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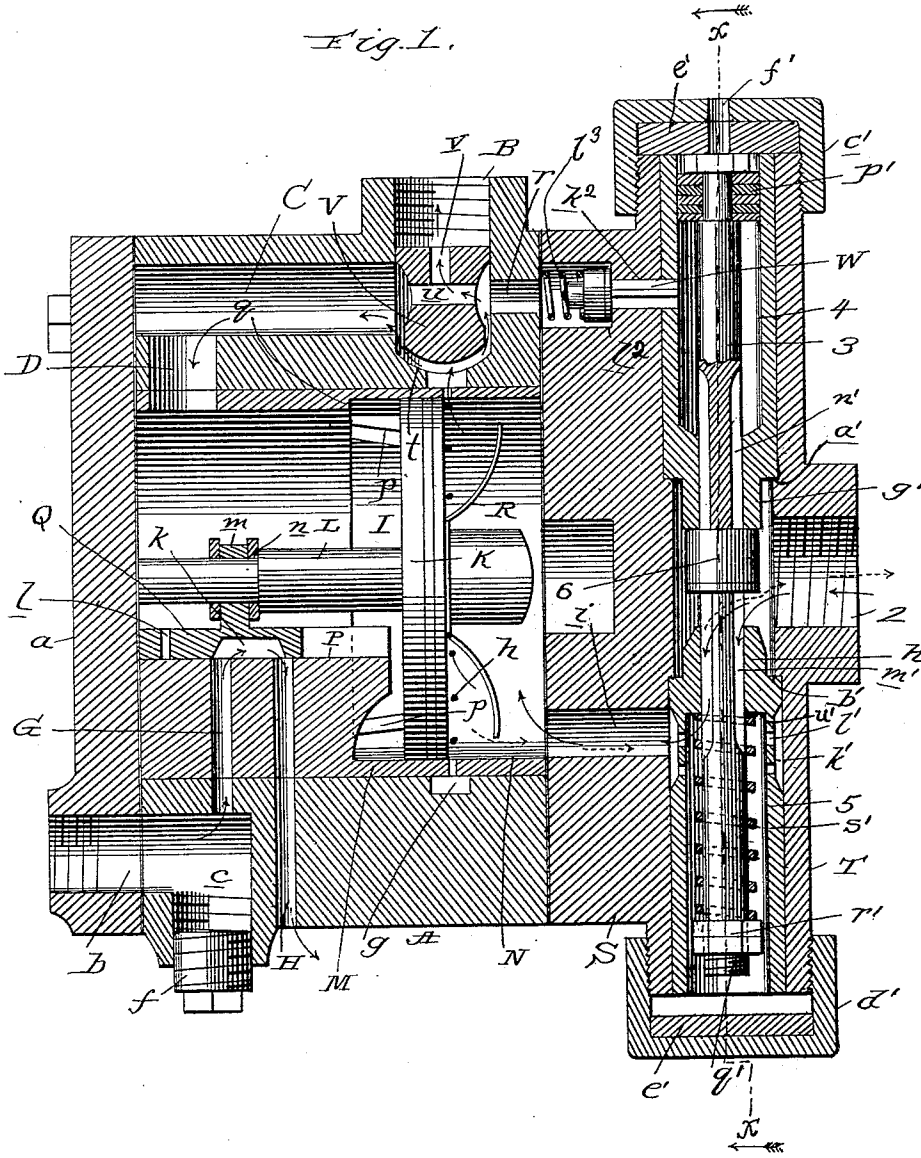
W. T. BOTHWELL.

FLUID PRESSURE RAILWAY BRAKE.

No. 508,364. Patented Nov. 7, 1893.

Fig. 1.



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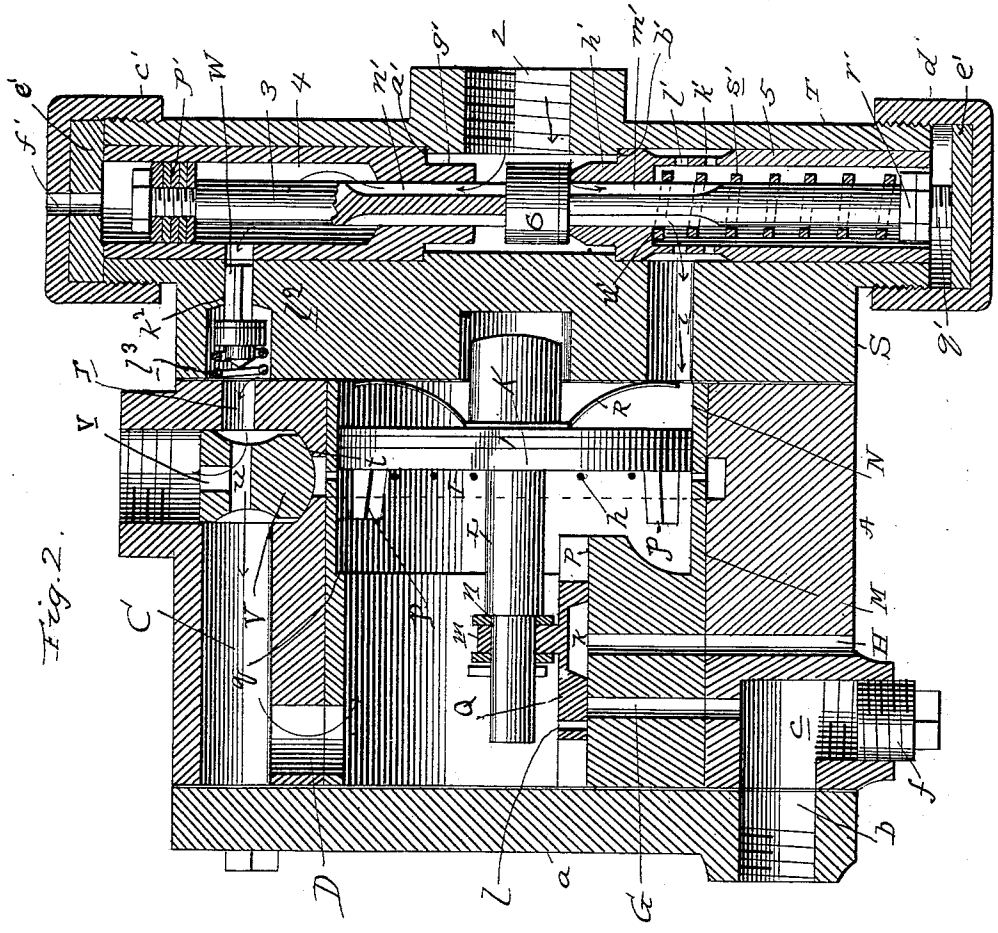

Fig. 2.

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W. T. BOTHWELL.

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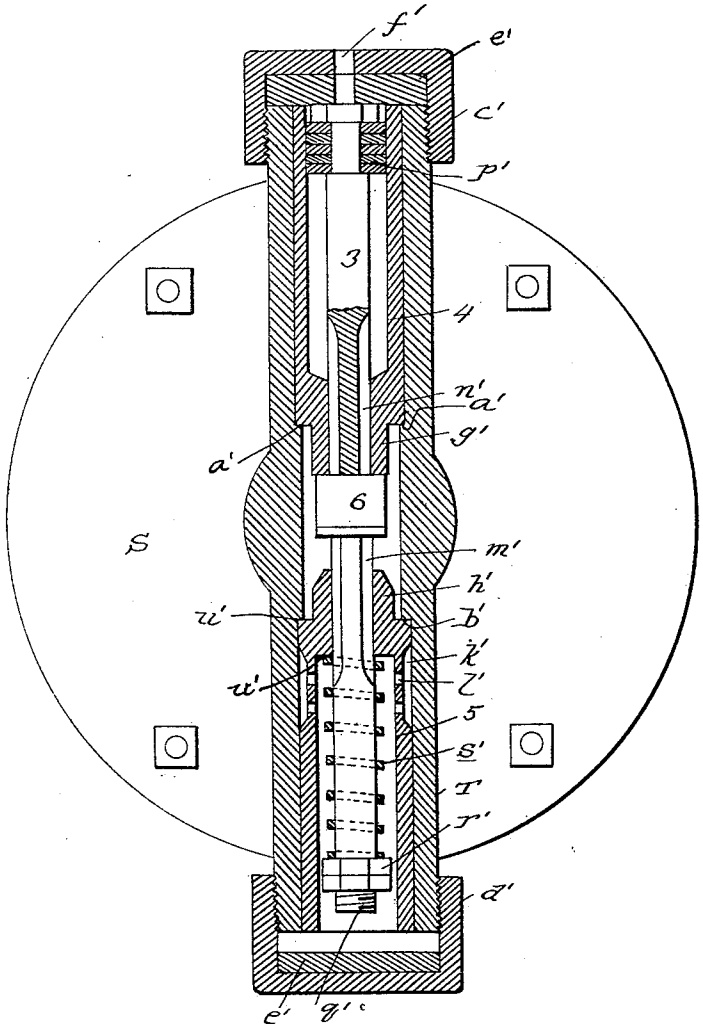
Fig. 3.



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W. T. BOTHWELL.

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Fig. 4.

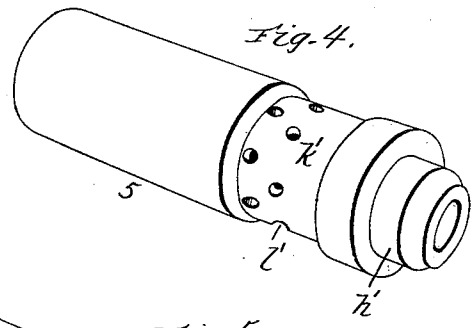


Fig. 5.

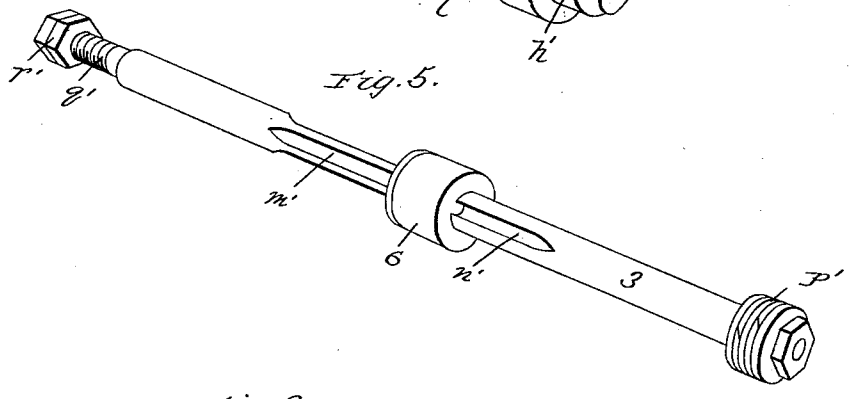


Fig. 6.

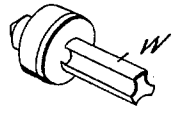
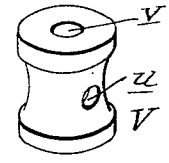


Fig. 7.



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UNITED STATES PATENT OFFICE.

WILLIAM T. BOTHWELL, OF JERSEY CITY, NEW JERSEY.

FLUID-PRESSURE RAILWAY-BRAKE.

SPECIFICATION forming part of Letters Patent No. 508,364, dated November 7, 1893.

Application filed April 26, 1893. Serial No. 471,912. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM T. BOTHWELL, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Pressure-Brake Systems; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention has relation to an improvement in fluid pressure brake mechanism and it has for its object to improve upon and perfect that class of mechanism by which the speed of a train may be regulated and held under control while descending long and dangerous grades and to provide for recharging the auxiliary reservoirs of automatic air brakes while the brakes are applied without releasing them or with the release of the brakes when desired, so that trains may with safety descend dangerous grades; the delays incident to the adjustment of the brake mechanism under each car before descending as well as after descending such grades, being dispensed with.

In the accompanying drawings, I have shown the convenient embodiment of my invention for accomplishing these objects, and in which—

Figure 1, is a vertical, longitudinal, central sectional view, illustrating the parts in a position with the brake off. Fig. 2, is a similar view, illustrating the parts in a position with the brake on. Fig. 3, is a sectional view, taken in the plane indicated by the dotted line *x*, *x*, on Fig. 1, looking in the direction of the arrow. Fig. 4, is a perspective view of one of the casings or bushings, for the third valve. Fig. 5, is a perspective view of such third valve. Fig. 6, is a perspective view of the check valve interposed in the port or passage between the piston cylinder and third valve-cylinder, and Fig. 7, is a perspective view of the check valve arranged in the port or passage leading from the piston cylinder to the auxiliary reservoir.

In my application, Serial No. 470,854, filed April 13, 1893, I have shown a piston cylinder or casing A, with a head *a*, covering one end, and provided with a screw-tapped aperture *b*, for the attachment of a pipe or other suitable connection from the brake cylinder, and the body of the casing or cylinder A, is also provided with a screw-tapped aperture *c*, for a similar purpose; a plug *f*, being employed to close one of these apertures, when the other is being used in connection with the brake-cylinder. The two apertures *b*, and *c*, are shown so as to permit a more convenient means of attachment with the brake cylinder as in some cases the position of the triple valve-casing beneath a car will bring the aperture *c*, more convenient to receive the pipe from the brake cylinder than would the aperture *b*, when the plug *f*, should be placed in the latter aperture.

A screw tapped port or passage B, is provided for connection with the storage or auxilary cylinder, and this port leads from an annular groove *g*, within the cylindrical body of the casing or cylinder A, and is provided with a check valve V. A longitudinal port or passage C, leads from the screw-tapped passage B, and connects with the interior of the piston cylinder A, at or near the opposite end by a transverse port or passage D.

A port or passage G, leads from the interior of the piston cylinder to the aperture or passage, for connection with the brake-cylinder, and an exhaust port or passage H, leads from the interior of said casing to the open air. A reciprocatory piston-valve I, is arranged within the piston cylinder A, and is provided with a head K, and a stem L. The body of the cylinder A, is provided in its bore with a lining M, which is preferably formed of brass. This lining is turned out on its inner side as shown at N, so as to provide a smooth surface for the head of the piston-valve, and in this turned-out portion, is formed a circular series of transverse holes or ports *h*, which lead into the annular groove *g*, which in turn communicates with the aperture or passage B. This lining has formed upon it a valve-seat P, which has longitudinal guide-flanges to receive and guide the valve Q, and the exhaust port or passage, and also the port or passage G, extending through this valve seat, as shown. An exhaust slide-valve Q, is arranged on this seat, and has its under side or face provided with a recess *k*, and a port or passage *l*. The valve is provided on its upper side with a lug

m, having an aperture *n*, to receive the stem of the piston valve, and said valve is secured to the stem by collars, and a pin or other suitable fastening devices. The piston head is provided on its inner side with lugs *p*, which serve as stops for the inward movement of the piston valve, when brought against the shoulder *q*, of the lining.

Arranged to bear against the outer side of the piston-head, and against the inner side of the adjacent head of the piston cylinder, is a spring R. This spring R, is preferably made of flat steel and curved, as shown, so that the ends of its branches will bear against the inner side of said head, and its central portion will bear against the head of the piston valve. These parts while forming the subject matter of the application above referred to, are to serve in connection with my improvements which I shall now describe in detail.

S, indicates a head, for the end of the piston cylinder, opposite the head *a*. This head S, is provided with a port or passage *i*, which leads from the interior of the piston-cylinder, to the interior of a valve chest or casing T. This head is also provided with a port or passage k^2, having a valve seat l^2, and leading from the valve chest or casing T, to a port or passage *r*, which latter port or passage communicates with the passage C, in the piston cylinder, and also with the passage B, which leads to the auxiliary or storage cylinder. A check valve V, is arranged at the intersection of the ports or passages B, C, and *r*, and this check valve which has a seat *t*, in the piston cylinder is provided with a transverse port *u*, and a vertical or longitudinal port *v*, which communicates with the transverse port *u*.

W, indicates a check valve, which is arranged in the port or passage *k*, of the head S, and is backed by a spring l^3, so as to keep it normally seated, and close communication between the piston cylinder and auxiliary storage, and the valve casing T. The valve casing T, is arranged on the head S, and preferably in a plane at right angles to the movement of the piston valve, and is provided centrally with a screw-tapped port or passage 2, for connection with the line or supply pipe of an air brake system.

3, indicates a reciprocatory valve, which I shall denominate the third valve. This valve is of a form substantially as shown in Fig. 5, of the drawings, and is arranged within the casing T, as will be presently described. Arranged within this casing T, is a bushing or lining for the valve 3, and this bushing is composed of two sections: an upper section 4, and a lower section 5, which are let in to the bore of the casing T, at opposite ends, as shown, and are secured against shoulders *a'*, and *b'*, by means of screw caps *c'*, and *d'*, and suitable packing *e'*, a vent aperture *f'*, being provided in the cap *c'*, so as to offer no obstruction by the inclosure of air to the free movements of the valve. These bushings 4, and 5, are each reduced at their adjacent ends as shown at *g'*, and *h'*, to form seats for the valve head 6, which is placed within the casing T, at the screw-tapped aperture or passage 2. The bushing 5, is reduced circumferentially at a point opposite the port or passage *i*, of the piston cylinder, as shown at *k'*, and this reduced portion is pierced with a number of holes *l'*, for the admission of air from the line pipe to the piston cylinder, and vice-versa. The valve 3, is of a form substantially as shown in Fig. 5, of the drawings, having an enlargement or head 6, about midway of its length, which is designed to seat against the adjacent ends *g'* and *h'*, of the bushings within the casing T, and the stem is grooved longitudinally at suitable points so as to form channels *m'*, and *n'*, extending from opposite sides of said head or enlargement. One end of the stem or rod of this valve which plays within the bushing 4, is provided with a head *p'*, having suitable packing, as shown, and the opposite end of the rod or stem of said valve is externally threaded as shown at *q'*, to receive nuts *r'*, and a spiral or coiled spring *s'*, surrounds the rod and bears at one end against the nuts thereon, and at the opposite end against a shoulder *u'*, in the bore of the bushing 5. By this construction I am able to strengthen or weaken the force of the spring by manipulating the nuts and consequently adjust the valve 3, for the air pressure desired to be used. It is desirable that the head *p'*, of this reciprocatory valve should be slightly greater in diameter than that of the head 6, on the rod or stem of the valve, so that the pressure acting upon the under side of said enlargement, may afford a quicker movement should there be any leakage, or other cause which might possibly retard its movement.

As before mentioned, the spring can be set by the manipulation of the nuts *r'*, to act at any pressure desired.

The object of the third valve is to control and regulate the passage of air from the line pipe to the piston cylinder and auxiliary cylinder and also from the piston cylinder back to the line pipe. Before letting any air from the line pipe into the piston cylinder or auxiliary cylinder, the spring *s'*, will of course hold the enlargement 6, of the third valve down upon the seat *h'* of the bushing 5, and the force required to raise said enlargement from the seat as thus described may be regulated by the manipulation of the nuts *r'*, so as to weaken or stiffen the spring. Now as air is let in from the line pipe through the port or aperture 2, of the third valve casing, it will pass into the bushing 4, through the channels *n'*, of the valve rod or stem above the enlargement 6, striking the head *p'*, will lift the enlargement 6, up to the seat *g'*, of the bushing, and the air thus received within the bushing 4, will unseat the check valve W, and passing through the passage *r*, and the passages in the check valve V, will be carried to the auxiliary reservoir and also into the piston cylinder on the inner side of

the piston head. As quick as the air moves the third valve so as to seat its enlargement 6, against the seat g', the air will then pass from the line pipe through the port or passage 2, down through the channels m', below the enlargement 6, and into the bushing 5, after which it will pass out from said bushing through the apertures l', into the circumferential groove k', and from thence through the passage i, to the piston cylinder and against the piston head therein, when said head will be forced inwardly in the piston cylinder and the air thus admitted will pass out through the holes h, of the lining into the groove g, and lifting the check valve V, will pass to the storage or auxiliary cylinder and also to the piston cylinder on the opposite side of the piston head as indicated by arrows in full lines. When pressure has been reduced in the line pipe but to a point greater in force than that exerted by the spring s', some of the air on the forward side of the piston head within the piston cylinder will return from said cylinder back through the port i, the port or recess k', holes or apertures l', into the bushing 5, and from thence through the channels m', back to the line pipe while when the pressure in the line pipe has been reduced to such an extent as to allow the spring s', to act such spring will draw down the third valve until its enlargement 6, has been seated upon the upper end of the bushing 5, thereby allowing the air in the storage cylinder to pass through the ports C, and D, to throw the piston and the valve O, so as to apply the brakes. During this application of the brakes, air under a certain pressure can be let in from the line pipe through the bushing 4, and the port or passage k^2, to the port or passage r, by unseating the check valve W, and from thence such air can pass to the storage reservoir and to the brake cylinder respectively.

The device as shown in Fig. 2, of the drawings, illustrates the parts in a position, as if the brakes were on. Now to release the brakes, pressure should be increased in the line pipe by the manipulation of the engineer's valve, and sufficient to overcome the force of the spring s'. This will raise the head or enlargement 6, off of the seat h', allowing the air to enter the bushing 5, and pass in the course indicated by the arrows in full lines, down and out through the holes l', into the piston cylinder. This will force the piston head inwardly, so as to uncover the small holes h, in the lining. The air will then flow from the line pipe through said holes into the annular groove g, and from thence through the port or passage B, to the storage cylinder. During this operation, the air will also pass through the ports or passages C, and D, into the interior of the piston cylinder, on the opposite side of the piston head, so that as the brakes are being released, air is stored in the auxiliary cylinder, and is also let into the piston cylinder. The valve Q, being moved by the piston valve K, so as to connect the port G, with the port H, through the medium of the recess k, the air from the brake cylinder will be allowed to exhaust through the latter port. The function of the spring R, is to cushion the outward throw of the piston and prevent it from being injured by striking the head S, and another function is to afford a gentle resistance to the outward movement of the piston, as I have found by experience that a better graduation and control of the piston, can be had when a spring is used in this position, although in some cases, the spring may be dispensed with.

For a service stop, in applying the brakes, the pressure is reduced in the line pipe, so as to bring the port or passage l, over the port or passage G, and in this movement the piston valve will be carried in advance of the holes h, when the air will be carried from the storage cylinder through the passages C, and D, into the interior of the cylinder A, and from thence to the brake cylinder. For an emergency stop, the pressure in the line pipe would be so reduced as to carry the exhaust valve Q, entirely past the large port or passage G, so that this port will be brought wholly in communication with the interior of the piston cylinder; allowing a larger volume of air to pass to the brake cylinder, and apply the brakes instantly.

While I have described specifically and in detail, the various parts of my device, yet I do not wish to be understood as limiting myself to the precise construction and combination of devices shown, as I am aware that many of the parts might be altered in form and arrangement, without departing from the spirit of my invention, and I therefore reserve the right to make such modifications and changes as may fall within the scope of my invention.

Having described my invention, what I claim is—

1. In an air brake system the combination with a brake cylinder and auxiliary cylinder and a triple valve cylinder; of a valve casing communicating with the triple valve cylinder and having a port for connection with the line pipe, a reciprocatory valve arranged in said casing and having an upper and lower seat on the inner side of the port for connection with the line pipe and also having a port for communication with the auxiliary cylinder and a check valve arranged in this latter port, substantially as specified.

2. The piston cylinder, constructed as described, in combination with the check valve V, the piston valve, the exhaust valve carried by the stem of the piston valve, the third valve casing, connected with the interior of the piston cylinder by a port or passage, and also connected with the port or passage of the cylinder carrying the check valve V, and having a check valve arranged in such port, and a third valve actuated by the variable pressure in the line pipe and aided by a spring for admitting air to the piston cylinder and aux-

iliary reservoir or cylinder, and also allowing air from the piston cylinder to re-enter the line pipe, substantially as specified.

3. In an air brake system, the valve casing, having a port or passage for connection with the line pipe, and also having two ports for connection with the piston cylinder and auxiliary cylinder or reservoir, respectively, in combination with a check valve arranged in one of said ports, the upper and lower valve seats in said casing, the valve having the central enlargement adapted to engage said seats and also having a head at one end, and an adjustable spring surrounding the valve rod or stem at its opposite end, substantially as specified.

4. The combination with the piston cylinder, substantially as described; of the valve casing T, the bushings 4, and 5, arranged therein at opposite sides of the train pipe port 2, and having seats g', h' the bushing 5, having the holes l', the valve 3, having the channels m', and n', and a central enlargement 6, and also having the head at one end and the opposite end threaded, the spring surrounding the stem within the bushing 5, and the nuts on the threaded end of the spring for regulating the tension of the spring, the whole adapted to operate, and be attached to one end of the piston cylinder, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM T. BOTHWELL.

Witnesses:
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C. H. RAEDER.

Corrections in Letters Patent No. 508,364.

It is hereby certified that in Letters Patent No. 508,364, granted November 7, 189[illegible] upon the application of William T. Bothwell, of Jersey City, New Jersey, for an improvement in "Fluid-Pressure Railway-Brakes," errors appear in the printed specification requiring correction, as follows: In line 29, page 1, the word "the" should read *one;* and in line 35, page 3, the reference letter "O" should be *Q;* and that said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 21st day of November, A. D. 1893.

[SEAL.]

JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:

JOHN S. SEYMOUR,
Commissioner of Patents.