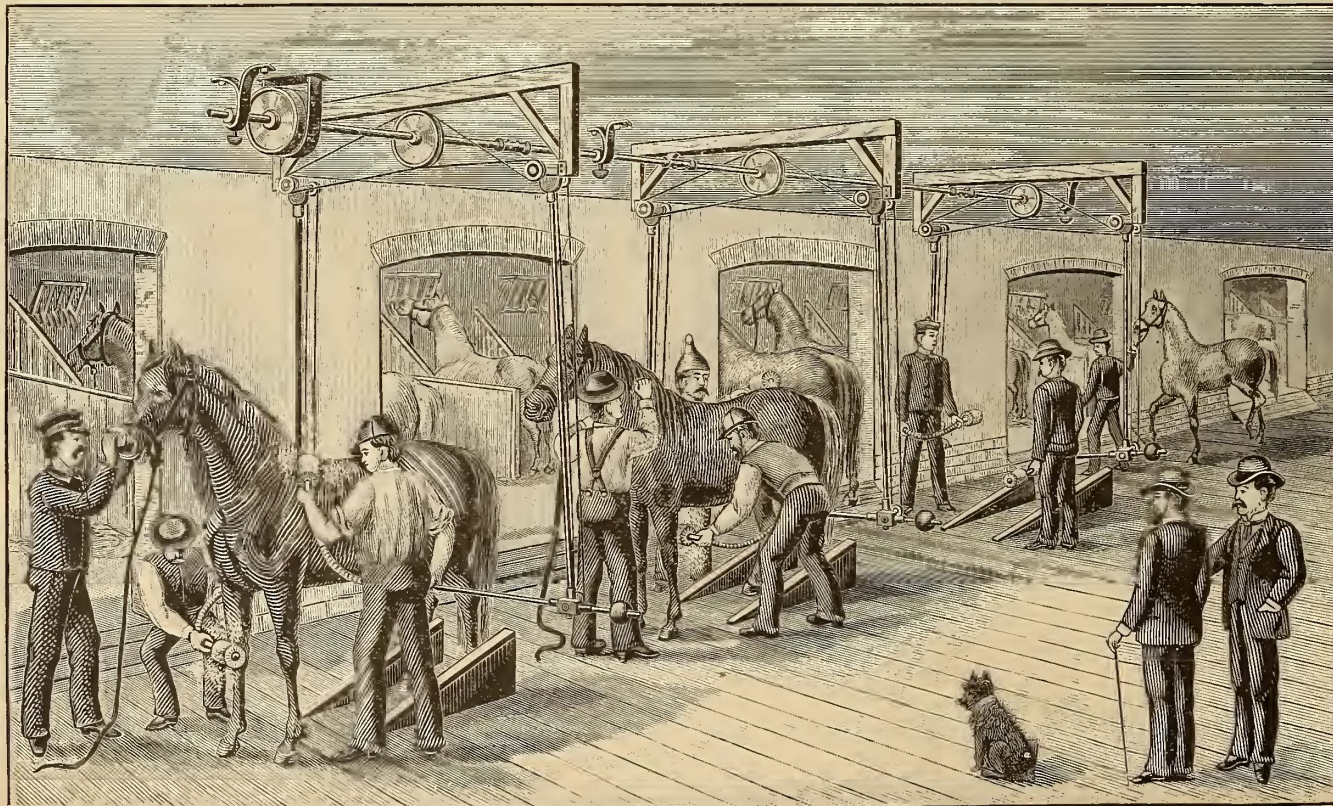


Patent No. 171,232, December 21, 1875.

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.



Patented December 15th, 1874.

Patented January 9th, 1883

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.

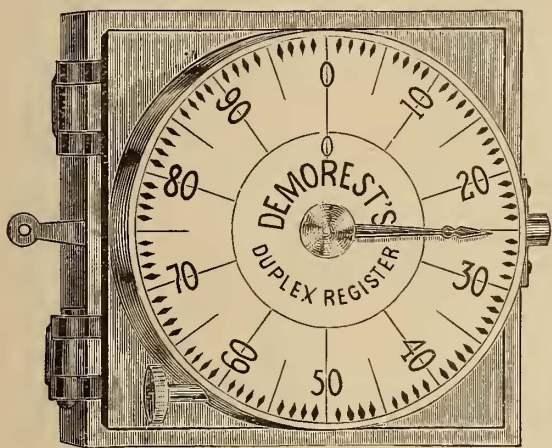
The Curry Comb and Hand Process Superseded! Economy of Labor! Perfection of Work!

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.

DEMOREST DUPLEX REGISTER AND FARE-BOX, FOR STREET CARS.



OUR INFALLIBLE DUPLEX REGISTER

Combines Simplicity, Efficiency, and Absolute Accuracy.

As each trip and each fare, when rung, is duplexed on an interior sheet that cannot be tampered with, the conductor is his own detective, collusion or fraud being impossible.

As an illustration of a practical and unanimous opinion, we present the following :

CLEVELAND, OHIO :

I have gone through a thorough examination and trial of the Lewis & Fowler's and other stationary Registers, and have been using in the past the Hornum or Punch Company's Register. After looking over the matter thoroughly, I am satisfied that the *Half Trips on the Paper Dial* is the right principle, and have therefore adopted the Demorest Duplex Register.

TOM L. JOHNSON.

NEW YORK :

The Demorest Duplex Register is an improvement on the one we are using, and is the best I have ever seen.

J. W. FOSHAY.

DES MOINES, IOWA :

The Duplex Registers we are using on our Cars are giving us entire satisfaction, and can cheerfully recommend them to do all you claim for them.

M. P. TURNER.

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,

OUR FARE-BOX WITH THE REGISTER.

Embodies the only perfect system for collecting and saving the Company ALL THE FARES on "One Horse" Cars without a Conductor.

1. The Register being part of the Fare-box, is in the most conspicuous place possible, in order to be noticed by the passengers.
2. It is the easiest to deposit the fares in, as the opening is larger than others.
3. It is impossible for the money to be taken out by an improper person : for
4. The box has no lock, therefore cannot (as others) be picked; and
5. There is no access to the Fare-box except through the Register.
6. The driver has more time to attend to his other duties when the Register is combined with the Fare-box.
7. Our system of trip slips is so effective and yet so simple in connection with the fare-box and register, that it cannot be surpassed.
8. There is an internal record on a dial sheet.
9. This dial sheet is removed from the Register once a day, with the money and trip slips They *must correspond*.
10. This method of tallying the fares assists both driver and receiver, and is a positive check on both, beyond the possibility of collusion.
11. The construction of the Register and Fare-box is simple, the parts are well made and will last. The material is of the best and mechanical adjustment perfect.
12. The Register and Fare-box can be quickly placed in position and ready for use by any mechanic.

W. JENNINGS DEMOREST,

R. M. ROSE, Manager.

15 East 14th Street, New York City.

FOR STREET CAR THE EUREKA FOLDING
WOOD MATS ARE THE CHEAPEST MOST PRACTI
CAL AND DURABLE HIGHEST REFERENCES GIVEN

Price per running foot, width to fit any car 90 cts. Net.

FOR FURTHER PARTICULARS ADDRESS

EUREKA ROLLING FLOOR CO.,

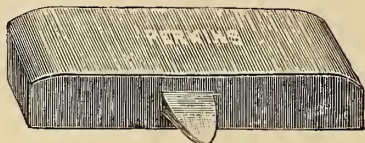
14 COOPER UNION,

NEW YORK.

Patent Rights For Sale.

PERKINS' TOE CALK.

JUST OUT.



The old style end prong Calks often cause shoes to break, as the prong is driven into the crease. Perkins' new Calk obviates this. They are cheaper than any others, and warranted to weld and harden. Special pattern for Street Railroad work. Samples and price on application.

DURRIE & McCARTY, Agents,
97 Chambers St., New York.

Fare Boxes and Change Receptacles

MADE BY

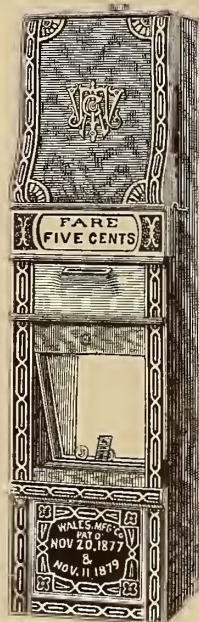
WALES MANUFACTURING CO.,

76 and 78 East Water Street,

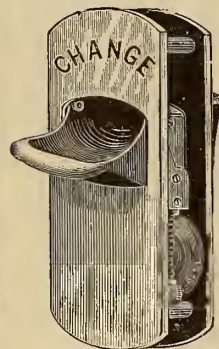
SYRACUSE, N. Y.

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.



Front View. No. 3.



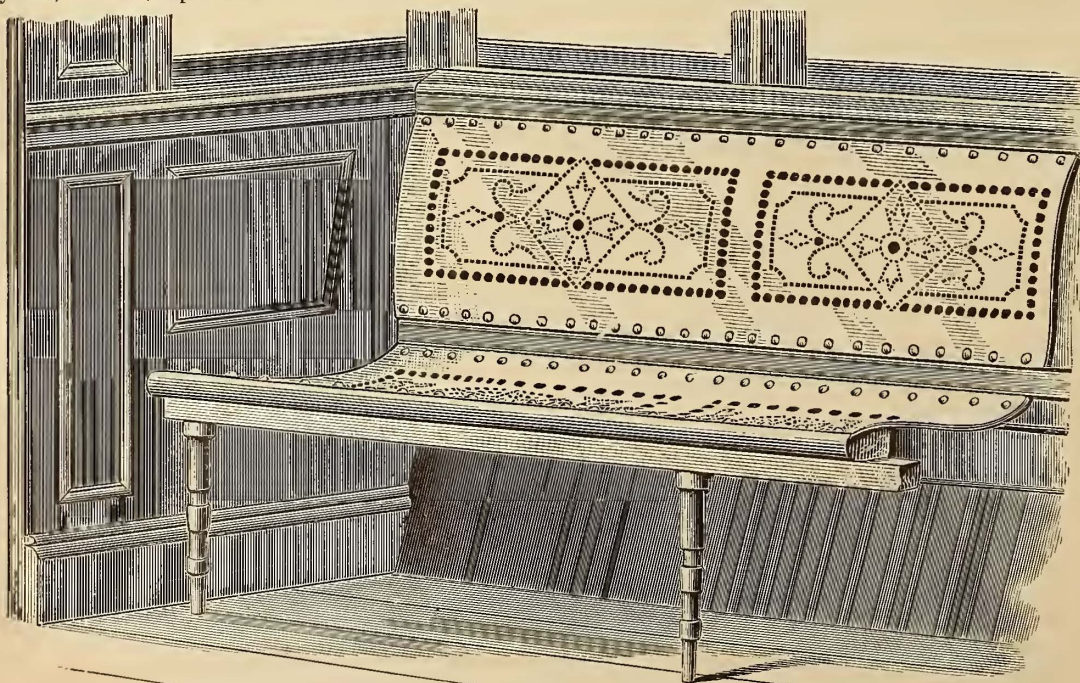
Back View. No. 3

STREET CAR SEATS AND BACKS.

This Seat and Back, so well known all over the world, has given much satisfaction. We cannot claim for it a merit which is not known and acknowledged.

It will recommend itself for its **lightness, cleanliness, healthfulness and beauty** as an ornamental seat; is also indestructible by moths, the great enemies of upholstery, and will not harbor vermin or insect, or carry or communicate contagion or disease.

On account of its cheapness and durability it is the most popular Seat in the market, and our trade in this line has grown, in nine years, to vast proportions.



To avoid trouble and mistake, our patrons in ordering will give length of inside of car, number of windows, width of back and depth of seat.

The woods used in construction of our Seat are **Birch, Walnut and Mahogany**; the Birch is most generally used, but Mahogany makes a very handsome seat.

We are making three-ply **White Wood Car Sides**, the foot and main panel which adds greatly to the strength of the car, and will not split. We make them full length of car without a joint. Our **decorated or plain three-ply Veneer** panels for sides and ceiling of car adds greatly to the beauty and is the cheapest way of decorating cars and gives better satisfaction than anything in the market.

We are prepared to make panels for all parts of cars. We are also making car roofs which give good satisfaction. Send for blue print.

PERFORATED VENEER STREET CAR SEAT AND BACK.

GARDNER, HOLMES & CO., 183 Canal Street, New York.

TOM L. JOHNSON'S IMPROVED FARE BOX,

Patented October 14th, 1873.

Now in general use in Cities throughout the United States.

One of the principal merits of these Fare Boxes over all others, consists in the fact that the fares are not turned out of sight at once by the drivers, leaving nothing but the bare word and memory of the parties as evidence of the payment, thereby making it easy for deception to be practiced, even though an officer is on the car, and endeavoring to see that the driver is faithfully performing his duties.

The boxes are so constructed that the fares are kept in sight from one end of the road to the other, and at any point on the line an officer of the Company, or indeed any other person can tally passengers with the fares.

The glass fronts and drops render it so transparent that a person sitting in the further end of the car can readily count the fares and make the tally, without making himself conspicuous in the matter, if desirable.

The drops can easily carry from seventy-five to eighty fares, and can be counted without mistake, and counterfeit money can be easily detected.

These boxes are very simple in construction, being cleaned, when required, in five minutes.

They are lighted from an outside lantern (which is only on the car at night, and should be taken off during the day), giving an excellent light, for the fares can be seen almost as plain as by day.

When the box is put in a car it can not be taken out of the car or tampered with, unless the keys are obtained from the office, and can not be robbed without violence.

A new pattern of the Yale Lock is used, having no two keys alike, and the keys can only be withdrawn when locked.

ROADS EQUIPPED WITH BOXES ON TRIAL, and if not satisfactory, returned without any expense to the company trying them.

Boxes made of Mahogany, Walnut, or any desired wood, and being nickel-plated throughout, are **AN ORNAMENT TO ANY CAR**

Reduction in prices where two (2) boxes are placed in one car. "THE BEST IS THE CHEAPEST."

Address all correspondence to

A. A. ANDERSON,

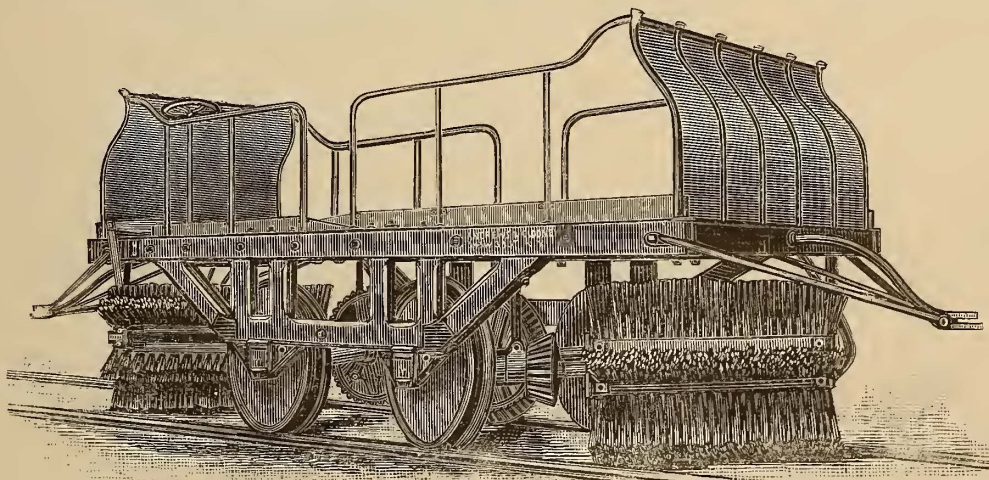
With Tom L. Johnson.

Indianapolis, Indiana.

F. H. ANDREWS.

B. A. CLOONEY.

ANDREWS & CLOONEY,



STREET RAILROAD SNOW SCRAPERS AND PLOWS.

WORKS:

545 WEST 33d STREET, 535 to 551 WEST 33d AND 538 to 552 WEST 34th STREETS, NEW YORK.

MANUFACTURERS OF

ELLIPTIC, SPIRAL, VOLUTE, CAR AND ENGINE SPRINGS

OF EVERY DESCRIPTION.

CAR WHEELS, AXLES, PEDESTALS, BRAKE SHOES, 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.

SEND FOR ILLUSTRATED CATALOGUE.

RAILWAY REGISTER MANUF'G CO. BUFFALO, N. Y.

BEADLE & COURTNEY,

General Agents.

1193 BROADWAY, NEW YORK,

— AND —

426 WALNUT STREET,

PHILADELPHIA, PA.

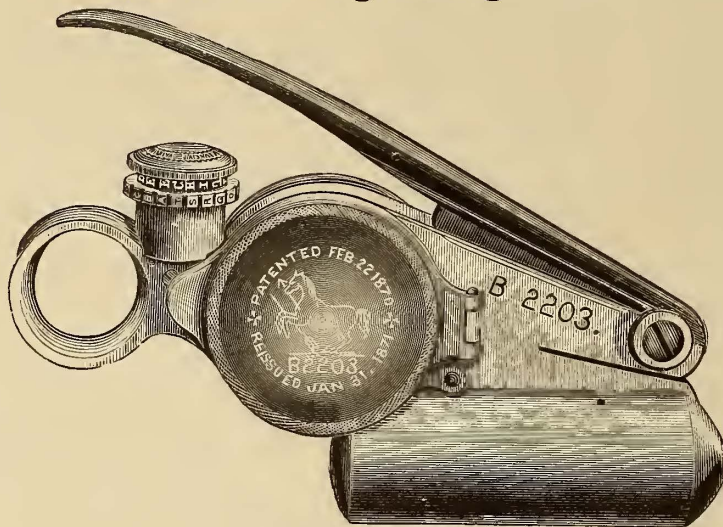


MANUFACTURERS AND OWNERS OF THE

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

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

The Alarm Registering Punch.



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

The Conductor is provided with Trip Slips numbered, of different colors for different rates of fare, on which he is obliged to punch out a number every time he receives a cash fare; there is a Register in the Punch

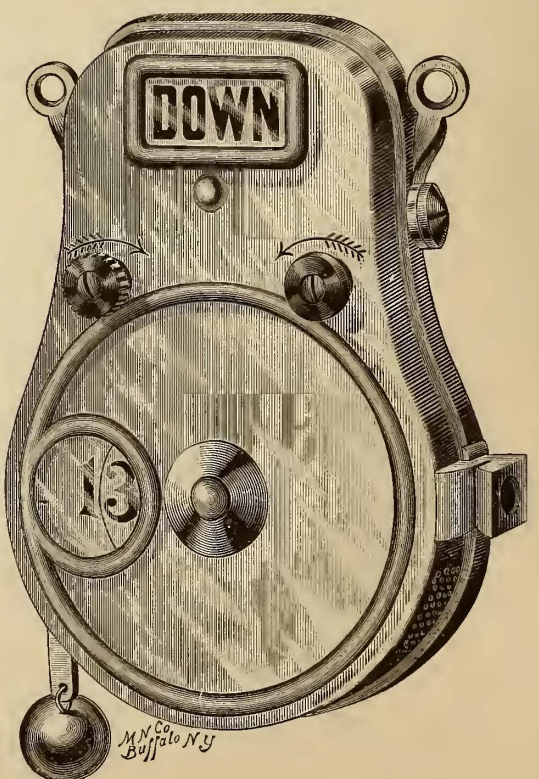
which records the number of times it is used; the Register and the receptacle for clippings are secured by a combination lock, which renders access to them impossible by any one unacquainted with the combination. When the Conductor renders his report to the office, he returns his Trip Slips, Tickets and Punch, and the Register Totals, Slips and Clippings must agree. Roads using tickets should not be without it.

This system has been found very perfect by the roads using it, some of the largest in the country.

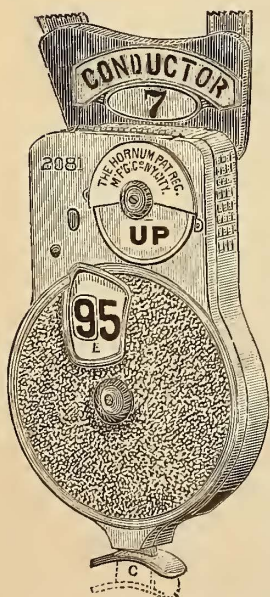
The Benton Register.

This Register, lately introduced, is a very perfect one; it is in use on several of the largest roads, and they express themselves as much pleased with it.

It shows a figure on front of Register for every cash fare or ticket taken, also has an indication plate, which the Conductor is obliged to turn at the end of the route, showing which way he is going, East, West, North, or South; the same movement also throws back the front Register to zero; the permanent Register records 1,000,000. It is also, when desired, provided with a Punch at side, to cancel passes or tickets, making in all a very perfect and handsome machine.



The Hornum Register.



This Register is similar to the Benton, and it is a perfect check, not only upon the Conductor, but being a perpetual Register, is thoroughly reliable as to the Receiver in your office—collusion being impossible. A comparison of the Register with the Conductor's or Receiver's books displays all errors at a glance, and not only so for the moment, but can be traced back to the first fare registered by each instrument, being always a reliable and infallible detective. It does not increase the Conductor's labors, as he has the free use of both hands; he can collect fares from either side of the car, make change, and register the largest loads any closed or open car can carry, as has been for many months proved; so that perfect attention can be given passengers, and every fare registered in a second of time. It does not add to clerical labor at general office, as the General Register does not require to be set; the Trip Register is so constructed that it must be set back to 0, and only to 0, each half trip by the Conductor, while it prevents him making any fraudulent manipulations. This Register shows at a glance at its general index the total fares collected during the day; this index cannot be altered a single fare, except the instrument be destroyed.

Its daily record proves the Conductor's report, and the Receiver's account at once. It does more, and what is perhaps of greater importance, it shows in plain figures in full view, the number of fares collected each half trip, so that passengers, time inspectors, or any one interested, can at any time or place compare the number of passengers with the Register.

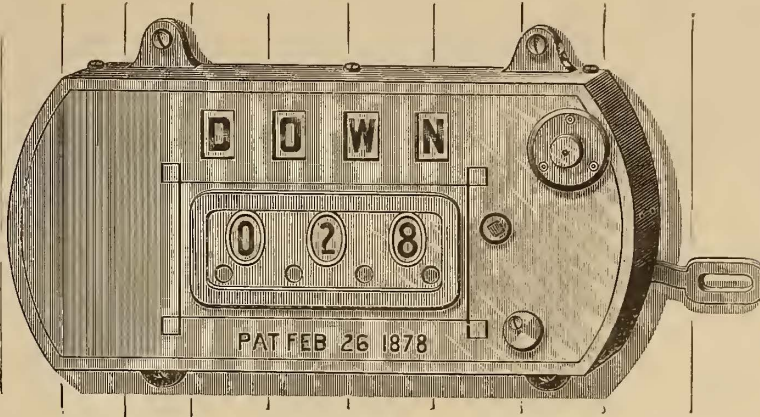
The Pond Register

This cut represents our Pond Fare Register with Indicator Plate. These machines are constructed so that at each pull of the lever an alarm is sounded, and, at the same time a record shows on the visible dials.

The permanent Register is viewed, when necessary, through the four small openings just below the visible Register; but when not being inspected the registration is covered by a slide, which is under the control of a lock and key.

The permanent Register records up to 10,000. Another peculiarity in this machine is the Indication Plate, which can be changed only when the visible Register is at 0. This device is intended to make it certain that a full transfer of the count of the visible Register has been made, as the plate cannot be changed until an entire transfer has been completed.

When it is absolutely necessary to set the visible Register back to zero at stated times, then this ma-



chine is invaluable, for it will show upon its face whether the change was made at the proper time.

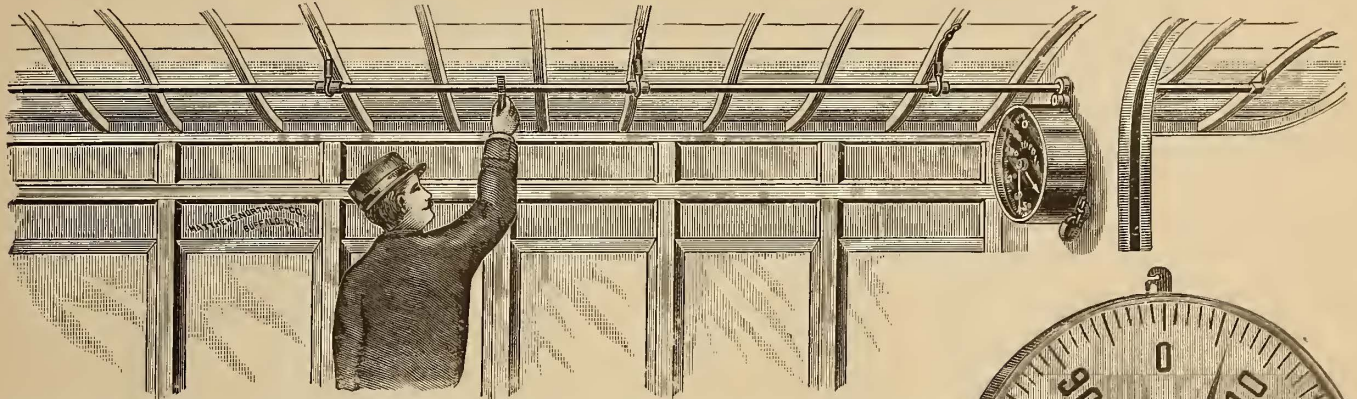
This machine is specially adapted for use on cars of Street Railways, to assist in the collection and proper returns of the fares collected. When used for this purpose the indication plate will show the direction the car is traveling, as Down or Up, or East and West, or North and South, and at the end of each trip the direction or Indicating Plate must be shifted, so as to denote the direction of the next trip or half trip.

This is done by turning a thumb-pin at the right hand upper corner of the machine, but before this can be done, the trip or visible Register must be first set back to zero.

This Register has been greatly improved, and we claim for it superiority over all permanent Registers now in use.

It is the only Register of its kind that shows a positive figure each time it is operated.

The Monitor Register



This Machine belongs to that class of Registers known as Stationary Registers; that is, the machine is secured in the car at one end, and connected with it is a small square rod passing through the car and out on the platform at each end, and as each fare is collected, the Conductor, by applying a wrench to the rod, records the fare. It can also be operated by a cord.

This Register is of the "Duplex" kind, and resembles a clock in appearance; the dial is divided into one hundred divisions and numbered prominently; a long hand or pointer moves over this dial, and records the fares taken on each trip. A smaller hand, in connection with a hundredth disk, records the totals, and constitutes what is known as the "Permanent Register" or Register of Totals. The Trip Register is set back to zero at the end of each trip by a key.

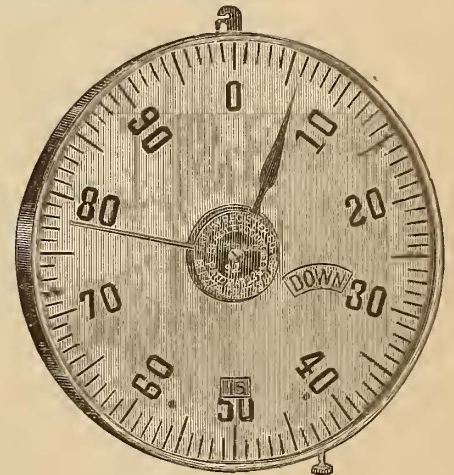
This machine is a very strong, durable Register, and when there is but one rate of fare to be recorded, it is one of the best Registers of its kind. The Conductor can record the fares on the platform as well as in the car.

This machine has a large bell, which can be distinctly heard from any part of the car. It also has our Up and Down attachment, a very valuable feature to a fare Register.

The cut herewith, shows the position of the Monitor in the car, and the Conductor about to record the fare he has just collected.

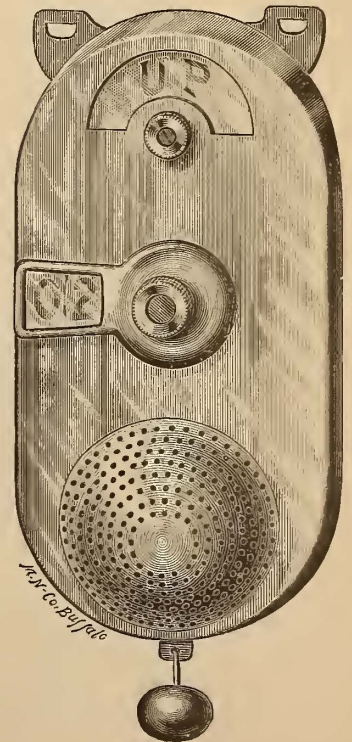
The rod connection used with this Register, can be applied to the Pond Register. We make all kinds of connections to be used with our machines, suitable for one-horse Cars, Omnibuses, etc.

This Register has also been lately improved and enlarged, it now has a ten inch silver dial, which enables the figures to be seen from any part of the car. If desired it can be operated with a cord instead of the rod connector.



Chesterman Register

These cuts represent the CHESTERMAN FARE REGISTER, now owned by this Company, as well as the patents under which they are constructed, and is an excellent Register for either one or four fares for Roads that do not require their tickets to be canceled when taken by the Conductor.



BEADLE & COURTNEY,

General Agents Railway Register Manufacturing Co.

1193 Broadway, New York.

Branch Office: 426 Walnut St., Philadelphia, Pa.

J. W. FOWLER,
President.

THE

DAN'L F. LEWIS,
Treasurer.

LEWIS & FOWLER M'F'G CO.

8 COLUMBIA HEIGHTS,

Near Fulton Ferry.

BROOKLYN, N. Y.

PATENTEES AND MANUFACTURERS OF

THE IMPROVED "ALARM" PASSENGER REGISTER.

This Register was awarded *and has received* the Highest Prize (Silver Medal) at the Chicago Exposition of Railway Appliances in 1883, against all competitors of any note for

"THE BEST STATIONARY REGISTERING DEVICE."

This Register is guaranteed to be the most

Complete, Durable and Perfect

Machine in this Country, for Registering fares on Street cars. We are now manufacturing a

Portable Register

for Railroad Companies desiring a machine of this style where tickets are required to be Cancelled and Registered at the same time.

SOLE AGENTS AND MANUFACTURERS OF

"RANDALL'S" PATENT CAR AXLE AND BOX,

—ALSO—

"SMALL'S PATENT AUTOMATIC FARE COLLECTOR"

FOR FARE BOX CARS. THIS DEVICE WILL SAVE MONEY NOW LOST AND POPULARIZE

THIS SYSTEM OF CARS.

RICHARD VOSE,

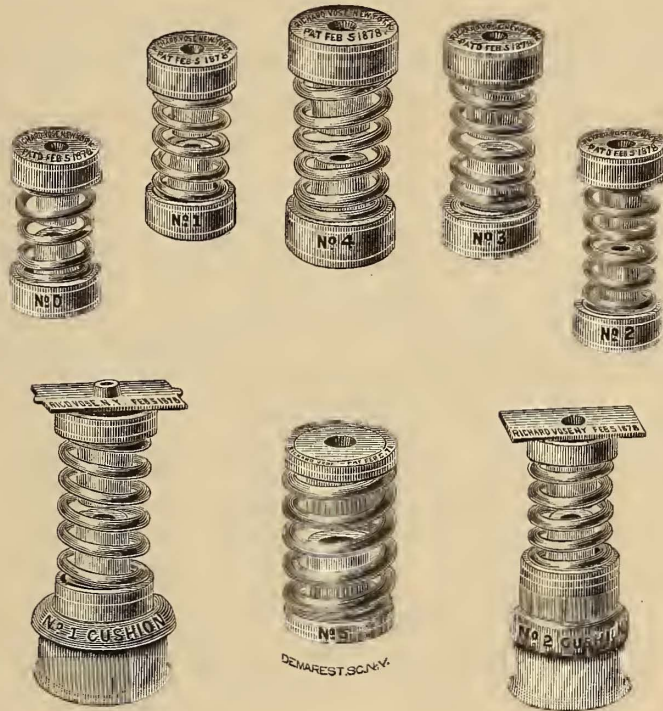
13 Barclay Street, . New York,

MANUFACTURER OF THE

Graduated Street Car Springs.

RUBBER CONE.

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. Light 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.

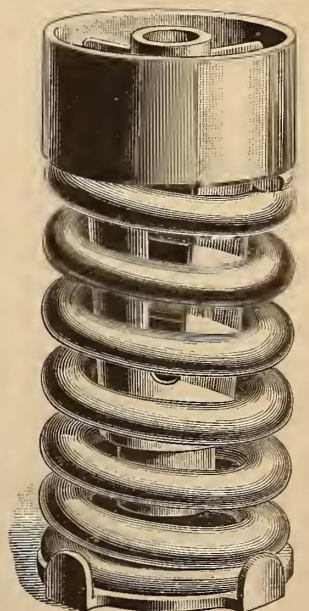
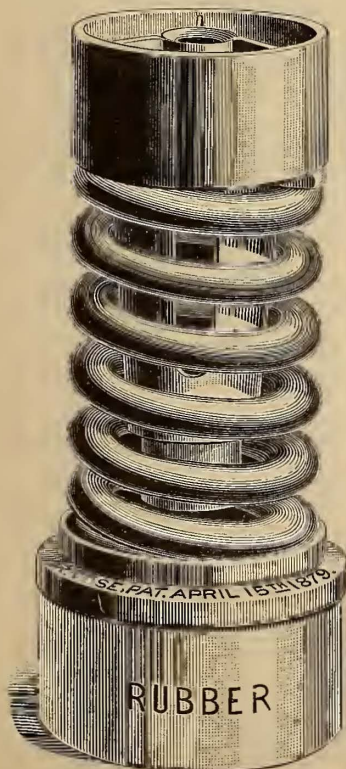
STEEL CONE CITY CAR SPRING.

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.

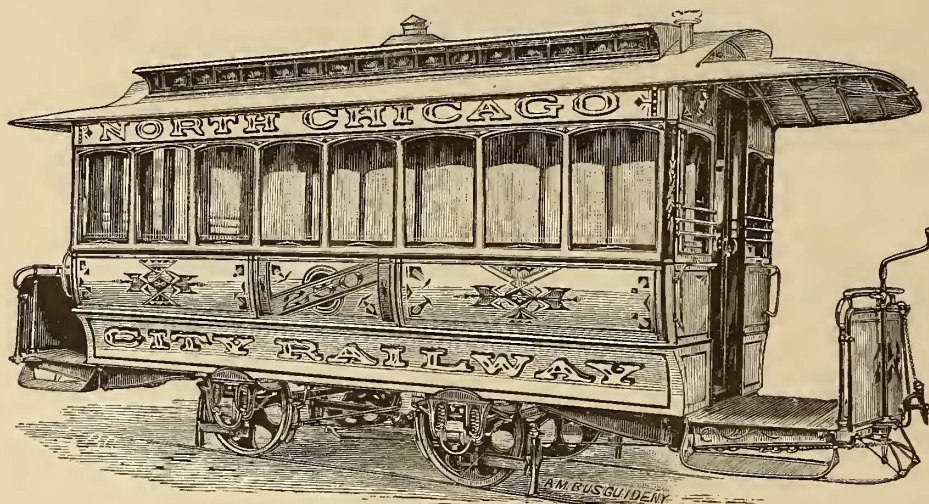


JOHN STEPHENSON CO.,

(LIMITED)

New York.

TRAMWAY CARS



LIGHT, ELEGANT, DURABLE.

Every Description.

Best Materials.

Minimum Prices.

ORDERS QUICKLY FILLED. CAREFUL ATTENTION TO SHIPMENTS.

All Climates Suited.