(No Model.) 4 Sheets—Sheet 1.

S. P. M. TASKER.

PNEUMATIC APPARATUS FOR THE PROPULSION OF VEHICLES.

No. 364,450. Patented June 7, 1887.

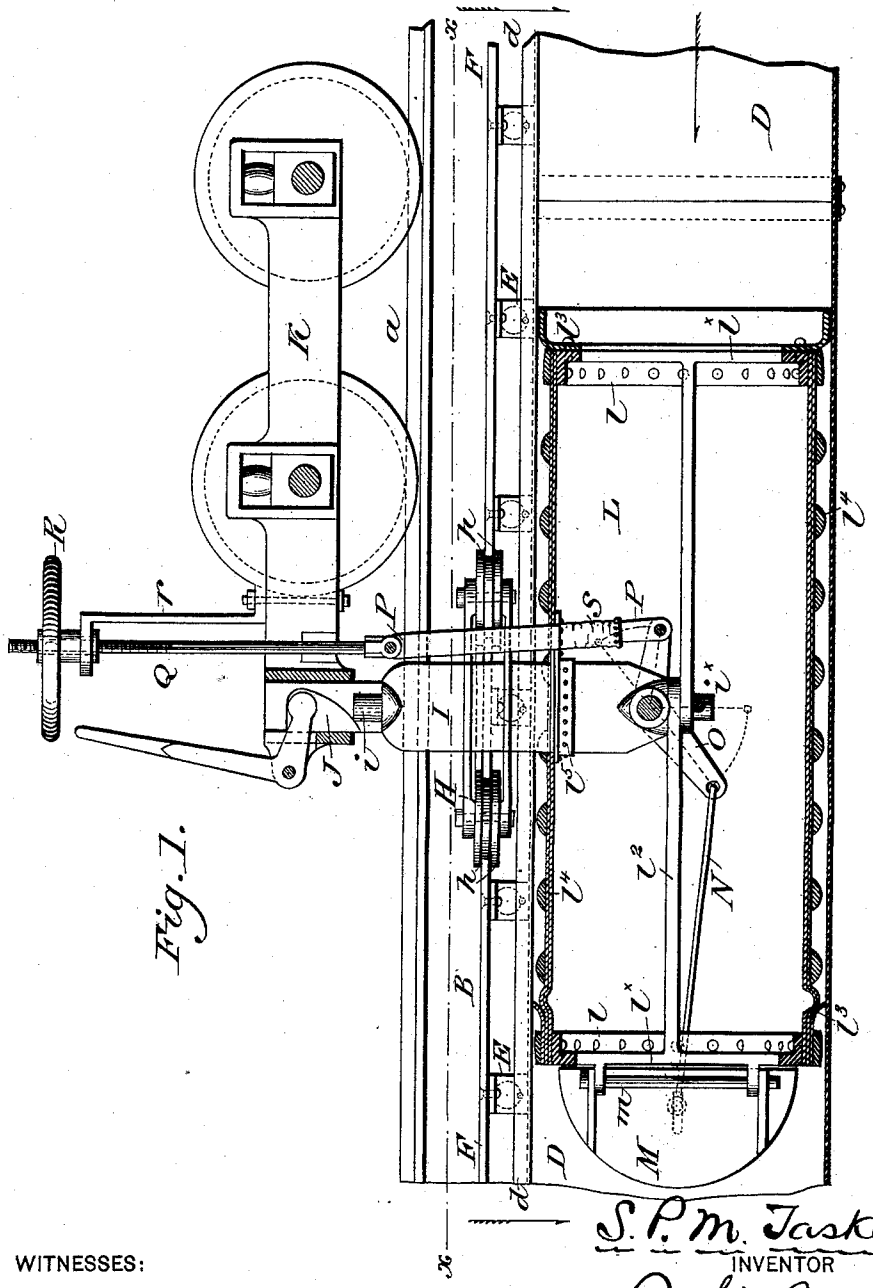


Fig. 1.

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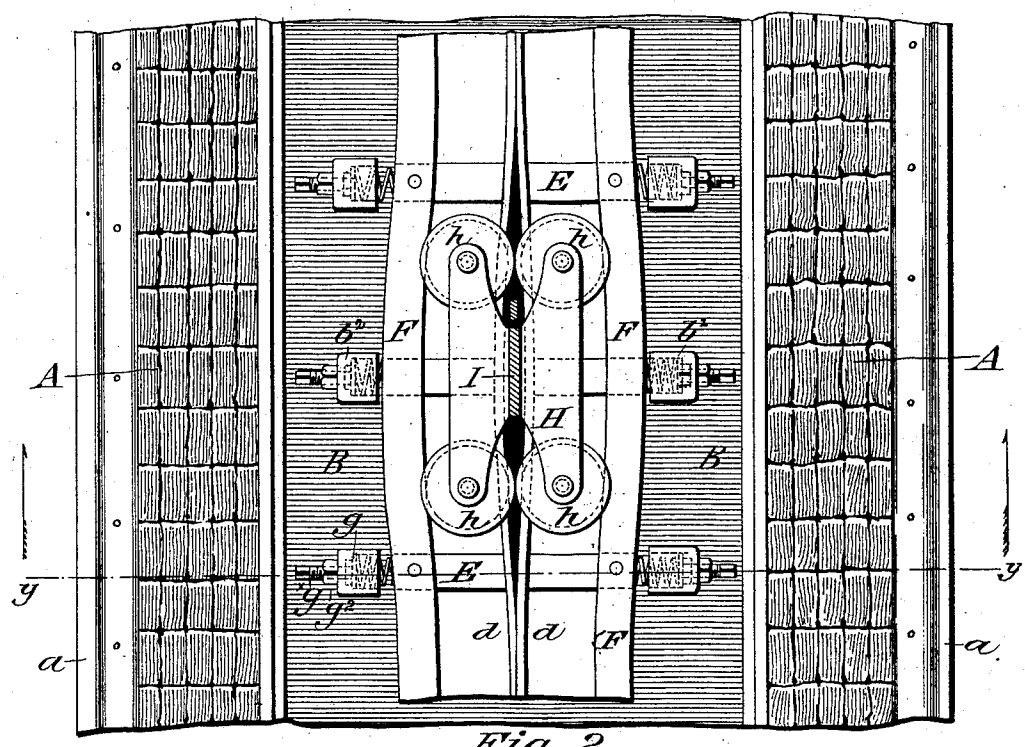


Fig. 2.

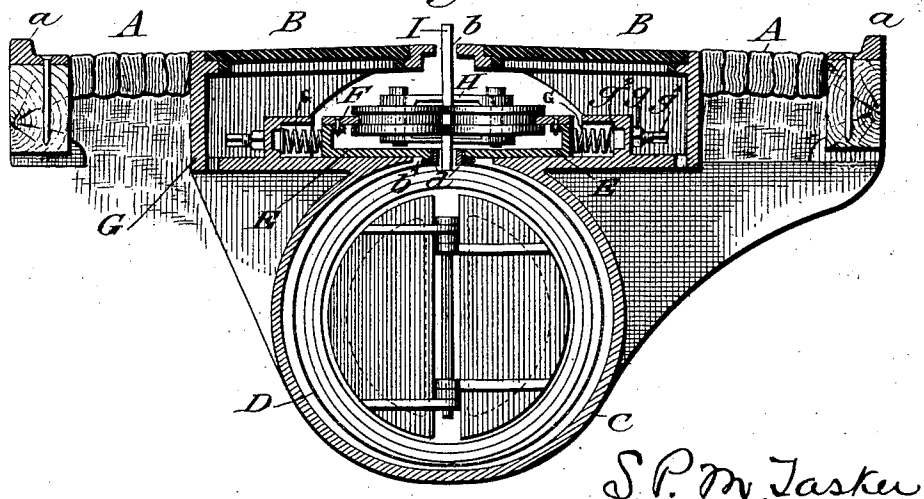


Fig. 3.

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PNEUMATIC APPARATUS FOR THE PROPULSION OF VEHICLES.

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Fig. 5.

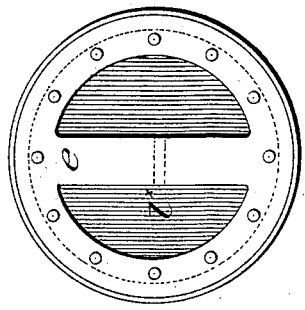
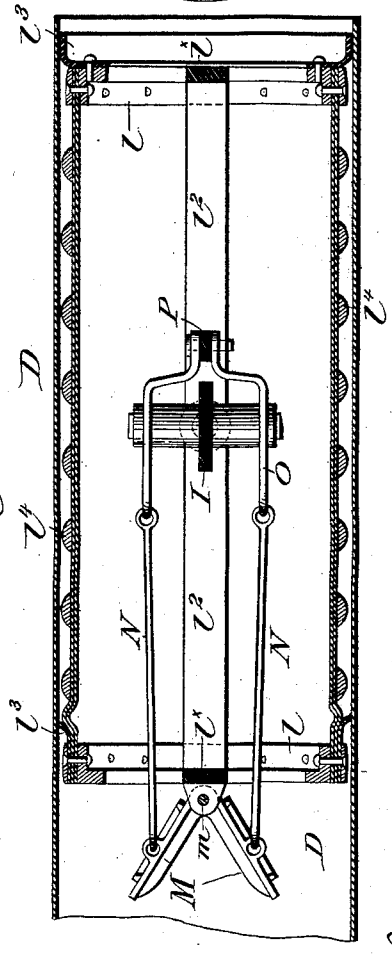


Fig. 4.



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PNEUMATIC APPARATUS FOR THE PROPULSION OF VEHICLES.

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Fig. 7.

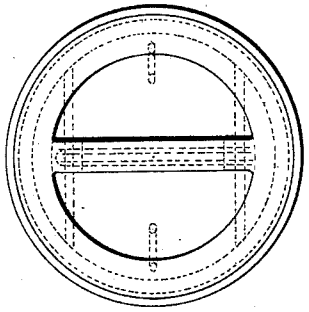
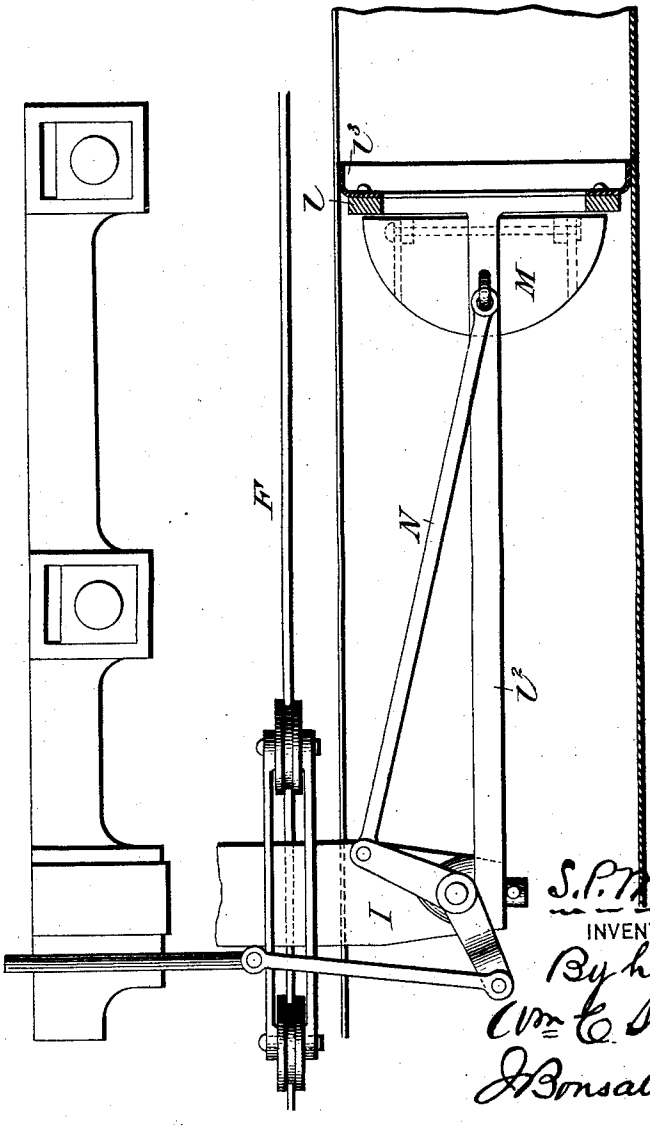


Fig. 6.



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UNITED STATES PATENT OFFICE.

STEPHEN P. M. TASKER, OF PHILADELPHIA, PENNSYLVANIA.

PNEUMATIC APPARATUS FOR THE PROPULSION OF VEHICLES.

SPECIFICATION forming part of Letters Patent No. 364,450, dated June 7, 1887.

Application filed October 9, 1886. Serial No. 215,796. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN P. M. TASKER, a citizen of the United States, residing in the City and County of Philadelphia, in the State of Pennsylvania, have invented an Improved Pneumatic Apparatus for the Propulsion of Railroad Cars, Elevators, and other Vehicles, of which the following is a specification.

Broadly stated, the object of my invention is the propulsion by pneumatic or kindred power of wheeled vehicles,—its especial applicability being as a substitute for horse, steam, cable, electric and other motive powers in the propulsion of street railway or tram-way cars, although it is equally applicable to the moving of elevator cars and other lifts.

Apparatus embodying a good form of my invention is represented in the accompanying drawings and described in this specification, the particular subject matter claimed as novel being hereinafter definitely specified.

In the drawings, which represent the device in employment with a street railway car truck, Figure 1 is a vertical longitudinal central sectional elevation through devices conveniently embodying my invention. Fig. 2 is a top plan view in the plane of the dotted line *x*—*x* of Fig. 1, the casing cover being supposed removed. Fig. 3 is a transverse sectional elevation through the casing and conduit of Fig. 1 in the plane of the dotted line *y*—*y* Fig. 2, showing the spreading truck, carrier, pneumatic tube, and conduit. Fig. 4 is a top, central, sectional plan of the pneumatic tube and contained carrier. Fig. 5 is a rear elevational, or right hand, end view of the carrier. Fig. 6 is a vertical, longitudinal, central, sectional elevation through a portion of the pneumatic tube, showing a modified form of carrier adapted for use when but one car is to be driven, and Fig. 7 is a right hand end elevational view of the carrier represented in Fig. 6.

Similar letters of reference indicate corresponding parts.

In the drawings, A represents a road bed upon which are laid two tracks or rails, *a*, upon which the wheels of the vehicle run. Between the rails, midway of the intervening road bed, is placed a cast or otherwise suitably formed rectangular casing B, the upper surface of which is either, as shown, flush with the road bed and forming a part thereof, or else is sunken and top-covered, and which is preferably of greater breadth than depth. A permanent cover slot *b* opens longitudinally through the central portion of the upper surface or cover of said casing. The floor of the casing is likewise longitudinally slotted with a floor slot $b^{\times}$ of greater breadth than the cover slot *b*. Beneath the floor of the casing, preferably as a connected part of the casing itself, is placed a longitudinally extending conduit C of cast iron, or other preferred material, to which the floor slot $b^{\times}$ forms a longitudinally extending top opening.

Within the conduit is contained a pneumatic tube or duct D of suitable elastic material, which in the case of a horizontal disposition of parts such as that now being described, is provided along its upper portion with a longitudinally extending slit which is in alignment with the floor slot $b^{\times}$ of the casing and the edges or lips of which are faced with packings *d* of rubber, or other soft or elastic material, which when firmly pressed and held together constitute the pneumatic tube an air-tight device capable of safe subjection to any such pneumatic pressure as the material of the walls of the tube is capable of withstanding.

It is to be understood that the casing, its cover slot, its floor slot, the conduit, and the slit pneumatic tube within the conduit, are each co-extensive with the length of the track upon the road-bed, and, in the form of construction represented, all sunken below the road bed, after the manner of the cable conduit of a cable road.

Within the casing and connected with the exterior faces of the continuous packings *d* which bound the edges of the slit in the pneumatic tube, are a double series of (considered with respect to longitudinal disposition) equidistant rail brackets E, each conveniently in the form of an angle iron, as shown in Fig. 3, which bear upon the floor of the casing, but are unconnected therewith so as to be adapted to be moved transversely thereon. Each series of these rail brackets, and by "each series" I mean such brackets as lie upon a given side of the casing is fixedly provided with a continuous spring rail F, the two rails being corresponding and preferably flat spring-bars coextensive in length with the length of the casing and contained therein.

The rail brackets E, as represented in the drawings, are disposed in opposing pairs, and when forced together by said pairs close together the packings which are applied to the respective edges of the slit of the tube and maintain the latter pneumatically tight. Many means for maintaining this closure of the edge packings of the tube, may be resorted to but perhaps the simplest are a set of spiral springs G adjusted to bear against the exteriors of the rail brackets and by their stress to normally maintain the latter together.

For convenience, and to permit of ready adjustment, I place these spiral springs within spring sockets b^2 erected within the casing, and provide each socket with an internal follower g controlled by an adjusting bolt $g^\times$ threading through the socket and controlled as to its set by a lock nut g^2. By the adjustment of the bolts the tension of the springs is regulated and the rail brackets maintained together at a given tension.

It will now be obvious that if the spring rails, which lie in the same horizontal plane, are spread apart by any instrumentality, they will occasion, to the extent to which they are sprung apart, the separation of certain of the opposing pairs of rail brackets, the opening to a corresponding extent of the slit in the pneumatic tube, and the compression of the rail springs G which bear within the range of their movement; and that when the instrumentality for spreading the rails is removed, the rails under the stress of the compressed springs, reinforced by their own elasticity, will re-assume their normal parellelism and close the slit in the pneumatic tube. The instrumentality which I employ to occasion this opening to a limited extent of the slit of the pneumatic tube is what I term a "spreading truck" H, the same being a device containing, in the form of apparatus represented, horizontal grooved wheels h,—two pairs of which are preferably employed,—which run between the spring rails or upon the inner edges of said rails, and being, by pairs, of a greater breadth than the normal breadth between the spring rails, serve, as the truck is propelled, to spread said spring rails to a limited extent both before and behind the truck.

The truck is, midway of its wheels, provided with a vertical yoke or carrier bar I which passes through both the cover and floor slots of the casing, and also through that portion of the slit of the pneumatic tube which is open by reason of the spread given to the spring rails by the truck itself which carries said carrier bar, as above explained.

Above the cover slot of the casing the carrier bar is adapted to be connected, conveniently by means of a pin i adapted to engage with a lever-actuated vertically movable plunger J, with a car K upon the road bed, as shown in Fig. 1.

It will be now understood that any longitudinal movement imparted to the vertical carrier bar is also imparted to the spreading truck and to the car upon the road bed with which said carrier bar is connected.

The device which I employ for moving the carrier bar is a pneumatic carrier or follower contained within the pneumatic tube, and well made when of the following construction, which is that represented in the first five figures of the drawings.

L is an elastic cylindriform bag or flexible tube of diameter sufficient to almost fill the pneumatic tube. This bag is provided with two end rings $l\,l$ of metal or other suitable material, each of which is conveniently provided with a vertical radial web $l^\times$ from each of which latter extends a horizontal connecting bar l^2, the two bars being centrally pivotally united, conveniently upon a pin $i^\times$ formed as a portion of the carrier bar. Each of the end rings of the carrier is provided with an elastic packing ring l^3 which makes tight union with the circumscribing pneumatic tube. The body of the bag or carrier proper is reinforced by external strengthening rings of metal or other material l^4, spaced apart a sufficient distance to prevent the body of the carrier from coming into contact with the internal faces of the pneumatic tube in its movement therethrough. The rear end ring of the carrier is permanently open so that air, or other fluid, forced through the pneumatic tube in the direction of the arrow in Fig. 1 has free access to within the carrier. The carrier bar at the region of its passage through the carrier proper is by any suitable means, as for instance by the application of an elastic collar l^5 Fig. 1, made air tight with respect to said carrier.

The vertical web of the front ring of the carrier is provided with two vertically disposed semi-circular doors M which swing upon a vertical hinge pin m, and are adapted to move in opposite directions,—either forward from the ring or back against it so as to close it completely,—under the influence of links N connected with a double arm bell-crank lever O conveniently pivoted to the carrier bar and controlled by a lever bar P passing up through the carrier, through the spread slit close to the carrier bar, and through the cover slit in the casing, above which it is connected with a threaded rod Q, or kindred operating device, connected with the car upon the road way and controlled for vertical movement in either direction by a hand wheel R threaded upon it and supported upon a suitable wheel housing r framed upon the car. The lever bar, which, of course, has vertical movement with respect to the carrier through which it passes, is made tight to said carrier by a packing bag S connected on the one hand at its lower portion with said lever bar and on the other hand at its upper portion with the carrier. When the hand wheel is operated to raise the threaded rod and lever bar and deflect the bell crank lever in such manner as to cause the closure of the doors, this packing bag is drawn up after the fashion of a bellows within the carrier, while it is extended into the position

shown in Fig. 1 of the drawings when the doors are opened.

It is to be observed that the carrier is of such sufficient length that its end portions, which are, as stated, provided with packings to bear against the inside of the pneumatic tube, are beyond that portion of the pneumatic tube the slit of which is spread apart by the operation of the spreading truck, and through which temporary opening, as explained, the carrier bar and lever bar pass.

Although such a carrier as that above described is perhaps the best form, and that necessary when a series of carriers is employed, it is obvious that it is not the only form to which resort can be had. Thus, for instance, in Figs. 6 and 7 I have represented a modified form of carrier equally well adapted to subserve the purposes of the invention when but a single carrier, as in the case of an elevator, is employed, and which is composed of a single end ring *l* provided with a packing l^3, equipped with doors M similar to those applied to the front end ring of the carrier first described, and also provided with a single horizontal connecting bar l^2 which supports the carrier bar I and the bell crank lever O for operating the links N connected with the doors. It is manifestly inconsequential that the doors of this carrier are to the rear of the carrier bar rather than to the front of it, as the operation of the device is precisely the same in either construction. Both of the carriers described readily pass around curves in the pneumatic tube.

Such being a description of a good form of apparatus embodying my invention, its operation will be readily understood. Air under pressure, or, in fact, any desired aeriform or gaseous fluid, being forced through the pneumatic tube in the direction of the arrow in Fig. 1, passes freely through the carrier when its doors are open, but, when its doors are closed, acts upon said doors to force the carrier forward and with it the carrier bar, spreading truck, and vehicle connected with the carrier bar. As the carrier advances the spreading truck serves to spread the spring rails in the region of the passage of the truck to an extent sufficient to admit of the continuous advance through said spread slit of the carrier bar and lever bar, but not sufficient to occasion a spreading of the slit beyond the region of the respective end rings of the carrier. After the passage of the spreading truck the springs serve to close together the spring rails, so as to once more make hermetically tight the pneumatic tube. To the extent, therefore, of the area which it occupies within the pneumatic tube the carrier of the first five figures itself becomes a part of said tube, in that it forms an hermetically tight section within the tube which always necessarily is located at that part within the tube at which the latter is as to its slit spread apart.

As the doors of the carrier are always under control of the person entrusted with the movement of the car, it is obvious that by gradually opening or shutting them the car can be brought to a standstill or caused to advance at any desired speed. Thus, when the car is stopped the doors of the carrier will be open and the entire body of air within the pneumatic tube will be passing unobstructedly through the carrier and serving to act upon any carrier in advance; at the same time, when the doors of any particular carrier are closed and that carrier is in motion the compressed air in advance of it, being pressed forward by the closed doors or for the time being tight head of the carrier in question, will act upon the carrier next in advance, in the same manner that it would were the doors in question open. It is therefore apparent that any number of carriers can be driven through the tube at the same time, and that each one can be controlled independently of its neighbors, so that all are in movement, all at rest, or any particular ones in movement and the others at rest.

It is of course to be understood that the pressure must be sufficiently great to propel the desired number of cars.

It will now be apparent that the important feature of this invention is the provision of a pneumatic tube a slitted portion of which can be opened and closed automatically to an extent just sufficient to permit the passage of a carrier bar connected with a carrier inside the tube through the normally closed slit in the tube, the said carrier bar being connected with a vehicle and all portions of the slit in the tube not immediately adjacent to the carrier bar being tightly closed,—a result, when a series of carriers are being operated, furthered by the extension of the carrier a sufficient distance in either direction beyond the range of opening of the slit.

I have represented and described what I consider a convenient and practical construction of apparatus embodying my invention: It is however to be understood that in matters of mechanical detail the construction shown may be departed from without departure from the invention. Thus, the forms of the lever connection for controlling the doors of the carrier, and the form of the doors themselves, may be varied without a departure from the principle of the carrier's having a head adapted to be opened or closed,—it being immaterial whether doors, as such, or a register contrivance, or a movable disk, or any kindred device, be employed as a substitute for the particular doors shown and described. Thus, also, the form of the spreading truck and the specific mode of mounting the spring rails may be likewise varied. Of course the construction of the carrier, the pneumatic tube, the conduit and casing may be such as convenience of manufacture may dictate, while the carrier bar and lever bar may be connected with the vehicle to be propelled in any preferred manner,—that mode of connection represented, being simply one of convenient illustration. Thus also instead of

the spiral springs for closing the rails, elastic cushions, elliptic springs, or kindred spring devices, may be substituted.

It is also apparent that it is not essential that the pneumatic tube should be below the surface of the road bed, or that it should be maintained in any conduit, as it is apparent that the device would be equally operative were the pneumatic tube erected above the road way and connected with vehicles from above, or at the side, rather than from below. Of course, as stated, the device is especially applicable for elevators.

Having thus described my invention, I claim:—

1. In a pneumatic apparatus for the propulsion of vehicles, the following elements in combination: a pneumatic tube having a longitudinal slit co extensive with its length, a carrier closely fitted and adapted to travel within said pneumatic tube, a pair of spring-controlled rails respectively connected with the respective edges of the slit in the pneumatic tube and normally adapted to retain them closed, a spreading truck adapted to travel between and spread said rails, a carrier bar connected with the carrier and adapted to pass through the temporarily open portion of the slit of the tube, to which said truck is connected, doors or their equivalent applied to the carrier, suitable devices for opening and closing said doors, a lever bar for operating said devices for opening and closing the doors adapted together with the carrier bar to pass through the temporarily open portion of the slit of the tube, and a car or kindred vehicle to which said carrier bar and lever bar are connected and from which said lever bar is directly operated, substantially as set forth.

2. In combination with the pneumatic tube hereinbefore described, a carrier having a flexible body and packed at its respective extremities against the interior walls of said tube, and likewise provided with doors for preventing, admitting, or regulating the passage of air in the tube through it, substantially as set forth.

3. In an apparatus of the class herein specified, a pneumatic tube having a longitudinal slit co-extensive with its length, packings applied to the edges of the slit for making a tight union between said edges, spring rails connected with the packings or edges of the tubes, a travelling truck for spreading said rails apart and thereby opening the slit of the tube, and springs for returning the said rails to parallelism and thereby closing said slit, substantially as set forth.

4. A carrier for a pneumatic tube having a head provided with doors or kindred devices for admitting, preventing or regulating the passage of air through it, suitable means for controlling said doors, a bar passing air tight through the walls of the carrier for operating the devices for controlling the passage of air through the carrier, and a carrier bar for connecting a car with said carrier, substantially as and for the purposes set forth.

5. In a pneumatic apparatus for the propulsion of vehicles, the following elements in combination: a pneumatic tube having a slit co-extensive with its length, a carrier closely fitted and adapted to travel within said pneumatic tube, a pair of spring controlled rails respectively connected with the respective edges of the slit in the pneumatic tube and normally adapted to retain them closed, means for spreading apart said rails, a carrier bar connected with said carrier and adapted to pass through the temporarily open portion of the slit of the tube, a car adapted to be connected with the carrier through the medium of the carrier bar and to be propelled thereby, a casing for containing the spring rails and within which the rail-spreading devices travel, and a conduit for containing the pneumatic tube, substantially as set forth.

In Testimony Whereof I have hereunto signed my name this sixth day of October, A. D., 1886

STEPHEN P M TASKER.

In the presence of
J BONSALL TAYLOR
WM, C, STRAWBRIDGE,