

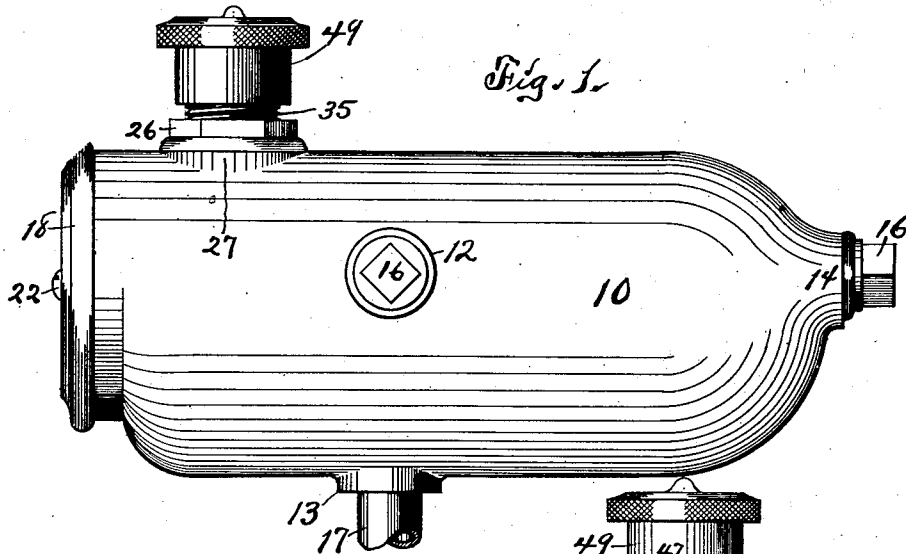
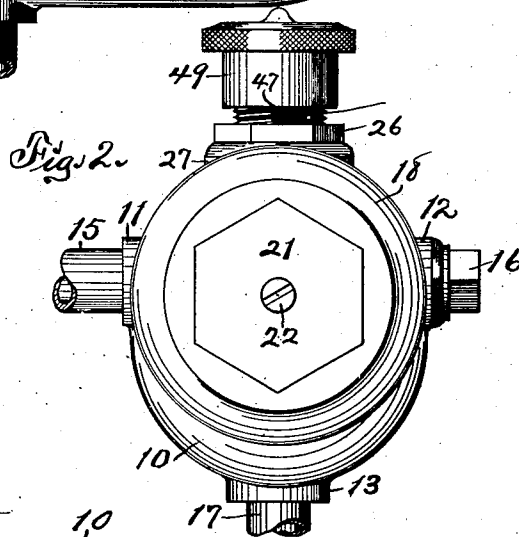
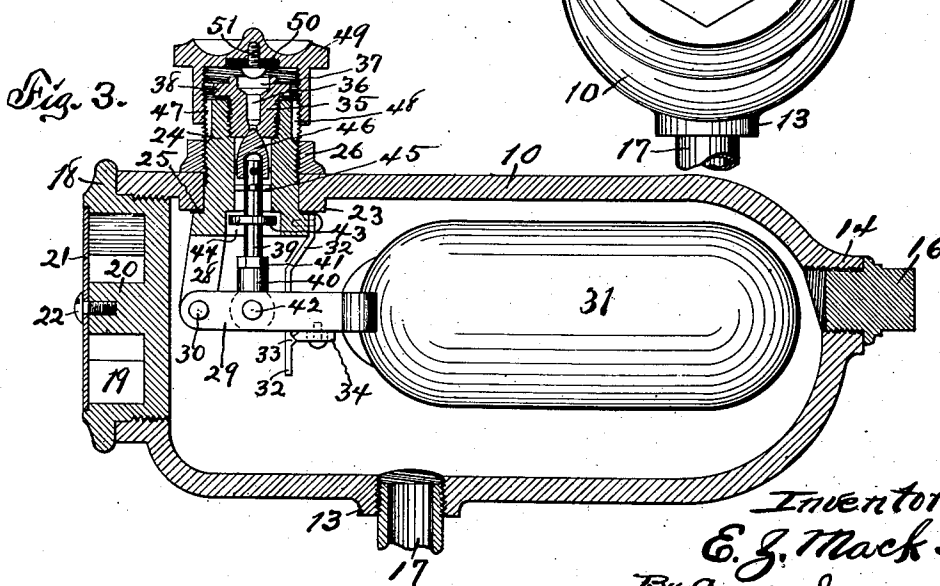
May 19, 1925.

E. Z. MACK

1,538,049

AUTOMATIC AIR VALVE FOR HOT WATER RADIATION

Filed April 11, 1921



Inventor:
E. Z. Mack.
By Carl M. Sinclair
Att'y

UNITED STATES PATENT OFFICE.

EDWIN Z. MACK, OF MARSHALLTOWN, IOWA.

AUTOMATIC AIR VALVE FOR HOT-WATER RADIATION.

Application filed April 11, 1921. Serial No. 460,598.

To all whom it may concern:

Be it known that I, EDWIN Z. MACK, a citizen of the United States of America, and resident of Marshalltown, Marshall County, Iowa, have invented new and useful Automatic Air Valves for Hot-Water Radiation, of which the following is a specification.

The object of this invention is to provide means for venting air and trapping water under pressure in hot-water heating and supplying systems.

A further object of this invention is to provide improved means for retarding the operation of a float pending accumulation of surplus power therein susceptible of quick, positive and complete action to the end that opening and closing of a valve may be made instantaneous rather than progressive, thus avoiding sputtering and the spattering of water during such operation.

A further object of this invention is to provide means for combining a circulation function with a relief valve function in pressure operated hot-water heating and supplying systems whereby the pressure of water in a valve chamber is equalized to that in a radiator or supply chamber.

A further object of this invention is to provide improved means for assembling various elements of a float-operated valve relative to a chamber containing and carrying the same.

A further object of this invention is to provide improved means for automatically cutting off or closing the vent of a float-operated valve extraneous to the normal venting valve when certain elements associated therewith are removed for cleaning, repair or substitution.

A further object of this invention is to provide improved means for closing, by manual operation, the normal vent of a float-operated valve mechanism.

A further object of this invention is to provide improved means for selectively arranging, in different locations, an air relief valve relative to a radiator or supply chamber in hot-water heating and supplying systems.

My invention consists in the construction, arrangement and combination of elements hereinafter set forth, pointed out in my claims and illustrated by the accompanying drawing, in which—

Figure 1 is a side elevation and Figure 2

an end elevation of my improved device. Figure 3 is a longitudinal elevation, partly in section centrally of the device, illustrating the construction and arrangement of parts in normal operative positions.

In the construction of the device as shown the numeral 10 designates a casing substantially of cylindrical form but reduced or tapered slightly at its ends in a somewhat irregular manner. The casing 10 is formed with bosses 11, 12 diametrically opposite each other and in the sides of the chamber, a similar boss 13 in the bottom of the chamber and a similar boss 14 at the apex of one tapered end portion of the casing. The bosses 11, 12 and 14 preferably lie in the same horizontal plane and above the median line of the casing, it being understood that the casing 10 is adapted to be set level and recumbent at all times as indicated in the drawing. The casing 10 preferably is secured to a radiator or supply chamber of a hot-water heating and supplying system by means of a nipple 15 screwed in said radiator or chamber and also tapped into one or another of the bosses 11, 12 or 14; the holes provided in the remaining bosses of the series mentioned being closed by plugs 16. Thus the casing may be selectively located by employing the nipple 15 in connection with either of the inlet bosses. When the casing is mounted on a radiator or supply chamber as above suggested a communicating pipe 17 is tapped at one end into the boss 13 and opens at its other end at some convenient point into the heating or supply system, preferably through a boss now common and well known in the radiator or chamber at a point below the inlet communication between the latter element and the casing. Thus provision is made for maintaining a circulation between the casing 10 and radiator or supply chamber through the nipple 15 and communicating pipe 17 whereby heat and pressure are substantially equalized between the two main elements. The end portion of the casing 10 opposite to the boss 14 is formed with a circular opening and is interiorly threaded and adapted to receive a closing cap 18 having an angular socket 19 opening outwardly therefrom. A stud 20 is formed on and projects outwardly from the central portion of the cap 18 and is provided with a screw seat. A rabbet is formed in the cap 18 surrounding the socket 19 and the bottom of the rabbet preferably

falls in the same plane with the outer end of the stud 20. A name plate 21 is fitted to the rabbet and forms a closure for and flush with the extremity of the socket 19 and said plate is removably and replaceably mounted by means of a screw 22 seated in the stud 20. The name plate 21 is removed and a combination socket and spud wrench is employed in the socket 19 to remove or replace the closing cap 18 relative to the casing.

The casing 10 also is formed with an internal boss 23 in the outer end portion of its top and a small circular hole is formed in said boss and in the upper wall of the casing. A valve chamber 24 is mounted loosely in the hole last mentioned and is formed with an annular flange on its inner end portion adapted to approach the inner face of the apertured boss 23 and be sealed thereto by a gasket 25 of suitable form. The valve chamber 24 is threaded externally on its outer end and is adapted to receive on its threaded portion a lock nut 26, which lock nut, when turned down, engages a flattened outer end portion of a boss 27 formed on the exterior of the upper wall of the casing in registration with the boss 23. It is the function of the nut 26 to clamp the valve chamber 24 rigidly to a seat in the casing 10. An arm 28 is formed on and extends radially of the casing substantially to the median line thereof and a float lever 29 of forked form is fulcrumed at one end on a pin 30 extending through said arm. A float 31, preferably made of imperforate metal, generally cylindrical in form with rounded ends, is mounted on the inner end portion of the forked lever 29 and extends longitudinally of and within the casing. A leaf spring 32 is fixed at one end to the valve chamber 24 at a point diametrically opposite to the arm 28 and depends through the forked lever 29 radially and across the center of the casing 10. The spring 32 is formed with a wedge-shaped lug 33 on one side and said lug is adapted to engage a trigger 34 adjustably mounted on said lever and, in turn, formed with a wedge-shaped end portion adjacent to the spring. The trigger 34 may be manually adjusted longitudinally of the forked lever 29 to regulate and determine the tension of the spring 32 in respect of cooperation or coaction of the lug 33 and wedge-shaped end of said trigger. It is the function of the spring 32, in association with the lug 33 and trigger 34, to sustain the float 31 extraneous to the buoyancy of said float in water in the casing against movement in one direction and also to limit return movement of said float by buoyancy until said buoyancy attains to an abnormal degree. In either event the spring is a retarding or "hold-back" element in the combination tending to the accumulation of power in the float to a predetermined

degree, whereby, upon the release of the retarding influence, the resultant action of the float is quick, sudden and snappy. A valve seat 35 is screwed into the outer end portion of the valve chamber 24 and is provided with a central bore 36 having a conical seat in its lower end and a cylindrical cavity 37 at its upper end. The valve seat 35 also is formed with a nut-flange 38 on its upper end portion whereby it can be manipulated through the use of a wrench to place or remove the same relative to the chamber 24. A valve stem 39 is screw-seated in a hub 40 and secured adjustably therein by a jam-nut 41. The hub 40 extends within the forked lever 29 and is pivoted thereto by a pin 42. The valve stem 39 also is formed with a sub-valve 43 entering a cavity 44 in the inner end portion of the valve chamber 24 and adapted to seat at times and prevent upward flow through said valve chamber. The valve stem 39 also is formed with guide pins 45 radiating therefrom and adapted to slide on the wall of the bore of the valve chamber and guide the valve stem in reciprocation therein. A valve plug 46 is pivoted on the outer end portion of the stem 39 and is provided with a tapered end portion adapted to engage and close at times the seat in the inner end portion of the bore 36 of the valve seat 35. The valve plug 46 has a freedom of oscillation on the stem 39 and is spaced from the wall of the bore of the chamber 24. Thus is provision made for self centering and seating of the plug 46 in the lower end of the bore 36 of the valve seat 35 and also for the passage of air through the valve chamber around said plug. Grooves 47, 48 are cut in the outer wall of the valve chamber 24 across the threads thereof and through the plane of the upper end of said chamber. A cap 49 is screwed on the extremity of the valve chamber 24 and is provided with a bibb washer 50 mounted in a countersink centrally of its inner face, which bibb washer is adapted at times to close on the upper end of the valve seat 35 and entirely cut off the flow of air and water through said seat; a holding screw 51 for said bibb washer being received loosely in the cavity 37 of the bore 36. The cap 49 is adapted for manual actuation in either direction and for such purpose preferably is formed with a milled head.

In practical use the device is so mounted that the horizontal plane defining the uppermost point of the bore of the nipple 15 is slightly above a horizontal plane intersecting the axis of the pin 30. Thus sufficient buoyancy of water is applied to lift the float 31 into the position shown. Thereafter when the level of water in the radiator or supply chamber, and consequently in the casing 10, falls there is a tendency on the

part of the float 31 to descend and open the valve, which tendency is retarded or held back by engagement of the wedge-shaped end of the trigger 34 with the upper inclined face of the lug 33 backed by the pressure of the spring 32. This retarding influence is continued until the level of water recedes to a point where the weight of the float and elements carried thereby, relieved of the buoyancy of the water, is sufficient to overcome the pressure of the spring 32 and cause it to recede and withdraw the lug 33 from the trigger, at which time the float drops suddenly and quickly and carries the trigger beyond the lug. Such descent of the float, acting through the lever 29, unseats the valve plug 46 suddenly and permits venting of the confined air under pressure through the valve seat, the chamber of the cap 49 and the grooves 47, 48. The venting of the air is continued and, consequently, the level of water in the casing rises, until the buoyancy of the water raises the float 31 with sufficient force to overcome the retarding influence of the lug 33 (engaging by its lower face with the upper inclined face of the trigger 34) and causes the spring 32 to recede and permit the trigger to pass the lug suddenly and quickly, thus replacing the valve plug 46 in closing position.

If it be desirable to remove the cap 49 and valve seat 35 for cleaning, repair or substitution, then, in that event, the float 31 is raised by the water sufficiently to seat the sub-valve 43 and cut off the flow through the valve chamber 24.

Should it occur that the valve-plug 46 cannot seat or adjust itself to the valve seat 35, due to floating or separable particles in the water, then the cap 49 may be screwed down manually until the bibb washer 50 engages a seat on the upper end of the valve seat 35, thereby cutting off all flow through the port 36 thereof. Following such emergency operation, the valve seat 35 may be removed and, if the cause of trouble can be corrected by cleaning the valve seat 35 and plug 46, then the valve seat can be reset and the automatic feature of the valve be restored.

I claim as my invention—

1. An automatic air valve for hot water radiation, comprising a casing adapted to be mounted on a radiator or supply chamber and communicate therewith horizontally, air-venting valve mechanism carried by said casing, and a float pivoted on a horizontal axis within said casing and acting on said mechanism, together with retarding means acting on said float, said means including a trigger carried by the float device and a spring formed with a lug adapted to engage said trigger.

2. An automatic air valve for hot water

radiation, comprising a casing adapted to be mounted on a radiator or supply chamber and communicate therewith horizontally, air-venting valve mechanism carried by said casing, and a float pivoted on a horizontal axis within said casing and acting on said mechanism, together with retarding means acting on said float on opposite sides of the neutral point in its range of movement, said means including a trigger adjustably connected with the float and a spring formed with a lug adapted to engage said trigger.

3. In a device of the class described, a casing having means of communication horizontally with a radiator or supply chamber and further means of communication vertically therewith, one end of said casing being formed with a relatively large opening and provided with a closing cap, said casing also being formed with a vertically apertured boss in its top, a valve chamber mounted through the latter boss, a nut on said valve chamber engaging said casing, a valve seat threaded in said chamber, a cap superposed on said chamber and overlying said seat, there being ports between said chamber and cap, a float-operated lever pivoted on said chamber and arranged wholly within said casing, and a valve carried by said lever and adapted to close said valve seat.

4. In a device of the class described, a casing having means of communication horizontally with a radiator or supply chamber, and further means of communication vertically therewith, one end of said casing being formed with a relatively large opening and provided with a closing cap, said casing also being formed with a vertically apertured boss in its top, a valve chamber mounted through the latter boss, said valve chamber being formed with a flange on its inner end adapted to engage the inside of the wall of the casing, a nut on said valve chamber engaging said casing, a valve seat threaded in said chamber, a cap superposed on said chamber and overlying said seat, there being ports between said chamber and cap, a float-operated lever pivoted on said chamber and arranged wholly within said casing, and a valve carried by said lever and adapted to close said valve seat.

5. In a device of the class described, a casing having means of communication horizontally with a radiator or supply chamber and further means of communication vertically therewith, one end of said casing being formed with a relatively large opening and provided with a closing cap, said casing also being formed with a vertically apertured boss in its top, a valve chamber mounted through the latter boss, a nut on said valve chamber engaging said casing, a valve seat threaded in said chamber, a cap superposed on said chamber and overlying

said seat, there being ports between said chamber and cap, a float-operated lever pivoted on said chamber and arranged wholly within said casing, and a self-centering valve carried by said lever and adapted to close said valve seat.

6. In a device of the class described, a casing, a valve chamber on and extending within said casing, a seat member threaded therein and formed with a downwardly opening seat, a float lever within but independent of said casing and pivoted on said chamber, a valve stem adjustably mounted on said lever and pivoted thereto, and a self-centering valve on said stem adapted to engage said seat.

7. In a device of the class described, a valve chamber formed with a port of two diameters, there being a seat at the juncture thereof, a seat member carried by said valve chamber and having a seat at one end, a float lever fulcrumed on said chamber, a valve stem pivoted on said float lever, a valve on said stem adapted to engage the second seat and a sub-valve on said stem adapted to engage said first seat at times.

8. In a device of the class described, a valve chamber having a port formed with a seat, said port being of different diameters on opposite sides of said seat, a seat member screwed in said valve chamber and having a downwardly opening seat, a float lever pivoted on said valve chamber, a valve stem pivoted on said float lever, a self-centering plug on said stem adapted to engage the second seat, and a sub-valve on said stem adapted to engage the first seat at times.

9. In a device of the class described, a valve chamber having a port formed with a seat, said port being of different diameters on opposite sides of said seat, a seat member screwed in said valve chamber and having a downwardly opening seat, a float lever pivoted on said valve chamber, a valve stem pivoted on said float lever, said stem being adjustable relative to said lever, a self-centering plug on said stem adapted to engage the second seat, and a sub-valve on said stem adapted to engage the first seat at times.

10. In a device of the class described, a valve chamber having a port of two diameters forming a seat, a seat member screwed in said valve chamber and having a downwardly opening seat, a float lever pivoted on said valve chamber, a valve stem pivoted on said float lever, a self-centering plug on said stem adapted to engage the second seat, and a sub-valve on said stem adapted to engage the first seat at times, together with guide pins on said stem adapted for sliding engagement with the bore of the valve chamber.

11. In a device of the class described, a valve chamber formed with external threads and also formed with grooves intersecting said threads, a seat member mounted in said chamber, a valve adapted to engage said seat member, the seat member being formed with a bore having an enlarged cavity at one end, a cap adapted to be screwed on said intersected threads of the valve chamber, and a bibb washer mounted within said cap and adapted to engage the adjacent end of the seat member and close the cavity of the bore thereof.

12. In a device of the class described, a float lever mounted for oscillation on a horizontal axis, a float fixed to said lever, a leaf spring, fixed at one end, extending across said float lever and formed with a wedge-shaped lug and a member adjustably mounted on said float lever and adapted to engage selectively on opposite sides of said lugs whereby said float is held back or retarded on opposite sides of the neutral point of its movement.

13. In a device of the class described, a float lever mounted for oscillation on a horizontal axis, a trigger mounted thereon, and a spring extending transversely of said lever and formed with a lug adapted to engage said trigger.

14. In a device of the class described, a float lever, a trigger adjustably mounted thereon, and a spring formed with a lug adapted to engage said trigger.

Signed at Marshalltown, in the county of Marshall and State of Iowa, this 30th day of March, 1921.

EDWIN Z. MACK,