(No Model.) 3 Sheets—Sheet 1.

N. A. CHRISTENSEN.

AIR BRAKE PUMP AND APPARATUS.

No. 534,813. Patented Feb. 26, 1895.

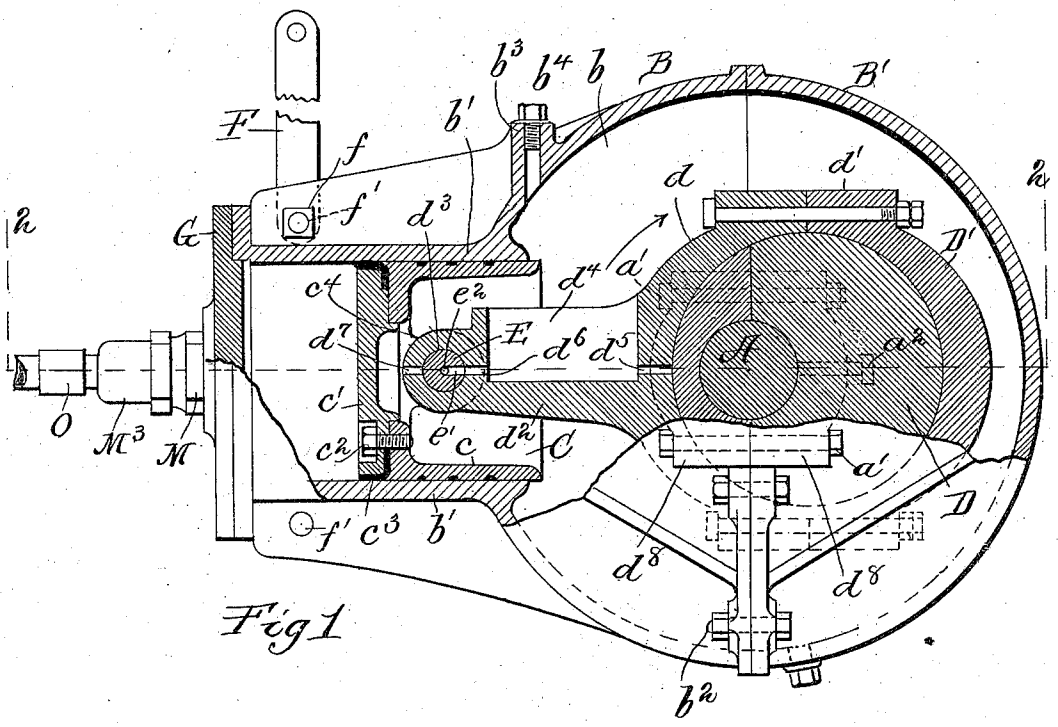

Fig 1

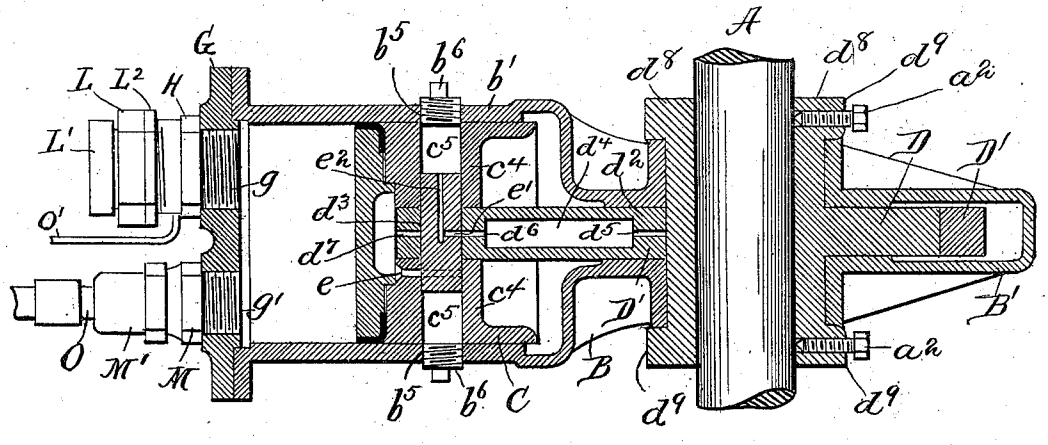

Fig 2

Witnesses.
W. C. Corlies
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(No Model.) 3 Sheets—Sheet 2.

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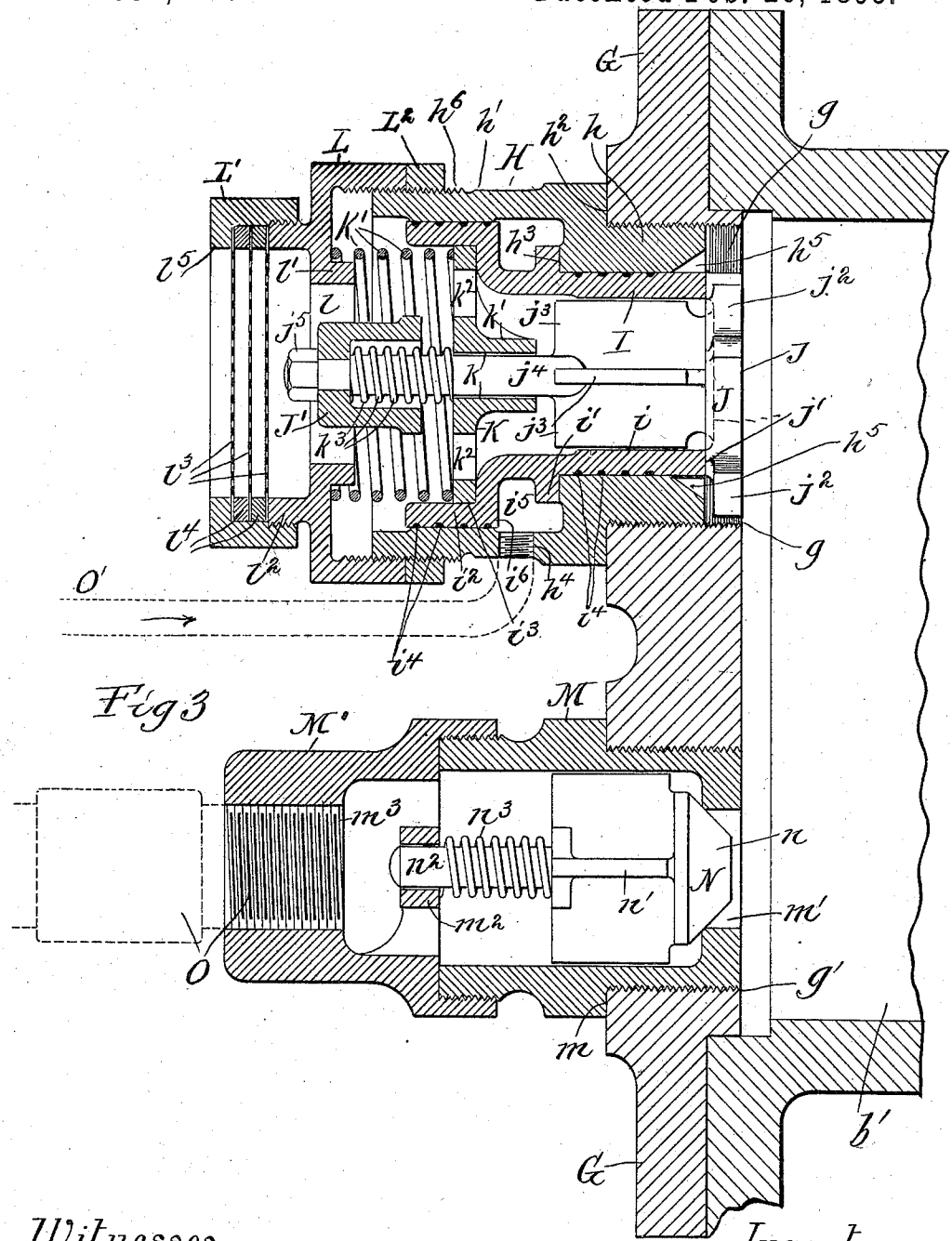

Fig 3

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(No Model.) 3 Sheets—Sheet 3.

N. A. CHRISTENSEN.

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Fig 6

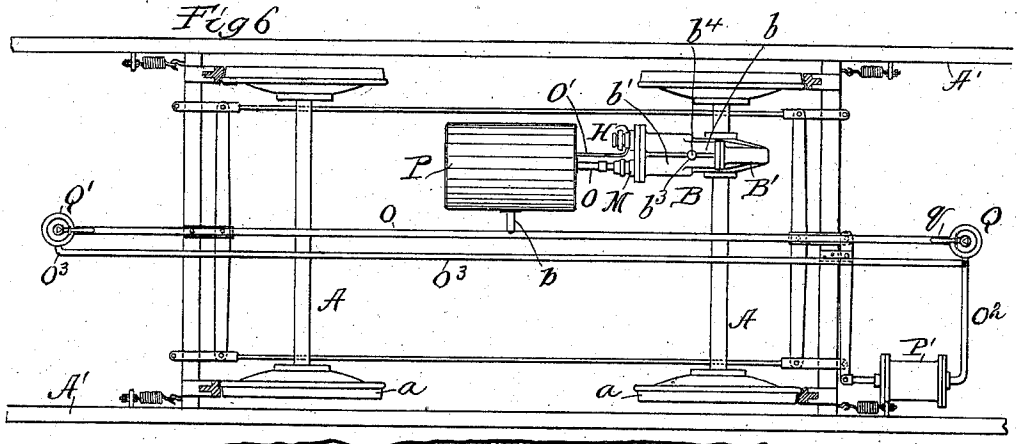

Fig 4

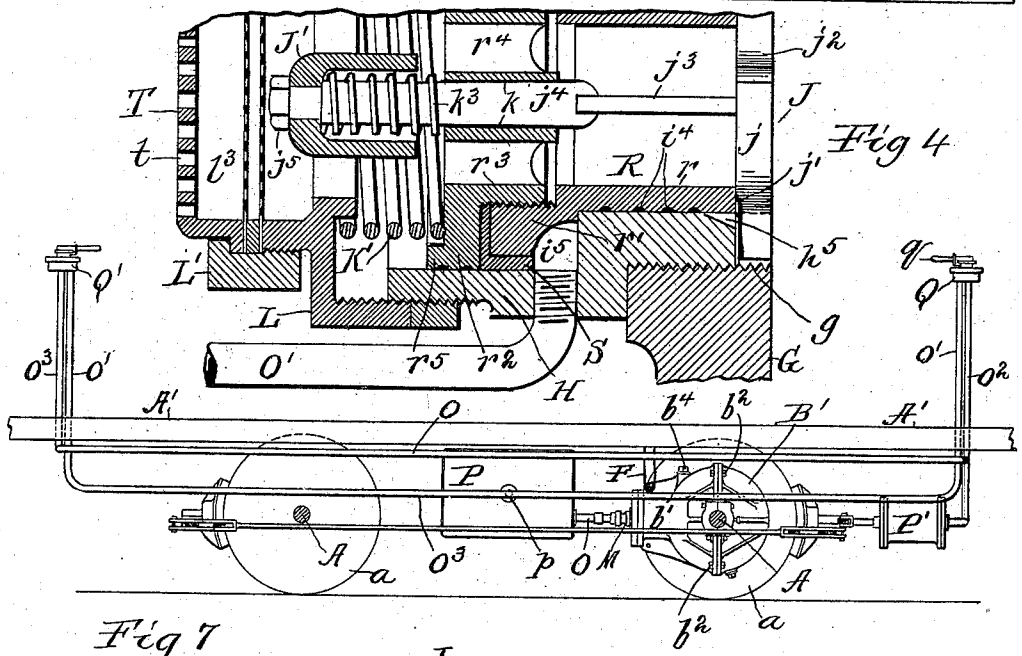

Fig 7

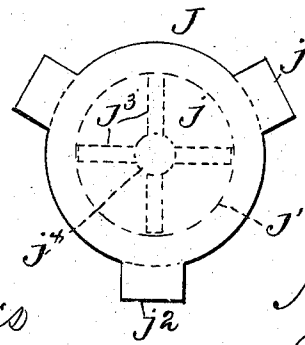

Fig 5

Witnesses.
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R. C. Page

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UNITED STATES PATENT OFFICE.

NIELS ANTON CHRISTENSEN, OF CHICAGO, ILLINOIS.

AIR-BRAKE PUMP AND APPARATUS.

SPECIFICATION forming part of Letters Patent No. 534,813, dated February 26, 1895.

Application filed March 22, 1893. Serial No. 467,158. (No model.)

To all whom it may concern:

Be it known that I, NIELS ANTON CHRISTENSEN, a subject of the King of Denmark, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Air-Brake Pumps and Apparatus, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a side elevation partly in vertical section of a pump, embodying my invention, mounted on a car axle; Fig. 2, a plan section of the same taken on the line 2. 2. of Fig. 1, the connections at the front end of the cylinder being in full plan; Fig. 3, a plan section of said connections at the front end of the cylinder and part of the latter, taken on the same line as Fig. 2; Fig. 4, a detail plan section on the same line as Fig. 3, and showing a modification of the construction in the upper part of said figure, with parts broken away; Fig. 5, a front elevation of the suction valve; Fig. 6, a plan view of an ordinary street car-truck and frame with my pump and brake applied thereto, and Fig. 7, a side elevation of the same.

In the drawings, Figs. 1 and 2 are upon one scale; Figs. 3, 4, and 5 upon another and much enlarged scale, and Figs. 6 and 7 upon a separate scale considerably reduced from that of Figs. 1 and 2.

My invention relates to an air brake apparatus, designed especially for application to street cars, and consists of an air pump of special construction applied to the car, so as to be operated by the rotation of the axle or axles of the truck in the ordinary movement of the car upon its track, and connected up with the air reservoir, with a special regulator device whereby the pump becomes inoperative when a certain pressure is reached in the reservoir.

I will now describe in detail the construction and operation of my invention as applied in a practical way to a street car, and will then point out more definitely in the claims the particular improvements which I believe to be new and wish to secure by Letters Patent.

In the drawings, A represents the axles of a street car truck provided with wheels, *a*, as usual, and having mounted thereon a truck frame, A′. A two-part casing is mounted upon one of the truck axles and is composed of two castings, B and B′. The casting, B, has a semi-circular portion, *b*, from which projects centrally a tubular portion, *b′*, which serves as the pump cylinder. The casting, B′, is semi-circular and corresponds with the section, *b*, of the casting B. These two parts are cast so as to be brought together on a vertical line, passing through the diameter of the axle on which the casing is placed, and the two castings are then secured together so as to form an entire casing around said axle, as seen in Fig. 1 of the drawings, where the parts are shown fastened together by bolts, b^2. The object of this casing is to provide the cylinder of the pump and a protection to the mechanism for operating the pump piston, so that none of the moving mechanism will be exposed. It is also adapted to receive and hold oil, dry graphite, or any other suitable lubricant. The lubricant is introduced through a perforated lug, b^3, which is stopped by a screw-plug, b^4.

The piston, C, is a casting adapted to fit the cylinder, *b′*. The main body, *c*, of the piston is cup-shaped, as seen in Fig. 1, and the piston head, or follower, *c′*, is a separate piece fastened to this body in any suitable way, screw bolts, c^2, being shown in the drawings. The follower is also provided with an ordinary cup leather packing, c^3. A large lug, c^4, projects inward diametrically from each side of the piston. These lugs do not meet, but a free space is left between their inner ends, and each is provided with a central aperture, c^5, extending entirely through it lengthwise. The cylinder, *b′*, is also provided with an aperture, b^5, on each side thereof, corresponding in size and form with these openings through the piston lugs. These side openings are closed by screw plugs, b^6.

One of the axles, A, is selected for driving the pump, and the casing described is mounted thereon when the complete apparatus is applied. The axle is provided with an eccentric, D, fixed thereon, and the pump piston is connected thereto by means of an eccentric strap, D′, which is applied in any ordinary way to the eccentric. In the drawings, the strap is shown in two parts, *d* and *d′*, which are fitted to and secured around the eccentric by bolts—an ordinary and well known expedient. The main part, *d*, of the eccentric strap is connected to the piston, C, and for this purpose is provided with a projecting arm, d^2, which serves as the eccentric rod, and

the outer end of which is fitted into the space between the side lugs, c^4. A transverse aperture, d^3, is made at this end of the arm, d^2, corresponding to the apertures in the side lugs of the piston, and the arm is secured to the piston by means of a plug or pin, E, which is inserted through one of the said apertures in the cylinder into the central aperture in one of the side lugs of the piston, and then passed through the said opening in the arm into the opposite lug, as seen in Fig. 2, and is secured in place by means of a small screw, e, set in from the outside of the lug. This eccentric rod, d^2, is cut out on its upper side to provide a shallow receptacle, d^4, for a lubricant, and at one end of this receptacle there is a small port, d^5, opening upon the eccentric on the axle, and at the other end is a similar port, d^6, which registers with a small port, e', in the fastening pin, E, and this latter port communicates with a central port, e^2, running lengthwise of the pin. The eccentric rod is also provided with a port, d^7, similar to d^6, but on the opposite side of the fastening pin and opening out into a free space just back of the follower, as seen in Figs. 1 and 2. It will be seen that this construction joins the eccentric strap to the piston and that provision is made for the free lubrication of both joints. The apertures in the side lugs of the piston will also be filled with the lubricant at each end of the joint pin, and so the piston itself will be lubricated as well as the joints. The bearing face of the eccentric strap may be straight, as seen in the drawings, or it may be V shaped, or any suitable and well known form.

The eccentric, D, is made in two parts, as seen in Fig. 1, so that it may be applied at any time to one of the axles of the car. At each side of the eccentric there is formed a projecting neck, d^8, each being made of two parts, one on each side of the halves of the eccentric, as seen in Figs. 1 and 2, and at their outer ends enlarged to provide a rim flange, d^9. The eccentric is secured around the axle by bolts, a', passing through the outer ends of these necks, and is fastened to the axle so as to turn therewith by means of binding screws, a^2. The outer casing is fitted around these two neck pieces of the eccentric between the shoulders of the rim flanges, as seen in Fig. 2, thus providing for the mounting and support of this case; and it is obvious that the latter can be readily swung upon the axle of a car with the construction of the eccentric and case described above; but in order to prevent the case from swinging around with the axle, it must be connected or attached to some fixed point. In the drawings I have shown this accomplished by means of a stiff link, F, which is secured at its upper end to some part of the truck frame and at its lower end is connected to the casing by means of a bolt, f, passing through a hole, f', in the outer or cylinder end of the casing.

A back cap or head, G, is applied to the outer end of the cylinder and secured thereto in any ordinary way. This cap is provided with two apertures, g, g', both of which extend through the cap and provide openings into the cylinder. The aperture, g, is somewhat larger than g', and both are threaded, as seen in Fig. 3. These apertures are for the reception of the pump or suction valve case and a delivery valve case, and these devices I will now describe. The suction valve case, H, is cylindrical and of two diameters. The inner section, h, is of the smaller diameter and is threaded to fit the larger threaded opening, g, in the back cap. Just back of this threaded section the case is enlarged to provide a section, h', of larger diameter, which construction provides an outer shoulder, h^2, adapted to abut against the back cap when the case is fitted thereto, and an inner shoulder, h^3, which serves a purpose presently to be described. At one side of this valve case there is also provided an aperture, h^4, just back or outside of the inner shoulder, h^3. At the inner end of the case the edge thereof is cut away to provide an inside bevel, h^5, extending around the inner circumference of the case section, h. The outer end of this valve case is provided with an exterior threaded section, h^6, and the case is open at both ends. Within the valve case, H, is fitted a tubular bushing, I, the inner section, i, of which is adapted to fit the smaller section, h, of the case, within which it finds a seat. At a distance back or outward from the inner end of this bushing, corresponding to the inner length of the smaller section, h, of the case, there is an outwardly projecting flange, i', on the bushing which is adapted to abut or be seated upon the inner shoulder, h^3, of the case, and thus limit the inward movement or adjustment of the bushing, as seen in Fig. 3. This smaller section, i, of this bushing is extended backward or outward a little beyond this flange, and the bushing is then enlarged to provide an outer section, i^2, adapted to fit the outer and larger section, h', of the valve case. This enlargement provides a flat seat or shoulder, i^3, on the inside of the bushing at the junction of the two sections, as seen in said Fig. 3. The bushing may also be provided with small circumferential grooves, i^4, on both sections thereof for the application of a suitable packing, as this bushing must be air-tight in both the larger and smaller sections.

The suction valve, J, is seated upon the smaller section of the bushing at the inner end thereof. The head of the valve is a disk, j, which is provided upon its inner face with an annular thin flange or rim, j', which is adapted to nicely fit the inner end edge of the bushing, I, which constitutes the seat of this valve, the said ring flange being the seating face thereof, as seen in Fig. 3. The head of the valve is also provided with several projections, j^2, which extend out radially therefrom, as seen in Fig. 5, but are only as thick as the

disk proper; that is they do not extend back even with the annular seating face of the valve, and when the latter is properly set on the bushing, there will be a slight free space between these projecting lugs and the inner end of the valve case over which these lugs project, as seen in Fig. 3. As shown in the drawings, this valve is of the winged type, being provided with several wings, j^3, extending back from the rear face of the valve. The stem, j^4, of this valve extends still farther rearward or outward, and as shown in the drawings, projects a little beyond the outer end of the valve case. A thimble, J', is mounted on the outer end of the valve stem, and is secured in place by any suitable device, a nut, j^5, applied to the end of the stem being shown in the drawings for this purpose. A grid, K, is mounted loosely upon this valve stem, and, as seen in the drawings, this grid is a circular disk which is provided with a central opening, k, adapted to receive the stem. Preferably the disk at this point is provided with an enlarged or prolonged hub, k', through which the central opening also extends, thereby providing a long bearing for the disk upon the valve stem on which it is loosely mounted. The disk is also provided with a series of perforations, k^2, and it is adapted to fit the larger section of the bushing, I, and to be seated on the outside of the shoulder or seat, i^3, as seen in Fig. 3. A light spring, k^3, is fitted around the valve stem between the thimble, J', and the grid, K, which obviously serves to retain the suction valve upon its seat under normal conditions. A cup-shaped cap, L, is adapted to fit to the outer end of the valve case, H, being internally threaded so as to be turned upon the latter, as seen in Fig. 3. This cap is provided with a small central opening, l, around which there is an internal annular flange, l'. A spring coil, K', is arranged within this cap, being seated at its outer end upon the latter and at its inner end upon the grid, K. The internal flange, l', serves to keep this spring in place, and the latter obviously operates to hold the grid up to its seat when the cap, L, is applied to the valve case. The cap, L, is also provided with an exterior flange, l^2, of somewhat greater diameter than the interior flange, l', and threaded upon its exterior circumference. One or more screens, l^3, are seated upon the exterior edge of this flange, l^2, being separated by suitable rings, l^4, and held in place by a ring, L', provided with an inwardly projecting flange, l^5, of sufficient width to extend in over said screens to hold them in place when the ring, which is threaded for this purpose, is turned upon the said outer flange, as seen in Fig. 3.

It will be noticed that with the parts in normal position as seen in Fig. 3, there is an annular space, i^5, between the valve case and the tubular bushing around the smaller section of the latter just in front of the larger section thereof, which here forms an interior flat annular surface, i^6. It will also be noticed that when the parts are in this position there is some free space between the thimble and the grid, both of which are on the stem of the suction valve. It is obvious that the tension of the spring coil, K', depends upon the position of the cap, L, upon the valve case, and thus this tension may be regulated by adjusting the position of the cap. For the purpose of fixing the cap in any adjustment, I provide a jam nut, L², which is in the shape of a screw ring adapted to be turned upon the valve case in advance of the cap. The position of this jam nut on the case will, of course, determine the adjustment of the said cap, which is turned up against it, and by changing this position the pressure of the spring, K', upon the grid may be increased or decreased, as required.

A valve case, M, for the discharge valve, is constructed to be applied to the back cap, G, by fitting it to the aperture, g', in the latter. This case is cylindrical and is threaded at its front end to fit the said aperture in the back cap; and back of the threaded section is a shoulder, m, which abuts against the back cap when the case is fitted in place. The front end of the case is partially closed but has a large central opening, m', which is controlled by the discharge valve, N. This valve is provided with a conical head, n, adapted to be seated in the case opening, m', and extending back from this head are wings, n', of ordinary construction. The stem, n^2, of this valve extends backward or outward just beyond the outer end of the case, and is supported in an eye, m^2, formed within a screw cap, M', which is turned upon the outer end of the valve case, M, and closes the latter. A light spring, n^3, is applied to the valve stem between its supporting eye and the wings. The stem has a sliding movement in its eye support which permits the valve to open inward against the tension of the spring, which serves to close the valve and hold it upon its seat under ordinary circumstances. The screw cap, M', is provided with a central opening, m^3, through the front or cover portion thereof, which is threaded and receives one end of a pipe, O, which is run thence to an air reservoir, P, supported on the truck frame and arranged in any convenient and desirable way. In the drawings it is shown located underneath the truck frame and between the truck wheels. A second pipe, O', is connected with this same reservoir at one end and thence is extended to the suction valve case, H, where it is fitted to the side opening, h^4, so that it connects the air reservoir with the annular space, i^5, within the valve case, H, as seen in Figs. 2 and 6.

A pipe, o, is arranged underneath the truck frame from end to end and is connected by a short pipe, p, with the air reservoir. At each end this pipe is bent upward and an upright section, o', is carried up at the platform of the car and enters a valve case, Q, at one end, and a similar case, Q', at the other end of the car. A pipe, o^2, extends from case Q to the

brake cylinder, P′, which in the drawings is shown located underneath one end of a truck frame, as seen in Figs. 6 and 7. A pipe, o^3, is connected at one end with the valve case, Q′, and is thence extended downward below the truck frame and underneath the latter to the opposite end of the car, where it is connected with the pipe, o^2, leading to the brake cylinder, as seen in Fig. 7. Each of the cases, Q, Q′, is provided with an ordinary threeway valve or cock, which controls the pipe connections therewith, and a lever, *q*, or handle is provided, adapted to be applied to one of these cocks for turning it as desired, to open and close the said pipe connections.

The brake cylinder is of any ordinary and well known construction, and the piston thereof is connected up with the brakes of the car so as to operate them in the usual way. There is nothing new about this part of the apparatus, but all these devices are well known and require no special description here.

The operation is as follows: Whenever the car is in motion, it is obvious that the pump piston will be operated by means of the eccentric on the axle and the eccentric arm connected to the piston. This movement takes air in through the outer open end of the suction valve case and tubular bushing, the suction valve opening as the piston is drawn inward and the air rushing in through the screens, which prevent the passage of dirt, thence through the central opening in the cap and apertures in the grid, and out past the valve into the chamber of the cylinder. At the close of this stroke of the piston, the suction valve is closed by the operation of its spring and the forward movement of the piston drives the air out of the cylinder chamber through the discharge valve chamber, the discharge valve yielding for this purpose, and thence through the pipe, O, into the air reservoir where it is stored for use. In order to prevent an excess of pressure in the air reservoir, which would be undesirable, the pumping of air into the reservoir is completely suspended when a certain degree of pressure is reached. This is effected by means of the pipe, O′, which connects the reservoir directly with the interior of the valve case, H, as already described. It will be noted from the description already given, that the bushing, I, is movable lengthwise within this valve case; that it furnishes the seat for the suction valve; that it is held up in place for such seat by a spring K′; and that the tension of this spring may be regulated to resist a certain amount of pressure, say thirty pounds. It will also be noticed that air from the reservoir entering, through the pipe, O′, the annular space, i^5, between the valve case and the tubular bushing, will act directly upon the abutment afforded by the flat annular surface, i^6, on the bushing. The pressure in this annular space will obviously be the same as in the reservoir, and consequently when this becomes greater than the force of the retaining spring, K′, the bushing will be moved back or outward gradually by the pressure of the air, which movement will at once withdraw the seat of the suction valve away from the valve itself. The valve can not follow this movement of its seat because of the radial projections, or lugs, j^2, which almost immediately stop any such movement by coming in contact with the inner end of the valve case. This results in leaving the valve constantly open, and the reciprocation of the piston therefore simply takes air into the cylinder past the valve and then drives it out in the same direction; the resistance to this movement of the air back through the valve case being less than that afforded by the discharge valve which controls the passage of air from the cylinder to the air reservoir. The backward movement of the tubular bushing to effect this result is limited by the thimble on the end of the valve stem, against which the grid strikes after a certain amount of this movement of the bushing and stops any further reciprocation. This prevents the bushing moving back too far under the influence of the air pressure. When the pressure in the air reservoir is reduced to a point below the active force of the spring, it is obvious that the latter will at once return the bushing to its former forward adjustment, thereby seating the suction valve and bringing the pump into action to force air into the reservoir again. It has already been explained that the tension of the retaining spring, K′, is regulated by adjusting the cap on the outer end of the valve case, and this provides for regulating the air pressure in the reservoir, which is always determined by the power of this spring; so that the maximum air pressure in the said reservoir, which may be utilized for appying the brakes, may be regulated as circumstances may demand. The inside bevel at the inner end of the valve case facilitates the return passage of air from the cylinder back into the case when the seat of the valve is withdrawn, as explained above.

By the arrangement of air pipes and the two three-way valve cases, Q, Q′, it is obvious that the brakes may be controlled by an attendant at either end of the car. If the attendant is to be on the platform where the case Q is located, the valve in case Q′ is turned so as to close communication between it and the air reservoir, and then upon turning the valve in case Q, so as to open communication between it and the said reservoir, communication is also at the same time opened with the brake cylinder, and air passes at once from the former to the latter to operate the brakes. If the attendant is to be at the case Q′, the valve in case Q is adjusted to shut off communication with the reservoir, and then upon turning the valve in Q′, to open communication with the said air reservoir,

communication will at the same time be opened with the brake cylinder through the pipes, o^3, and o^2, leading to said cylinder.

In Fig. 4 of the drawings, I have shown a slight modification of the construction of some of the parts contained in or connected with the suction valve case. In this modification all the parts are precisely the same as shown in Fig. 3, except the movable bushing and grid, and are therefore indicated by the same letters as in said Fig. 3. Only those parts which are changed in construction or added thereto are indicated by different letters, as will now be described. Here the bushing, R, is composed of two parts, the front section, r, corresponding to the smaller section of the bushing, I, and extended back beyond the side opening in the casing and enlarged somewhat at its outer end so as to form an outside projecting annular flange, r', and internally threaded, as seen in said Fig. 4. The outer section, r^2, of this bushing corresponds to the larger section of the bushing I, but is made in a separate piece from the section, r. This section is adapted to fit the larger chamber of the valve case, H, and is cut down on its rear side to provide a smaller hub-like portion, r^3, which is adapted to fit the outer end of the section, r, and is provided with an exterior thread whereby it may be turned into the latter. An angular packing, S, may be applied to the joint between these two sections, as seen in the said Fig. 4, and the outer section, r^2, is provided with perforations, r^4, for the passage of air through the valve case and bushing under the operation of the pump piston, already explained. The grid as a separate piece is here dispensed with, and the larger section of the bushing I and the separate grid are practically united in the one piece, r^2. There is also shown in this figure an additional device in the shape of a perforated cap or cover, T, which is applied to the outer end of the cap, L, being provided with perforations, t, for the passage of air, and secured in place just outside the screens by means of the ring, L', as seen in the said Fig. 4. This serves as an additional screen to the air passing into the valve case. The operation of the mechanism thus modified is substantially the same as that of the mechanism shown in Fig. 3, and will be readily understood from the description already given of the latter.

Other modifications may be made in the construction and organization of some of these devices. For instance, the valve cases may be one or both made in one piece with the back cap, and other like changes may be effected without changing the principle of operation as here shown and described. Hence, I do not wish to be understood as limiting my invention to the particular construction and organization of devices herein described and shown, but contemplate such modifications as may be made without changing the mode of operation.

In the modification shown in Fig. 4, the outer section, r^2, of the bushing is also provided upon its outer face with a small annular flange ring, r^5, within which the retaining spring, K', is received and thereby held in place.

Having thus described my invention, what I believe to be new, and desire to secure by Letters Patent, is—

1. In an air pump for brakes, an air pump cylinder, in combination with a suction valve and movable seat for said valve, an air reservoir connected with said pump cylinder, and mechanism whereby the said valve seat and valve are separated when the pressure in the air reservoir passes a certain fixed degree, thereby establishing open communication between the atmosphere and the cylinder of the pump, whereby the action of the latter is suspended, substantially as described.

2. In an air pump for brakes, a pump cylinder and piston, in combination with the suction valve case, H, bushing, I, arranged within said case and movable lengthwise thereof, suction valve, J, seated on said bushing, air reservoir, P, pipe O', connecting said reservoir with an air space between the said valve case and bushing, and a retaining spring, K', adapted to hold said bushing in its normal position as a seat for the valve, substantially as described.

3. In an air pump for brakes, a pump cylinder and piston, in combination with the suction valve case, H, having sections of different diameter, the bushing, I, arranged with sections of different diameter to fit the said case and movable lengthwise therein, the suction valve, J, seated on the inner end of said bushing and provided with radial lugs or projections, j^2, extending beyond the bushing over the inner end of the casing, a retaining spring, K', adapted to hold the bushing in its forward adjustment, a stop to limit the backward movement of the bushing, an air reservoir, P, and a pipe, O', connecting said reservoir with the annular space, i^5, back of which is the annular surface, i^6, on the enlarged portion of the bushing, substantially as described.

4. In an air pump for brakes, a pump cylinder and piston, in combination with the suction valve, H, the bushing, I, arranged therein and movable lengthwise, the suction valve, J, seated on said bushing and provided with stops projecting radially beyond the same, the retaining spring, K', the thimble, J', on the suction valve stem, air reservoir, P, and pipe O' connecting the latter with the interior of the valve case, substantially as described.

5. In an air pump for brakes, a closed casing mounted on and inclosing a part of one of the axles of the car, and provided with a pump cylinder extended at one end from said casing and forming part thereof, in combination with an eccentric on said axle within the casing, and a pump piston in said cylinder operatively connected with said eccentric, and all

included in the casing and cylinder, a suction valve case and a discharge valve case on the cylinder, and an air reservoir connecting with the discharge valve case, all substantially as described.

6. In an air pump for brakes, a closed casing mounted on necks projecting from the sides of the eccentric, and inclosing a part of one of the axles of the car, and provided with a pump cylinder extended at one end from said casing and forming part thereof, in combination with an eccentric on said axle within the casing and a pump piston in said cylinder operatively connected with said eccentric, and all included in the casing and cylinder, a suction valve case and a discharge valve case on the cylinder and an air reservoir connecting with the discharge valve case, all substantially as described.

7. In an air pump for brakes, a closed casing mounted on and inclosing a part of one of the axles of the car, and provided with a pump cylinder extended at one end from said casing and forming part thereof, in combination with an eccentric on said axle within the casing and a pump piston in said cylinder operatively connected with said eccentric, and all included in the casing and cylinder, a suction valve case and a discharge valve case on the cylinder and an air reservoir connecting with the discharge valve case, and a stiff link connecting the cylinder to the truck frame, all substantially as described.

8. In an air pump for brakes, a car axle, A, in combination with the eccentric, D, provided with side necks, d^8, surrounding the axle, the casing, B, B′, hung upon the necks of the eccentric and inclosing the latter and provided with a cylinder, b', at its opposite end, a stiff link connecting the cylinder end of said case to the truck frame, an eccentric strap, D′, arranged within the case and connecting the eccentric to the cylinder piston, and passages connecting said cylinder with the atmosphere and the air reservoir, respectively, controlled by suitable valves, substantially as described.

9. In an air pump for brakes, the pump cylinder and piston, in combination with a suction valve case on the cap of the said cylinder, open at both ends and having a free passage through the same and into the cylinder, a suction valve controlling the opening at the inner end, and screens applied to and covering the open outer end through which the air passes, to the cylinder, substantially as described.

10. In an air pump for brakes, the pump cylinder and piston, in combination with the suction valve case, H, having an inside bevel, h^5, at the inner end thereof, the bushing, I, mounted in said case and movable lengthwise, the suction valve, J, seated on the inner end of said bushing and provided with stops to prevent its movement outward with the latter, and pipe, O′, connecting the air reservoir with an annular air space, i^5, around the said bushing within the case, substantially as described.

11. In an air pump for brakes, the pump cylinder and piston, in combination with the suction valve case, H, the bushing I, mounted therein and movable lengthwise, the suction valve, J, seated on the inner end of the said bushing and provided with radial projections, j^2, extending out over the inner end of the valve case and arranged at a little distance from the latter when the valve is normally seated, and mechanism whereby the bushing is withdrawn from the valve by over pressure of air in the reservoir, substantially as described.

12. In an air pump for brakes, the pump cylinder and piston, in combination with the suction valve case, H, the bushing, I, mounted therein, provided with an annular face, i^6, and movable lengthwise within the case, the suction valve, J, seated on said bushing and provided with stops to prevent its moving therewith, grid, K, loose on the valve stem, retaining spring, K′, stop thimble, J′, fixed on the valve stem, valve retaining spring, k^3, and pipe, O′, connecting the air reservoir with the annular space, i^5, in front of the face, i^6, on the bushing, substantially as described.

13. In an air pump for brakes, an eccentric fixed on one of the axles, a casing hung at one end upon and inclosing the same and provided at the other end with a cylinder, b', having side apertures, b^5, the piston, C, provided with the inwardly extending side lugs, c^4, having central perforations, c^5, the eccentric strap, D′, provided with connecting arm, d^2, having perforations, d^3, and the fastening pin, E, connecting the said arm to the piston lugs, substantially as described.

14. In an air pump for brakes, the eccentric, D, fixed on one of the truck axles, in combination with a casing surrounding the same and provided at one end with the pump cylinder, b', having side apertures, b^5, the piston, C, provided with inside perforated lugs, c^4, the eccentric arm, d^2, provided with lubricant receptacles, d^4, and lubricant ports, d^5, d^6, and the fastening pin, E, inserted in the piston lugs and passing through an aperture in the eccentric arm and provided with lubricant ports, e', e^2, substantially as described.

15. In an air pump for brakes, the pump cylinder and piston, in combination with the suction valve case, H, bushing, I, mounted therein and movable lengthwise, the suction valve, J, seated on the inner end of said bushing, retaining spring, K′, and the screw cap, L, adapted to be adjustably connected to the outer end of said casing, whereby the tension of the said retaining spring may be adjusted, substantially as described.

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Witnesses:
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