Dec. 17, 1929. C. H. JOCKMUS 1,739,638

VALVE UNIT FOR STEAM TRAPS

Filed Dec. 3, 1927

Fig. 1.

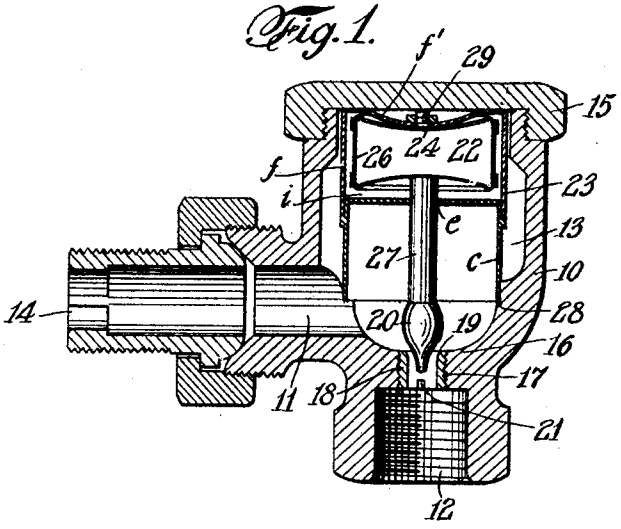
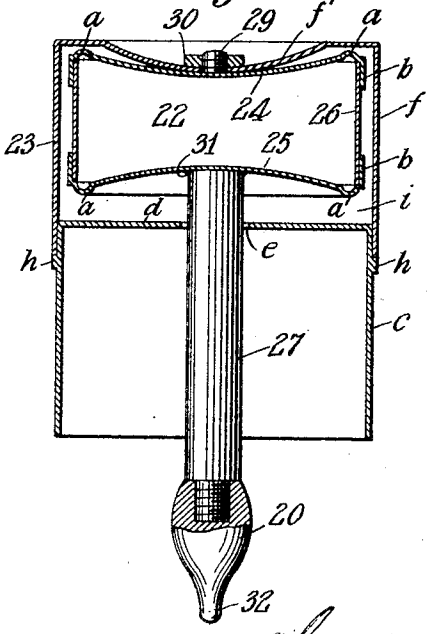


Fig. 2.



Inventor

By his Attorney

Patented Dec. 17, 1929

1,739,638

UNITED STATES PATENT OFFICE

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VALVE UNIT FOR STEAM TRAPS

Application filed December 3, 1927. Serial No. 237,357.

The present invention relates to thermostatic valves for steam traps useful in a return line of steam heating systems or in other systems, for the purpose of permitting the discharge of water or air from the radiator or system by the advancing steam but which will close to prevent the discharge of steam from the radiator. While I refer principally to steam heating systems for the purposes of this disclosure, it is to be understood that the invention may be used in any system or in any connection where it may be found useful.

Heretofore, valves of this character which employed diaphragm or expanding units became ineffective for their purposes due to the fact that the diaphragm or expansion elements expanded too far and became buckled or distorted, and remained so, whereby their function and operation were materially affected. Also, the expanding elements were affected by the hot water which preceded the steam and closed the valve before the radiator or line was emptied of all the hot water or air, whereby the advance of the steam was checked and the efficiency of the system reduced.

The object of the present invention is to provide a thermostatic valve of the above stated character designed to prevent the expansion of the diaphragms of the expansion elements beyond their elastic limits, and which will shield or house the expansion element and support the same in such a manner as to prevent it from being effective to close the valve until steam at 212° F. enters the valve casing and trap.

A further object of the invention is to provide a valve simple in construction of low manufacturing cost coupled with the functional advantages above stated.

One of the important features of the invention is that the expansion or thermo-dynamic element is completely enclosed in a shield or housing supported above and protected from the incoming hot water to retard its effective operation until the steam heats the thermo-dynamic element.

Another feature resides in the housing being so constructed that its end walls engage and limit the expansion of opposing diaphragms, so that they will not expand beyond their elastic limits.

A further feature of the invention resides in the construction of the diaphragms having an outstanding bead extending around their entire circumferences near their peripheries, and which renders them more flexible under expansion but reinforces them against buckling or distortion, as the metal from which they are made is very thin.

A still further feature of the invention is the adjustable tubular valve seat which is accessible for adjustment through the inlet or outlet opening of the valve trap casing to be adjusted to a nicety according to the expansion movement of the thermo-dynamic element by which the valve is operated to engage said seat, the seat member having a rounded edge or seat with which the valve engages, which will not score the valve but will permit it to sit tightly.

Other objects and features of the invention will appear as the specification proceeds and will be pointed out in the appended claims.

In the drawing which illustrates the invention as at present devised:

Figure 1 is a vertical sectional view through the valve trap casing equipped with the present invention.

Figure 2 is an enlarged vertical sectional view taken through the valve unit which has been removed from the trap or valve casing.

Referring to the drawing in detail, 10 designates the valve casing, here shown in the form of a right angle fitting, having an inlet opening 11 and a discharge opening 12, each communicating with a valve chamber 13. The casing or fitting 10 is designed to be interposed in the return line of a steam heating system and to have its inlet end 11 connected adjacent a radiator (not shown) by a coupling 14.

While the casing 10 is shown as a right angle fitting, it is to be understood that it may be of other design to be positioned to meet the requirements of prevailing conditions. However, it is preferred, but not necessary, that the chamber 13 be positioned vertically to have its major portion above the flow of water between the inlet 11 and the

outlet 12, in order that the thermodynamic element will not be immediately subjected to the temperature of the heated water preceding the flow of steam or vapor.

The outer or upper end of the chamber 13 is closed by a removable cap 15 suitably threaded upon the chamber. The passage between the inlet 11 and the outlet 12 is restricted by a central opening 17 having its inner walls threaded. An externally threaded bushing 18 is adjustably received within the opening 17 and provided at its upper or inner end with an inwardly inclinded rounded edge or face forming a seat 19 for the valve 20. The bushing or seat member 18 is adjustable in the opening 17 by means of a suitable tool or screw driver which may engage in notches 21 in the lower or outer edge of the bushing.

The chamber 13 is designed to receive the removable valve unit, which includes a housing 23 containing and completely enclosing or shielding the thermo-dynamic element 22, this unit being preferably cylindrical as shown in Figures 1 and 2. The thermo-dynamic element 22 comprises two circular diaphragms 24 and 25 arranged in opposed relation and dished inwardly toward each other, and a cylindrical side wall 26 extending between the peripheral edges of the diaphragms, thus providing a closed chamber for a volatile substance which will expand at a predetermined temperature to move the diaphragms outwardly. The diaphragms are made with outstanding beads *a* extending around their entire circumference near their periphery. These beads render the diaphragms more flexible under expansion and reinforce said diaphragms against buckling or distortion, since the metal from which the diaphragms are made is very thin.

The marginal portions of the diaphragms between the beads *a* and their edges are laterally extended to form the flanges *b* which extend around the adjacent edges of the side wall 26 of the thermo-element 22. The beads *a* maintain the body portions of the diaphragms in undistorted position, so that they act uniformly at all times.

The housing 23 for the thermo-dymamic member 22 comprises an inverted cup member *c*, preferably cylindrical in shape, and having a substantially flat top wall *d* provided with a central opening *e* through which the upper end of the valve stem 27 extends. The inverted cup *c* is designed to support the valve unit in position by having its lower edge or skirt rest upon a shoulder 28 on the lower walls of the chamber 13. A second inverted cup *f* is removably fitted over the cup *c* to provide a closed chamber *i*, which encloses and shields the thermo-element 22 from the heat of the warm water initially passing through the device, to retard the closing of the valve until all of the water has passed from the radiator and the element is acted upon by the steam at 212° F.

The cup *f* has its top wall *f'* depressed or concave to conform substantially with the dished surface of the opposing diaphragm 24 of the element 22. The diaphragm 24 is secured at its center to the center portion of said wall *f'* by any suitable means, such as by a detachable connection consisting of a bolt 29 projecting from the diaphragm through an opening in the wall *f'* and secured by the nut 30. The upper end of the valve stem is suitably secured to the center of the diaphragm 25 as at 31.

The depending side wall or flange of the cover cup *f* engages a bead or stop *h* on the cup *c*, which determines the distance between the walls *d* and *f'* and the limit of expansion of the thermo-element 22. The element 22 used in the present device has a maximum expansion which is greater than the distance between the walls *d* and *f'* of the housing 23, with parts assembled, thus permitting it to expand to a point less than its maximum value. At this point of expansion the diaphragms 24 and 25 will contact with the walls *d* and *f'* and will be held confined against expansion beyond their normal limits, thus insuring against improper operation of the element 22 causing distortion or buckling of the diaphragms 24 and 25.

The inverted cup portion *c* of the housing 23 is of sufficient length to hold the thermo-element 22 well above the incoming water from the radiator, and the cup *f* together with the wall *d* of the cup *c* completely enclose the thermo-element so that its expanding action is retarded until all of the water has passed through the radiator, the side wall 26 of the element being spaced from or out of contact with the side wall of the housing.

The valve 20 is formed with a depending projection 32 normally extending into the valve opening 17, whereby the valve is properly guided in position and maintained against undue lateral shifting or rocking movements which would be transmitted through the valve stem and the head to the diaphragms of the thermo-element 22.

As will be observed, the operation of the thermo-element 22 only positively affects the closing of the valve 20 and, after the same has been contracted, the valve will be opened thereby.

This construction also permits ready and convenient assemblage and disassemblage of the parts constituting the valve element, in order that any defective parts may be readily displaced singly, it being only necessary to remove the cap 15 from the valve trap casing and withdraw the entire valve unit therefrom. By removing the part or cap *f* of the valve unit, unscrewing the valve 20 and the nut 30, a new thermo-element may be readily inserted. Thus, it is manifest that a very com-

pact, desirable and convenient valve unit has been provided of simple construction, and which possesses features which overcome the drawbacks found in existing valves.

What I claim is:

1. A thermostatic valve unit insertable in valve casings comprising a housing having separable members adapted to be fitted together to form a closed chamber, an expansible member disposed within said chamber, a valve disposed exterior of the chamber, and a valve stem extending from the valve into said chamber to be actuated by said expansible member, said housing having downwardly projecting supporting means on its lower end, whereby the housing is supported in the valve casing above the inlet and outlet openings thereof.

2. A thermostatic valve unit insertable in valve casings comprising a housing having separable members adapted to be fitted together to form a closed chamber, an expansible member disposed within said chamber, a valve disposed exterior of the chamber, a valve stem extending from the valve into said chamber to be actuated by said expansible member, and a downwardly extending skirt projecting from the lower end of said housing to rest upon the walls of said valve casing, whereby the housing is supported in the valve casing above the inlet and outlet openings thereof.

3. A thermostatic valve unit insertable in valve casings comprising a housing having separable members adapted to be fitted together to form a closed chamber, an expansible member disposed within said chamber and secured in juxtarelation to one wall of one of the said separable members of the housing, a valve disposed exterior of the chamber, and a valve stem extending from the valve through a wall of the other of said separable members of the housing to be actuated by said expansible member, whereby the expansible member is shielded.

4. A thermostatic valve unit insertable in valve casings comprising a housing having separable members adapted to be fitted together to form a chamber, an expansible container disposed within said chamber having opposed diaphragms, one of said diaphragms being secured in juxtarelation with one wall of one of said separable members of the housing, a valve disposed exterior of the chamber, and a valve stem extending from the valve through a wall of the other of said separable members of the housing to be actuated by said expansible member, said walls of the housing being spaced relative to each other to be directly engaged by said diaphragms to limit their expansion beyond their elastic limits.

5. A thermostatic valve unit insertable in valve casings comprising a housing having separable members adapted to be fitted together to form a chamber, an expansible container disposed within said chamber having opposed diaphragms, one of said diaphragms being secured in juxtarelation with one wall of one of said separable members of the housing, a valve disposed exterior of the chamber, a valve stem extending from the valve through a wall of the other of said separable members of the housing to be actuated by said expansible member, said walls of the housing being spaced relative to each other to be directly engaged by said diaphgrams to limit their expansion beyond their elastic limits, and a downwardly extending skirt projecting from the lower end of said housing to rest upon the walls of said valve casing, whereby the housing is supported in the valve casing above the inlet and outlet openings thereof.

6. A thermostatic valve insertable in a steam trap comprising an inverted cup member, a valve stem slidably extending through an opening in the top wall of said cup member, a second cup member fitted over the upper end of the first cup member to form a closed chamber, a thermo-dynamic element within said chamber and secured to the inner end of said valve stem, a valve on said stem, and means limiting the closing movement of said cup member, when being fitted together, to relatively space the top walls thereof so that they may be directly engaged by the thermo-dynamic element to limit its expansion beyond its elastic limits.

7. A thermostatic valve comprising a valve casing having inlet and outlet openings and a thermo-valve-receiving chamber having a supporting shoulder therein, a valve seat between said openings and aligned with said chamber, a removable thermo-valve in said chamber including an inverted cup member, a valve stem slidably extending through an opening in the top wall of said cup member, a second cup member fitted over the upper end of the first cup member to form a closed housing, a thermo-dynamic element disposed within said housing and consisting of a container for a volatile substance having opposed concaved diaphragms, one inner wall of said second cup being concaved to have one of said diaphragms bear thereagainst and being removably secured thereto, the inner end of said valve stem being secured to the other diaphragm of said element, a valve removably mounted on said valve stem to cooperate with said seat, and a cap closing said chamber and normally engaging the second cup member to move the edge of the first cup member into engagement with said shoulder.

8. A thermostatic valve insertable in a steam trap comprising an inverted cup member, a valve stem slidably extending through an opening in the top wall of said cup member, a second cup member fitted over the upper end of the first cup member to form a closed chamber, a thermo-dynamic element disposed

within said chamber and consisting of a container for a volatile substance having opposed concaved diaphragms, the top wall of said second cup member being concaved and adapted to have one of said diaphragms bear thereagainst, a threaded projection on said last diaphragm extending through an opening in said top wall and a nut on said projection exterior of the wall and lying within the concavity thereof, the inner end of said valve stem being secured to the other diaphragm of said element, and a valve on said valve stem.

9. A thermostatic valve unit insertable in a steam trap including a housing having separable members adapted to be fitted together, a valve stem slidably extending through a wall of one of said members, an expansible cylindrical member lying within said housing and between the opposite walls of said housing, and means limiting the closing movement of said casing members when the same are fitted together, whereby said expansible member will be limited in its expansion movements by said opposite walls of said housing.

In testimony whereof, I have affixed my signature to this specification.

CHARLES H. JOCKMUS.