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J. ZANDER

VALVE DEVICE

Filed April 6, 1921

Fig. 1.

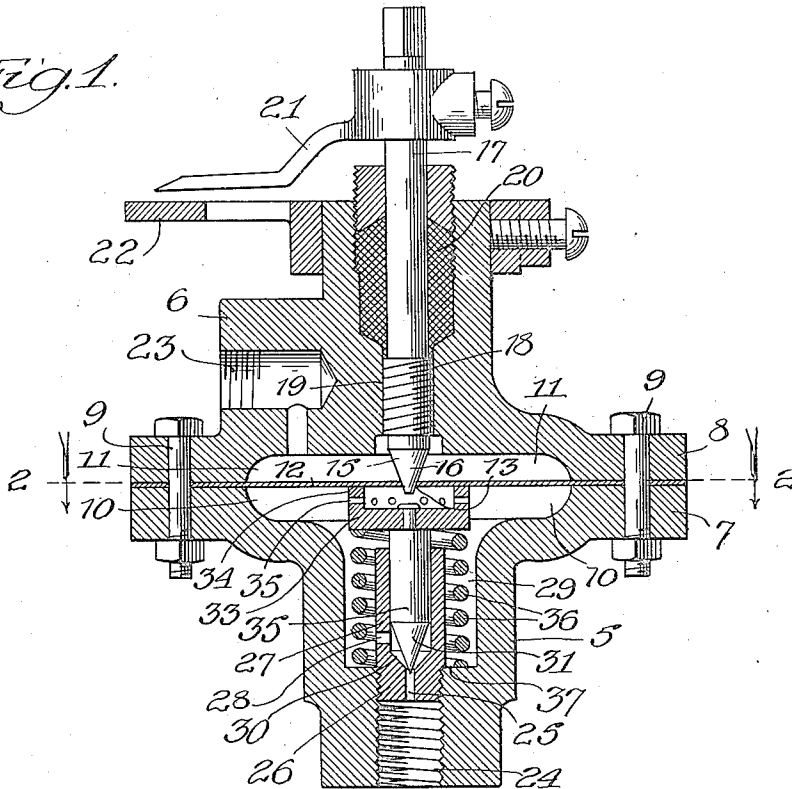
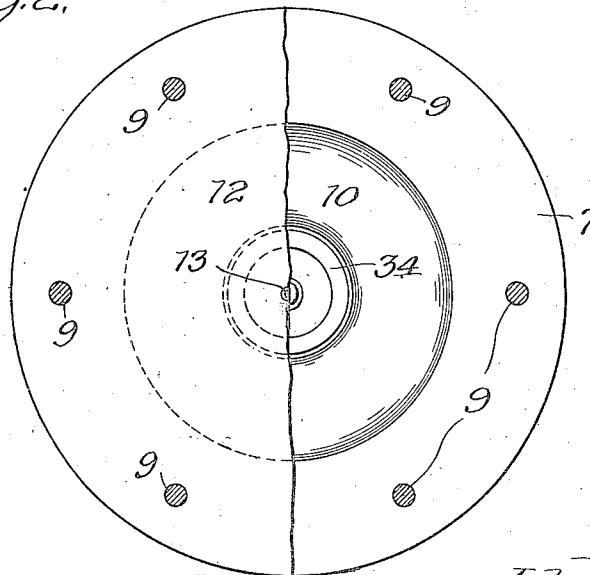


Fig. 2.



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JOHN ZANDER, OF CHICAGO, ILLINOIS.

VALVE DEVICE.

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To all whom it may concern:

Be it known that I, JOHN ZANDER, a citizen of the United States, residing at 4222 North Hermitage Ave., Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Valve Devices, of which the following is a specification.

My invention relates more particularly to valve devices adapted for use more especially as fluid pressure controllers for insuring the uniform flow of fluid pressure to its point of use from a source of fluid pressure regardless of variations in pressure of the fluid at the source, variations in back-pressure, or both.

I have devised my invention for use more especially, though not to the exclusion of such other uses to which it may be put, in connection with artificial refrigerating systems wherein a refrigerating agent such as ammonia is employed and involves for performing the refrigerating function the expansion of liquefied refrigerant into a gaseous condition and for such functioning employs a so-called expansion valve in which my invention may be embodied and used to great advantage.

My primary object is to provide valve mechanism especially to constitute the expansion valve of such a system, which shall operate accurately and effect uniform flow of fluid pressure, regardless of variations in the pressure of the supply, back-pressure where it exists, or both, and which shall not be liable to impairment; and other objects as will be manifest from the following description.

Referring to the accompanying drawings, Figure 1 is a view in sectional elevation of valve mechanism, shown as of the expansion type referred to, and constructed in accordance with my invention; and Fig. 2, a section taken at the line 2—2 of Fig. 1 and viewed in the direction of the arrows, one-half of the diaphragm of the device being omitted.

The device according to the preferred illustrated embodiment of my invention, is formed of a casing represented at 4 and preferably provided in sections represented at 5 and 6, these sections fitting flatwise together at disk portions 7 and 8 respectively thereof at which they are secured together as through the medium of bolts 9 passing

through the marginal edges of these disks. The opposed surfaces of the disks 7 and 8 are recessed as represented at 10 and 11 and extending across the space provided by these recesses, is a flexible diaphragm of any suitable material and represented at 12, this diaphragm being clamped by the bolts 9 at its marginal edges between the annular portions of the disks 7 and 8 surrounding the recesses 10 and 11, the diaphragm 12 containing a centrally disposed opening 13 which forms the sole means of communication between the chambers afforded by the recesses 10 and 11 and which cooperates with a valve represented at 15. The valve referred to is formed with a conical portion 16 concentrically disposed relative to the opening 13 and carried on the lower end of a stem 17 which has screw-threaded connection at a threaded portion 18 with an opening 19 in the section 6, the upper end of the stem 17 cooperating with a stuffing-box 20 and carrying a pointer 21 which turns with the valve and which may, in practice cooperate with indications (not shown) on a dial member 22 carried by the upper end of the casing section 6. As hereinafter described, the adjustment of the stem 17 lengthwise, by turning it in the section 6, controls the rate of flow through the outlet of the casing, and the dial 22 may present such matter thereon, for cooperation with the pointer, as to indicate the position to which the stem 17 is turned for effecting the desired rate of flow through the outlet.

The inlet of the valve device is represented at 23 and opens into the space provided by the recess 11, the outlet of the device being represented at 24, this outlet communicating with a relatively small passage 25 in a plug 26 screwed into the outlet 24. The passage 25 opens into a socket 27 in the plug 26 and open at its top, this socket communicating at a port 28 in the wall of the plug, with the reduced portion 29 of the recess 10. The opening from the passage 25 into the socket 27 is preferably of frusto-conical form as shown at 30 and forms a valve seat for the lower conical end portion 31 of a vertically-movable plunger valve 32 movable up and down in the socket 27, the upper end of this valve being connected with the disk 33 having an upwardly extending annular flange 34 perforated at intervals as indicated at 35 and bearing upwardly against the diaphragm

12, under the action of a coiled spring 36 surrounding the plug 26 and confined between an annular shoulder 37 provided by the section 5, and the bottom of the disk 33.

- 5 In the normal position of the parts of the valve device, namely, when no fluid pressure is being supplied thereto, the valve 31 will extend out of engagement with the seat 30.
- 10 The flow of fluid pressure to the device through the inlet 23 operates against the upper side of the diaphragm 12 with the result of flexing the latter, in opposition to the spring 36, in a direction to move the diaphragm 12 away from the valve 15, and
- 15 consequently permit fluid pressure to flow through the opening 13 and into the space provided between the disk 33 and the diaphragm 12 thence out through the holes 35
- 20 into the recess 10 from which it passes through the port 28 into the socket 27. Thus operating the diaphragm causes the valve 31 to be forced to closed position, and the fluid pressure continues to flow into the recess 10
- 25 until the pressure existing in this recess is sufficient, in combination with the pressure produced by the spring 36 in tending to expand, to equalize the pressure of the incoming fluid exerted against the upper side of
- 30 the diaphragm 12. The valve 31 thus becomes unseated and permits of the flow of fluid pressure from the recess 10 to and through the outlet 24. The drop in pressure of the fluid thereby produced in the recess
- 35 10 by the opening of the valve 31 permits the fluid in entering the recess 11 to force the diaphragm 12 downwardly and supply more fluid to the recess 10 and as the pressure increases in the recess 10 as hereinbefore stated, the diaphragm 12 moves back
- 40 toward normal position. It will thus be understood from the foregoing that the differential pressure at opposite sides of the diaphragm being a constant and the opening therethrough also a constant, a uniform
- 45 rate of flow of the fluid through opening 13 and also the outlet 24 will be maintained regardless of variations in the pressure of the fluid supplied to the device through the inlet 23, back-pressure at the outlet 24, or a
- 50 combination of both. The rate of flow through the device may be varied either by varying the tension of the spring 36, or, and as the device is shown preferably, by adjusting the valve 15 toward and away from
- 55 the diaphragm 12, or by a combination of these adjustments, it being understood that the closer the valve 15 is adjusted toward the diaphragm 12, the less the rate of flow
- 60 through the outlet 24. By the adjustments referred to the constant of differential pressure of the fluid at opposite sides of the diaphragm 12 may be varied as desired, and by adjusting the valve 18 the constant of the
- 65 opening afforded through the diaphragm

may also be varied as desired, thereby to vary the rate of flow of the fluid through the device

It will be noted that by the provision of the opening in the diaphragm cooperating with the valve which extends into the opening, this part of the structure is rendered self-cleaning which is of great advantage especially where the device is used as an expansion valve in refrigerating systems. Furthermore, the feature of backing the diaphragm 12 by a guide-member which is the valve 32 which is positively guided and engages at all times at the disk portion 33 with the diaphragm 12, is of advantage as there-

by distortion of the diaphragm 12 which might otherwise occur is prevented.

Where the valve shown is used in a refrigerating system of the intermittent absorption type wherein the gasified refrigerant is placed in solution and from which it is "boiled off" in any one part of the cycle of operations, an effect which causes a reverse flow of fluid to the valve would be produced, the valve operates automatically as a check to prevent the flow of the fluid through the valve device.

While I have illustrated and described a particular construction embodying my invention, I do not wish to be understood as intending to limit it thereto as the same may be variously modified and altered without departing from the spirit of my invention.

What I claim as new and desire to secure by Letters Patent is:

1. A valve mechanism comprising a casing containing an inlet and an outlet, a chamber between said inlet and outlet, a valve controlling said outlet, and means for controlling said valve comprising a movable member in said chamber against which the fluid operates at opposite faces thereof, said member being so arranged that the pressure of the incoming fluid is exerted against one face thereof and operates to produce the flow of fluid to said valve and movement of said valve toward closed position, the pressure of the fluid between said member and valve being exerted against the opposite face of said member, said valve in the building up of the pressure against said last-referred-to face of said member moving in a direction opposite to closing.

2. A valve mechanism comprising a casing containing an inlet and an outlet, and a chamber between said inlet and outlet, a member movable in said chamber and containing an opening, the pressure of the fluid in said chamber operating against the opposite faces of said member, a valve cooperating with said opening, said member tending to move toward a position in which said valve closes said opening and a second valve controlling said outlet, said second valve being controlled by said member and mov-

ing in a direction away from closed position upon the building up of pressure between it and said member and toward closed position upon reduction of pressure between said member and said last-named valve.

3. A valve mechanism comprising a casing containing an inlet and an outlet and a chamber between said inlet and outlet, a member movable in said chamber and containing an opening, the pressure of the fluid in said chamber operating against the opposite faces of said member, a valve co-operating with said opening, spring means tending to move said member toward a position in which said valve closes said opening, and a second valve controlling said outlet, said second valve being controlled by said member and moving in a direction away from closed position upon the building up of pressure between it and said member and toward closed position upon reduction of pressure between said member and said last-named valve.

4. A valve mechanism comprising a casing containing an inlet and an outlet and a chamber between said inlet and outlet, a member movable in said chamber and containing an opening, the pressure of the fluid in said chamber operating against the opposite faces of said member, a valve co-operating with said opening, a second valve controlling said outlet, and a spring tending to move said last-named valve to open condition and move said member in opposition to the flow of fluid into the said chamber, said second valve being controlled by said member and moving in a direction away from closed position upon the building up of pressure between it and said member and toward closed position upon reduction of pressure between said member and said last-named valve.

5. A valve mechanism comprising a casing containing an inlet and an outlet and a chamber between said inlet and outlet, a diaphragm located within said chamber and secured in place therein at its marginal edges, said diaphragm containing an opening, the pressure of the fluid in said chamber operating against the opposite faces of said diaphragm, a valve co-operating with said opening, said diaphragm tending to move toward a position in which said valve closes said opening, and a second valve controlling said outlet, said second valve being controlled by said diaphragm and moving in a direction away from closed position upon the building up of pressure between it and said diaphragm toward closed position upon reduction of pressure between said diaphragm and said last-named valve.

6. A valve mechanism comprising a casing containing an inlet and an outlet and a chamber between said inlet and outlet, a diaphragm located within said chamber and

secured in place therein at its marginal edges, said diaphragm containing an opening, the pressure of the fluid in said chamber operating against the opposite faces of said diaphragm, a valve co-operating with said opening, spring means tending to move said diaphragm toward a position in which said valve closes said opening, and a second valve controlling said outlet, said second valve being controlled by said diaphragm and moving in a direction away from closed position upon the building up of pressure between it and said diaphragm toward closed position upon reduction of pressure between said diaphragm and said last-named valve.

7. A valve mechanism comprising a casing containing an inlet and an outlet and a chamber between said inlet and outlet, a diaphragm located within said chamber and secured in place therein at its marginal edges, said diaphragm containing an opening, the pressure of the fluid in said chamber operating against the opposite faces of said diaphragm, a valve co-operating with said opening, a second valve controlling said outlet, and a spring tending to move said last-named valve to open condition and move said diaphragm in opposition to the flow of fluid into said chamber, said second valve being controlled by said diaphragm and moving in a direction away from closed position upon the building up of pressure between it and said diaphragm toward closed position upon reduction of pressure between said diaphragm and said last-named valve.

8. A valve mechanism comprising a casing containing an inlet and an outlet and a chamber between said inlet and outlet, a diaphragm located within said chamber and secured in place therein at its marginal edges, said diaphragm containing an opening, the pressure of the fluid in said chamber operating against the opposite faces of said diaphragm, a valve co-operating with said opening, a second valve controlling said outlet and movable in a direction at angles to the plane of said diaphragm and abutting said diaphragm, and a spring operating against said second valve and operating to move the latter toward open condition and said diaphragm in a direction to close said first-referred-to valve, said second valve being controlled by said diaphragm and moving in a direction away from closed position upon the building up of pressure between it and said diaphragm and toward closed position upon reduction of pressure between said diaphragm and said last-named valve.

9. A valve mechanism comprising a casing containing an inlet and an outlet and a chamber between said inlet and outlet, a diaphragm located in said chamber and held therein at its marginal edges, said dia-

phragm containing an opening, whereby the portions of said chamber at opposite sides of said diaphragm are in communication with each other. a valve of taper form extending into said opening, a second, receptacle valve controlling said outlet and a spring tending to move said second valve toward open condition, said second valve abutting, under the action of said spring, against the face of said diaphragm opposite to the face thereof nearest said inlet, whereby upon the building up of pressure between said diaphragm and said second valve, said second valve moves in a direction away from closed position, and upon reduction of pressure between said diaphragm and said second valve, moves toward open position.

JOHN ZANDER.