Oct. 12, 1926. 1,603,112

A. F. JENKINS

PRESSURE REGULATOR

Filed Dec. 8, 1924

FIG. 1.

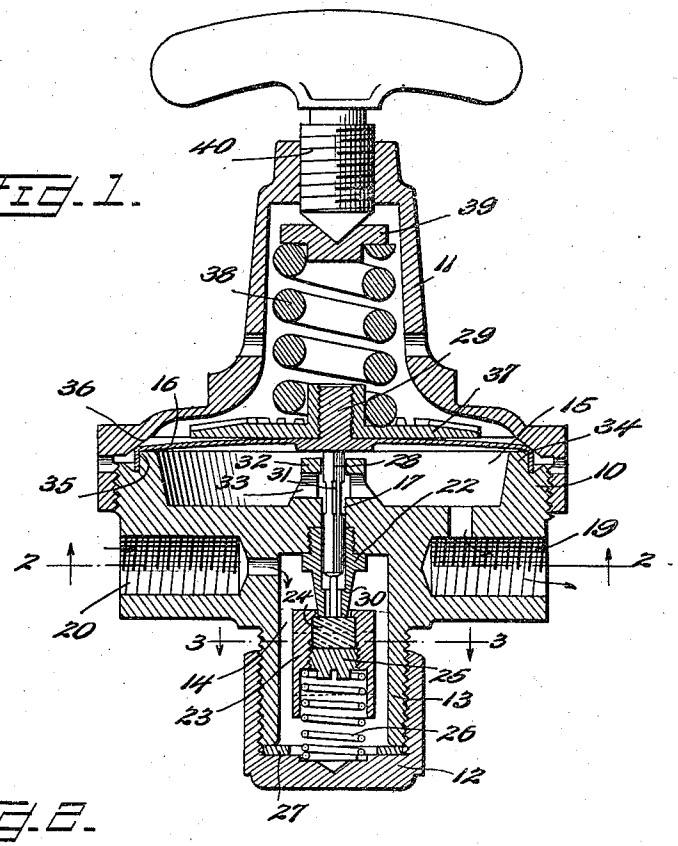


FIG. 2.

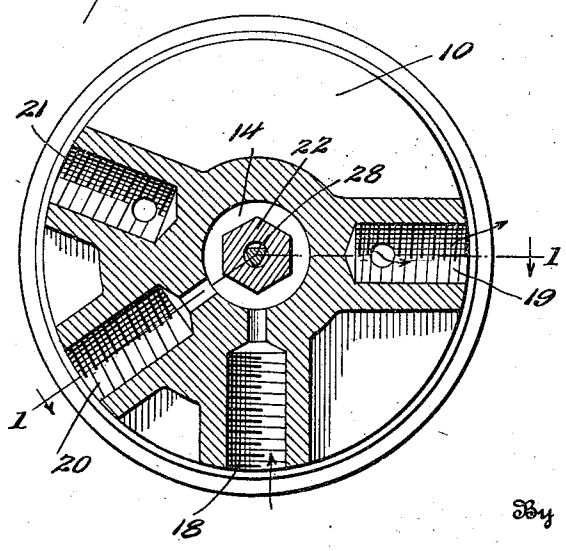
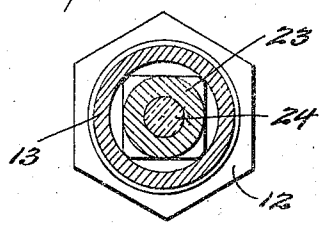


FIG. 3.



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UNITED STATES PATENT OFFICE.

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PRESSURE REGULATOR.

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The present invention relates to pressure regulators and particularly to pressure regulating attachments for high pressure gas supply tanks whereby the flow of gas from a storage tank to a point of consumption is automatically maintained at a given, sufficiently low, pressure.

In my Patent No. 1,488,007, dated March 25, 1924, a pressure regulator of this type is disclosed and claimed, and the present invention comprises an improvement upon the regulator disclosed in that application, certain of the details of construction being so changed, however, that the resulting structure is more sensitive, positive in its action, and durable than the regulator first developed. A regulator of the improved type is illustrated in the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of the regulator, taken on the line 1—1 of Figure 2;

Figure 2 is a section on line 2—2 of Figure 1, and

Figure 3 is a section on the line 3—3 of Figure 1.

My improved regulator is formed of three principal parts, a main portion or body 10, a top 11, and a bottom piece 12, detachably secured together. The top 11 is in the form of a shell which is screwed over the body 10, and the cup-shaped bottom 12 is screwed over a depending boss 13 formed integrally with the body 10.

A cylindrical recess in boss 13 is closed by cup 12, thereby forming a high pressure chamber 14.

The low pressure chamber 15 is formed by a shallow recess in the top of body 10, closed on the upper side by a flexible diaphragm 16. A passage 17 serves to connect the high and low pressure chambers. An inlet conduit 18 communicates with the high pressure chamber, and an outlet conduit 19 conducts the gas from the low pressure chamber. Additional conduits 20 and 21 are provided communicating with the high and low pressure chambers respectively, to which suitable gauges may be connected. Each of these conduits is threaded at its outer end for the attachment of suitable pipe connections.

The passage 17 is formed in part in the body 10, and in part in a nozzle 22 threaded to the member 10 and extending downward axially of the high pressure chamber. A longitudinally slidable valve carrying member 23 is mounted in the cylindrical recess forming the high pressure chamber, and carries at its upper end a cylindrical valve member 24, which is adapted to seat against the lower end of the nozzle 22, and which is held in place in the member 23 by a threaded plug 25. The ends of the member 23 are formed as squares having rounded ends which bear against the cylindrical wall of the chamber 14, the intermediate portion being cut away to a cylindrical shape, thereby reducing the friction between the member and the cylindrical wall. A cylindrical recess is formed in the lower end of the member 23 to accommodate one end of a spring 26, the other end of which bears against the cup 12. The valve member 24 is thereby yieldingly urged against the seat of the nozzle 22. A washer 27 is employed to seal the joint between the threaded cup 12 and the boss 13.

Positioned within the passage 17 is a triangular stem 28, the lower end of which bears against the valve member 24, and the upper end against the head of a threaded stud 29 which passes through and is soldered to the diaphragm 16. The lower end of the stem 28 is cut away to form a cylindrical portion of reduced diameter. The lower end of the passage through the nozzle 22 is of slightly smaller diameter than the remainder of the passage, and forms a shoulder 30 which prevents the stem 28 from dropping out when the bottom 12 and the associated parts are removed. The form of the stem is such as not to interrupt the flow of gas from the high pressure chamber to the low pressure chamber, being polygonal in cross-section and having its lower end reduced as above described. The rounded edges of the stem which bear against the wall of the passage are cut away as at 31 to reduce the area of contact and thereby lessen the frictional resistance to the sliding of the stem. The upper end of the stem 28 slides in a centrally apertured boss 32 formed integrally with the body 10, and provided with a plurality of lateral openings 33 which afford communication between the low pressure chamber 15 and the passage 17.

The diaphragm 16 fits over a rim 34 which is formed integrally with the body 10, and is clamped between a bevel 35 on the outer edge of the rim and a bevel 36 on the inner surface of the top 11. As before stated, the dia-

phragm is provided at its center with a threaded stud 29, which is soldered in place. The head of this stud takes the pressure and wear caused by the stem 28, and its threaded portion, extending above the diaphragm, carries a circular plate 37, which transmits the pressure of the spring 38 to the diaphragm. The plate 37 is flat on its lower side, but is provided with a ridged chamfer or bevel on its upper edge by means of which it may be gripped by the fingers or a suitable tool. The upper end of the spring 38 is provided with a plate 39 against which an adjusting screw 40 is adapted to bear. The screw 40 is provided with a handle and is threaded into the top 11 as shown.

For a detailed explanation of the operation of the pressure regulator, recourse may be had to my Patent No. 1,488,007, above referred to. It is sufficient here to state only that the spring 38 which presses downwardly upon the diaphragm 16, may be so adjusted that the valve 24 is opened by this spring against the action of the spring 26 when the pressure in the low pressure chamber falls below a certain degree, gas then flowing through the passage 17 to the low pressure chamber until the pressure in this chamber is again built up. This diaphragm 16 is slightly concaved so as to operate above the plane of the rim or annular abutment 34, and the centrally apertured boss 32 formed by the wall of the conduit 17 extending into the low pressure chamber serves as a guide for the stem 28, and as an abutment for preventing the downward movement of the diaphragm 16 below the plane of its supporting abutment 34 under the influence of the spring 38, when the screw 40 is improperly adjusted. The sensitivity of the operation of the movable parts of the regulator, and the accuracy of the results obtained, are greatly increased by the modifications of design of the stem, nozzle and valve carrying member above pointed out.

There are, of course, still other variations of design and arrangement of the component parts which will suggest themselves to one skilled in the art from the above disclosure, and such variations which do not involve modification or alteration of the essential features of my invention, are within the intent of the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by U. S. Letters Patent is:—

1. In a pressure regulator, in combination, a low pressure chamber, one wall of which comprises an annular abutment, and the other wall of which comprises a flexible diaphragm, supported by said abutment and adapted for operation above the plane of said abutment, a high pressure chamber, a conduit connecting said chambers, a valve in the high pressure chamber adapted to close the end of the conduit, and a stem extending through said conduit for communicating the movements of the diaphragm to the valve, the wall of said conduit extending into said low pressure chamber forming a centrally apertured boss which serves as a guide for the said stem within the low pressure chamber, and as an abutment for preventing the downward movement of the diaphragm below the plane of its supporting abutment.

2. In a pressure regulator, in combination, a low pressure chamber, one wall of which comprises an annular abutment, and the other wall of which comprises a flexible diaphragm supported by said abutment and adapted for operation above the plane of said abutment, a high pressure chamber, a conduit connecting said chambers the wall of said conduit being extended into the low pressure chamber to prevent the downward movement of the diaphragm below the plane of said abutment and cut away to provide a plurality of transverse passages into said chamber, a valve member in the high pressure chamber adapted to close the end of said conduit and slidably engaging the walls of said chamber, and a stem extending through said conduit for communicating the movements of the diaphragm to the valve.

3. In a pressure regulator, in combination, a low pressure chamber, one wall of which comprises a diaphragm, a cylindrical high pressure chamber, a conduit connecting said chambers and provided with a seat in the high pressure chamber, a polygonal sliding valve member adapted to close said seat and having its edges in sliding engagement with the cylindrical wall of said high pressure chamber, and a stem extending through said conduit for transmitting the movements of the diaphragm to the valve member, the edges of the polygonal valve member being cut away intermediate of its ends.

4. In a pressure regulator, in combination, a low pressure chamber, one wall of which comprises an annular abutment, and the other wall of which comprises a flexible diaphragm mounted on said abutment for operation above the plane thereof, adjustable means for urging said diaphragm downwardly, a high pressure chamber, a conduit connecting said chambers, a valve in the high pressure chamber adapted to close the end of said conduit, and a stem extending through said conduit for communicating the movements of the diaphragm to the valve, the wall of said conduit extending into said low pressure chamber, forming a centrally apertured boss, which serves as a guide for said stem and as an abutment to prevent the downward movement of the diaphragm below the plane of its supporting abutment under the influence of said adjustable means.

5. In a pressure regulator, in combination, a low pressure chamber, one wall of which comprises an annular abutment, and the other wall of which comprises a flexible diaphragm mounted on said abutment for operation above the plane thereof, adjustable means for urging said diaphragm downwardly, a high pressure chamber, a conduit connecting said chambers, a valve for closing said conduit, a stem for communicating the movements of the diaphragm to the valve, the wall of said conduit extending into said low pressure chamber forming an abutment for preventing the downward movement of the diaphragm below the plane of its supporting abutment under the influence of said adjustable means.

6. In a pressure regulator, in combination, a low pressure chamber, one wall of which comprises an annular abutment and the other wall of which comprises a flexible diaphragm mounted on said abutment and adapted for operation above the plane thereof, a spring for urging said diaphragm downwardly, a screw for adjusting the pressure of said spring, a high pressure chamber, a conduit connecting said chambers, a valve in the high pressure chamber, adapted to close said conduit, a stem for communicating the movements of the diaphragm to the valve, and an abutment within said low pressure chamber for preventing the downward movement of said diaphragm below the plane of its supporting abutment due to improper adjustment of said screw.

7. In a pressure regulator, in combination, a low pressure chamber, one wall of which comprises an annular abutment, and the other wall of which comprises a flexible diaphragm mounted on said abutment and adapted for operation above the plane thereof, adjustable means for urging said diaphragm downwardly, a high pressure chamber, a conduit connecting said chambers, a valve for closing said conduit, a stem for communicating the movements of the diaphragm to the valve, the wall of said conduit being extended into the low pressure chamber for the greater part of its depth, forming a centrally apertured boss for preventing the downward movement of said diaphragm, below the plane of its supporting abutment.

In testimony whereof I hereunto affix my signature.

ALEXANDER F. JENKINS.