L. E. FULLER.

DRAIN VALVE FOR STEAM HEATING RADIATORS.

APPLICATION FILED JUNE 16, 1908.

900,159. Patented Oct. 6, 1908.

Fig. 1.

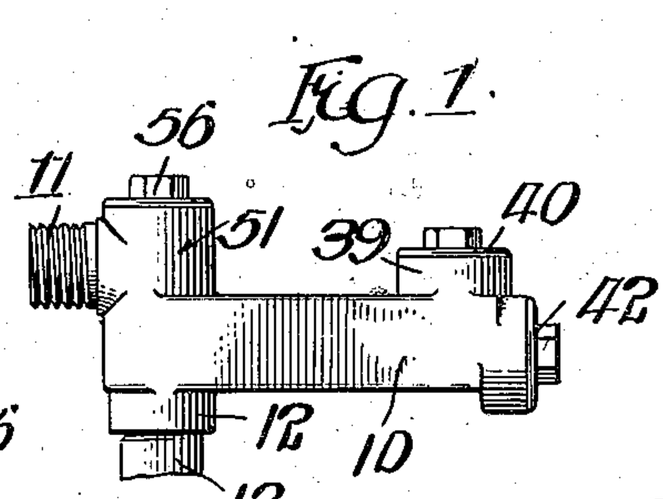


Fig. 2.

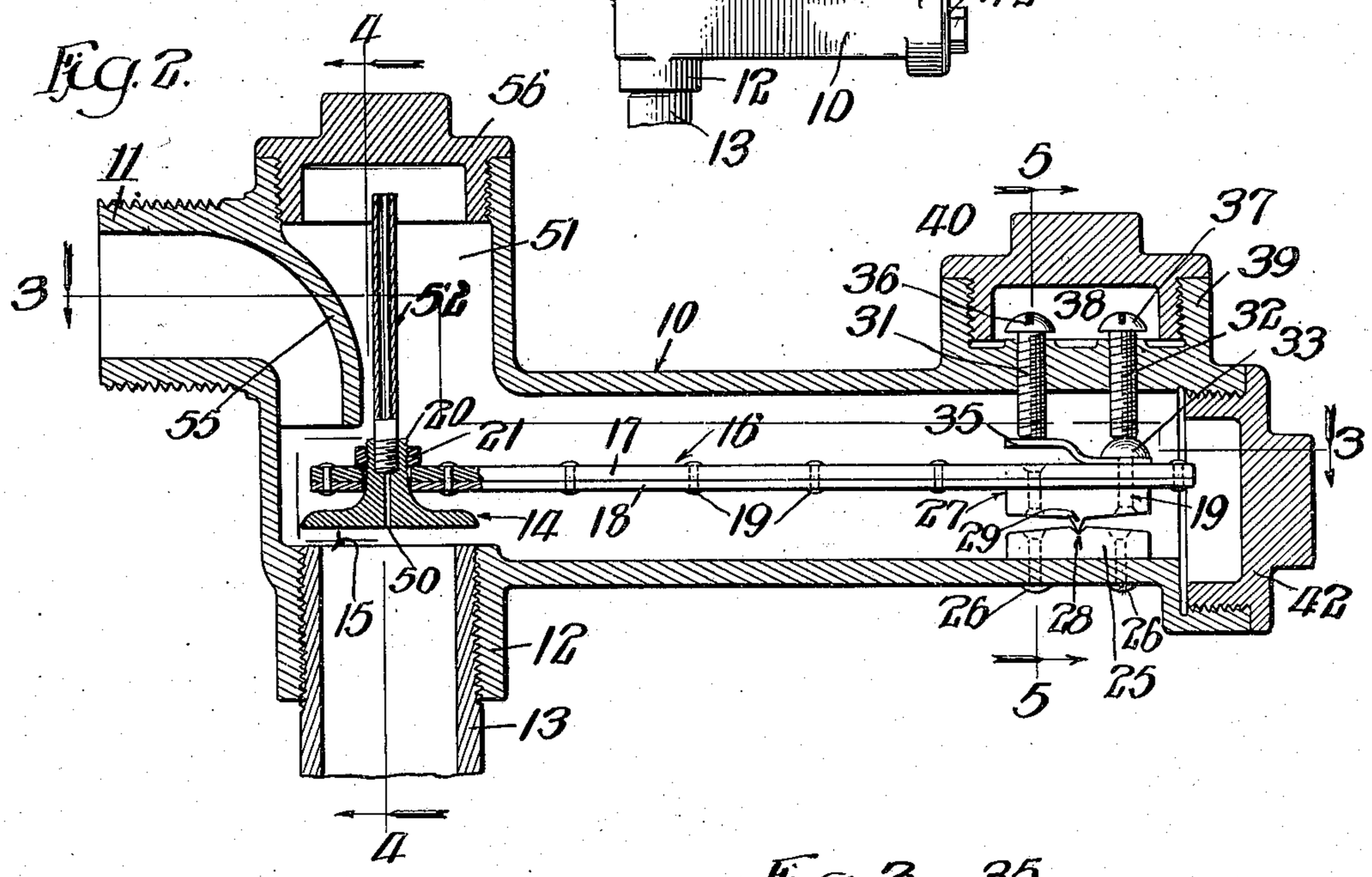


Fig. 3.

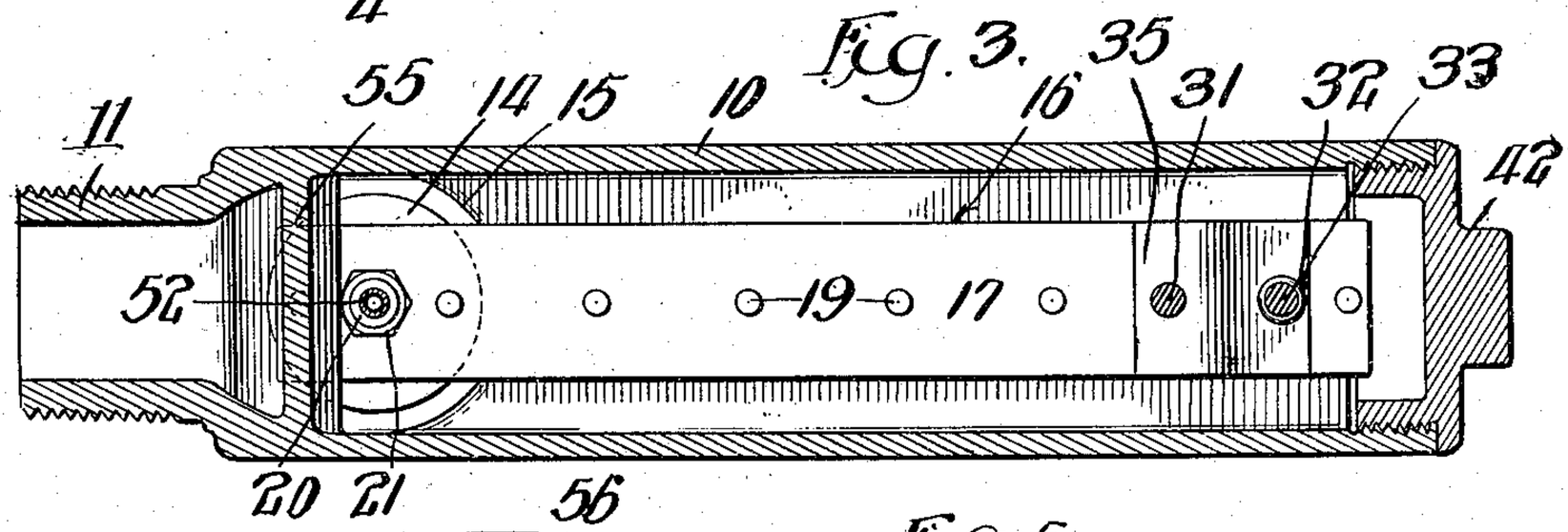


Fig. 4.

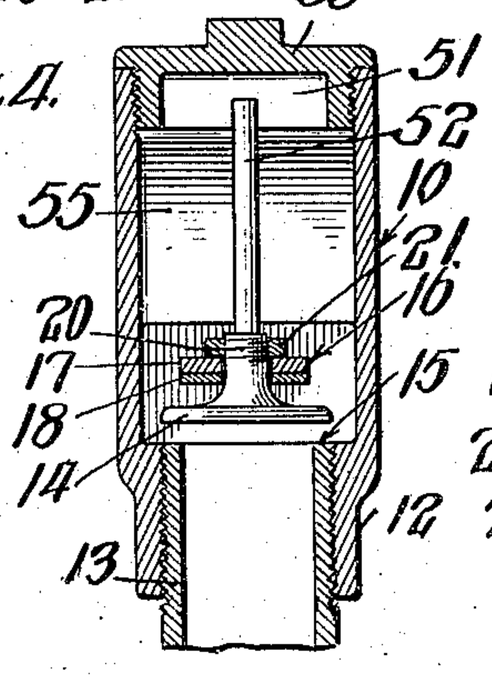
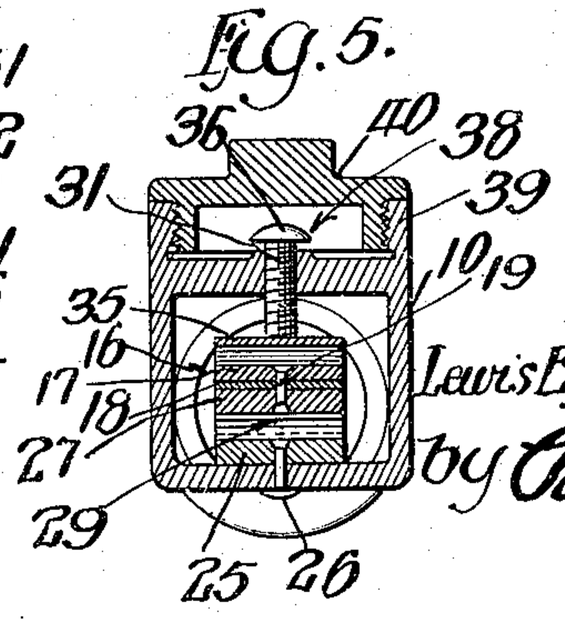


Fig. 5.



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UNITED STATES PATENT OFFICE.

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DRAIN-VALVE FOR STEAM-HEATING RADIATORS.

No. 900,159. Specification of Letters Patent. Patented Oct. 6, 1908.

Application filed June 16, 1908. Serial No. 438,778.

To all whom it may concern:

Be it known that I, LEWIS EUGENE FULLER, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Drain-Valves for Steam-Heating Radiators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in thermostatically controlled drain valves for use in steam heating systems for draining the water of condensation from steam heating radiators or units, while avoiding the wasteful escape of steam therefrom, and the invention consists in the matters hereinafter set forth and more particularly pointed out in the appended claims.

In the drawings:— Figure 1 is a side elevation of a drain valve made in accordance with my invention. Fig. 2 is a vertical axial section thereof. Fig. 3 is a horizontal section, taken on line 3—3 of Fig. 2. Fig. 4 is a vertical section, taken on line 4—4 of Fig. 2. Fig. 5 is a vertical section, taken on line 5—5 of Fig. 2.

As shown in the drawings, 10 designates a horizontally arranged, elongated casing or shell which is formed at one end to provide a tubular inlet branch 11 adapted for attachment to the radiator or heating unit to be drained, and with a tubular outlet branch 12 adapted for screw-threaded or other suitable connection with an outlet pipe 13. Located in the casing between said inlet and outlet branches is a valve closure 14, having the general form of a disk and provided with a flat lower face that is designed to engage an annular seat 15 surrounding the inner end of the outlet branch. Said seat 15 may be formed on the inner end of the pipe 13 or on a ring seated in said outlet branch. The said valve disk 14 is supported on and is controlled in its opening and closing movements by a thermostatic bar 16 which is pivotally mounted within the casing or shell at its end remote from the valve disk or closure. The said thermostatic bar consists, as herein shown, of upper and lower flat strips 17 and 18 having different coefficients of expansion such, for instance, as zinc and spring steel, the strips being so arranged that an increase of temperature serves to swing the free end of the bar and the valve disk carried thereby toward the valve seat to close the valve, while a reduction of temperature operates to swing said bar and the valve disk away from said seat to open the valve. The two strips 17 and 18 are fixed flatwise together by means of rivets 19, 19.

The valve disk or closure 14 is loosely mounted on the thermostatic bar and in such manner as to give the same sufficient freedom of movement thereon to accurately engage the seat 15 to reliably close the valve notwithstanding the fact that the thermostatic bar 16 may be somewhat distorted or the seat inaccurately faced. The means herein shown for effecting this result consists in providing the disk on its upper side with a central stem or lug 20 which extends upwardly through an opening in the said bar made of greater diameter than the upper end of the stem. The said stem is made conical at its lower end where it joins the disk 14 and of such diameter that it is engaged by the bar around the opening therein on a single circular line, while the part of the stem above said line of engagement is out of contact with the bar. A nut 21 having screw-threaded engagement with the upper end of the stem above the bar holds the disk or closure in place and said nut, if desired, may be rounded on its lower side for contact with said bar. Thus there is formed between the bar and disk a connection in the nature of a swivel joint which permits the valve to accurately accommodate itself to the seat under the abnormal conditions referred to.

The pivotal connection of the thermostatic bar 16 in the casing or shell is such as to permit the valve disk or closure carried thereby to be accurately adjusted with respect to its seat and to be maintained in such adjustment. The construction whereby such adjustment is effected is made as follows:

25 designates a stationary fulcrum block which is attached to the lower wall of the casing 10 inside said casing, as by means of screws or rivets 26, and 27 designates a pivot piece which is fixed to the lower side of the adjacent end of the thermostatic bar and is pivotally mounted on said fulcrum block 25. As herein shown said fulcrum block 25 is provided on its upper face with a transverse V-shaped notch or groove 28 and the pivot piece is provided on its under face with a like

shaped transverse rib 29 engaging said notch to constitute a knife edge pivot between said parts.

31, 32 designate two screws which extend downwardly through screw-threaded openings in the upper wall of the casing or shell 10, one at each side of said fulcrum. The screw 31 constitutes a presser screw which serves to hold the pivot piece 27 engaged with the fulcrum block, and the screw 32 constitutes an adjusting screw which acts on the thermostatic bar in rear of its fulcrum to adjust the valve or closure 14 towards and away from its seat. The said adjusting screw 32 bears at its lower end, as herein shown, on the upper rounded head 33 of one of the rivets 19 by which the strips of the thermostatic bar are fastened together. The presser screw 31 may bear directly against the thermostatic bar between its fulcrum and the valve disk 14. Preferably, however, and as herein shown, the lower end of said presser screw bears against a spring 35 carried by the bar and separated a distance therefrom in the part thereof which is engaged by the presser screw to afford a yielding connection of the presser screw with said bar. As herein shown, the said spring 35 is attached at one end to the thermostatic bar by the rivet 19, against the head 33 of which the adjusting screw bears, and the free end of said spring extends towards the disk and is separated a distance from the bar. In adjusting the parts after they have been assembled within the casing or shell, the presser screw 31 may be turned downwardly against the free end of the spring 35 until the disk or closure 14 is pressed against its seat, after which the adjusting screw 32 may be turned down against the bar, or the rivet head 33, to swing said bar, against the action of the spring, upwardly to move the disk away from its seat the required distance, in which position said disk or closure is held by the two screws 31 and 32 acting on opposite sides of the fulcrum of the bar.

If it be desired to adjust the disk closer to its seat the adjusting screw is turned backwardly or eased and the spring 35 swings the free end of the bar and disk towards its seat. By reason of the yielding engagement of the presser screw with the thermostatic bar, such adjustment of the valve towards and from its seat may be effected without adjustment of the presser screw, such as would be necessary if the presser screw should bear directly against a rigid or non-yielding part of the thermostatic bar. It will be observed that the valve disk or closure may be adjusted to its seat and held in such adjusted position without imposing a bending stress on the strips and without in any way interfering with their usual action under varying temperatures. Moreover, the arrangement described provides an extremely accurate adjustment and renders the operation of the valve highly sensitive to variations in temperature. The adjusting and presser screws 31 and 32 are provided at their upper ends with slotted heads 36, 37, respectively, which are located in a chamber 38 formed within an annular flange 39 rising from the upper wall of the casing 10. Said chamber is closed by a screw-threaded plug 40. The end of said casing 10 adjacent to the fulcrum of the thermostatic bar is closed by a screw-threaded plug 42, the removal of which affords access to the casing to assemble the parts therein and remove them therefrom.

In some instances it may be desirable to provide means for discharging air from the valve at a time when the valve disk or closure 14 is seated. This may be effected by providing the said valve with a restricted passage 50 which affords communication between the upper and lower sides of the valve disk when the latter is seated. As herein shown the air is withdrawn from the upper part of an air chamber 51 formed in the upper part of the valve casing adjacent to the discharge branch thereof through the medium of a pipe 52 rising from and having screw-threaded engagement with the valve disk and communicating with said passage 50. An inverted weir 55 is located at the inner end of the inlet branch 11 and extends below the level of the lower wall or floor of said inlet branch. Said weir provides a seal at the inner end of the inlet branch when the valve casing is filled with water to the level of the lower margin of said weir to prevent the escape of steam to the air chamber 51 and thence through the tube 52 and passage 50 to the outlet branch of the valve casing. The said air chamber 51 is closed at its upper side by a screw-threaded plug 56.

In use, the drain valve is attached to the radiator or heating unit at a point to receive the water of condensation therefrom and the outlet pipe 13 of the valve leads to a place for the disposal of the water of condensation. If the heating system in which the valve is employed be a vacuum system, said pipe 13 will lead to a vacuum pump by which air and water of condensation are removed from the radiators or heating units. The thermostatic bar 16 is so constructed and arranged that when cold and before steam is admitted to the radiator or heating unit to which it is attached, the valve disk 14 is held in its open position as shown in Fig. 2. When steam is admitted to the radiator it drives the air therefrom through the valve to the discharge pipe 13, and when live steam enters the valve, the thermostatic bar is heated and it is expanded to close the valve disk against its seat and prevent the wasteful escape of steam through the valve. As the water of condensation collects from the radiator in the valve casing and becomes cool the reduction of

temperature of the thermostatic bar serves to move the valve disk off its seat and permit the escape of the water until steam again enters the valve casing and impinges against the thermostatic bar, whereupon the valve disk is again moved to its closed position to cut off the escape of steam through the valve. The valve is thus intermittently opened and closed to permit of the periodic discharge of water as it collects in the valve casing, while at the same time preventing the wasteful escape of steam from the radiator or heating unit. When the supply of steam to the radiator is discontinued the valve is opened and held open so as to drain the water completely therefrom, thus avoiding liability of water freezing within the casing and disrupting the same. By reason of the horizontal elongation of the valve casing and the horizontal arrangement of the thermostatic bar therein the said bar is submerged by a less quantity of water than would be true if the bar were disposed vertically. The arrangement adds to the sensitiveness of the operation of the valve.

I claim as my invention:—

1. A drain valve for removing water of condensation from steam heating systems comprising a horizontally elongated casing provided with a water inlet branch and at one end with a water discharge branch having a valve seat surrounding the same, a valve closure for controlling said discharge branch, a horizontally arranged thermostatic bar in said casing on one end of which said valve closure is mounted, means for pivoting the bar at its opposite end to the casing to swing towards and from said discharge branch, and means acting on the pivoted end of the bar for adjusting the valve towards and from said seat, said bar being composed of two strips of material having different coefficients of expansion.

2. A drain valve for removing water of condensation from steam heating systems comprising a casing provided with an inlet branch and with a discharge branch having a valve seat surrounding the same, a valve closure for controlling said discharge branch, a thermostatic bar in the casing on one end of which said valve closure is mounted, means for pivoting said bar at its opposite end to the casing, and means acting on said bar at its pivoted end for adjusting the valve towards and from its seat without imposing a bending stress on said bar.

3. A drain valve for removing water of condensation from steam heating systems comprising a casing provided with an inlet branch and with an outlet branch having a valve seat, a valve closure for controlling said outlet branch, a thermostatic bar on one end of which said valve closure is mounted, means for pivotally connecting the other end of said bar with the casing, a presser device acting on said bar at one side of its fulcrum for holding the bar against its fulcrum, and an adjusting device acting on the bar on the other side of the fulcrum for adjusting the valve closure towards and away from its seat.

4. A drain valve for removing water of condensation from steam heating systems comprising a casing provided with an inlet branch and with an outlet branch having a valve seat, a valve closure for controlling said outlet branch, a thermostatic bar on one end of which said valve closure is mounted, means for pivotally connecting the other end of said bar with the casing, a presser device acting on said bar at one side of its fulcrum for holding the bar against its fulcrum, an adjusting device acting on the bar on the other side of the fulcrum for adjusting the valve closure towards and away from its seat, and a spring interposed between said presser device and said bar.

5. A drain valve for removing water of condensation from steam heating systems comprising a casing provided with an inlet branch and with a discharge branch, the latter having a valve seat, a valve closure for controlling said discharge branch, a thermostatic bar on one end of which said valve closure is mounted, pivotal connection between the other end of said bar and the casing comprising a fulcrum block fixed in the casing, a pivot piece fixed to the bar and having a knife-edge pivotal connection with said fulcrum block, and means acting on the bar to adjust the valve towards and from its seat.

6. A drain valve for removing water of condensation from steam heating systems comprising a casing provided with an inlet branch and with a discharge branch, the latter having a valve seat, a valve closure for controlling said discharge branch, a thermostatic bar on one end of which said valve closure is mounted, pivotal connection between the other end of said bar and the casing comprising a fulcrum block fixed in the casing, a pivot piece fixed to the bar and having a knife-edge pivotal connection with said fulcrum block, a presser device acting on the bar between its fulcrum and said closure to press the bar towards said fulcrum piece, and an adjusting device acting on the bar at the other side of the fulcrum for adjusting the valve closure towards and from its seat.

7. A drain valve for removing water of condensation from steam heating systems comprising a casing provided with an inlet branch and with a discharge branch, the latter having a valve seat, a valve closure for controlling said discharge branch, a thermostatic bar on one end of which said valve closure is mounted, pivotal connection between the other end of said bar and the casing comprising a fulcrum block fixed in the casing, a

pivot piece fixed to the bar and having a knife-edge pivotal connection with said fulcrum block, a presser device acting on the bar between its fulcrum and said closure to press the bar toward said fulcrum piece, an adjusting device acting on the bar at the other side of the fulcrum for adjusting the valve closure towards and from its seat, and a spring interposed between the presser device and said bar.

8. A valve for removing water of condensation from steam heating systems comprising a horizontally elongated casing provided at one end with a discharge branch having a valve seat surrounding the same and provided also with an inlet branch, a valve closure for controlling said discharge branch, and a horizontally arranged thermostatic bar carrying at one end said valve closure and pivoted at its other end to the casing, said closure being provided with a restricted air passage arranged to permit the passage of air from the valve casing to the discharge branch when the closure is seated.

9. A valve for removing water of condensation from steam heating systems comprising a horizontally elongated casing provided at one end with a discharge branch and provided also with an inlet branch, a valve closure for controlling said discharge branch, a horizontally arranged thermostatic bar pivoted at one end to the casing and carrying at its other end said closure, said closure being provided with a restricted air escape opening, a tube communicating with said opening and rising from the closure into an air chamber formed in the upper part of the casing above the closure and an inverted weir arranged at the inner end of the inlet branch.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 25th day of January A. D. 1908.

LEWIS EUGENE FULLER.

Witnesses:
G. R. WILKINS,
A. M. BUNN.