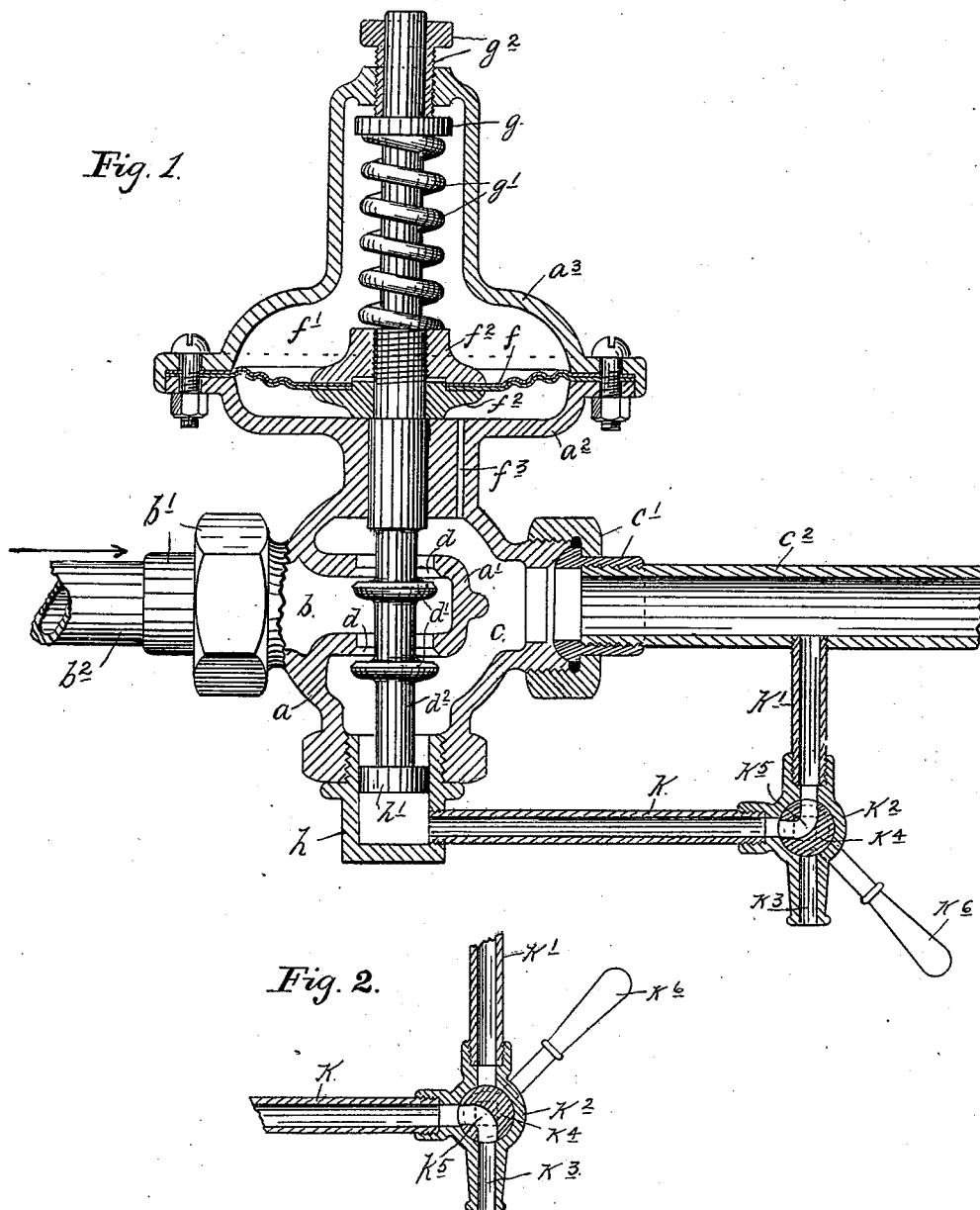


(No Model.)

R. HARDIE.
FLUID PRESSURE REGULATOR.

No. 553,851.

Patented Feb. 4, 1896.



Witnesses:

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UNITED STATES PATENT OFFICE.

ROBERT HARDIE, OF ROME, ASSIGNOR TO THE GENERAL COMPRESSED AIR COMPANY, OF NEW YORK, N. Y.

FLUID-PRESSURE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 553,851, dated February 4, 1896.

Application filed July 16, 1895. Serial No. 556,134. (No model.)

To all whom it may concern:

Be it known that I, ROBERT HARDIE, a citizen of the United States, residing at Rome, in the county of Oneida and State of New York, have invented certain new and useful Improvements in Fluid-Pressure Regulators; and I do hereby 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.

My invention relates to automatic fluid-pressure regulators, and has for its object to provide an improvement therein whereby an increased working pressure may be made temporarily available at the will of the operator.

My improved regulator was especially designed for use in connection with compressed-air street-railway motor-cars. In this class of work there are times when a higher working pressure than normal is temporarily desirable—as, for example, when starting up-grade under a heavy load, or when the car is derailed, or when starting an extraordinary load on a level track.

My invention was especially designed to meet these conditions.

To this end the invention consists of the novel features of construction hereinafter described and defined in the claims.

The invention is illustrated in the accompanying drawings, therein like letters referring to like parts.

Figure 1 is a sectional elevation through my improved regulator with the parts in position to afford the normal working pressure. Fig. 2 is a detail in section, showing some of the parts of Fig. 1 as they would appear when set for rendering available a higher working pressure.

The main casting a a' is of the ordinary or customary form and of the proper shape to afford the high-pressure chamber b and the low-pressure chamber c , properly separated by the re-entrant part a' of the said casting. The said part a' of the said casting is provided with the customary valve-seats d for co-operation with the double-seat valve d' on the common stem d^2 . The stem d^2 extends upward and is attached in the customary

way to the diaphragm f , which is located in the chamber f' , formed by the half-bowl flange a^2 , integral with the main casting a , and the cap-section a^3 , bolted to the flange a^2 . The diaphragm f is clamped to the valve-stem by the nuts f^2 , and between the top member of the said nuts f^2 and a loose washer g on the valve-stem is mounted a spring g' , which is set under the desired tension by a follower g^2 , working through the top of the bowl-cap a^3 and bearing against the washer g .

The part of the diaphragm-chamber f' below the diaphragm f is in communication with the main low-pressure chamber c through the passage f^3 , which renders the under surface of the diaphragm subject to the low-pressure fluid.

The high-pressure chamber b connects by suitable fitting b' with the high-pressure supply-pipe b^2 , which leads to the storage-reservoirs charged with air under high pressure, and the low-pressure chamber c connects by a suitable fitting c' with the low or working pressure pipe c^2 , which leads to the engine or other motor.

The parts so far described are substantially the same as the ordinary standard regulators or reducing-valve mechanisms, wherein a spring or equivalent weight operates or tends to throw the reducing-valve into its open position, and a diaphragm or equivalent device subject to the reduced or working pressure fluid operates against the spring to throw the valve into its closed position when the working pressure is at the predetermined desired limit.

I will now describe my improvement. Broadly viewed, I provide a supplemental cylinder h , which is fitted with a piston h' , operative on the reducing-valve, and these parts are so arranged that one end of the supplemental cylinder is constantly open to the low or working pressure fluid, and the other end of said cylinder is provided with valve connections adapted to throw the same either into communication with the working-pressure fluid or the atmosphere at will.

As shown, the supplemental cylinder h is in the form of a lower end cap for the valve casing or casting a a' , with its upper end opening directly into the low-pressure chamber c ,

and the piston h' , with which the said cylinder h is fitted, is attached directly to the lower end of the stem d^2 of the reducing-valve. The valve connections for the lower end of the cylinder h are shown as comprising the pipe-sections $k k'$, connecting with the valve-casing k^2 , which is provided with an outlet k^3 , leading to the atmosphere, and a valve-stem k^4 in said casing having a two-way passage k^5 and hand-lever k^6 .

The two-way passage k^5 in the valve-stem k^4 may, of course, be made to connect either the parts k and k' or the parts k and k^3 . If the said parts $k k'$ are connected, as when the valve-stem k^4 is in the position shown in Fig. 1, the piston h' will be subject on both sides to the working-pressure fluid; but if the valve-stem k^4 be turned into the position shown in Fig. 2, so as to connect the parts k and k^3 , the working-pressure fluid will be cut off from the lower end of the cylinder h , and the lower end of the said cylinder h will be open to the atmosphere.

When the parts are as shown in Fig. 1, the regulator will operate exactly as if the supplemental cylinder h and its co-operating parts had not been provided, because the pressures above and below the piston h will be the same; but when the hand-valve is thrown into the position shown in Fig. 2, so as to open the lower end of the cylinder h to the atmosphere, the working-pressure fluid on the top of the piston h' will become available to reinforce the spring g' and co-operate therewith to hold the reducing-valve open until the necessary increased pressure is reached on the working side to render the diaphragm f effective to close the valve.

The hand-valve k^4 will of course occupy such a position on the motor-car as to be conveniently within reach of the motorman or operator. Hence, in virtue of my supplemental cylinder and piston and the valve connections therefrom, as described, an increased working pressure can be rendered temporarily available at the will of the motorman or operator for use whenever desired to meet the conditions of an extraordinary lift or pull on the motor. In other words, it renders the

motor equal to the temporary emergency of an extraordinary load.

Of course it will be understood that the supplemental cylinder h and piston h' , with the valve connections thereto, might be differently located and differently connected up, as long as the said parts operate in substantially the same way to accomplish substantially the same result.

I have described my improved regulator as especially designed for use in connection with compressed-air motors; but it will be understood, of course, that the same is capable of general application for all kinds of fluids to which regulators are generally applied.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In an automatic fluid-pressure regulator, the combination with the high and low pressure chambers, reducing-valve and diaphragm, of a supplemental cylinder fitted with a piston operative on said valve, with one end of the said cylinder always open to the low-pressure fluid, and the other end thereof provided with valved connections operative to open the same either to the said low-pressure fluid or to the atmosphere, at will, substantially as and for the purposes set forth.

2. In a fluid-pressure regulator, the combination with the high and low pressure chambers, the reducing-valve and the diaphragm, of the casing-cap cylinder h fitted with the piston h' fixed to the lower end of the reducing-valve stem, with the upper end of the said cylinder open to the low-pressure chamber, and the valved pipe connections from the lower end of the said cylinder, comprising the pipe-sections $k k'$ united by the hand-valve casing k^2 , having the outlet k^3 to the atmosphere, and the hand-valve k^4 in said casing k^2 , provided with the two-way passage p , all arranged and operating substantially as and for the purpose set forth.

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

ROBERT HARDIE.

Witnesses:

A. E. OSBORNE,
JOHN ACKER.