

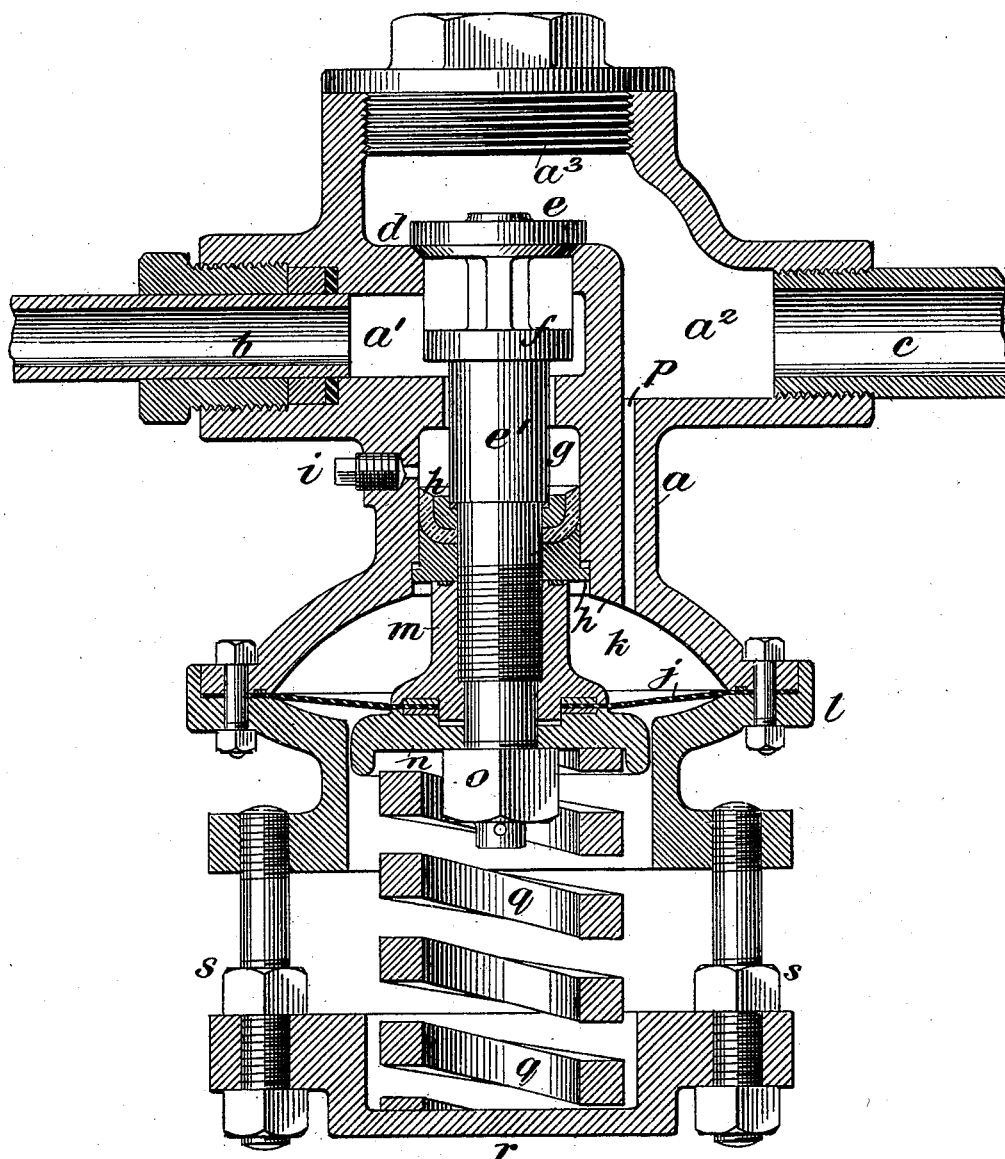
No. 646,428.

Patented Apr. 3, 1900.

R. HARDIE.  
PRESSURE REDUCING VALVE.

(Application filed Apr. 3, 1899.)

(No Model.)



WITNESSES:

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# UNITED STATES PATENT OFFICE.

ROBERT HARDIE, OF CHICAGO, ILLINOIS.

## PRESSURE-REDUCING VALVE.

SPECIFICATION forming part of Letters Patent No. 646,428, dated April 3, 1900.

Application filed April 3, 1899. Serial No. 711,483. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT HARDIE, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Pressure-Reducing Valves, of which the following is a specification.

This invention relates to pressure-reducing devices or valves, and has for its object improvements in the construction of this class of valves to correct the want of accuracy of such valves as heretofore made when employed to reduce a very high storage pressure to a comparatively-low working pressure and when the variations of the pressure of the active fluid extend over a wide range at the source of supply—as, for instance, when the fluid is contained in a reservoir under initial pressure many times greater than the desired working pressure and is utilized until its pressure about equals the working pressure.

This invention consists of the combination, with a valve adapted to close a passage from the high-pressure side to the low-pressure or working side of the device, of a piston fitted in a cylindrical bore and exposed at one side to the high-pressure and at its other side to the low or working pressure side of the device, a diaphragm connected to the piston and valve and located in a chamber open to the low or working pressure, and an adjustable spring arranged to act in opposition to the low pressure acting on the diaphragm. The invention also provides a means for closing the valve-opening should the valve from any cause, as the breakage of its stem, be abnormally raised from its seat, said means consisting of a collar or piston on the stem of the valve, formed to fit into and then close the valve-opening when the valve is brought to rest by coming in contact with a part of the body of the device after being abnormally raised.

The accompanying drawing represents in central vertical section a pressure-reducing valve embodying my invention, and to which I will refer to more fully describe the nature and operation of my improvements.

The body *a* is a suitably-formed casting having an inlet *a'*, by which it may be connected by the pipe *b* to the source of supply, which may be a reservoir containing compressed air or other elastic fluid, and an out-

let *a''*, by which it may be connected by the pipe *c* to the engine or other motor device that is to be actuated by the fluid under reduced pressure. In the body is formed the conical valve-seat *d*, to which is fitted the valve *e* in the ordinary manner. The stem *e'* of the valve *e* is provided with a piston or collar *f*, preferably integral with the stem and valve and which is so located with relation to the valve that it will enter and close the valve-opening when the valve is arrested in its upward movement by contact with the cap *a''*, which closes the opening in the body through which the valve-seat is formed and the valve inserted in the device. This excessive movement of the valve *e* will occur only from accident—as, for instance, the breakage of the valve-stem below the piston or collar *f*—and at such time the piston or collar *f* will practically cut off the high-pressure from the low or working pressure side of the device, and any slight escape of fluid that may occur, tending to raise the working pressure above the normal, will be provided for by means of a safety-valve usually used for this purpose.

Below the valve-seat *d* and in alinement axially therewith is formed the cylindrical bore *g*, in which is fitted the piston *h*, secured to the stem *e'* of the valve *e*. This piston is preferably of the cup-packing kind and is provided with a suitable lubricant, which may also act as a liquid seal therefor through a hole formed through the side of the bore *g*, closed by a plug *i*. The piston *h* is subjected on its upper side to the action of the high-pressure fluid-supply and is made of such area that its surface exposed to such supply normally balances the pressure under valve *e*. The lower end of the piston *h* is provided with a collar *h'*, for the reception of which a shouldered recess is formed on the lower end of the cylindrical chamber *g*, and this collar by contact with the shoulder of the recess acts as a stop to prevent the valve *e* opening too far in ordinary working, for should the diaphragm *j* break the valve might move into its extreme upper position. This shoulder and collar also limit the distance the diaphragm can be moved and relieve the diaphragm of the whole force or power of the spring *q* when there is no pressure in the device.

The diaphragm *j* closes a chamber *k*, located

immediately below the cylindrical bore *g* of the body, by being clamped between the flange of said chamber and the retaining-ring or frame *l*, a collar *m* being interposed between the diaphragm and the piston *h* and a washer *n* placed on the outside of the diaphragm, the whole—viz., the washer *n*, the diaphragm *j*, the collar *m*, and the piston *h*—being rigidly secured on the stem *e'* of the valve *e* by the nut *o*. The chamber *k* is in communication with the outlet *a*<sup>2</sup> through the passage *p*, the fluid under the reduced or working pressure thus acting on the diaphragm *j* to tend to close the valve *e*.

To counterbalance the low working pressure on the diaphragm *j*, so that the device will operate to supply and maintain a constant desired working pressure at the outlet *a*<sup>2</sup>, the spring *q* is caused to bear against the washer *n* on the under side of the diaphragm, it being upheld thereagainst by seating in a yoke-piece *r*, which is connected to the ring of the frame *l* by means of the bolts and nuts *s s*. The nuts of these bolts are arranged to hold the yoke-pieces in different positions, so that the spring *q* may be more or less compressed, according to the required upward forces necessary to oppose the pressure acting downwardly on the diaphragm to cause the device to act under the desired conditions.

I claim as my invention—

1. In a pressure-reducing valve, the combination of the body of the device having a valve-seat and a cylindrical bore in alinement, a valve fitted to the valve-seat, and a piston connected thereto fitted to the cylindrical bore, one side only of said piston being exposed to the high-pressure inlet of the device to cause it to act to close the valve against its seat, a diaphragm located in a chamber of the body and connected to the valve and piston, said chamber being in communication with the other side of the piston and with the outlet or working-pressure side of the device and a spring arranged to act on the diaphragm in opposition to the force of the low pressure thereon.

2. In a pressure-reducing valve, the combination of the body of the device having a valve-seat and a cylindrical bore in alinement, a valve fitted to the valve-seat, and a piston connected thereto fitted to the cylindrical bore, one side only of said piston being exposed to the high-pressure inlet of the device, a diaphragm located in a chamber of the body and connected to the valve and piston, said chamber being in communication with the other side of the piston and with the outlet or working-pressure side of the device and a spring arranged to act on the diaphragm in opposition to the force of the low pressure thereon and a collar on the lower end of the piston arranged to bear against a shoulder of the cylinder to limit the movement of the valve and the diaphragm.

3. In a pressure-reducing valve, the combi-

nation of a body having a valve-seat, a valve fitted to close said seat, means for opposing the high pressure acting on the valve to open it, and a collar or piston connected to the stem of the valve and fitted to close the valve-opening, should the valve from any cause be abnormally raised from its seat.

4. In a pressure-reducing valve, the combination of the body of the device having a valve-seat and a cylindrical bore in alinement, a valve fitted to the valve-seat, and a piston connected thereto fitted to the cylindrical bore, one side only of said piston being exposed to the high-pressure inlet of the device, to cause it to act to close the valve against its seat and a collar or piston connected to the stem of the valve and fitted to close the valve-opening should the valve from any cause be abnormally raised from its seat.

5. In a pressure-reducing valve, the combination of the body of the device having a valve-seat and a cylindrical bore in alinement, a valve fitted to the valve-seat, and a piston connected thereto fitted to the cylindrical bore, one side only of said piston being exposed to the high-pressure inlet of the device to cause it to act to close the valve against its seat, a diaphragm located in a chamber of the body and connected to the valve and piston, said chamber being in communication with the other side of the piston and with the outlet or working-pressure side of the device, a spring arranged to act on the diaphragm in opposition to the force of the low pressure thereon, and a collar or piston connected to the stem of the valve and fitted to close the valve-opening, should the valve from any cause be abnormally raised from its seat.

6. In a pressure-reducing valve, the combination of the body of the device having a valve-seat and a cylindrical bore in alinement (with a shouldered recess at its lower end), a valve fitted to the valve-seat, and a piston connected thereto fitted to the cylindrical bore (and having a collar at its lower end), one side of said piston being exposed to the high-pressure inlet of the device, a diaphragm located in a chamber of the body and connected to the valve and piston, said chamber being in communication with the other side of the piston and with the outlet or working-pressure side of the device, a spring arranged to act on the diaphragm in opposition to the force of the low pressure thereon, and a collar or piston connected to the stem of the valve and fitted to close the valve-opening, should the valve from any cause be abnormally raised from its seat.

Signed at Rome, in the county of Oneida and State of New York, this 29th day of March, A. D. 1899.

ROBERT HARDIE.

Witnesses:

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S. A. DOHN.