

June 17, 1930.

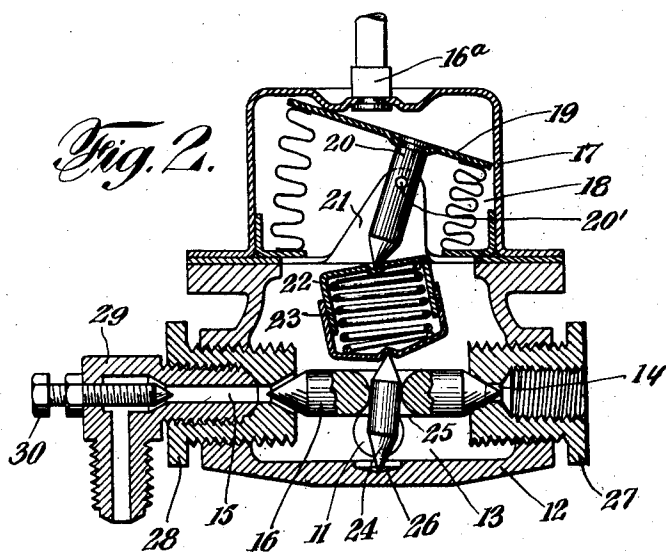
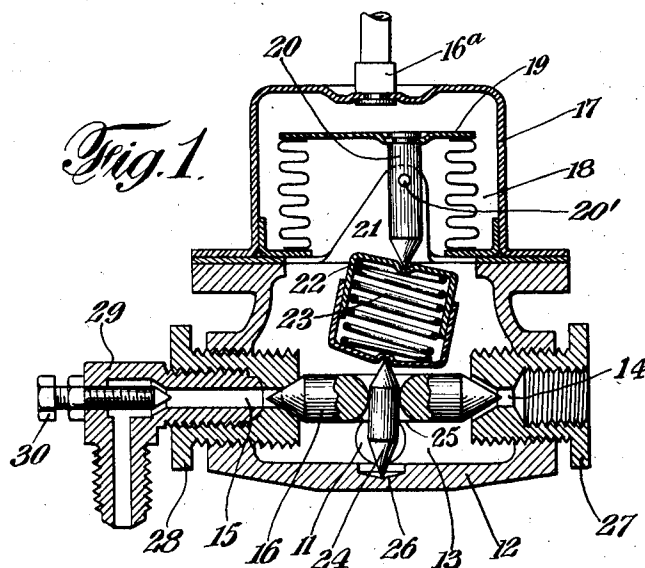
L. BRUEHL

1,764,193

FLUID CONTROL

Filed March 22, 1927

2 Sheets-Sheet 1



Inventor

Lawrence Bruehl

By his Attorneys

Dean Fambark Albright & Fireck

June 17, 1930.

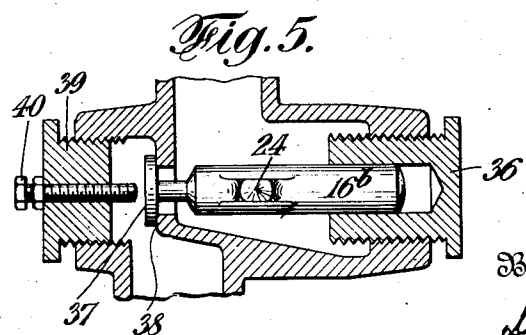
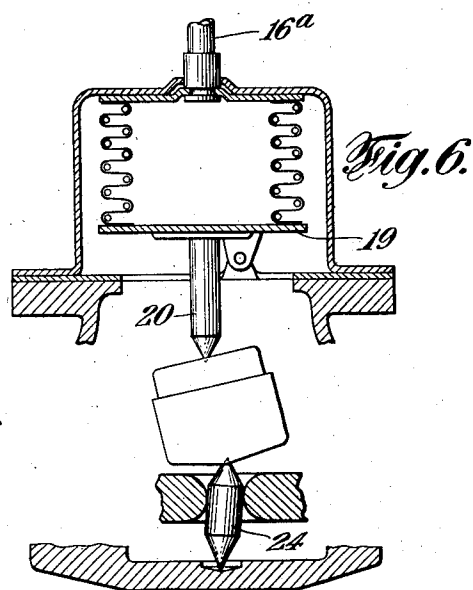
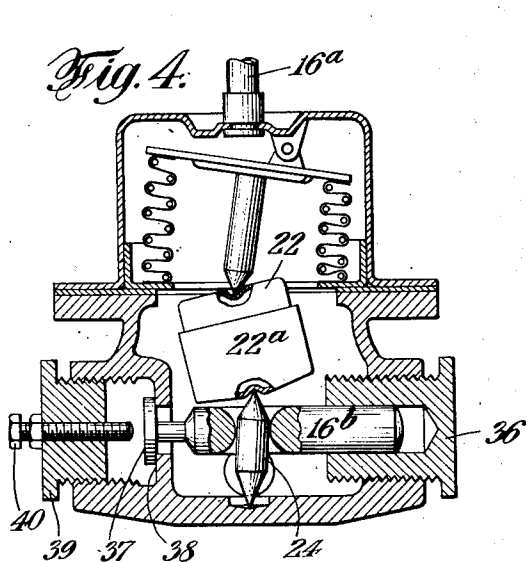
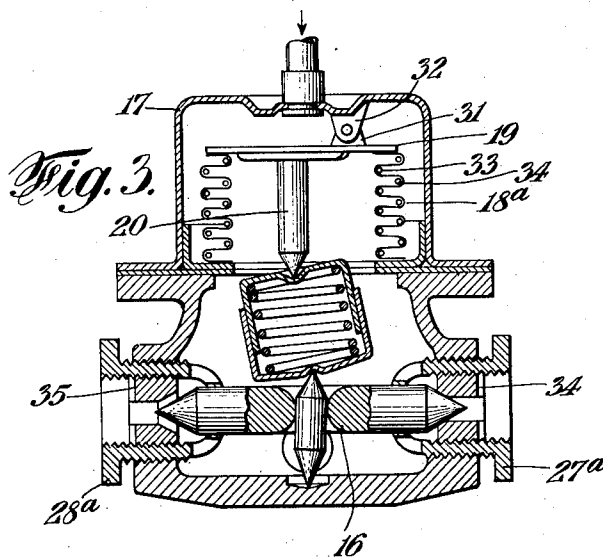
L. BRUEHL

1,764,193

FLUID CONTROL

Filed March 22, 1927

2 Sheets-Sheet 2



Inventor
Lawrence Bruehl
 By his Attorneys
Dean Furbush Obrecht & Fitch

UNITED STATES PATENT OFFICE

LAWRENCE BRUEHL, OF BROOKLYN, NEW YORK, ASSIGNOR TO GAS REFRIGERATION CORPORATION, OF SCRANTON, PENNSYLVANIA, A CORPORATION OF DELAWARE

FLUID CONTROL

Application filed March 22, 1927. Serial No. 177,313.

This invention relates to automatic valve control and more particularly to devices responsive to changes of fluid pressure resulting from changes in operating conditions in some part of the system.

The main object of the present invention is to provide an effective device of this character having a relatively small number of parts, simple in structure and economical to manufacture.

As one important feature of the invention, there is provided a valve operating means including a bellows expanding and contracting in accordance with differences between the external and internal pressures to which it is subjected and which is so mounted that the movement under change in pressure is a tilting or swinging one rather than a straight-line movement. I utilize this tilting movement for swinging the end of a spring and snapping the valve to either of two limiting positions.

As a further feature, I provide a lever member for moving the valve member and so construct the lever, the valve member and the connections therebetween that a greater leverage is brought to bear in moving the valve in one direction than in the other.

Various other advantages, important features and objects of the invention will be pointed out hereinafter or will be apparent from a consideration of the constructions illustrated in the accompanying drawings.

In these drawings:

Fig. 1 is a section through one construction embodying the invention.

Fig. 2 is a view similar to Fig. 1, but showing the parts in opposite limiting positions.

Fig. 3 is a similar view of another form in which the pivot of the bellows is outside rather than inside.

Fig. 4 is a section of a form similar to Fig. 3, but showing a two-way rather than a three-way valve.

Fig. 5 is a section in a plane at right-angles to the plane of Fig. 4 and along the axis of the valve, and

Fig. 6 is a section of a further form.

The form illustrated in Figs. 1 and 2 may be used in connection with a refrigerating

system of the intermittently operating absorption type for instance in an arrangement of the general character illustrated in co-pending application Ser. No. 167,423, filed Feb. 11, 1927.

Water or other fluid under pressure is delivered to the inlet 11 of a three-way valve 12 having a chamber 13 from which the fluid may flow through either of two oppositely disposed outlet ports 14 and 15 in accordance with the position of a plunger member 16 having its opposite ends serving as the valve portions and adapted to seat alternately against said ports 14 and 15.

The valve control apparatus includes means for holding the plunger member in either of its two limiting positions and shifting it from one position to the other when a particular pressure condition is reached in a pipe 16^a. This pipe 16^a leads from a fluid chamber to a casing 17 having an open end communicating with the chamber 13 in the casing of the three-way valve. The casing is separated into two compartments by a water tight bellows 18 having a closed end 19 in the form of a disc.

As one important feature, this disc is pivoted to swing about a point eccentrically disposed in respect to the center line of the bellows. The pivotal connections include a member 20 preferably in the form of a pin perpendicular to said disc 19 and pivoted intermediate of its ends on a pivot 20' carried by one or more ears 21 supported on the valve housing and projecting into said bellows. The inner end of the pin 20 is pivoted to the end plate 22 of a spring 23 in any suitable manner, as for instance by being tapered to engage the plate 22 in a depression in the latter. At the opposite end the spring 23 is pivotally connected to a valve operating member. This member is shown as a lever 24 passing through an opening 25 in the valve plunger 16 and pivoted to the wall of the chamber 13. Its ends are pointed, one end seating in a recess 26 in said wall and the other end seating in a depression in a second spring end plate 22^a. It should be noted that the opening 25 in the plunger 16 is flared at its ends to permit a rocking move-

ment of the lever 24 while maintaining a relatively close contact therewith. Preferably the end plates 22 and 22^a have peripheral flanges which may telescope to form a housing for the spring. The pivot or swivel point about which the closed end of the bellows turns, is illustrated in Figs. 1 and 2 as inside the bellows, but as shown in the other figures, it may be located outside the bellows at either end.

In operation the fluid to be controlled, as for instance water under pressure, is supplied to the three-way valve through the inlet 11 and fills the chamber 13 and the bellows 18. With the plunger 16 in its Fig. 1 position the water flows through the outlet 14 to any desired point. The water tends to expand the bellows 18 but the pressure in the pipe 16^a and in the space between the bellows and the casing 17 is such as to maintain the parts in their Fig. 1 positions.

When, however, the pressure in the pipe 16^a falls below the pressure required, the water causes the disc 19 to be tilted to the position shown in Fig. 2 due to the lowering of the external pressure in respect to the internal pressure. At the same time the volume of the space between the bellows 18 and the casing 17 is decreased. Such swinging causes the upper end of the spring 23 to be swung to the left, and after it is carried past a certain critical position, the spring will shift the member 24 and the plunger 16 with a snap action to open the port 15 and to close the port 14 as indicated in Fig. 2. Upon increase of pressure in the pipe 16^a to and past the critical pressure relative to the internal pressure in the bellows 18, the bellows will be contracted and the lower end of the pin or lever 20 will be swung to the right and the parts will snap back to the Fig. 1 position. It should be understood that suitable means may be provided to limit the swinging of pin 20 or the disc 19.

For convenience and ease of manufacture the outlet ports 14 and 15 may be formed in plugs 27 and 28 with their inner ends adapted to be threaded into openings in the valve casing and having threaded openings at their outer ends. For some purposes it may be desirable to restrict the flow through one or both of said ports or to vary the amount of such flow. To this end use may be made of an elbow member 29 adapted to be screwed into the openings at the outer end of one of the plugs 27 and 28 and having a screw 30 threaded into said member 29 in alignment with the entrance passage therein and having its tapered end movable back and forth in an enlarged part of the passage through the elbow and to cooperate with a suitable valve seat to vary the flow through the elbow. As illustrated in the drawings the elbow member 29 is threaded into the plug 28.

If the device is to be used for controlling

the flow of water, it is preferable that it be so mounted that the water will drain therefrom readily, for otherwise water remaining in the bellows might be frozen, and the parts ruptured, as for example while being shipped. For this reason the bellows is placed on top of the valve as illustrated in the drawings. The valve casing may have any suitable means for attaching it to a support if desired.

Although my improved device may be employed for controlling the flow of various different fluids and by the use of various different pressure mediums, the specific form hereinbefore described is particularly adapted for use in a refrigerating apparatus of the absorption type. The water which enters the chamber 13 through the port 11 may be discharged to the absorber during the cooling period or may go to the condenser, to the waste or to a diaphragm for holding open a gas valve during the heating period. The pipe 16^a may lead to a thermostatic element or cell in the evaporator or in the boiler-absorber, so that as the temperature of the cell increases the fluid therein will expand and will contract the bellows to shift the valve in one direction. As the temperature decreases the pressure outside of the bellows will decrease and the water pressure inside will expand the bellows and move the valve in the opposite direction.

If a greater flow is desired through one of the liquid outlets 14—15 than is desired through the other, the variation in the rate may be secured by adjusting the screw 30.

In Fig. 3, I have illustrated a construction which is similar to that disclosed in Fig. 1, except that the end plate 19 is pivotally connected to the end of the casing 17 by a pair of ears 31 and 32 for supporting a pivot pin. Thus the pin 20 does not act as a pivotal support. The mounting of the pivot pin at a greater distance from the spring engaging end of the pin 20 permits of a greater range of movement of the latter. In this construction, it is not essential that the pin be eccentrically disposed in respect to the end wall 19.

The bellows shown in Figs. 1 and 2 may serve as a spring tending to cause expansion against the pressure of the fluid in the pipe 16^a. This spring pressure of the bellows itself may be such that the water pressure has a negligible effect. If it is desired to supplement the spring action of the bellows, an axial spring may be placed inside or outside. In the form shown in Fig. 3 the bellows 18^a has helical corrugations, and these may receive springs 33 and 34, or either of them, one spring being shown inside of the bellows and the other outside.

In Fig. 3, I have also shown a somewhat modified form of valve plugs 27^a and 28^a. These serve as guides for the valve member 16 and include adjustable seats 34 and 35.

In some constructions, it may be desired to employ my improved mechanism for operating a two-way valve instead of a three-way valve.

In Figs. 4 and 5, I have shown the valve actuating lever 24 extending through a valve plug 16^b. This is guided by a plug 36 at one end and having a valve plate 37 engaging a valve seat 38 formed in the valve casing. Opposite to the valve seat, there is provided a plug 39 which may have an adjusting screw 40 whereby the extent to which the valve is opened may be regulated.

In the constructions above described, the pressure fluid delivered through the pipe 16^a acts upon the exterior of the bellows. In Fig. 6, I have shown a construction in which the pipe 16^a communicates with the interior of the bellows. In this case, the bellows has a closed inner end and this end is pivotally connected by means of ears or lugs to the valve casing. The pin 20 is shown concentric with the disc 19, while the pivotal support is eccentric.

I have not illustrated the complete valve in Fig. 6 as the valve member may be of the type shown in any of the other figures.

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

1. The combination of a valve having a valve chamber, an inlet and an outlet, a valve member for closing said outlet, and means for shifting said valve member to and from a position to close said outlet comprising a bellows having a substantially cylindrical, extensible, peripheral wall and a closed end, said bellows forming one side of said valve chamber, a casing surrounding said bellows and connected with a source of pressure, a lever rigidly connected to and extending approximately at right angles from the closed end of said bellows and pivoted at a point eccentrically disposed with respect to said bellows, and means including a spring interposed between said lever and said valve member for snapping said valve member in one direction or the other in accordance with the expansion or contraction of the bellows due to excess of internal pressure over external pressure or of external pressure over internal pressure.

2. The combination of a three-way valve having an inlet and oppositely disposed outlets, a reciprocating valve member for closing either of said outlets upon opening the other, and means for operating said valve member comprising a casing communicating with a source of pressure, a bellows in said casing and interposed between said source of pressure and the interior of said valve, an eccentrically disposed pivotal support for the closed end of said bellows, and a connection between said bellows and valve member including a member rigidly connected to the

closed end of said bellows and extending substantially at right angles thereto, whereby it swings about said pivotal support as a center during expansion and contraction of said bellows to cause the shifting of said valve member. 70

3. The combination of a valve having a valve chamber, an inlet and an outlet, a valve member for closing said outlet, a bellows having an extensible peripheral wall and a closed end communicating with said valve chamber, a casing surrounding said bellows and connected with a source of pressure, a lever having one end rigidly connected with the closed end of said bellows and pivoted intermediate of its ends inside of and eccentrically with respect to said bellows, a second lever arranged to operate said valve member and a compression spring interposed between said levers for snapping said valve member in one direction or the other in accordance with the excess of either internal pressure or external pressure over the other. 75

4. In combination a bellows having a substantially cylindrical, extensible, peripheral wall and an end plate, a pair of levers disposed in end to end, but spaced relationship, a spring between the spaced ends of said levers, and a valve connected to one of said levers, the other of said levers being rigidly secured to said end plate at one side of the center of the latter. 80

5. In combination a bellows having an end plate, a lever secured to and projecting from said plate at substantially right angles to the latter, a pivotal support for said plate disposed at one side of the center, whereby the plate and lever swing upon expansion or contraction of the bellows, a valve member spaced from and movable in a direction substantially parallel to the path of movement of said lever, and means interposed between said lever and said valve for imparting snap action to the latter. 85

6. In combination a bellows having an end plate, a lever secured to and projecting from said plate at substantially right angles to the latter, a pivotal support for said plate disposed at one side of the center, whereby the plate and lever swing upon expansion or contraction of the bellows, a valve member spaced from and movable in a direction substantially parallel to the path of movement of said lever, a lever for operating said valve, and a spring interposed between said levers. 90

7. In combination a bellows having an end plate, a lever secured to and projecting from said plate at substantially right angles to the latter, a pivotal support for said plate and lever disposed at one side of the center of the plate, whereby the plate and lever swing upon expansion or contraction of the bellows, a pair of opposed valve seats relatively adjustable toward and from each other, a valve member disposed between said seats and mov- 95

70

75

80

85

90

95

100

105

110

115

120

125

130

able back and forth between said seats, and means interposed between said lever and said valve for imparting snap action to the latter.

8. The combination of a three way valve including a casing having an inlet and oppositely disposed outlets, said outlets being disposed in separate members adjustable longitudinally in the wall of the casing, a reciprocating valve member disposed between said first mentioned members for closing said outlets alternately, a member having one end pivoted to said casing between said outlets and having its intermediate portion engaging with said valve member, a bellows forming one wall of said valve casing, a member rigidly secured to said bellows, and a spring interposed between said last mentioned member and said lever for imparting snap action to said valve upon predetermined movement of said bellows, the extent of movement of said bellows which is required to effect said snap action being controlled by the adjustment of the position of said first mentioned members.

9. In combination a reciprocating valve, a pivoted lever for effecting back and forth movement of the valve, a pair of opposed valve seats at opposite ends of said valve, a bellows having a pivoted portion, a spring interposed between said portion and said lever for effecting snap action of said valve when said bellows is in predetermined positions, said valve seats being independently adjustable toward and from each other to control the range and limits of movement of the bellows required to effect snap action.

10. A valve casing having a bellows forming one wall thereof, an inlet, a pair of opposed outlets, said outlets having valve seats in axial alignment and relatively adjustable toward and from each other, and means for effecting snap action of said valve in one direction when the bellows expands to one predetermined position and snap action of the valve in the opposite direction when the bellows contracts to a second predetermined position, said positions of the valve and the range of movement between said positions being controlled by the positioning and spacing of said valve seats.

Signed at New York, in the county of New York and State of New York, this 19th day of March A. D. 1927.

LAWRENCE BRUEHL.

55

60

65