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PRESSURE REGULATING VALVE.

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1,231,293.

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Fig. 1.

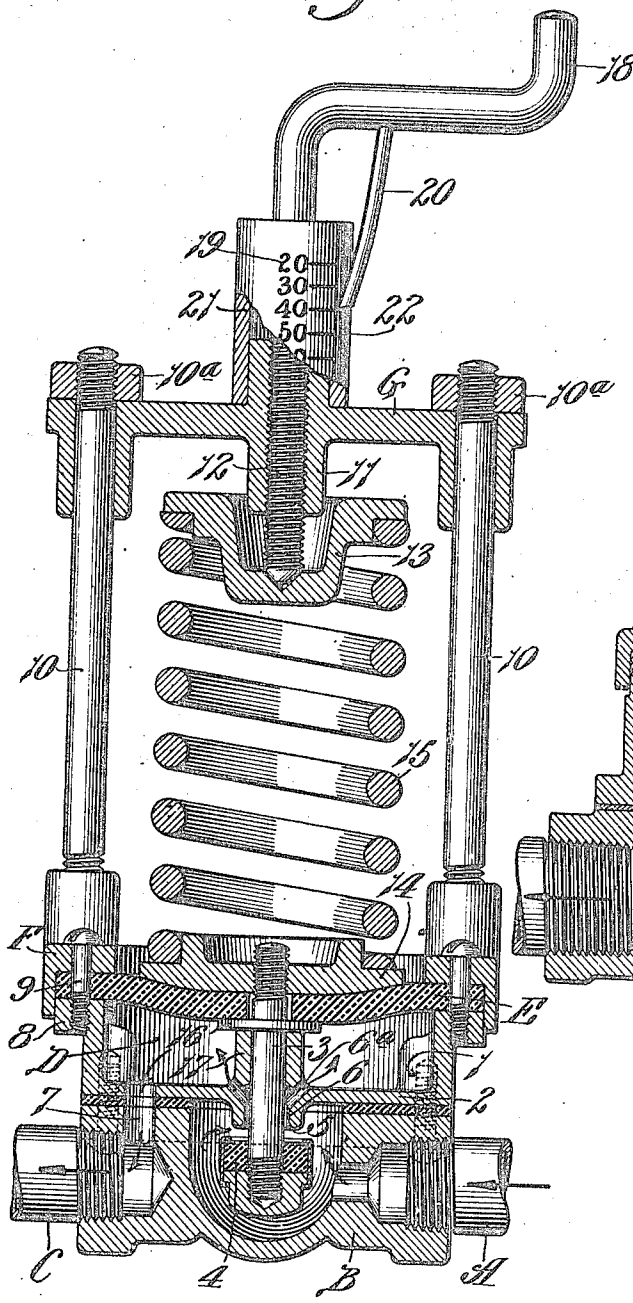
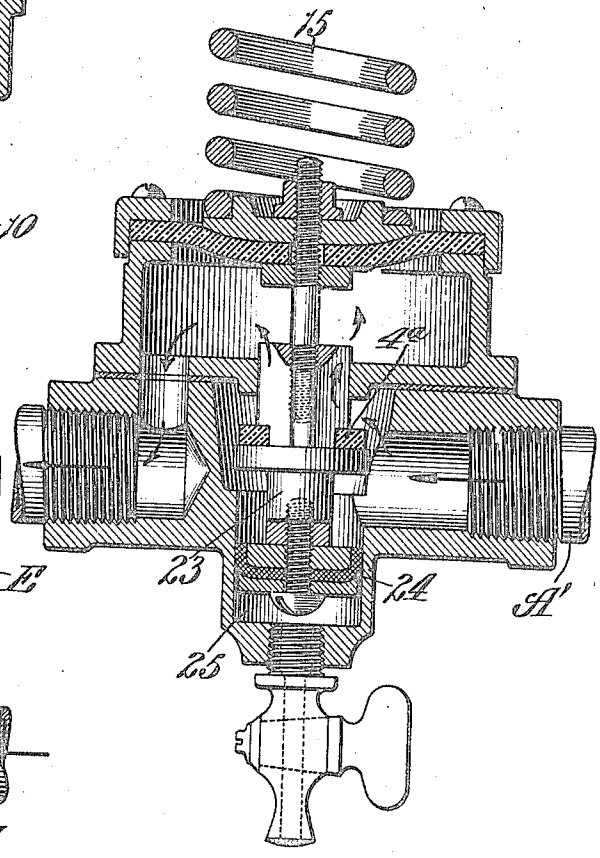


Fig. 2.



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UNITED STATES PATENT OFFICE.

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PRESSURE-REGULATING VALVE.

1,231,293. Specification of Letters Patent. Patented June 26, 1917.

Application filed May 20, 1916. Serial No. 98,931.

To all whom it may concern:

Be it known that I, THEODORE PETERS, a citizen of the United States, residing at Ferdinand, Indiana, have invented a certain new and useful Improvement in Pressure-Regulating Valves, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to pressure-regulating valves of the type which comprise a diaphragm-actuated valve for controlling or regulating the pressure of the medium passing through the valve.

The main object of my invention is to provide a pressure-regulating valve in which the desired pressure on the discharge side of the valve can be accurately gaged and controlled in a novel manner.

Another object is to provide a valve of the type referred to in which the gage for indicating the pressure in the discharge side of the valve is an integral part of the device.

Another object is to provide a valve of the character described in which the gage can be calibrated by an unskilled person.

Still another object is to provide a pressure-regulating valve in which, under certain conditions of service, the diaphragm is relieved from undue pressure on one side thereof, thus prolonging its life and eliminating the liability of stretching said diaphragm.

A further object is to provide a pressure regulating valve in which the valve that controls the inlet is so constructed that its operation is not affected by the direct pressure of the incoming medium thereon.

A still further object is to provide a valve of the type referred to which comprises few simple parts which can be easily and quickly assembled and which can be produced at a low cost of manufacture. Other objects and desirable features of my invention will be hereinafter pointed out.

Figure 1 of the drawings is a vertical sectional view of a pressure-regulating valve constructed in accordance with my invention; and

Fig. 2 is a similar view, illustrating a slightly modified form of my invention.

Briefly stated, my invention consists in a pressure-regulating valve that is adapted to be arranged in a pipe line leading from a supply of gas or liquid under pressure, means being provided in said valve for accurately regulating, controlling or maintaining the pressure of the medium from the discharge side of the valve at any desired pressure below that in the pipe line leading from the source of supply.

Referring to Fig. 1 of the drawings, which illustrates one form of my invention, A designates a pipe leading from a source of supply of a gas or liquid under comparatively high pressure, said pipe being connected to a casting B which forms part of the valve structure, and C designates a similar pipe connected to said casting oppositely to the pipe A, and through which the medium that passes through the valve is discharged. A chamber D is arranged above the casting B, said chamber being formed by a cup-shaped casting that is connected by suitable fastening devices 1, shown in dotted lines in Fig. 1, to the casting B, the bottom wall of said chamber being formed by a floor or partition 2 that separates the chamber from the casting B, and the upper wall being formed by a diaphragm E of rubber or other suitable flexible material. The diaphragm E carries a valve stem 3 that extends through an opening in the bottom wall 2 of the chamber D, and a valve disk 4 is arranged on the lower end of said stem and adapted to coöperate with a valve seat 5 to close a port 6 which establishes communication between the pipe A and the chamber D, said port 6 being formed by an enlargement of a portion of the opening in the wall 2 through which the stem 3 passes and a plurality of branching ducts 6^a that connect said enlarged portion of the opening with the interior of said chamber. A port 7 establishes communication between the chamber D and the discharge pipe C for the egress of the fluid that enters said chamber through the ports 6 and 6^a.

The diaphragm E is securely held in operative position between an annular flange 8 at the upper edge of the chamber D, and a cap piece F, by means of suitable fastening devices 9, said cap piece serving to support two or more uprights 10 which carry a cross piece G at their upper ends. The cross piece G is provided with an elon-

gated, vertically-disposed boss 11 having an internally screw-threaded bore for receiving a threaded member 12, said member having its lower end substantially conical and engaging a correspondingly shaped seat in a spring cap or seat 13. The diaphragm E is provided with a spring seat 14 that is secured thereto by means of a threaded extension of the valve stem 3, and a coiled expansion spring 15 is interposed between said spring seat and the spring cap 13 previously referred to.

The valve stem 3 is provided with a flange or collar 16 that is arranged under the diaphragm E, said collar resting, when the valve is not in use or when there is no passage of fluid through the valve, on a boss or guide 17 that projects upwardly from the bottom wall 2 of the chamber D, so as to relieve the diaphragm E from the constant downward pressure of the spring 15, thus prolonging the life of said diaphragm and preventing the same from being stretched out of shape by the constant tension or pressure exerted by said spring.

The member 12 which is threaded into the boss 11 of the cross piece G is adjustable vertically for the purpose of compressing the spring 15 more or less so as to vary the tension or pressure which said spring exerts on the diaphragm E, and said member is provided with an offset or crank shaped portion that forms an operating handle 18.

In order to indicate to the operator the pressure of the medium that passes outwardly from the valve through the discharge pipe C, I have provided a gage or scale 19 that coöperates with a resilient finger 20 on the offset portion of the adjustable member 12, said scale preferably being formed on a sleeve 21 that surrounds the shank of the member 12, said sleeve being provided with a vertical groove 22 arranged adjacent to the scale 19, into which the finger 20 is adapted to snap at the end of each revolution of the member 12, thus holding said member in any desired adjusted position. In order to accurately calibrate the gage 19, the cross piece G is adjustably mounted on the uprights 10, and in the form of my invention herein shown, the upper ends of the uprights are threaded to receive adjusting devices or nuts 10^a, which can be adjusted vertically, so as to vary the tension of the spring 15, regardless of the position of the member 12, and thus calibrate the gage 19 so that the readings thereon will correspond exactly with the pressure in the discharge side of the valve.

In operation, assuming the pipe A to be connected to a source of supply of a fluid under comparatively high pressure, for instance, air under pressure of one hundred pounds per square inch, the adjustable device 12 is rotated until the finger 20 thereon registers with the figure on the scale or gage 19 which corresponds to the pressure desired to be maintained in the discharge pipe C. When the valve is "dead"; that is, when no fluid is passing through the same, due to lack of pressure in the supply pipe, the diaphragm and its carried valve will be in the position shown in Fig. 1 of the drawings. As soon as air is admitted through the pipe A, it will pass around the valve disk 4 into the chamber D, through the ports 6 and 6^a, and then outwardly through the discharge port 7 into the pipe C. This will continue until the pressure in the chamber D builds up to a point higher than forty pounds to the square inch (the desired pressure represented by the gage) when this pressure in the chamber D will force the diaphragm upwardly against the tension of the spring, thus raising the valve disk 4 upwardly toward its seat 5, so as to restrict the entrance to the port 6 and only allow sufficient air to enter the chamber D to replace that that is being used from the pipe C. Should there be no air drawn from the pipe C, the valve disk 4 will be seated and cut off communication entirely between the supply pipe A and the chamber D, the forty pounds pressure in the chamber D being sufficient to hold said valve disk 4 seated. As soon, however, as air is drawn off from the discharge pipe C the pressure therein and in the chamber D will be reduced and the spring 15 will operate against the diaphragm E to force the valve disk 4 away from its seat and permit sufficient air to enter the chamber D from the pipe A to build up and maintain the desired pressure. By simply rotating the operating handle 18 so as to adjust the member 12 vertically, any desired pressure may be maintained in the discharge pipe C, and by combining the simple gage 19 with the handle 18, an expensive pressure gage in the pipe C is eliminated.

In Fig. 2 I have illustrated an embodiment of my invention which is especially adapted for use with a liquid under pressure, such as water, the chief distinction between this construction and that previously described being that the valve disk 4^a is provided with a downwardly-extending shank 23 which carries a piston 24 that operates in a cylinder 25 formed in the casting B'. The object of the piston 24 is to counteract the pressure of the incoming water on the under side of the valve disk 4^a, which, if no opposing area were present, such as the upper side of the piston 24, would act with all its force continually on the under side of the valve disk 4^a and hold the valve disk seated against the tension of the spring 15, which tension would not be great enough to operate against the high pressure maintained in the inlet pipe A'.

A pressure-regulating valve of the construction above described is very efficient in operation and simple in construction, being composed of a few rugged parts that can be easily and quickly assembled and which can be produced at a low cost of manufacture.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is:

1. In a pressure-regulating valve, a casing provided with inlet and discharge ports, a flexible diaphragm which controls the passage of a medium under pressure from said inlet to said discharge port, a plurality of uprights on said casing, a cross piece mounted on said uprights, a rotatable member threaded into said cross piece, a spring cap arranged at the lower end of said member, a coiled expansion spring arranged between said cap and said diaphragm, a stationary element on said cross piece through which said rotatable member passes, said element being provided on its outer surface with a scale, and a device on said rotatable member that coöperates with said stationary element to lock said rotatable member and also to indicate the pressure which said spring applies to said diaphragm.

2. In a pressure-regulating valve, a casing provided with inlet and discharge ports, a flexible diaphragm which controls the passage of a medium under pressure from said inlet to said discharge port, a plurality of uprights on said casing, a cross piece mounted on the upper ends of said uprights, a rotatable member threaded into said cross piece, a stationary sleeve on said cross piece through which said rotatable member passes, a vertically-disposed groove in the outer surface of said sleeve, a scale on the sleeve adjacent said groove, a spring cap arranged at the lower end of said member, a coiled expansion spring arranged between said cap and said diaphragm, a resilient finger on said rotatable member whose free end travels over the outer surface of said sleeve and snaps into the groove therein when said member is given a complete turn, and means for adjusting said cross piece relatively to said uprights; for the purpose described.

THEODORE PETERS.