Sept. 3, 1935. F. J. VINCENT 2,013,015

STEAM TRAP

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Fig. 1

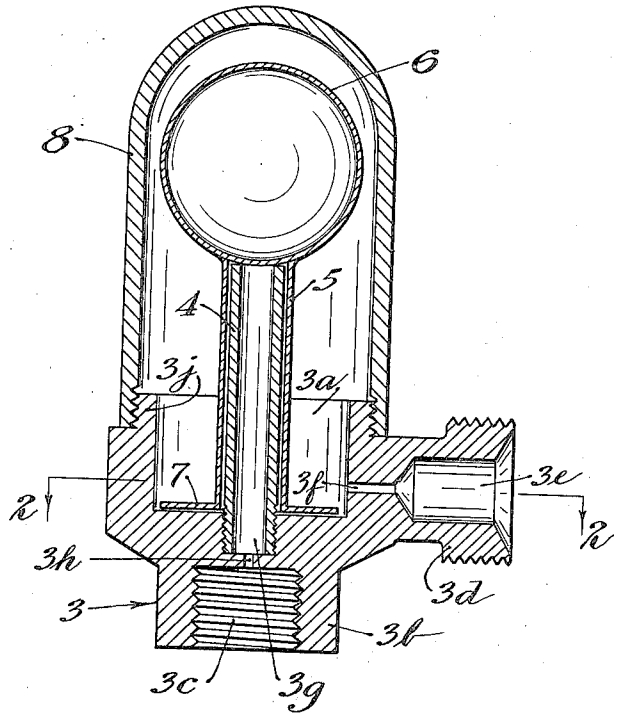
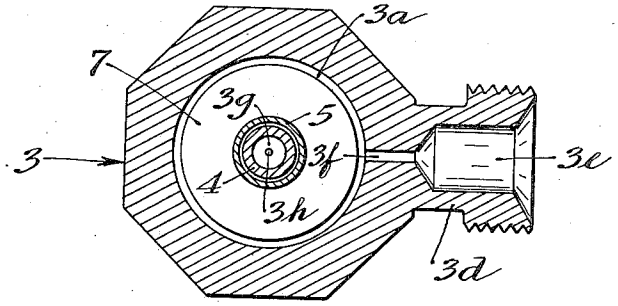


Fig. 2



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STEAM TRAP

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2 Claims. (Cl. 137—103)

My invention relates to steam traps.

Many steam traps now available are either of complicated construction, are unreliable for various reasons or are slow in operation. Some types of traps have parts so constructed that corrosion will cause sticking or binding and so render the trap inoperative. Others utilize thermally operated elements which are relatively slow in operation and cause wastage of steam.

An object of my invention is to provide a steam trap of novel, simple, inexpensive and reliable construction and which is rapid and accurate in operation.

Another object is to provide a steam trap of such construction that parts subject to the effects of wear and corrosion are unnecessary.

These and other objects and advantages will more fully appear from the following description, made in connection with the accompanying drawing, wherein like reference characters refer to the same or similar parts throughout the various views, and, in which,

Fig. 1 is a vertical sectional view of my steam trap taken diametrically thereof; and

Fig. 2 is a horizontal sectional view taken along the line 2—2 of Fig. 1, as indicated by the arrows.

Referring to the drawing, the embodiment of my invention illustrated includes an annular base or body member 3 having an upwardly opening cylindrical recess or well 3*a* in the upper portion thereof. A boss 3*b* extending downwardly from the lower end of the body 3 is cylindrically recessed as at 3*c* and internal screw threads are formed in portions defining the recess 3*c*. A flanged boss 3*d*, extending radially outwardly from a side of the body 3 is externally screw-threaded in the flange portion thereof and is cylindrically recessed as at 3*e*, the recess 3*e* being connected to the well 3*a* by means of a relatively small aperture 3*f* as shown. An upwardly opening recess 3*g* extends downwardly from the center of the lower end of the well 3*a* into the lower portion of the body 3 and is provided with internal screw threads formed in the portion of the body 3 by which it is defined. A relatively small aperture 3*h* connects the recess 3*g* with the recess 3*c* of the boss 3*b*.

A vertically disposed tubular member or outlet tube 4 is provided with external screw threads at its lower end by which it is rigidly mounted in the screw threads of the aperture 3*g*. The tubular member 4 extends upwardly from the lower end of the well 3*a* and is open at its upper end.

A second or outer tubular member 5, of larger diameter than the tubular member 4 and open at the lower end, is loosely telescoped over the tubular member 4 so as to be vertically movable with respect thereto and is of such proportions that a restricted annular space will be provided between the interior periphery of the outer tubular member 5 and the exterior periphery of the inner tubular member 4 to form a passage. A float 6, preferably in the form of a hollow sphere, as shown, is secured to the upper end of the outer tubular member 5 and incidentally serves to close the upper end of the tubular member 5. A part of the lower portion of the sphere 6 defined by the upper end of the outer tubular member 5 forms, in cooperation with the upper end of the inner tubular member 4, a valve for controlling communication between the annular space between the tubular members 4 and 5 and the interior of the inner tubular member 4.

A centrally apertured stabilizer disc 7, having a diameter slightly less than the diameter of the well 3*a*, is secured to the periphery of the lower end of the outer tubular member 5 in a horizontally disposed position as shown. The relative lengths of the tubular members 4 and 5 are such that the disc 7 will be slightly spaced above the lower end of the well 3*a* when the lower portion of the spherical float 6 is engaged with the valve seat formed by the upper end of the inner tubular member 4.

The upper end 3*j* of the body 3 is of reduced diameter to form a shoulder immediately therebelow and is externally screw-threaded. An open bottomed dome or cap 8, having internal screw threads in its lower end, is screw-threadedly mounted on the portion 3*j* of the body 3 to enclose the float 6 and the tubular members 4 and 5. The lower edge of the dome 8 is in tight engagement with the shoulder on the body 3 below the reduced portion 3*j*. The dome is of such dimensions as to permit limited vertical movement of the float 6. The dome 8 and the well 3*a* cooperatively form a chamber which is completely closed except for the small apertures 3*f* and 3*h*.

The small aperture 3*f* and the large cylindrical recess 3*e* of the boss 3*d* cooperatively form an inlet passage for the chamber formed by the dome 8 and the well 3*a* and will hereinafter be referred to as the inlet of my steam trap. The small aperture 3*h* and the large cylindrical recess in the boss 3*b* cooperatively form an outlet from the interior of the inner tubular member 4 and will hereinafter be referred to as the outlet of my steam trap.

Operation

In normal use of my steam trap in connection with a steam heating system for the purpose of draining condensate from a radiator of such a system, the inlet of my steam trap is connected to the lower portion of the interior of the radiator (not shown) and the outlet is connected to a conduit (not shown) through which condensate may flow to a suitable place of disposal therefor such as the feed water system of a boiler serving the heating system.

Steam condensing in the radiator will collect in the lower portion of the radiator and will be conducted to the chamber of my steam trap through the restricted passage afforded by the aperture 3*f*. The pressure of the steam in the radiator will be impressed on the condensate in the radiator to urge the same toward the chamber of my steam trap and the condensate in my steam trap will obviously be subjected to substantially the same pressure.

Normally, the chamber of my steam trap will be filled with condensate up to such a level that the buoyant effect of the condensate on the float 6 will not exceed the combined weight of the float 6, the outer tubular member 5 and the disc 7. It is to be noted that the level of the condensate is always above the valve formed at the upper end of the inner tubular member 4 whereby a water seal is at all times provided for this valve. As additional condensate accumulates in the chamber, the level of the condensate reaches a point at which the buoyancy of the float exceeds the combined weight of the float and the parts carried thereby with the result that the float is raised and the valve formed by the lower portion of the float and the upper end of the inner tubular member 4 is opened to permit passage of condensate therethrough. Also the disc 7 is raised and the clearance between the disc 7 and the lower end of the well 3*a* is increased. Condensate will then flow from the chamber of the device successively through the annular space between the periphery of the disc and the wall of the well 3*a*, through the space between the disc 7 and the bottom of the well 3*a*, through the annular space between the tubular members 4 and 5, between the bottom of the float and the top end of the inner tubular member 4, through the interior of the inner tubular member 4, through the restricted passage afforded by the aperture 3*h* and thence through the conduit previously mentioned to a place of disposal.

When enough condensate has been drained from the radiator and the chamber of my steam trap to lower the level of the condensate in said chamber the float 6 will drop to a point at which its lower side will engage the upper end of the inner tubular member 4 to stop the flow of condensate. The pressure transmitted to the chamber from the interior of the radiator acts on the float 6 to produce a slight force tending to hold the float in its lowermost position. When condensate again rises and buoys up the float to an extent whereby the buoyancy exceeds the above mentioned force plus the weight of the float and the parts carried thereby, the float will again rise and the above described cycle will be repeated.

The force supplied by pressure referred to above as tending to hold the float in its lowermost position, as will be obvious, will amount only to the product of the pressure per unit of area and the internal cross-sectional area of the inner tubular member 4.

The inner tubular member 4, being screw-threadedly mounted, is vertically adjustable and may be adjusted to secure the best operation of the device. This member and portions thereof function as part of the float valve, as a guide for the float 6 and the outer tubular member 5 and as a conduit for outgoing condensate.

The apertures 3*f* and 3*h* and the annular space between the tubular members 4 and 5 are purposely made very small to limit the rate of flow of condensate through the device hence eliminating the chance of water hammer when the valve of the device is closed and reducing the speed with which the valve must close to prevent steam from following the condensate through the valve. I have found that an aperture having a diameter of approximately one-sixteenth of an inch results in the best operation of my device in connection with an average sized radiator.

The stabilizer disc 7 has several functions. It serves as a weight to partially counterbalance the buoyancy of the float and, being disposed at the lowest portion of the movable group of parts, tends to maintain the movable tubular member 5 in vertically disposed position so as to move freely with respect to the stationary tubular member 4. The disc 7 serves also as a dashpot element to restrain the float from bobbing up and down and to prevent unduly rapid openings or closure of the float actuated valve.

The aperture 3*f* and the relatively large recess 3*e* comprises a sediment trap in that sediment will settle to the lower portion of the large recess 3*e* and the aperture 3*f* is situated a reasonable distance above the bottom side of the recess 3*e*. The small size of the aperture 3*f* and the slow rate of water flow therethrough eliminates turbulence in the water and hence provides for substantially undisturbed settling of sediment.

It will be noted that the dome 8 may be readily removed and that, when the dome has been removed, the internal parts of my steam trap are all immediately accessible for inspection, cleaning or replacement. The float and the parts carried thereby may be removed as a unit without detachment of any securing or retaining means and constitute the only movable unit in the device.

It is to be noted that my steam trap contains no pivotal connections and no other closely fitting parts which would be subject to binding or corrosion.

It is obvious that the inlet and outlet connections of my steam trap may be arranged at various portions of the body or base of the device to facilitate connections to pipes extending in various directions and that such alteration does not necessitate any changes in the remaining parts of the device.

It is apparent that I have invented a novel, simple, inexpensive, reliable and effective form of steam trap which is substantially free from trouble due to binding, distortion of parts or corrosion.

Although my device has been described as constructed for use in connection with the radiator of a steam heating system it is obvious that it may be readily adapted for use wherever it is desired to drain off condensate without loss of live steam.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the various parts

without departing from the scope of the present invention.

What is claimed is:—

1. A steam trap comprising a chamber having an inlet and an outlet, a float and a valve both disposed in said chamber, one portion of said valve being connected to said float for actuation thereby and another portion being in communication with said outlet, said float being so located that the level of liquid in said chamber at which said float will just close said valve will be above said valve, and a substantially horizontally disposed plate carried by said float in a position below the normal level of liquid in said chamber, the edges of said plate being but slightly spaced from the sides of said chamber to form a restricted annular passage between said edges and said sides.

2. A steam trap comprising a chamber, said chamber having an aperture forming a restricted inlet thereinto, a float disposed in the upper portion of said chamber, a tubular member depending from said float and closed at its upper end, an upstanding tubular member substantially closed at its lower end and rigidly mounted in said chamber, said chamber being apertured to form a restricted outlet therefor extending from the lower portion of said upstanding tubular member to a point located exteriorly of said chamber, said depending tubular member being disposed loosely about the exterior of said upstanding tubular member, the closed upper end of said depending tubular member cooperating with the upper end of said upstanding tubular member to form a valve, and a centrally apertured disc rigidly mounted on the periphery of the lower end of said depending tubular member and having edges but slightly spaced from the sides of said chamber to form a restricted annular passage between said edges and said sides, said depending tubular member being vertically movable with respect to said upstanding tubular member and being of such proportions that said valve will be closed and said disc will be slightly spaced from the lower end of said chamber when said depending tubular member is at its lowermost limit of movement.

FELIX J. VINCENT.