Jan. 17, 1928. 1,656,372

J. L. FITTS

THERMOSTATIC TRAP

Filed June 3, 1925

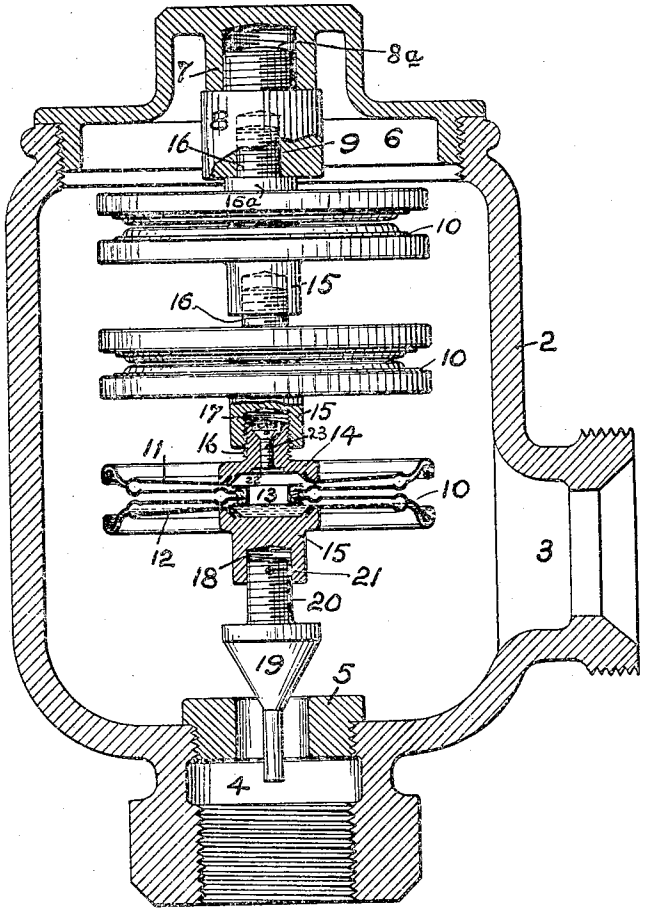


FIG. 1

FIG. 2

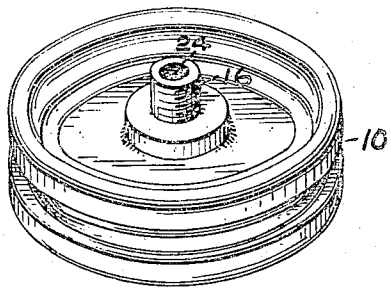
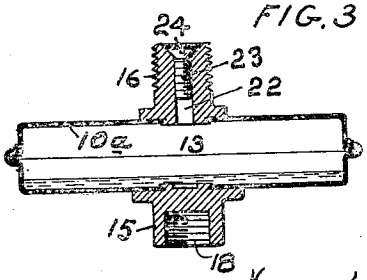


FIG. 3



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By

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UNITED STATES PATENT OFFICE.

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THERMOSTATIC TRAP.

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This invention relates to that class of thermostatically operated traps or valves which control the discharge orifice by variations in temperature of the fluids passing through the valve wherein the presence of steam causes the expansible member to expand and close the discharge orifice whereby the trap may operate automatically to permit the discharge of water of condensation while restricting or preventing the escape of steam, such as is necessary in the use of return traps on radiators of steam heating systems.

In thermostatic valves heretofore employed, it has been customary to provide expansible members of bellows form and containing a volatile fluid which, when the member is heated by the surrounding presence of steam, gasifies and thereby expands the bellows-like member which, in operation, moves the valve piece to restrict the discharge orifice to be controlled.

In some cases, the expansible members have been made of disk form such as shown, for example, in Letters Patent No. 1,235,673, granted to me on August 7, 1917, the same comprising a plurality of disks connected in pairs at their outer ends and adjacent disks connected at their inner ends so as to form a bellows-like structure, the entire interior of which constitutes a single chamber. The construction illustrated in the said Letters Patent has been found well adapted for the purpose of thermostatic control where the movement of the valve piece required was small, such as where only small quantities of water of condensation would be required and hence only adapted to relatively small heating units.

My present invention is intended to utilize the general advantages of structure of the aforesaid patented device or any other equivalent single thermostatic expansible element which may be conveniently utilized when a plurality of said devices are associated in tandem connection for providing a greater movement to the valve piece and, consequently, permitting a greater discharge orifice to be employed in cases where the thermostatic trap is required to receive the condensate from large heating units or in cases where a large quantity of condensate is received from any source and required to be delivered through a single trap.

More specifically, my invention consists in the combination of a plurality of separate expansible thermostatic members connected in tandem by adjustable means wherein they are held in accurate alinement and in proper spaced relation, said expansible members detachably connected within the trap body at the top and provided at their lower end with a valve piece for cooperation with the trap outlet, the said thermostatic elements and valve piece being suspended from the upper part of the valve body and without any obstructions to the free passage of the steam about the expansible elements.

My invention also comprehends further details of construction which, together with the features above stated, are more fully described hereinafter and pointed out in the claims.

Referring to the drawing: Fig. 1 is a vertical section through a thermostatic trap embodying my invention; Fig. 2 is a perspective view of one of the expansible thermostatic elements shown in the structure of Fig. 1; and Fig. 3 is a vertical section of a modified form of expansible element which may be employed in lieu of the particular thermostatic element shown in Figs. 1 and 2.

The body 2 is usually of cast metal open at the top and with an inlet 3 at one side near the lower part and an outlet 4 at the bottom in which is fitted a non-corrosive valve seat 5. The condensate flows into the body through the inlet 3 and outward through the orifice of the valve seat 5 under the control of the vertically movable valve piece 19 which is usually of conical shape. The upper part of the valve body is provided with a bonnet 6 forming a screw tight joint therewith and having a central hub 7 formed with an internal screw threaded socket.

10, 10, 10 represents thermostatic elements which are in disk form and are connected

in tandem, one above the other, in the following manner: At the bottom of each of the thermostatic elements there is provided a hub 15 which is formed with a hole internally screw threaded and at the top said elements are each provided with an upwardly projecting screw threaded nipple, the structure of the nipple being adapted to snugly screw into the hole of the hub on the bottom of the thermostatic element immediately above. This connection is particularly illustrated between the two lowermost thermostatic elements in Fig. 1, wherein the parts are shown in section. The screw threaded nipple 16 projecting upward from the central portion of the disk shaped thermostatic element is screwed into the threaded hole 17 of the said hub 15 projecting downward from the central portion of the disk shaped thermostatic element immediately above. In the case of the connection between the hub 15 of the lowermost thermostatic element and the valve piece 19, the latter is provided with a screw threaded upwardly projecting nipple 20 which is screwed into the screw threaded hole 18 in the hub to the desired extent and the parts are then held against relative displacement by a transverse pin 21.

In respect to the connection between the uppermost thermostatic element and the bonnet or cap of the body, I employ an extension piece 8 which is provided at its lower part with an internal threaded hole 9 to receive the threaded nipple 16 of the thermostatic element and at the top with an externally threaded nipple 8^a which tightly screws into the internally threaded hole in the hub 7 of the cap or bonnet. In the case of the upper thermostatic element, the threaded nipple 16 may be provided at its base and central portion of the thermostatic element with a collar 16^a which tightly fits against the under part of the extension member 8, and similarly, the upper part of the extension member 8 forms a collar about the threaded nipple 8^a and thereby forms a tight connection with the bottom of the hub 7 of the cap or bonnet.

In respect to the connections between the several thermostatic elements first described, it is pointed out that in these cases the screw threaded joints between the parts 15 and 16 are made with a relatively tight fit and are cemented so that they are permanently fixed when adjusted to the proper relative positions, to insure the valve piece 19 having the greatest possible movement under the normal conditions to which the trap is to be subjected. The cement which may be employed in this connection may be shellac or any compound which will remain hard under ordinary steam temperature. It is manifest that the extent of movement of the valve piece 19 will be a function of the combined expansibility of the several thermostatic elements 10 when subjected to a maximum temperature to which the trap is to be subjected under normal use, but, as it is necessary that the trap shall completely close at or before all of the water of condensation received into the trap body has passed through the valve seat, the tendency to expansion exerted by the thermostatic elements, after the valve piece has closed the discharge, will be utilized to maintain the valve seat in its closed position until the accumulations of water entering through the inlet 3 is in sufficient quantity to close off the entrance of the steam. It is manifest, therefore, that the parts should be adjusted and proportioned so that no undue strain shall come upon the thermostatic elements after the valve has seated and to insure this condition, the connections between the several thermostatic elements should be adjusted so that they will insure the closing of the discharge being maintained for the necessary period without any abnormal expansive effort being put upon the several expansible elements. The provision which I have shown between the several thermostatic elements for providing for this necessary adjustment has been found well adapted to its purpose.

Referring more particularly to the specific form of the thermostatic elements shown in Figs. 1 and 2 and which are embodied in my former Patent No. 1,235,673, aforesaid, there is employed an upper pair of flexible disks 11 and a lower pair of flexible disks 12, the disks of each pair being united by brazing about their peripheries. The central portion of the upper disk 11 is mechanically secured to the central hub 14 which carries the screw threaded nipple 16 and, likewise, the central portion of the lower disk 12 is similarly connected to the bottom hub 15. The central portions of the two middle disks are removed and the inner edges of said disks firmly united by an annular flanged collar 13. In this manner, the thermostatic element constitutes a bellows-like structure and embodies great strength with reasonable expansibility. The interior of the element constitutes a single chamber and the fluid supplied thereto may be introduced through a tubular passage 22 and sealed by a screw 23 which may be soldered in position to hermetically seal the device by solder 24. It will be understood that a thermostatic element constructed in this manner retains its shape and alinement of its hub 15 and nipple 16 under all expansible duties, and hence is suitable for the tandem connection illustrated wherein the alinement of the valve piece 19 is to be reasonably assured in respect to the discharge orifice in the valve seat 5.

In place of the particular construction of

thermostatic element shown in Figs. 1 and 2, the simple form shown in Fig. 3 may be employed. This simply embodies what approximates a pill box of metal attached to the central metal portions constituting the hub 15 and the nipple 16. A structure of this kind does not give the extent of expansibility of that illustrated in Figs. 1 and 2, but the principle involved of multiplying the expansibility of the elements to provide a maximum movement of the valve piece would still be maintained in the use of the particular thermostatic element shown in Fig. 3 in lieu of those shown in Figs. 1 and 2. While the expansible disks may be largely formed of copper or brass, I prefer to form the expansible disks from non-corrosive metal such as monel, phosphor bronze, cupro nickel and stainless steel, as the use of these latter metals lengthens the operative life of the expansible elements by reducing the possibility of corrosion.

It will be understood that I do not limit myself to the special construction of the thermostatic element beyond the fact that they must be disk shaped elements so that they can be arranged in parallel planes one above the other and connected in tandem.

While it will be understood that a thermostatic element may be made with a great many expansible disk shaped plates connected alternately at outer and inner ends to make a large bellows where it is desired to have a great movement of the valve piece, but such constructions have been found to be costly to make and do not operate accurately as to alined movement and, moreover, they are not as durable as those made with a limited number of plates 4 such as shown in Fig. 1 and more specifically set out in my Letters Patent aforesaid. It being, therefore, more convenient and easier to make the thermostatic elements with lesser number of disks, these advantages are retained by my improvement by utilizing a plurality of such expansible elements connected in tandem, as shown, for the purpose of obtaining the greater movement of the valve piece required.

A further advantage lies in the fact that where there are a large number of disks employed in making the expansible bellows, it frequently happens that one set of disks will wear out or become seriously corroded while others remain in fair and operative condition, and whereas it is practically impossible to make repairs to an expansible element employing a large number of such disks, a repair may readily be made when the thermostatic elements are constructed in the manner illustrated, since it is possible to remove any one of the elements and replace the same with a new element and, therefore, my improved thermostatic trap is insured a long available life. Furthermore, by providing the expansible means in the form of disk shape elements, the steam may more readily find access to the expansible members and consequently make the device as a whole more responsive to temperature variations.

It will also be understood that all of the expansible elements 10 may be made similar and hence any plurality of them may be employed in tandem for operating the valve piece, the number required being proportional to the extent of movement required by the valve piece, thereby simplifying the manufacture of the individual expansible elements and, at the same time, permitting them to be combined in any number necessary to secure the extent of valve operation which may be necessary.

While ordinarily the same character of volatile fluids may be employed in all of the expansible elements 10, I do not restrict myself in this respect as the said elements may contain, if so desired, volatile fluids of different degrees of volatility.

It will now be apparent that I have devised a novel and useful construction which embodies the features of advantage enumerated as desirable, and while I have in the present instance shown and described the preferred embodiment thereof which has been found in practice give satisfactory and reliable results, it is to be understood that I do not restrict myself to the details, as the same are susceptible of modification in various particulars without departing from the spirit or scope of the invention.

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

1. A thermostatic means for a trap or other device, comprising a plurality of disk shaped thermostatic expansible elements containing volatile fluids whereby they are expanded under the application of heat, said disks being connected axially end to end in tandem relation, the connection between the several thermostatic expansible disk shaped elements consisting of an internally screw threaded hub at one end of the elements and a threaded nipple at the other end screwed into the hub of the adjacent element, and wherein further, a valve piece is provided with a screw threaded shank screwed into the internally screw threaded hub on the outermost axial portion of the thermostatic means.

2. The invention according to claim 1, wherein the screw threaded nipples are screwed only part way into the respective hubs and secured against relative rotary displacement by having the engaging screw threaded portions formed into a normally fixed joint by the application of a cement

which will not melt at any normal temperature to which the thermostatic means may be subjected.

3. The invention according to claim 1, wherein further, the screw threaded nipple of the thermostatic means most distant from the valve piece is further provided with a sustaining extension piece having at one end a screw threaded hole in which the said nipple is screwed and at the other end with an externally screw threaded shank of greater diameter than the aforesaid screw threaded hole on its other end.

In testimony of which invention, I hereunto set my hand.

JAMES L. FITTS.