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RADIATOR VALVE FOR STEAM HEATING SYSTEMS

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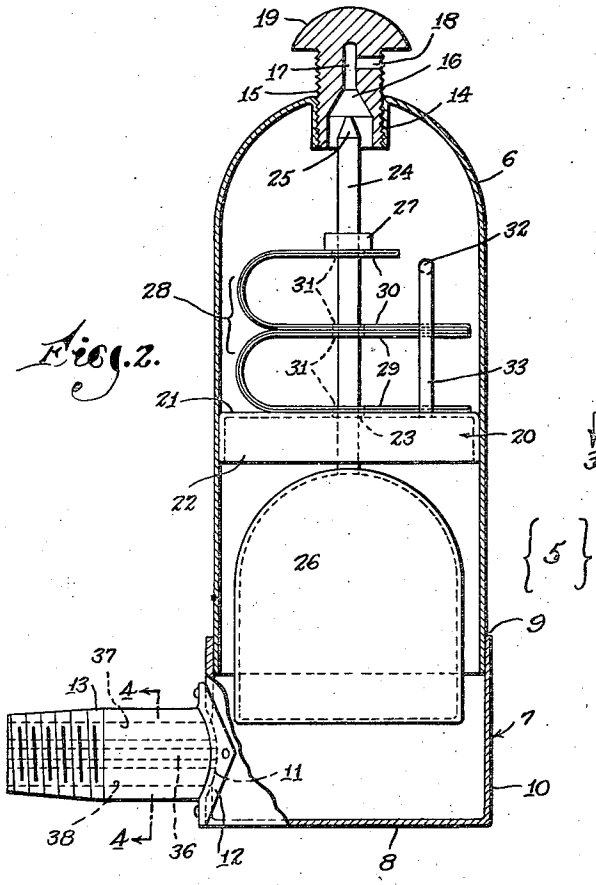



Fig. 2.

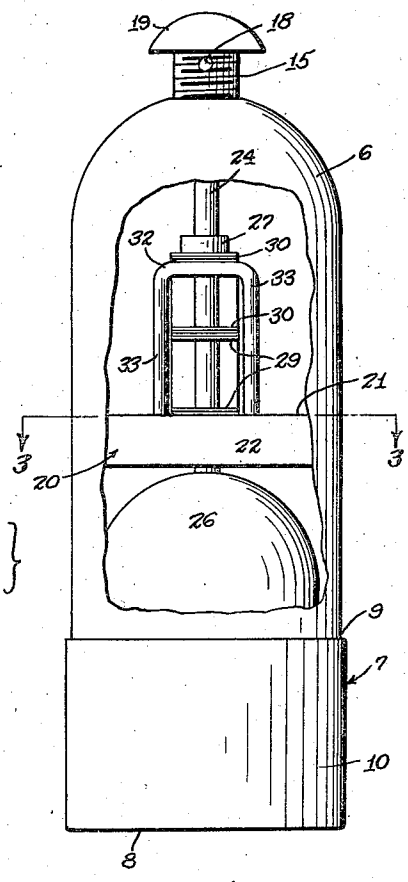



Fig. 1.

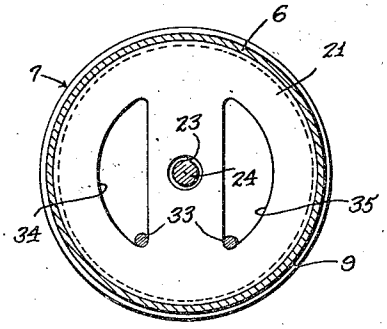



Fig. 3.

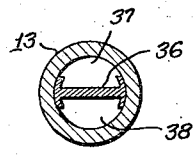



Fig. 4.

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## RADIATOR VALVE FOR STEAM HEATING SYSTEMS

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11 Claims. (Cl. 236—62)

The present invention relates to radiator valves for steam heating systems.

As steam heating systems are loaded with rust, rusty water, scale particles, and acid from the compounds used to clean the boiler, it is necessary to construct radiator valves entirely of non-corrosive material. Moreover, it is necessary to construct the radiator valves so that they are open normally to allow the free venting of air from the system and so that they will close automatically to prevent the escape of steam or water through the air vent. Heretofore many different forms of radiator valves intended to accomplish these desiderata have been proposed, but experience has demonstrated that they are complicated in construction and therefore expensive to manufacture, difficult to assemble, and liable to get out of order.

The principal object of the present invention is to produce a radiator valve for steam heating systems which will be simple in construction, cheap to manufacture, easy to assemble, and not liable to get out of order.

Heretofore it has been proposed to secure the radiator valve to the radiator by means of a nipple through which a curved siphon tube extends loosely into the radiator valve casing in order to siphon out of the casing any water which may collect therein, the tube being smaller than the interior of the nipple to provide a space therein exterior of the tube for the passage of steam into the radiator valve casing. The free end of the siphon tube depends out of the threaded end of the nipple. This free end of the siphon tube is burdensome in its nature as it is subject to being bent, broken, or located improperly within the radiator. A tube bent so as to prevent the passage of water therethrough is useless, and if the stricture in the tube even partially restricts the passage of water, the passage soon becomes blocked from particles of loose rust, scale, and dirt. If the tube is broken off at the threaded end of the nipple, the loose end remaining in the radiator valve chatters and produces noise. In assembling the radiator valve with the radiator the workman is liable to position the free end of the siphon tube at a higher level than the end within the radiator valve casing, thus rendering the tube useless as a siphon.

Another object of the present invention is to produce a radiator valve for steam heating systems in which the siphon tube, long in use, expensive and burdensome in its nature, is obviated.

To the accomplishment of these objects and such others as may appear hereinafter, the various features of the present invention consist in certain devices, combinations, and arrangements of parts fully set forth hereinafter the advantages of which will be readily understood by those skilled in the art.

The various features of the present invention will be understood readily from an inspection of the accompanying drawing illustrating the best form of the invention at present known to the inventors, in which

Figure 1 is a view in front elevation, the dome of the casing being broken out to show interior parts;

Fig. 2 is a view in sectional elevation, the dome and the base of the casing being cut to show the valve seat in sectional elevation and the interior unit and the nipple in left side elevation;

Fig. 3 is a detail view in sectional plan on the line 3—3 of Fig. 1; and

Fig. 4 is a detail view in rear sectional elevation on the line 4—4 of Fig. 2.

In the illustrated embodiment of the invention the working parts of the radiator valve for steam heating systems are housed in a casing 5 comprising a dome 6 and a base 7. The base 7 is a cylindrical cup having a solid bottom 8, an open top 9, and an upstanding peripheral wall 10. The wall 10 is provided with an opening 11 (Fig. 2), and surrounding the opening 11 and secured to the exterior of the wall 10 is a flange 12 on one end of a nipple 13 the other end of which is threaded to facilitate its attachment to a radiator (not shown) in the steam heating system.

At its apex the dome 6 is provided with a threaded opening 14 into which is threaded a plug 15 having a valve seat 16 formed therein. Above the valve seat 16 the plug is provided with a vertical passage 17 and a lateral port 18 communicating therewith. The plug 15 is provided with a mushroom head 19 to facilitate the insertion of the plug into the opening 14 and to protect the exit of the port 18.

Intermediate its top and bottom the dome 6 is provided interiorly with a support 20 comprising a flat disk 21 having a depending peripheral skirt 22 pressed tightly into contact with the internal cylindrical wall of the dome 6. Mounted to slide freely through an opening 23 formed in the disk 21 is a vertical spindle 24 having a frusto-conical needle valve 25 formed on its upper end and having an inverted bell-float 26 secured to its lower end. The float 26 is hollow and is provided with a bottom.

Intermediate the support 20 and the needle

valve 25, the valve spindle 24 is provided with a collar 27. Interposed between the support 20 and the collar 27 is a thermostat 28, of the bi-metallic type, which supports normally the valve spindle 24 and the float 26 carried thereby in a position such that the needle valve 25 is disengaged from the valve seat 16.

The thermostat 28 comprises two superimposed bi-metallic strips 29 and 30, the legs of which are perforated to form a vertical passage 31 through which the valve spindle 24 may slide freely vertically.

The bi-metallic strip 29 is bent to form two parallel legs, equal in length and joined by a bend. One of the legs of the strip 29 rests upon the disk 21. The bi-metallic strip 30 is bent to form two parallel legs, unequal in length and joined by a bend. The longer leg of the strip 30 rests upon the upper leg of the bent strip 29. The shorter leg of the strip 30 engages the collar 27, and is shortened to support the weight of the valve spindle 24 and the float 26 with the valve 25 disengaged from the valve seat 16. With this construction, the weights of the valve spindle 24 and the float 26 are counterbalanced by the short leg of the strip 30, thus rendering the spindle 24 quickly responsive to the influences presently to be described for elevating the valve spindle 24 to engage the needle valve 25 with the valve seat 16.

In order to guide the legs of the strip 29 and the long leg of the strip 30, the disk 21 supports a cage 32 comprising a rod bent U-shaped, the parallel legs 33 of which embrace loosely the said legs of the strips 29 and 30. The lower ends of the legs 33 are secured, respectively, to the internal edges of substantially semi-cylindrical openings 34 and 35 formed through the disk 21.

The valve spindle 24, the float 26, the collar 27, the thermostat 28, the support 20, and the cage 32 are assembled as a unit which is inserted within the dome 6 prior to the assembly of the base therewith. This may be conveniently done by forcing the depending peripheral skirt 22 a predetermined distance within the dome 6, the fit being sufficiently tight to insure the support 20 remaining in a stationary position at the point desired. The dome 6 is then pressed into the base 7. Three tests are then given the radiator valve to determine the final position of the valve seat 16 with respect to the needle valve 25. These three tests are made with air, steam, and water, respectively. During these tests the plug 15 is threaded into or out of the dome 6 until the proper position of the plug 15 is found. Then the plug is soldered securely in position. This adjustment is done in the factory, and no adjustment is necessary thereafter.

With this construction the needle valve 25 is disengaged normally from the valve seat 16 thus providing for the free venting of air out through the port 18. Upon the collecting of water in the base 7 the float 26 rises, elevates the valve spindle 24, and engages the needle valve 25 with the valve seat 16, thus preventing the flow of water out through the port 18. As the float 26 is balanced delicately by the short leg of the thermostatic strip 30 and is positioned with its bottom within the base 7, the float 26 operates to close the valve under the influence of a small quantity of water. An important function is obtained by suspending the float in a position in which the needle valve 25 is disengaged from the valve seat 16. If the float 26 were supported from below particles of rust and scale might collect between the bottom of the float and its support, resulting in only a partial opening of the valve and a restriction in the free venting of air from the casing.

Upon the entrance of steam into the casing at a time when the valve is open to allow air to vent freely from the casing, the thermostat operates to elevate the valve spindle 24 and thus close the valve by engaging the needle valve 25 with the valve seat 16. During the operation of the thermostat 28 the legs of the strips 29 and 30 bow outwardly, producing a compound movement which is transmitted to the valve spindle 24 with the result that the valve is closed instantly. Experience has demonstrated that the thermostat 28 is extremely sensitive to changes in temperature, closing the valve upon an increase from the normal temperature and opening the valve upon a decrease from the normal temperature.

In order to obviate the use of the objectionable siphon tube projecting out of the threaded end of the nipple, the nipple 13 is provided with an interior, horizontally arranged partition 36 (Fig. 4) which divides the nipple into two superimposed passages 37 and 38, the passage 37 being for steam and the passage 38 being for water. With this construction any water which may collect in the base 7 is forced out through the passage 38 and into the radiator by the steam which enters the base 7 through the passage 37.

All the parts are constructed of non-corrosive metal, the exterior being nickel plated to impart an attractive appearance.

What is claimed as new, is:

1. In a radiator valve for steam heating systems, the combination with a casing comprising a dome and a base, and a nipple for connecting the base with a radiator, of a unit insertable into the dome prior to the assembly of the base therewith, said unit comprising a valve spindle, a float, a thermostat, and means engageable with the dome for frictionally maintaining the unit within the dome independently of the base.

2. In a radiator valve for steam heating systems, the combination with a casing comprising a dome and a base, of a unit insertable into the dome prior to the assembly of the base therewith, said unit comprising a valve spindle, a float depending from one end of the spindle, a thermostat, operatively connected to the spindle, and a support for the thermostat, said support being frictionally engageable with the walls of the dome to maintain the unit within the dome and being interposed below the thermostat and above the float.

3. In a radiator valve for steam heating systems, the combination with a casing comprising a dome and a base, of a unit insertable into the dome prior to the assembly of the base therewith, said unit comprising a valve spindle having a collar thereon, a float depending from one end of the spindle, a thermostat operatively connected to the collar, and a support for the thermostat interposed between the float and the collar.

4. In a radiator valve for steam heating systems, the combination with a casing comprising a dome and a base, said dome having a valve seat at its upper end and a support intermediate its ends, and a spindle, freely movable vertically in the support, having a needle valve on one end and a float on the other, of a thermostat, supported by the support and operatively connected to the spindle, acting normally to support the spindle with its needle valve disengaged from the valve seat.

5. In a radiator valve for steam heating systems, the combination with a casing comprising a

dome and a base, said dome having a valve seat at its upper end and a support intermediate its ends, and a spindle, freely movable vertically in the support, having a needle valve on one end and a float on the other, of a thermostat, supported by the support and operatively connected to the spindle, acting under normal conditions of temperature to support the spindle with its needle valve disengaged from the valve seat and acting under the influence of steam entering the casing to elevate the spindle to engage its valve with the valve seat.

6. In a radiator valve for steam heating systems, the combination with a casing comprising a dome and a base, said dome having a support intermediate its ends, and a valve spindle, freely movable vertically in the support, having a float on its lower end, of a thermostat, in which the spindle is freely movable vertically, supported on the support and operatively connected to the spindle.

7. A radiator valve for steam heating systems having, in combination, a casing comprising a dome and a base, said dome having a support mounted therein, a valve spindle, freely movable vertically in the support, having a float on its lower end, a bi-metallic strip bent to form two legs equal in length, one of said legs resting on the support, and a bi-metallic strip bent to form two legs unequal in length, the longer one of said legs resting on the first named strip and the shorter one of said legs being operatively connected to the spindle.

8. A radiator valve for steam heating systems having, in combination, a casing comprising a dome and a base, said dome having a support mounted therein, a valve spindle, freely movable vertically in the support, having a float on its lower end, a bi-metallic strip bent to form two legs equal in length, one of said legs resting on the support, and a bi-metallic strip bent to form two legs unequal in length, the longer one of said legs resting on the first named strip and the shorter one of said legs being operatively connected to the spindle, and a cage, carried by the support, embracing the legs of the first named strip and the long leg of the second named strip.

9. In a radiator valve for steam heating systems, the combination with a casing comprising a dome and a base, of a unit insertable into the dome prior to the assembly of the base therewith, said unit comprising a valve spindle, a float depending from one end of the spindle, a thermostat operatively connected to the spindle, and a support for the thermostat, said support being adapted to engage the interior of the dome above the float and to remain in said position frictionally.

10. In a radiator valve for steam heating systems, the combination with a casing comprising a dome and a base, of a unit insertable into the dome prior to the assembly of the base therewith, said unit comprising a valve spindle, a float, a thermostat, and a support interposed below the thermostat and above the float, said valve spindle being freely movable vertically in said thermostat and said support.

11. In a radiator valve for steam heating systems, the combination with a dome provided with an open bottom, and a base for the dome, said dome and said base comprising a casing when they are assembled together, of a unit insertable into the dome through its open bottom prior to said dome and base assembly, said unit comprising a valve spindle, a float, a thermostat, and means for maintaining these three elements within the dome independently of the base.

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