May 24, 1932. J. J. LAWLER 1,860,189

THERMOSTATIC CONTROL VALVE

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Fig. 1.

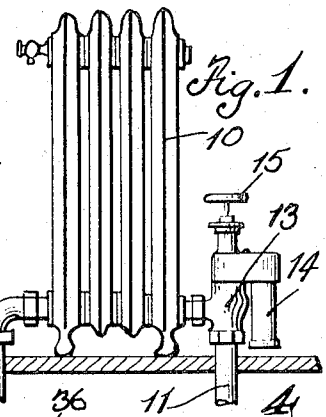


Fig. 2.

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Fig. 3.

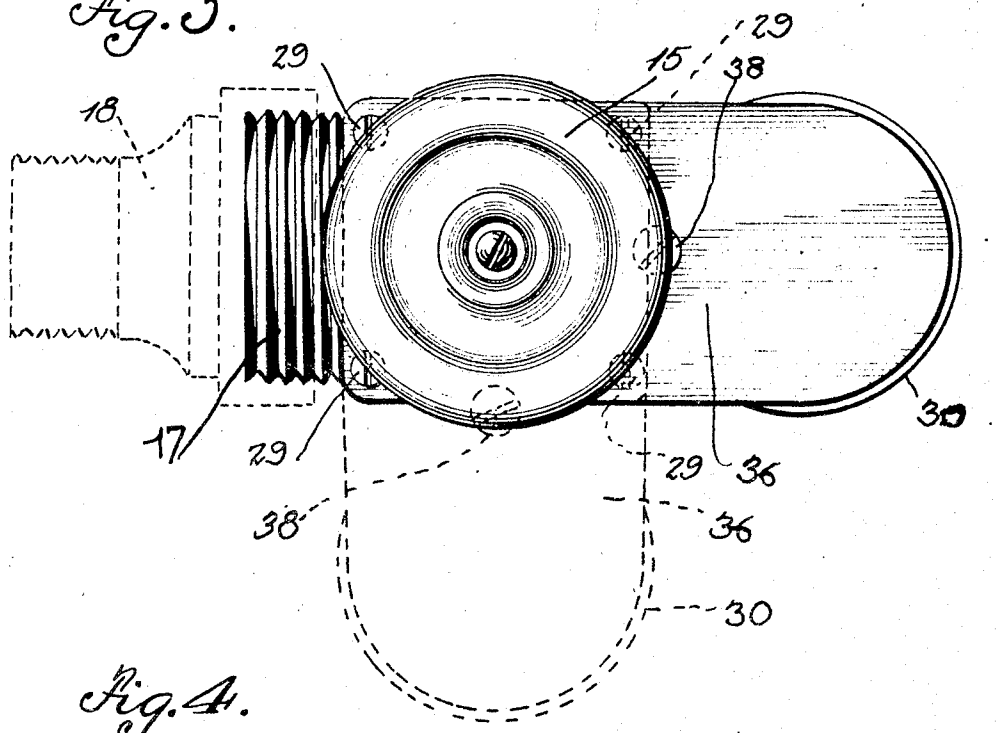


Fig. 4.

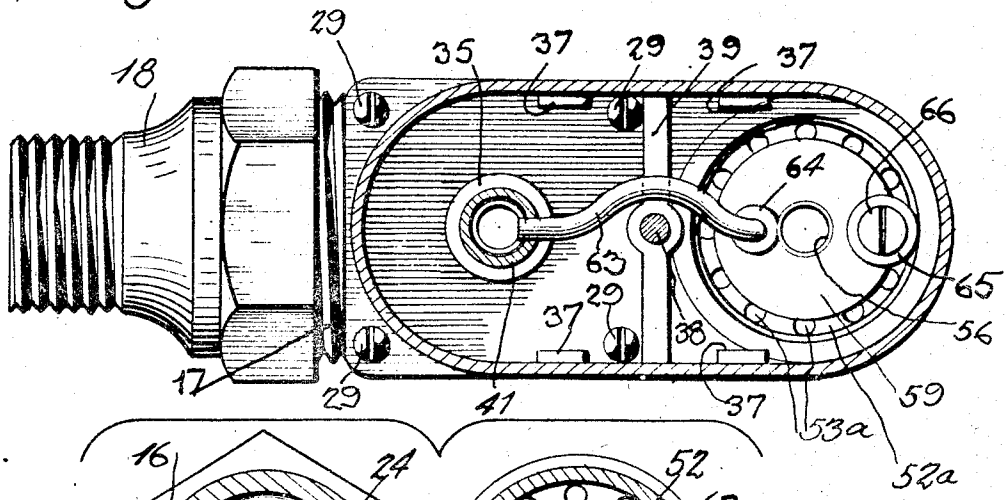
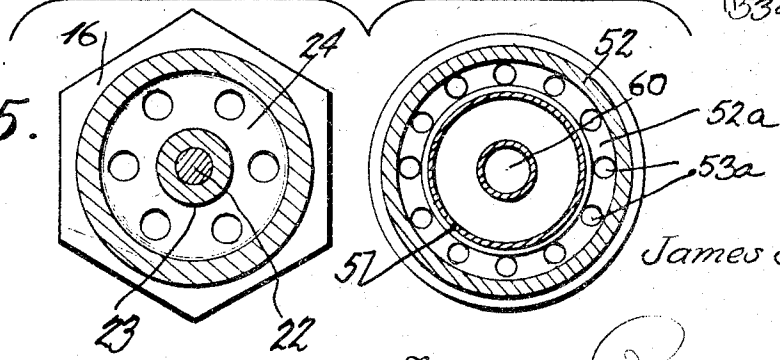


Fig. 5.



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1,860,189

UNITED STATES PATENT OFFICE

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THERMOSTATIC CONTROL VALVE

Application filed November 21, 1929. Serial No. 408,827.

This invention relates to certain new and useful improvements in thermostatic control valves. An object of the invention is to provide a thermostatically actuated device associated with the control valve of a hot water or steam radiator and in fact, in any instance, where a valve or damper is capable of being thermostatically operated, the thermostatically actuated device when associated with the hot water or steam radiator functioning to effect the opening and closing movement of the valve whereby constant room or compartment temperature surrounding the radiator may be maintained.

A further object of the invention is to provide a thermostatically actuated device for the control valve of the hot water or steam radiator embodying variably tensioned elements for controlling the maximum opening movement of the valve and further being operable for positively holding the valve on its seat, further novelty residing in the particular type of casing for the thermostatic actuated device and the manner of mounting the same upon the casing of the radiator valve.

With the above and other objects in view that 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 drawings:—

Figure 1 is a side elevational view of a radiator in which the control valve thereof is equipped with the thermostatically actuated device for controlling the flow of heating medium by way of the valve to the radiator;

Figure 2 is a vertical sectional view illustrating the association between the thermostatically actuated device and the control valve for the radiator;

Figure 3 is a top plan view of the assembled devices and illustrating by dotted lines another angle mounting for the thermostatically actuated device;

Figure 4 is a horizontal sectional view taken on line 4—4 of Figure 2; and

Figure 5 is a horizontal sectional view taken on line 5—5 of Figure 2.

As illustrated in Figure 1, the radiator 10 that may be either of the hot water or steam type or have any other heating medium associated therewith, but which for purposes of clearness will be hereinafter referred to as a hot water radiator, as a hot water inlet pipe 11 in communication with one end coil and an outlet pipe 12 in communication with the other end coil, the hot water inlet pipe 11 having a valve casing 13 set therein and enclosing a valve that may be thermostatically operated by the thermostatically actuating device 14 and also manually operated by the valve handle 15.

The valve casing 13 as shown in Figure 2 has a lower internally threaded coupling end 16 with which the hot water inlet pipe 11 is engaged and a lateral outlet 17 attached by the connector 18 to the radiator 10. A cross-partition in the valve casing 13 provides a valve seat 19 with which the valve 20 cooperates, the valve embodying a cup-shaped member containing a cushion body 21 for direct contact with the valve seat 19. The valve 20 is of the reciprocating type and guided in its movement by the stem 22 reciprocable in the upstanding bearing 23 carried by the spider frame 24, the upper end of the stem 22 being threaded as at 25, passing through the cushion body 21 and engaged with the cup-shaped valve 20. A collar 26 is fixed to the valve stem 22 above the bearing 23 and is of a diameter greater than said bearing, the coil spring 27 surrounding the bearing and engaged with the spider frame 24 and collar 26 for normally influencing movement of the valve 20 to its open position.

The upper end of the valve casing 13 is of a rectangular formation and a rectangular plate 28 is removably mounted thereon, the plate 28 being of elongated formation and projecting laterally of the valve casing 13, the plate being selectively mounted on the valve casing to cause its projecting end to extend at different sides of the valve casing for purposes presently to appear. The plate 28 is retained in position by the four corner

screws 29 passing therethrough and engaged with the upper end of the valve casing, the laterally extending end 30 of the plate 28 having a circular internally threaded opening therein as indicated at 31. A packing washer 32 and disk plate 33 are interposed between the valve casing 13 and plate 28 to provide a fluid tight connection. An expansible tube or flexible bellows 34 is attached at its lower end to the valve 20 and at its upper end to the disk plate 33 surrounding the opening 35 in the disk plate 33 and plate 28 to prevent escape of fluid from the upper end of the valve casing 13.

A hood or casing 36 is movably mounted upon the plate 28 and is of the same general configuration of said plate, one rounded end of the casing 36 locating two of the attaching screws 29 for the plate 28 exteriorly of the casing while the other two screws are confined therein, the inner sides of the lower edges of the casing 36 carrying guide lugs 37 seated upon the plate 28 while the casing is retained in position upon the plate by the screw 38 having its upper headed end engaged with the casing and its lower threaded end having threaded engagement with the cross-spider 39 on the casing and the plate 28 as clearly shown in Figures 2 and 4. An upstanding cylinder 40 is carried by the top wall of the casing 36 and is concentric with the opening 35 in the plate 28 and valve 20.

The thermostatically actuated device that is associated with the valve 20 includes a tubular piston 41 in the cylinder 40 that is closed at its upper end by a screw plug 42, the piston 41 carrying a depending expansible tube 43 that is closed at its lower end by a plug 44 engaged with the valve 20, the expansible tube 43 being enclosed by a tubular guide 45 secured at its upper end to the piston 41 with its lower end telescoping into the upstanding concentrically arranged guide collar 46 on the valve 20, the expansible tube 43 and tubular guide 45 extending through the opening 35 in the plate 28 and disk 33 with a substantial clearance between the tubular guide and wall of the opening. The piston 41 is normally influenced in a downward direction by the coil springs 47 within the cylinder 40 that is engaged at its upper end by the screw follower 48 threaded into the cylinder and carried by the stem 49 of the valve handle 15, the stem 49 extending through a cap plate 50 that is attached to the upper end of the cylinder 40 as at 51.

A tubular casing 52 of heat insulating material is threaded at its upper end into the threaded opening 31, the bottom wall 52 of the casing having a circular series of openings 53 therein adjacent the side wall of the casing 52 and a central opening surrounded by a depending tubular boss 54, an end cap 55 being threaded onto the lower end of the casing 52 and having openings 53*a* therein that register with the openings 53 in the bottom wall 52. A pair of spaced concentric shells 56 and 57 are located within the tubular casing 52 and supported by the bottom wall 52*a*, the lower end of the outer shell 57 seating within the upstanding annular collar 58 carried by the bottom wall 52*a* inwardly of the openings 53 while the inner shell 56 extends through the tubular boss 54, the lower ends of both shells having fluid tight connections with the bottom wall 52*a*. A disk cap 59 is mounted upon the upper ends of the concentric shells 56 and 57 and has a central opening through which the inner shell 56 extends, a depending annular flange on the disk cap 59 inclosing the upper end of the outer shell 57, the disk cap 59 having a fluid tight connection with the two shells. The inner shell 56 provides an air passage 60 upwardly from the floor line as indicated in Figure 2, through the casing 36, the top wall of the casing 36 having a circular series of openings 61 permitting the flow of air from the casing. The annular space between the two shells 56 and 57 is filled with fluid as indicated at 62 that is subject to expansion and contraction, due to temperature variations, as is also the expansible tube 43, communication between the fluid space separating the concentric shells and expansible tube being established by a copper tube or other flexible connection 63 that has one end passed through an upstanding boss 64 on the top plate 59 and its other end engaged with the piston 41 and expansible tube 43. A filler plug 65 is carried by the disk cap 59 for the space between the concentric shells and is closed by the screw plug 66. The fluid is introduced into the expansible tube 43 and space between the concentric shells by means of the filler spout 65 and hollow piston 41 and after being completely filled, the fluid area is closed by the two plugs 42 and 66.

The device being designed for thermostatically controlling operation of the valve 20, the thermostatically actuating device being temperature operated, the upper face of the cap plate 50 is suitably graduated and with which graduations an indicator finger 67 fixed to the valve stem 49 is associated, a stop lug 68 on the cap plate 50 limiting movement of the indicator finger in one direction, such as to indicate the position for positively closing the valve 20 upon its seat. When the indicator finger 67 is shifted or rotatably adjustably positioned to indicate closing of the valve 20 upon its seat 19, the spring 47 is sufficiently compressed and placed under tension to overcome pressure of the spring 27 engaged with the valve 20 and the pressure of water or steam at the underside of the valve, the spring 47 depressing the piston 41 and expansible tube 43 to cause the latter to hold the valve upon its seat. The valve

20 as shown in Figure 2 is in an open position, the indicator finger 67 having been rotatably adjusted relative to temperature graduations upon the cap plate 50 to obtain the desired room temperature, tension of the spring 47 being thereby reduced so that the combined pressure of the spring 27 together with hot water or steam below the valve 20 operating to unseat the latter. When the room temperature exceeds the degree at which the indicator finger 67 has been set, heated air flowing upwardly through the casing 52 containing the concentric thermostatic shells 56 and 57 the heated air flowing upwardly through the central passage 60 and outer passage 60*a* between the outer shell 57 and casing 52 as indicated by arrow lines to heat the fluid between the shells and to flow into the casing 36 for heating the fluid in the expansible tube 43, the heated air finding its escape through the circular series of openings 61 in the top wall of the casing 36 surrounding the base of the cylinder 40. With the valve unseated, the heating medium, such as water or steam flowing into the valve casing 13 passes through the connection 18 to the radiator 10 and escapes from the valve casing into the casing 36 is prevented by the bellows device 44. When the fluid in the thermostatic shells and expansible tube expands, the expansible tube moves or is elongated in the direction of least resistance which would be downward into engagement with the valve 20 for lowering the same upon its seat 19, any additional expansion of the tube 43 being in an upward direction against the tension of the main spring 47. When the valve 20 is fully closed upon its seat 19, a lateral escape or vent 19*a* is formed in the partition providing the valve seat as shown in Figure 2 to permit the escape of a small quantity of the heating medium into the valve casing for delivery to the radiator to eliminate the possibility of a freeze and to maintain a constant flow of a minimum amount of the heating medium. When the room temperature is lowered, the cold air flows upwardly through the casing 52 into contact with the thermostatically actuating device and causing a contraction of fluid therein, the valve 20 is unseated by pressure of the spring 27 and heating medium blowing into the valve casing. As illustrated, the casing 52 is mounted in line with the valve casing 13 and the radiator 10, but in certain installations it may be preferable to mount the casing 52 in an angular position as illustrated by dotted lines in Figure 3, this disposition being accomplished by removing the screw 38 and displacing the cover 36 from the plate 28, then removing the screws 29 that anchor the plate to the upper end of the valve casing 13 so that the plates may be shifted at right angles in either direction, the screws 29 being then replaced and the casing 36 restored to its proper position overlying the plate 28 and retained by the screw 38.

From the above detailed description of the invention, it is believed that the construction and operation thereof will at once be apparent, and 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.

I claim:—

Valve operating mechanism comprising a valve casing having a seat therein and a valve closing on the seat, a thermostatic actuating device including an expansible tube directly engageable with the valve, a laterally disposed thermostatic element in fixed position exteriorly of the casing in communication with the expansible tube, a flexible tube connection between the upper ends of the expansible tube and thermostatic element, said thermostatic element having an axial passage therethrough defining an annular fluid space closed at opposite ends, screw plug closed filler openings at the upper ends of the expansible tube and thermostatic element, a casing having openings in its top wall removably mounted on the valve casing, a cylinder extending upwardly from the last named casing alined with the expansible tube and a tensioned hollow piston in the cylinder attached to the upper end of the expansible tube and having the filler opening therein for the tube.

In testimony whereof I affix my signature.

JAMES J. LAWLER.