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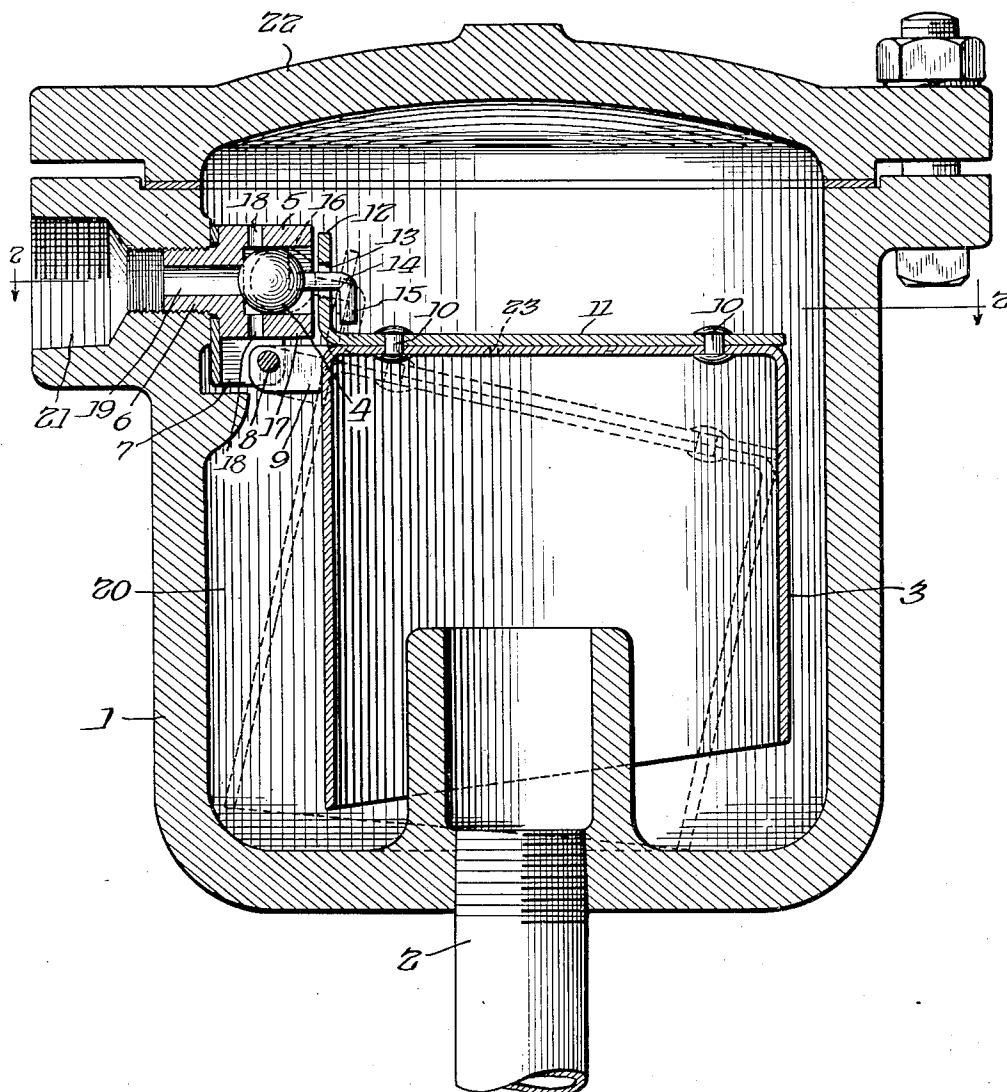
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INVERTED FLOAT STEAM TRAP

2,464,174

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2 Sheets-Sheet 1

Fig. 1.

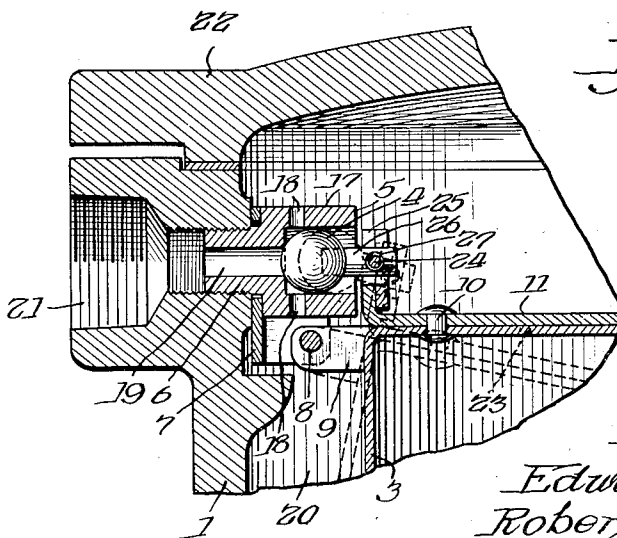


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UNITED STATES PATENT OFFICE

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INVERTED FLOAT STEAM TRAP

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1 Claim. (Cl. 137—103)

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This invention pertains to an improved inverted open float type of steam trap which is primarily used for collecting and disposing of the water of condensation normally gathering in heating coils, pressure piping and the like, although it will become apparent that the construction lends itself to other related uses not specifically mentioned herein.

At the outset, in order to obtain a better appreciation of the background of our invention, it should be understood that the problem of obtaining seating surface tightness in open float traps has long been a serious one, realizing that the structural relationship between the seat and the disc in devices of this type is necessarily relatively loose in order to avoid sticking or binding during normal service. Heretofore the usual type of trap closure construction provided for a cone-shaped disc which was generally lapped to its seat, resulting in a line seat contact bearing which, if not resealed in assembly, did not provide any assurance of seat tightness. The problem has been further aggravated by the use of relatively thin sheet metal parts for the mountings of the closure member or disc, making it even initially difficult to obtain dimensional accuracy in such assemblies, and in some instances there has been actual distortion of the disc mounting in the course of handling prior to assembly. As a result, in an attempt to overcome such deficiencies, skilled craftsmen have been employed to assemble the valve discs and seats, in many cases fitting and forming each part separately in an effort to obtain proper mechanical operation, but without significant success. As a result, what is termed by the industry rework runs have been necessarily frequent due to actual distortion occurring during the course of tests, since there was no assurance that the initially lapped face on the disc or closure member corresponded to the seat bushing face in assembly.

In a further effort to overcome the problems above mentioned, the use of the guided type of discs or closure members has been tried, but these attempts likewise have not been altogether successful primarily due to the character of the construction, which generally centered around guided rod types of closure members driven to their seats by means of bifurcated members either integral with or actuated by the floats. As will hereinafter become more apparent, any movement of a float when swiveling around its fulcrum will describe an arc during the course of such movement, and thus when the conventional bifurcated member moves through its arc and

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rubs against the guide grooves in the closure member, the lateral forces induced by frictional contact and movement of the float tend to hang or to stall further arcuate movement. The net result has been that the trap ceased to function.

In gaining a further appreciation of this background, it should be realized that the function of a steam trap depends largely upon a state of unbalance within the structure during its course of operation. Actually in operation of a conventional float of this type, line pressure multiplied by the seat area, and taking into consideration the length of the short lever arm of the float, is the force tending to close the valve after the weight and long lever arm of the float hinge have been overcome by the buoyancy given to the float. However, in opening the closure member of the trap the reverse is true, for the weight of the bucket without its buoyancy times the long lever arm of the float hinge is the force which provides the unseating effort and which is greater than the seating effort above referred to. Therefore when additional friction is introduced through the assembled mechanism itself, it is not difficult to understand the reasons for failure of the trap to function properly. The problem is particularly difficult because of the impossibility of determining a set value or safety factor relatively determinable by calculations in the initial design, because there are several unknowns entering the construction which are relatively not identifiable in advance.

Thus an important object of the present invention is to provide for a disc reseating guide eliminating the line bearing seat faces inherent to the previous cone valve closure member construction, and to further eliminate thereby the ill effects of dimensional variations and misalignment.

Another important object is to provide a type of closure member which by virtue of its construction lends itself to substantial flexibility, considering the manufacturing and assembly problems above mentioned.

Another important object is to provide a construction in which the closure member of the trap is resealed by flow and pressure after the float has regained its buoyancy, thus insuring movement of the closure member which is relatively unaffected by the float. In constructions heretofore it should be understood that the latter member had a tendency to wobble and to transmit the objectionable effect from such wobbling to the closure member in such instances

where the closure member had been securely fastened to the float.

Other important objects and advantages will become more readily apparent in proceeding with the following description read in light of the accompanying drawings, in which

Fig. 1 is a sectional assembly view taken substantially on the centerline of the device.

Fig. 2 is a plan sectional view taken on the line 2-2 of Fig. 1.

Fig. 3 is a fragmentary sectional view of a modified form of the invention.

Similar reference characters refer to similar parts in the several views.

Referring now to Fig. 1, the trap body 1 serves as the container for the accumulation of condensate resulting from the entrance of steam through the inlet 2. The normal position of the hollow float 3 is therefore as shown in Fig. 1 in solid lines when the disc or closure member 4 is in its seated position against the bushing 5. Preferably the bushing is held to the interior of the trap by means of the threads 6 which also hold the fulcrum support 7, clamped therebetween as indicated, for hingedly supporting the float 3 by means of the pin 8 engaging the lug 9 from which the float 3 is hingedly suspended. The upper surface portion of the float 3 is provided with the angular strip 11 having the turned-up or angular portion 12 provided with the aperture 13. Extending through the latter aperture is the holding pin 14 having the angular extension 15. An opposite end portion of the pin 14 is press-fitted into the ball 4, as indicated by the dotted lines at 16. The seat bushing 5 is substantially of cage or box formation having the annular wall 17 with the apertures 18 suitable for purposes hereinafter described, and having the discharge passage 19 leading to the trap outlet 21. A cap or cover 22 is bolted or otherwise attached to form a fluid sealed joint as indicated.

In normal operation, line condensate enters the inlet 2 under pressure flowing into the chamber 20 of the trap and around the float 3. At the same time condensate enters the inner open end portion of the float 3 and after reaching a level submerging the periphery of the float commences to compress the air collected therein, so that as the water surrounding the outside portion of the float rises to a higher level than that accumulated within the float, the latter member becomes buoyant and it rises to the position indicated by the full lines in Fig. 1. Such movement of the float guides the valve 4 to its seat, as indicated, and closes the passage 19. Air being lighter than water, the former will vent through the vent hole 23 provided for this purpose in the top of the float, and discharge into the upper portion of the chamber 20, thereby permitting the condensate to rise within the interior of the float. When the condensate has risen in the float to a certain level, its buoyancy being removed, the float will sink or drop. The latter movement of course draws the disc or closure member 4 away from its seat to thereupon open the passage 19 because the hooked portion 15 of the pin 14 attached to the ball 4 will be engaged by the hinge 12. The combined ball and holding pin 14 will thereby assume the position shown in dotted lines in Fig. 1.

At this stage of the trap operation, it will be apparent that the employment of a ball in combination with the holding pin allows for the closure member in its functioning to leave the seat with a minimum of frictional contact with the inner portion of the guide walls 17 of the

seat bushing 5. Further, because of the relative flexibility of the contact due to the size of the aperture 13, the combined ball and holding pin will not be detrimentally affected by either a fluttering or wobbling action of the float 3 in its movement from the position shown in full lines to that shown in dotted lines, or vice versa. In the latter connection it is also important to note that during the seating operation of the closure member or ball, as the float rises, it permits the holding pin 14 to move freely thus allowing the ball 4 to move easily to its seat without any binding effect. This is important and is a fundamental difference from the usual construction employed in which the closure member has been closely guided and has frequently been objectionably affected by wobbling of the float to interfere with or to delay the movement of the valve toward its seat. With this invention there will be no such interference and consequently the action will be desirable both in seating the valve as well as in lifting it from its seat. The ball because of its sphericity slides easily within the valve guide 5 since only a line bearing is provided and the initial clearance need not be close since the flow will tend to seat the ball to close the passage 19. It should be further understood that the use of the ball and the relatively small diameter of holding pin, as indicated, permits lapping the ball in an oscillating motion, insuring that the seat face and the bushing conforms to the sphericity of the ball. This advantage permits the ball to seat irrespective of side or end play of the adjoining parts of the assembly and thereby eliminates the previous special hand fitting of parts, and without requiring the close dimensional accuracy as hereinabove referred to.

Referring now to the modified structure in Fig. 3, the construction in general is similar to that described in connection with Fig. 1, except that the holding pin 24 is pinned to the bifurcated member 25, the dotted lines showing the position of the valve as it moves from closed to wide open position. It should be noted that the pin 24 is provided with a suitable clearance 27 so as to allow for relative movement therebetween. Thus the rod 26 extending from the ball closure member eliminates the use of the angular pin structure described in connection with Fig. 1, and in other respects is similar to the construction in the latter mentioned figure.

It is obvious that numerous changes may be made in the details of construction and design without departing from the spirit and the scope of the invention as defined in the claim appended hereto.

We claim:

In a condensation trap, comprising a hollow body provided with an inlet and an outlet, a hollow float tiltably suspended therebetween, a cap for the said body, the said outlet being located in a side wall of the said body and being provided with a renewable hollow bushing serving as a valve seat and guide, a valve closure member therefor cooperating with the said float and bushing, the said float member having at its top surface portion angularly extending actuating means consisting of an apertured bracket permitting relatively loose engagement with the said closure member whereby limited slidability and rotatability of the said closure member relative to the actuating means is provided when the float is in substantially full raised position, the said closure member having a spheroidal seating portion and being substantially spherical in form ex-

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cept for a portion thereof having a substantially longitudinal reduced extension oppositely disposed to the said seating portion and being loosely receivable within the aperture of the said bracket, the said reduced extension of the closure member 5 in the raised position of the said float having at one end transverse means normally spaced apart from the back of the apertured bracket to allow the said bracket to be positioned with clearance between an enlarged open end of the seat bushing 10 and the said end transverse means when the said closure member is being seated, the said end transverse means of the said closure member being engageable by the apertured portion of the said bracket when the float moves to its lowered position, the said closure member being guided within an apertured cylindrical wall portion of

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the enlarged open end of the said seat bushing to permit said limited slidability and rotatability.

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