Aug. 23, 1927. 1,640,243

J. J. LAWLER

THERMOSTATIC SUPPLY VALVE FOR STEAM RADIATORS

Filed June 14, 1926 2 Sheets-Sheet 1

Fig. 1.

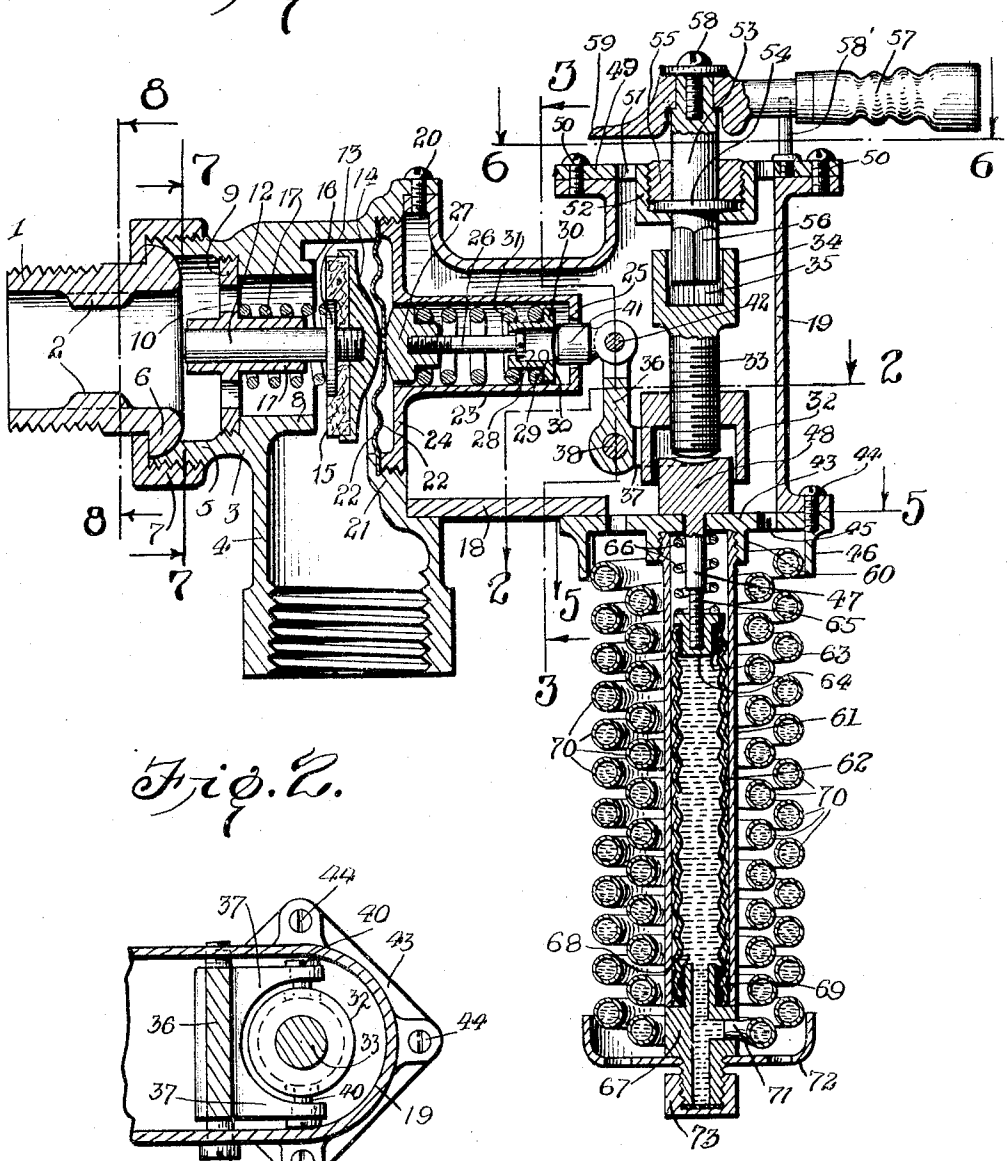

Fig. 2.

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Fig. 3.

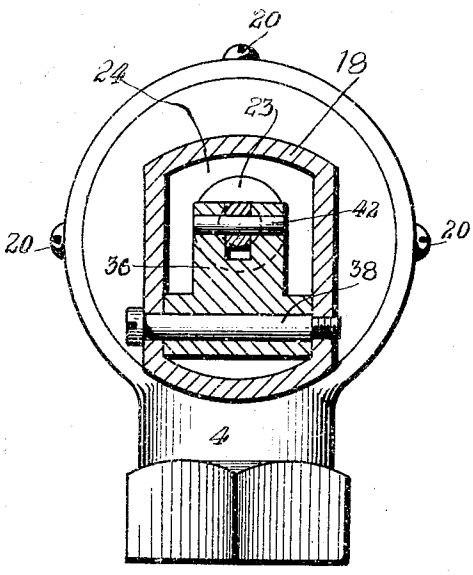


Fig. 4.

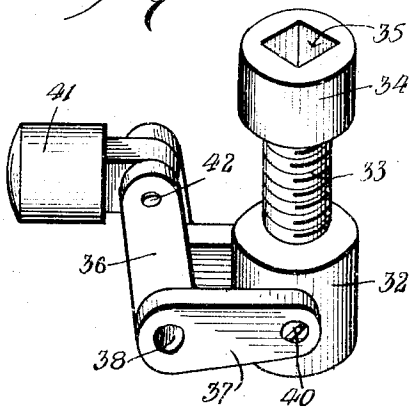


Fig. 5.

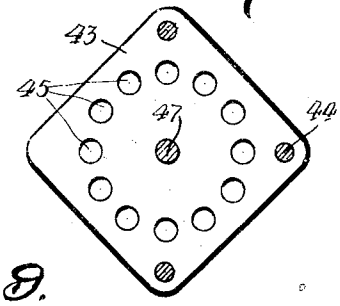


Fig. 6.

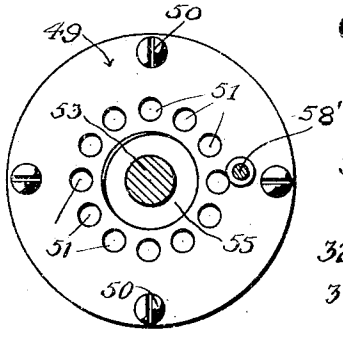


Fig. 8.

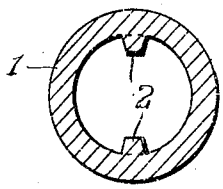
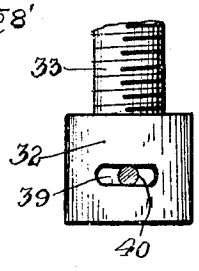
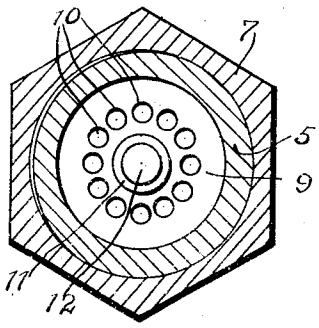


Fig. 7.





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UNITED STATES PATENT OFFICE.

JAMES J. LAWLER, OF MOUNT VERNON, NEW YORK.

THERMOSTATIC SUPPLY VALVE FOR STEAM RADIATORS.

Application filed June 14, 1926. Serial No. 115,949.

This invention relates to certain new and useful improvements in thermostatic supply valves for steam radiators of the type wherein the thermostatically operated device is associated with a steam supply valve of a radiator for thermostatically controlling the supply of steam to the radiator.

An object of the present invention is to provide a thermostatically controlled valve of the above type wherein the thermostatic device is highly sensitive to temperature changes and being associated with the steam supply valve shows constant room temperature of the desired degree.

With the above and other objects in view which will become apparent as the nature of the invention is better understood, the same consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawings and claimed.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a vertical longitudinal sectional view of a thermostatic supply valve for steam radiators showing the thermostatically operated device associated with the steam supply valve,

Figure 2 is a detail horizontal sectional view taken on line 2—2 of Figure 1,

Figure 3 is a vertical cross sectional view taken on line 3—3 of Figure 1,

Figure 4 is a perspective view of the toggle lever connection between the thermostatic device and the steam supply valve,

Figure 5 is a detail sectional view taken on line 5—5 of Figure 1,

Figure 6 is a detail sectional view taken on line 6—6 of Figure 1,

Figure 7 is a vertical cross sectional view taken on line 7—7 of Figure 1,

Figure 8 is a vertical cross sectional view taken on line 8—8 of Figure 1, and

Figure 9 is a fragmentary side elevational view of a part of the lever connection.

The thermostatic supply valve for steam radiators comprises a structure movable as a unit and embodying the steam supply valve and thermostatic device for attachment to a radiator, the structure comprising an externally threaded connector 1 having internal diametrically opposite spanner lugs 2 as shown in Figs. 1 and 8 to facilitate attachment of the connector to a radiator. The structure comprises a valve casing 3 having a lateral inlet 4 for attachment to a steam supply pipe and an end outlet 5 abutting the inner flanged end 6 of the connector 1 and firmly secured thereto by the clamping ring 7.

The valve within the casing 3 includes a cylindrical wall 8 aligned with the connector 1 and at the outer end of which wall an externally threaded disk 9 is mounted, the disk carrying a circular series of perforations 10 and having an axially positioned tubular pin guide 11 projecting from opposite sides thereof and through the cylindrical wall 8. A valve stem 12 is slidable in the tubular guide 11 and carries a metallic disk 13 adjacent its inner end, the metallic valve 14 secured to the extreme inner end of the stem 12 carrying the usual cushion valve 15 that pulls into engagement with the valve seat 16 which forms the inner edge of the cylindrical wall 8. A coiled spring 17 surrounding the tubular guide 11 and pin 12 engages at its opposite end the ring 9 and valve stem disk 13 for normally holding the valve spaced from its seat 16. The steam entering through the side inlet 4 passes over the valve seat and through the cylindrical wall 8 and apertured ring 9 to the connector 1 that is attached to the radiator.

The thermostatic device is attached to the valve casing 3 and includes a horizontal casing section 18 aligned with the connector 1 and a vertical casing section 19 at right angles to the connector. The horizontal casing section 18 is secured to the valve casing 3 by the set screws 20 while the vertical casing section 19 is formed integral with the horizontal casing section. The valve casing 3 at the side thereof opposite to the connector is provided with an opening surrounded by an internally threaded shoulder 21 that is engaged by the peripheral edge of the diaphragm 22 to prevent the escape of steam from the valve casing into the thermostatic device. A tensioned plunger device carried by the valve casing 3 and extending into the horizontal casing section 18 of the theremostatic device axially engages the diaphragm 22 to limit flexing movement thereof in one direction under force of the spring pressed valve 14, said tensioned plunger device including a cylindrical casing 23 open at the end thereof adjacent the diaphragm and carrying an annular wall 24 that is threaded into the shoulder 21 for en-

gaging the peripheral edge of the diaphragm to hold the latter in position. The opposite closed end of the casing 23 is provided with a central opening 25. The plunger includes a screw pin 26 threaded at one end into the plunger head 27 that is reciprocable in the tubular casing 23 while the headed end 28 of the screw pin 26 extends into the cup-shaped member 29 that carries an outwardly directed annular flange 30 at the open end adjacent the closed end of the tubular casing 23. A coiled spring 31 surrounding the screw pin 26 engages the plunger head 27 and flange 30 upon the cup-shaped member 29 for normally holding the cup-shaped member at its limit of movement away from the plunger head 27.

The cup-shaped member 29, screw pin 26, and plunger head 27 are movable as a unit with the spring 31 by parts of the mechanism that are thermostatically operated for flexing the diaphragm 22 and moving the valve 14 and cushioned seat 15 onto the valve seat 16 and these parts are located in the vertical casing section 19. As shown in Figs. 1, 4 and 9 an inverted cup-shaped member 32 has a screw pin 33 threaded through the upper wall thereof with the upper end of the screw pin provided with a head 34 having a key socket 35. A bell crank lever has vertically positioned legs 36 and horizontal legs 37 with the legs rigidly connected together and pivotally supported upon the pin 38 that extends through the side walls of the thermostatic casing. The opposite sides of the inverted cup-shaped member 32 are provided with horizontal slots 39 into which pins 40 carried by the ends of the lever legs 37 freely extend. A block 41 is pivotally supported at 42 to the upper ends of the lever legs 36 and freely extends through the opening 25 in the inner closed end wall of the casing 23 for engagement with the adjacent end of the cup-shaped member 29 as clearly shown in Figure 1.

The valve 14 may be limited in its opening movement by varying the normal position of the block 41 relative to the end wall of the casing 23 and includes devices for operating the screw 33 for rotating the screw to raise or lower the inverted cup-shaped member 32 and shift the arms 36 and 37. As shown in Figures 1 and 5, the lower end of the vertical casing section 19 of the thermostatic device is closed by the plate 43 and is secured thereto by the screws 44, the plate having a circular series of perforations 45 and a depending annular flange 46 adjacent its peripheral edge for purposes presently to appear. An opening is formed axially of the plate 43 through which a pin 47 extends and said pin carries an enlarged block 48 upon its upper end that normally rests upon the plate 43 and is disposed as illustrated in Figure 1 to be engaged by the screw 33. The upper end of the vertical casing section 19 is closed by the plate 49 secured in position as at 50 and said plate has a circular series of openings 51 permitting a free circulation of air through the thermostatic casing. The plate 49 has a depending internally threaded cup-shaped member 52 in which the handle stem 53 is rotatable, such stem carrying a disk flange 54 resting upon the bottom of the cup-shaped member 52 and retained in position by the screw plug 55. The lower end of the handle stem 53 is of polygonal formation as at 56 and freely enters the key socket 35 in the upper end of the screw head 34 for rotating the screw as previously described. The spindle 53 has an operating handle 57 detachably connected to its upper end as 58, the rotary movement of the spindle 53 and handle 57 being limited by the stop pin 58′ while the opposite end of the handle carries a pointer 59 cooperating with graduations upon the upper face of the plate 49. The block 48 carried by the pin 47 and normally resting upon the plate 43 is moved upwardly by the thermostatic element now to be described and engages the lower end of the screw pin 33 to elevate the same a distance limited by engagement between the lower edge of the keyed end 56 of the handle spindle 53 and the bottom wall of the key socket 35, the inverted cup-shaped member 32 and screw pin 33 moving directly vertically by the provision of the pin and slot connection 39 and 40 between the lever legs 37 and the inverted cup-shaped member 32.

As shown in Fig. 1, an internally threaded depended annular flange 60 is carried axially of the plate 43 at the end of the casing section 19 and surrounds the opening through which the pin 47 extends and said flange 60 receives the upper end of the tubular casing 61. An expansible tube 62 of accordion formation is housed within the casing 61 and is permanently anchored, as by soldering at its upper end at 63 to the plug 64 attached to the lower threaded end 65 of the pin 47. A coiled spring 66 surrounds the pin 47 and engages at its upper end the lower face of the plate 43 and at its lower end the plug 64 adapted to hold the pin at its limit of downward movement with the block 48 upon the upper end thereof in engagement with the plate 43. A nipple 67 having an axial and lateral bore has one end thereof permanently anchored within the expansible tube 62 as at 68 while the lower end of the expansible tube 62 is also anchored to the lower end of the casing 61 as at 69. A thermostatic coil 70 of spiral formation and including inner and outer convolutions has one end 71 thereof entering the lateral bore of the nipple 67 while the other end of the coil 70 disposed adjacent the plate 43 is confined within the depending annular flange 46. A

bowl-shaped plate 72 is carried by the nipple 67 and confines the lower convolutions of the coil 70 to present a finished joint. The expansible tube 62, nipple 67 and coil 70 are filled with a fluid through the outer end of the nipple 67 that is closed by the screw cap 73.

The room temperature desired is determined by operating the handle 57 to move the pointer 59 over the graduations upon the plate 49 and during such movement, rotation of the handle spindle 53 causes a raising or lowering movement of the screw pin 33. The block 48 is held at its limit of downward movement by the spring 66 which spring also tends to operate the expansible tube 62 to contract the same to its limit of liquid capacity. In this manner, all lost motion in the operation of the thermostatic mechanism is eliminated. The spring 17 associated with the valve 14 normally holds the valve in its open position in engagement with the diaphragm 22 and plunger head 27 while the diaphragm prevents the passage of steam into the thermostatic casing. When the fluid in the expansible tube 62 expands due to a rise in temperature, the block 48 is raised to engage the screw 33 and operates the lever legs 36 and 37 upon their pivotal mounting 38 to project the block 41 into the casing 23 to move the cup-shaped member 29, spring 31 and plunger head 27 for forcibly causing the valve 14 upon its seat against the tension of the spring 17. By the provision of the movable connection between the screw pin 26 and cup-shaped member 29, injury to the parts is eliminated as continued movement of the block 41 would only tend to compress the spring 31 after the valve 14 has been moved to its seat 16. The thermostatic mechanism is of extreme simplified construction and effectively accomplishes the objects sought, the thermostatic mechanism being highly sensitive by permitting a free circulation of air around the tubes 70, and through the thermostatic casing by the provision of the apertured plates 72, 43 and 49.

While there is herein shown and described the preferred embodiment of the present invention, it is, nevertheless, to be understood that minor changes may be made therein without departing from the spirit and scope of the invention as claimed.

Having thus described my invention, I claim:—

1. In a thermostatic supply valve for radiators, valve and thermostatic casings, a tensioned normally open valve in the valve casing and thermostatically operated devices in the thermostatic casing in constant engagement with the valve, said devices including a tensioned plunger, a thermostatically expansible tube having lever connections with the plunger, and a thermostatic coil in communication with the tube, said plunger comprising a rod and plunger head, a coil spring inclosing the rod and engaging the plunger head, a member movably mounted on the other end of the rod and engaged by the spring and a block connection between the member and lever.

2. In a thermostatic supply valve for radiators, valve and thermostatic casing, a tensioned normally open valve in the valve casing and thermostatically operated devices in the thermostatic casing in constant engagement with the valve, and a diaphragm separating the two casings and interposed between the valve and thermostatically operated devices, said devices including a tensioned plunger, a thermostatically expansible tube having lever connections with the plunger, and a thermostatic coil in communication with the tube, said plunger comprising a rod and plunger head, a coil spring inclosing the rod and engaging the plunger head, a member movably mounted on the other end of the rod and engaged by the spring and a block connection between the member and lever.

3. In a thermostatic supply valve for radiators, valve and thermostatic casings, a tensioned normally open valve in the valve casing and thermostatically operated devices in the thermostatic casing in constant engagement with the valve, said devices including a tensioned plunger, a thermostatically expansible tube, lever devices interposed between the tube and the plunger, a thermostatic coil in communication with the tube, said plunger comprising a rod and plunger head, a coil spring inclosing the rod and engaging the plunger head, a member movably mounted on the other end of the rod and engaged by the spring, a block carried by the lever devices constantly engaged with said member, and a manually adjusted element carired by the lever devices to be moved by said expansible tube for operating the lever devices to close the valve whereby the valve may be closed at different temperatures.

4. In a thermostatic supply valve for radiators, valve and thermostatic casings, a tensioned normally open valve in the valve casing and thermostatically operated devices in the thermostatic casing in constant engagement with the valve, a diaphragm separating the two casings and interposed between the valve and thermostatically operated devices, said devices including a tensioned plunger, a thermostatically expansible tube, lever devices interposed between the tube and plunger, a thermostatic coil in communication with the tube, said plunger comprising a rod and plunger head, a coil spring inclosing the rod and engaging the plunger head, a member movably mounted on the other end of the rod and engaged by the spring, a block carried by the lever devices constantly engaged with said member,

and a manually adjustable element carried by the lever devices to be moved by said expansible tube for operating the lever devices to close the valve whereby the valve may be closed at different temperatures.

5. In a thermostatic supply valve for radiators, valve and thermostatic casings, a tensioned normally open valve in the valve casing and thermostatically operated devices in the thermostatic casing in constant engagement with the valve, said devices including a tensioned plunger, a thermostatically expansible tube, lever devices interposed between the tube and plunger, a thermostatic coil in communication with the tube, a tensioned device carried by the expansible tube normally tending to contract the same, and means for varying the distance between the lever devices and tensioned device carried by the tube to cause closing movement of the valve at different temperatures.

6. In a thermostatic supply valve for radiators, valve and thermostatic casings, a tensioned normally open valve in the valve casing and thermostatically operated devices in the thermostatic casing in constant engagement with the valve, and a diaphragm separating the two casings and interposed between the valve and thermostatically operated devices, said devices including a tensioned plunger, a thermostatically expansible tube, lever devices interposed between the tube and plunger, a thermostatic coil in communication with the tube, a tensioned device carried by the expansible tube normally tending to contract the same, and means for varying the distance between the lever devices and tensioned device carried by the tube to cause closing movement of the valve at different temperatures.

7. In a thermostatic supply valve for radiators, valve and thermostatic casings, a tensioned normally open valve in the valve casing and thermostatically operated devices in the thermostatic casing in constant engagement with the valve, said devices including a tensioned plunger, a thermostatically expansible tube, lever devices interposed between the tube and plunger, a thermostatic coil in communication with the tube, said plunger comprising a rod and plunger head, a coil spring inclosing the rod and engaging the plunger head, a member movably mounted on the other end of the rod and engaged by the spring, a block carried by the lever devices constantly engaged with said member, a tensioned device carried by the expansible tube normally tending to contract the same, and means for varying the distance between the lever devices and tensioned device carried by the tube to cause closing movement of the valve at different temperatures.

8. In a thermostatic supply valve for radiators, valve and thermostatic casings, a tensioned normally open valve in the valve casing and thermostatically operated devices in the thermostatic casing in constant engagement with the valve, a diaphragm separating the two casings and interposed between the valve and thermostatically operated devices, said devices including a tensioned plunger, a thermostatically expansible tube, lever devices interposed between the tube and plunger, a thermostatic coil in communication with the tube, said plunger comprising a rod and plunger head, a coil spring inclosing the rod and engaging the plunger head, a member movably mounted on the other end of the rod and engaged by the spring, a block carried by the lever devices constantly engaged with said member, a tensioned device carried by the expansible tube normally tending to contract the same, and means for varying the distance between the lever devices and tensioned device carried by the tube to cause closing movement of the valve at different temperatures.

In testimony whereof I affix my signature.

JAMES J. LAWLER.