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L. W. EGGLESTON

1,541,930

AIR VALVE

Filed Feb. 4, 1921

Fig. 1.

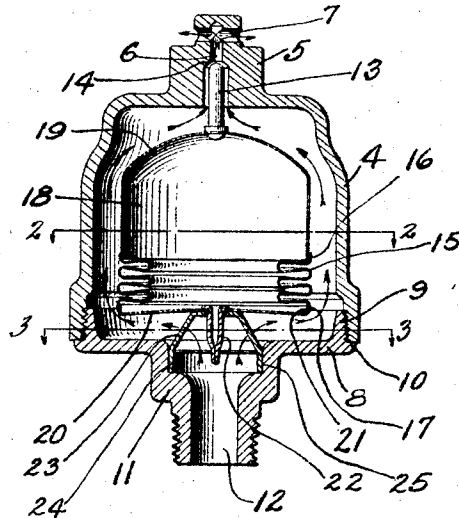


Fig. 2.

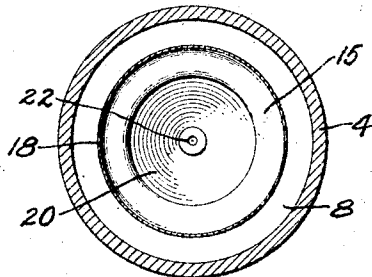
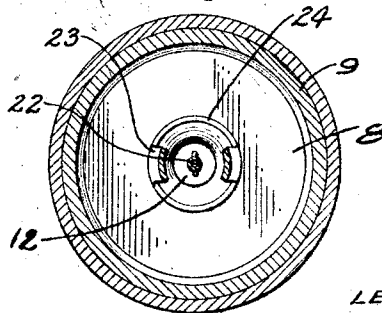


Fig. 3.



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UNITED STATES PATENT OFFICE.

LEWIS W. EGGLESTON, OF BUFFALO, NEW YORK, ASSIGNOR TO AMERICAN RADIATOR COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF NEW JERSEY.

AIR VALVE.

Application filed February 4, 1921. Serial No. 442,532.

To all whom it may concern:

Be it known that I, LEWIS W. EGGLESTON, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Air Valves, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to new and useful improvements in valves, and more particularly to that character or type including actuating means responsive to temperature or pressure conditions.

One object of the invention is to provide an improved valve-actuating or controlling element which will be expansible and collapsible under temperature changes, and which will operate as a float under certain conditions of operation and use.

Other objects and advantages of my invention will appear more fully in the accompanying specifications and claims.

The invention consists in the improvements to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

For the purpose of disclosing my invention I have illustrated a preferred embodiment thereof in the accompanying drawings, in which—

Figure 1 is a longitudinal sectional view of a valve embodying my invention;

Fig. 2 is a transverse sectional view taken on the line 2—2 of Figure 1; and

Fig. 3 is a transverse sectional view taken on the line 3—3 of Figure 1.

In the embodiment illustrated I provide a valve casing 4 which is substantially cup shaped and has at its upper end a boss 5 provided with a vertically extending port 6 and a horizontally extending port 7 communicating with the vertically extending port. The lower end of the casing is closed by means of a closure 8 having an annular flange 9 externally screw-threaded and engaging an internal screw-thread formed in the casing. The outer periphery 10 of the closure seats on the lower edge of the casing to make a tight joint at this point. This closure is provided with a restricted neck 11 having an inflow port 12 and the neck is externally screw-threaded to provide means

for coupling the same with a main, riser or other portion of a heating system.

The passage of air or vapor through the ports 12 and 6 is controlled by a valve 13 preferably in the form of a rounded stem having a semi-spherical end adapted to engage in the seat 14 which opens into the port 6.

This valve is operated by means of a combined float and expansible-collapsible member of my invention. The expansible-collapsible member comprises an annular metallic shell having a thin side wall preferably composed of a lower part or portion which is circumferentially corrugated to form a series of corrugations or folds 15 and having at its opposite ends flat annular band portions 16 and 17. Telescoping the annular band portion 16 is a float portion 18 which consists of a cylinder having a smooth rigid wall and the one end open so as to form a chamber with the corrugated shell, the other or upper end 19 being closed and substantially semi-spherical in shape. The valve 13 is riveted or otherwise secured to the central portion of this semi-spherical end 19. The opposite end of the expansible-collapsible member is closed by a disc 20 having an annular flange 21 arranged to telescopically fit and be secured to the band 17. The cylinder 18, the member 15 and the disc 20 are preferably soldered, brazed or otherwise secured in position to make a gas tight joint. The head or end 20 is made of suitable resilient metal or other suitable material and in making is normally dished so that the resiliency thereof tends to restore or maintain it in such normal or dished position, and said head, when secured in position in the part 15 is arranged so that the normal resiliency tends at all times to cause said head or end to bulge or flex outwardly relative to said part 15. The interior of the expansible-collapsible member is rarefied to a partial vacuum and is preferably charged with a suitable volatile liquid, and for this purpose I provide the member with a charging and exhausting stem which comprises a tube 22 adapted to be riveted in the disc 20, the joint being made gas tight. The stem also acts as a guide for the expansible-collapsible member and moves in an opening formed in the center of a frustro-conical shell 23 having fluid passage openings

therein and having an annular flange 24 at its bottom which flange fits tightly in an annular seat or recess 25 formed in the neck 11.

5 The corrugations 15 in the shell impart to the latter the necessary resiliency and flexibility, so that it will cause the valve stem to travel the required amount. At the same time, with the dimensions and conditions generally met with in a valve of this character, a shell entirely corrugated would be so heavy that it would not float. The smooth-walled float portion renders the shell sufficiently light, to assure sufficient buoyancy, to make the entire shell float. By making the shell of corrugated and of smooth portions, therefore, it performs the double function of imparting to the valve stem the necessary travel in a positive and reliable manner, and of making the entire shell float when submerged in water.

The expansible-collapsible member is arranged to be charged with a suitable volatile liquid which, when subjected to the heat of steam passing through the valve, will expand, thereby creating sufficient pressure within the member to permit the disc 20 to bow outwardly, and permit the corrugated wall to expand thereby raising the valve 13 and causing it to engage its seat 14 closing the port 6. I have found that when the expansible-collapsible member is charged in a temperature of 70° Fahrenheit with one fifth of a cubic centimeter of a mixture consisting of 85% distilled water and 15% wood alcohol or approximately 75% distilled water and 25% ethyl alcohol and a vacuum of fifteen inches of mercury created therein it will expand to close the valve at 180° Fahrenheit.

While I have described the expansible-collapsible member as being charged with a volatile liquid it will be understood that any fluid or gas expansible under the influence of heat may be depended upon for this purpose.

In practice the end closure disc 20 of the expansible-collapsible member is dished outwardly so that before the expansible-collapsible member is charged the normal position of said disc 20 will be an outward dish or bow, and with the member in its normally expanded condition the valve will be closed. The expansible-collapsible member is charged through the filling or charging stem 22, and before the charge of volatile liquid is inserted, the air in the expansible-collapsible member is exhausted thereby creating a partial vacuum in the expansible-collapsible member. This partial vacuum is sufficient to draw the outwardly dished disc 20 inwardly and collapse the expansible-collapsible member 15. After the partial vacuum is produced in the expansible-collapsible member a suitable charge of volatile

liquid is inserted, being drawn in by the partial vacuum, and the filling stem is then squeezed to seal the member. The squeezed end is preferably soldered to insure a gas tight joint although I have found in practice that merely squeezing the tube together makes a sufficiently tight seal. The partial vacuum produced in the expansible-collapsible member as before stated, is sufficient to collapse the outwardly dished disc end 20 and also slightly collapse the corrugated walls of the expansible-collapsible member to such an extent that, with the volatile liquid cold, when the expansible-collapsible member is placed in position in the casing with the guide stem 22 extending through the shell 23 and the bottom of the expansible-collapsible member resting on the shell, the valve will be open. As soon as steam is admitted to the system adapted to be controlled, it forces such air as is in the system before it out through the port 7. When, however, the steam strikes the expansible-collapsible member the temperature of the volatile liquid within the expansible-collapsible member is raised until the volatile liquid is expanded in the expansible-collapsible member sufficiently to create a pressure therein, equal to the external pressure, which permits the disc 20 to bow outwardly, and the expansible-collapsible member to expand thereby moving the valve to closed position.

If for any reason water of condensation in the system rises in the casing the expansible-collapsible member, due to its float portion, will be floated upwardly thereby moving the valve 13 to its seat 14 and preventing the escape of water through the port.

In actual practice I have found that care must be exercised in spacing the walls of the casing from the walls of the expansible-collapsible member. If these two walls are brought too closely together, after the water has risen in the casing and the steam pressure then drops permitting the water to drop with it the water will be held between the two by capillary attraction and also by a partial vacuum created by the condensation of the steam above the water and the thermosensitive member and float will not fall and open the valve. Consequently, when steam is again turned on the air will not vent through the valve. I have found that in a valve wherein the casing has an inside diameter of one and fifteen-sixteenths inches, a clearance of seven thirty-seconds of an inch between the wall of the casing and the thermosensitive member will be sufficient to prevent the water being so held between the casing and said member as to prevent free opening movement of the valve. This feature is claimed in my copending application, Serial No. 510,239.

While I have shown and described one embodiment of my invention it will be un-

derstood that the same may take various other embodiments and the structure illustrated modified without departing from the spirit of the invention as set forth in the appended claims.

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

1. In a valve, the combination of a casing having inlet and outlet ports therein, a valve for controlling one of said ports, and means for operating said valve, said means comprising a shell having a flexible body portion and a float portion and closed ends, one of said end portions being resilient and normally dished outwardly.

2. In a valve, the combination of a casing having inlet and outlet ports therein, a valve for controlling one of said ports, and means for operating said valve, said means comprising a shell having a longitudinally flexible body portion, and a float portion, and closed ends, one of said ends being resilient and having a spring tendency to move outwardly, the interior of said shell being rarefied sufficiently to tend to hold said end against outward movement.

3. In a valve, the combination of a casing having inlet and outlet ports therein, a valve for controlling one of said ports, and means for operating said valve, said means comprising a shell having a circumferentially corrugated flexible body portion provided with annular bands at its opposite ends, a disc-like closure member telescoping one of said bands, and a cylindrical closure member having a closed end and the other end open, said open end portion telescoping the other of said bands.

4. In a valve, the combination of a casing having inlet and outlet ports therein, a valve for controlling one of said ports, and means for operating said valve, said means comprising a hollow shell having a wall including a non-flexible float portion and a flexible, expansible-collapsible, corrugated portion, said shell having end closure walls, one of which is resilient and normally flexed outward relative to the shell by its spring tendency.

5. In a valve, the combination of a casing having inlet and outlet ports therein, a

valve for controlling one of said ports, and means for operating said valve, said means comprising a shell having a cylindrical wall including a non-flexible float portion and a flexible, expansible-collapsible, corrugated portion, said wall having end closure walls, one of which is rigid and the other of which is resilient and normally flexed outward relative to the shell by its spring tendency.

6. In a valve, the combination of a casing having inlet and outlet ports therein, a valve for controlling one of said ports, and means for operating said valve, said means comprising a cylindrical shell having a body portion circumferentially corrugated and a float portion having a substantially semi-spherical closed end, a normally outwardly dished resilient end closure for the opposite end of said shell, and a tubular charging stem opening through said end closure.

7. In a valve, the combination of a valve casing having an outlet port at its top and an inlet port at its bottom, a seat surrounding said inlet port, a valve for controlling said outlet port, a combined float and thermosensitive member comprising a shell having a flexible body portion and a float portion, the bottom end of said shell being closed, a charging stem secured to and opening through said closed end, and a guide secured in said seat and guiding said stem.

8. In a valve, the combination of a valve casing having an outlet port at its top and an inlet port at its bottom, a seat surrounding said inlet port, a valve for controlling said outlet port, a combined float and thermosensitive member comprising a shell having a cylindrical wall formed with a flexible, expansible-collapsible, corrugated portion and a rigid float portion, said shell being closed at its ends by heads, the bottom head being resilient and normally dished outward, a stem secured to said bottom head, and a guide secured in said seat and guiding said stem.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

LEWIS W. EGGLESTON.

Witnesses:

F. NELSON,

P. E. STOKES.