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B. E. VAN AUKEN.

VALVE FOR RADIATORS.

APPLICATION FILED AUG. 1, 1903.

Fig. 1.

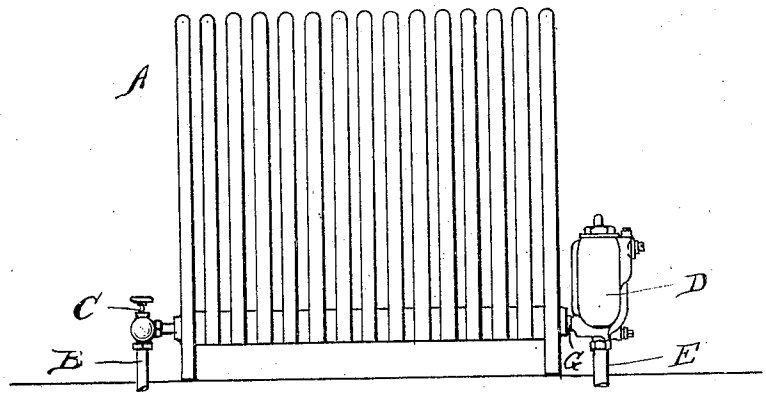


Fig. 2

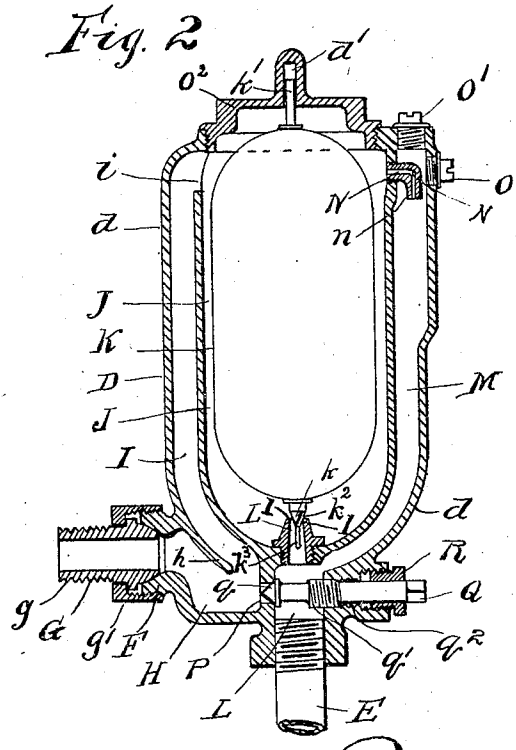
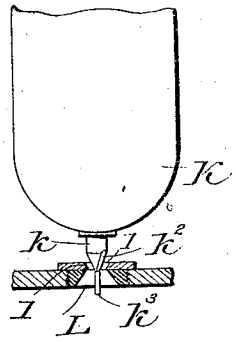


Fig. 3.



Witnesses.

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VALVE FOR RADIATORS.

No. 828,153. Specification of Letters Patent. Patented Aug. 7, 1906.

Application filed August 1, 1903. Serial No. 167,885.

To all whom it may concern:

Be it known that I, BYRON E. VAN AUKEN, a citizen of the United States, and a resident of Chicago, Cook county, in the State of Illinois, have invented certain new and useful Improvements in Valves for Radiators, of which the following, when taken in connection with the drawings accompanying and forming a part hereof, is a full and complete description sufficient to enable those skilled in the art to which it pertains to understand, make, and use the same.

This invention relates to valves designed to be placed upon the discharge ends of radiators of steam-heating systems for the purpose of discharging the air and water of condensation from the radiators; and the object of the invention is to provide means whereby when the air contained in the radiator to which the device is attached has been forced from the radiator through this device by the pressure in such radiator being greater than the pressure on the discharge end of this apparatus no considerable quantity of steam will be discharged from the radiator, while water of condensation forced into or deposited in the device will be automatically discharged therefrom when more than a given quantity of such water of condensation is contained in the float-chamber thereof.

A further object of the invention is to obtain a device of the kind named and for the purpose set forth which will produce a minimum of noise in the operation thereof, particularly when applied to a vacuum steam-heating system.

In the drawings referred to, Figure 1 is a side elevation of a radiator with a device embodying this invention attached thereto, such figure showing also the attachment of the steam-supply pipe to the radiator and the attachment of a pipe to the discharge end of this apparatus, such pipe being adapted to constitute the vacuum-pipe of a vacuum steam-heating system. Fig. 2 is a vertical sectional view, on an enlarged scale, of the device embodying this invention; and Fig. 3 is a view showing in detail a leakage-groove in the valve attached to the float of the apparatus.

A reference-letter applied to designate a given part is used to indicate such part throughout the several figures of the drawings wherever the same appears.

In Fig. 1, A is a radiator in a steam-heating system, B is a steam-supply pipe to radiator A, and C is a valve which when closed prevents admission of steam to radiator A and which must be open in order to permit steam to flow from steam-supply pipe B into radiator A. D is a side elevation of a device embodying this invention attached to the discharge end of the radiator A, and E is a pipe attached to the discharge end of this apparatus.

For the construction of the device embodying this invention particular reference is made in the description to Fig. 2 of the drawings, wherein *d* is the outer shell or casing of the device. F is the stem of the device, by means of which the device is attached to the radiator, preferably by a union G, consisting of the parts *g g'*. H is a well in the shell *d*, adjacent to the stem F. J is the float-chamber of the device. K is a float in float-chamber J. Radiator A and float-chamber J are connected by a conduit comprising a passage-way through stem F to well H and a passage-way I from well H to such float-chamber. Passage I discharges into float-chamber J above the level of the water therein required to lift the float K, as at *i*. *h* is a continuation of the side wall of the casing to below the top of the passage in stem F, forming a weir. Float K is provided at the lower end thereof with valve *k*, seating on seat *l*, to close outlet L when the float is in its lowest position, and at its upper end with guide-stem *k'*, moving loosely in the recess *d'*, provided therefor in shell *d*. k^2 is a groove in valve *k*, forming a leakage therethrough when the valve is seated. k^3 is a stem to valve *k*, extending below the valve-seat *l* into the outlet L, such stem tending to keep the valve-seat clean in the operation of the apparatus. Valve-seat *l* is preferably raised slightly above the bottom of float-chamber J for the same reason—that is, to tend to keep the valve-seat clean. M is a vertically-extending passage-way communicating at its upper end, as by means of the restricted passage-way N, with the float-chamber J, and at its lower end with the outlet L below the seat *l* of valve *k*. The restricted passage-way N is of such diameter that when steam passes therethrough some of such steam is converted into water of condensation. Q is a cap provided to close the opening in the wall of shell *d*, through which the elbow *n* (provided with the restricted passage-way N therethrough) is inserted in its place in passage-way M and screwed into position substan-

tially as illustrated in Fig. 2 of the drawings. O′ is a cap closing the upper end of passage-way M. O^2 is a cap closing the upper end of the float-chamber J.

The apparatus, as above described, comprises an automatically-operating device. To obtain means for hand operation of the device, I provide communicating passage-way P between well H and outlet L and the plug Q, having the valve q at the inner end thereof seating to close the passage-way P and the screw-thread q' on the body part thereof fitting into corresponding screw-threads q^2 in the shell of the apparatus, so that when the stem Q is turned in one direction the valve q will be forced onto its seat and when turned in the opposite direction will be retracted from such seat to open the passage-way P.

R is an ordinary stuffing-box to stem Q.

The groove k^2 in valve k is not intended to be of sufficient size to handle the water of condensation which is delivered into the float-chamber J in the operation of the device. Hence after the air has been forced from the radiator such groove will be quickly sealed against steam passing therethrough from the float-chamber into outlet L by the water of condensation contained in the float-chamber. When less pressure is created in the pipe E than obtains in the radiator, there is a tendency to force the contents of the radiator (whether air, water, or steam) through the device by way of the restricted passage-ways N and k^2; but when water of condensation is contained in the float-chamber J the passage-way or groove k^2 is sealed thereby against the flow of air therethrough, and when water of condensation or steam passes through restricted passage-way N it becomes partially clogged thereby and but little water or steam will flow therethrough. Water of condensation accumulates in chamber J in two ways. First, when steam is contained in float-chamber J after the passage-way k^2 is sealed by water of condensation deposited in such float-chamber additional water of condensation will accumulate therein by the continuous condensation of steam in such chamber, and, second, whether steam is contained in float-chamber J or not, as often as the well H becomes sufficiently filled with water of condensation from the radiator to which the apparatus is attached to seal the lower end of the vertical passage-way I and sufficient difference of pressure is obtained in the radiator and the float-chamber J some of such water of condensation will be forced over into such chamber J. In the foregoing-described operation of the device when sufficient water of condensation is contained in chamber J to raise the float K valve k is thereby unseated and the liquid contents of such float-chamber flow therefrom into the outlet L through valve-seat l. This operation is continued so long as sufficient water of condensation is contained in such chamber J to maintain the valve k off its seat, and water of condensation will be continuously supplied to chamber J so long as sufficient water of condensation is contained in the radiator to which this apparatus is attached to seal the lower end of passage-way I in well H. The water of condensation is forced from well H up the passage-way I over into the float-chamber J because of the greater pressure existing in the radiator over the pressure in float-chamber J. This difference of pressure is obtained in one of two ways—first, when outlet L communicates with the atmosphere by a pressure greater than that of the atmosphere maintained in the radiator; second, when the outlet L is connected to a vacuum-pipe, as is preferably done, by the lowering of the pressure of the contents of the float-chamber J to below the pressure of the contents of the radiator. When the pressure in the radiator is atmospheric or below, the pressure in float-chamber J is reduced below such radiator-pressure by connecting outlet-pipe L to a vacuum-pipe communicating with an exhausting apparatus. Restricted passage-way N becomes filled with water of condensation when steam is supplied thereto from the float-chamber due to the lower temperature of the walls of such passage-way, and when steam ceases to be supplied to the float-chamber and to such passage-way on the float-chamber side thereof the water of condensation in such passage-way will be drawn therefrom and the pressure in the float-chamber will gradually fall and become equalized with the pressure in discharge-outlet L. When the seal in well H is broken and no air is contained in the radiator, steam will pass from the radiator into float-chamber J and water of condensation will be thereby deposited in such float-chamber to seal passage-way k^2 and in passage-way N to substantially seal it. When air is in the radiator to which this device is attached and the seal in well H is broken, such air is forced into float-chamber J, where it remains until passage-way N or passage-way k^2 is freed, or nearly so, of water of condensation, whereupon such air is forced through such passage-ways or the one thereof which is opened. When air is forced from the radiator into float-chamber J and through passage-way N (or passage-way k^2) therefrom, if water of condensation is in the radiator such air is followed by such water of condensation, which will accumulate in the float-chamber until sufficient thereof is contained therein to raise the float and unseat valve k, whereupon water of condensation will flow through the seat of the valve from the float-chamber into the outlet L.

A minimum noise in the operation of the device is obtained by the construction illus-

trated in the drawings, as the level of the water of condensation in the float-chamber will at no time rise much above the center of the float, and the noise of air bubbling through water and also the rattling of valve *k* when about to be lifted from its seat will be obviated by the air from passage-way I being discharged into the float-chamber above the level of the water therein. Separation of the air and water of condensation thus delivered into the float-chamber is effected in the upper end of the float-chamber, the water falling by gravity and the air remaining above until such air is forced through the passage-way N and the water flows through the passage-way in the seat of valve *k*. In case of hammering in the radiator to which the device is attached this separation of the air and the water of condensation presents the air to the force of the hammer blows, tending to prevent the crushing of the float K.

It will be noted that the difference in pressure in the inlet and discharge ends of this device, which is necessary to obtain operation thereof, may be obtained by sufficiently raising the pressure of the steam in the radiator to which it is attached or by sufficiently reducing the pressure in the outlet-pipe L.

The principal purpose of the leakage provided by groove k^2 in valve *k* is to drain float-chamber J when steam is shut out from the radiator to which the device is attached, thereby preventing freezing, and to slowly lower the level of the water of condensation in such float-chamber when water of condensation ceases to be forced over from the radiator thereto.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. Valve mechanism for discharging air and water of condensation from steam-heating systems by differential pressure, comprising a float-chamber, a liquid-discharge passage communicating therewith, a float for governing said discharge-passage, a conduit adapted to provide communication between a radiator and said float-chamber, a liquid seal arranged to be sealed by the accumulation of water of condensation in said conduit, thereby increasing the differential pressure on opposite sides of said liquid seal, whereby a portion of the accumulated water of condensation is forced into said float-chamber, and an air-discharge passage arranged to discharge the air after it has passed said liquid seal.

2. Valve mechanism for discharging air and water of condensation from steam-heating systems by differential pressure, comprising a float-chamber, a liquid-discharge passage communicating therewith, a float and a valve attached thereto for governing said discharge-passage, a conduit adapted to provide communication between a radiator and said float-chamber, a liquid seal arranged to be sealed by the accumulation of water of condensation in said conduit, thereby increasing the differential pressure on opposite sides of said liquid seal, whereby a portion of the accumulated water of condensation is forced into said float-chamber, and an air-discharge passage arranged to discharge the air after it has passed said liquid seal.

3. Valve mechanism for discharging air and water of condensation from steam-heating systems by differential pressure, comprising a float-chamber, a liquid-discharge passage communicating therewith, a float and a valve attached to the under side thereof for governing said discharge-passage, a conduit adapted to provide communication between a radiator and said float-chamber, a liquid seal arranged to be sealed by the accumulation of water of condensation in said conduit, thereby increasing the differential pressure on opposite sides of said liquid seal, whereby a portion of the accumulated water of condensation is forced into said float-chamber, and an air-discharge passage arranged to discharge the air after it has passed said liquid seal.

4. Valve mechanism for discharging air and water of condensation from steam-heating systems by differential pressure, comprising a float-chamber, a liquid-discharge passage communicating therewith, a float and a valve rigidly attached to and extending below the under side thereof and moving therewith to open and close said discharge-passage, a conduit adapted to provide communication between a radiator and said float-chamber, a liquid seal arranged to be sealed by the accumulation of water of condensation in said conduit, thereby increasing the differential pressure on opposite sides of said liquid seal, whereby a portion of the accumulated water of condensation is forced into said float-chamber, and an air-discharge passage arranged to discharge the air after it has passed said liquid seal.

5. Valve mechanism for discharging air and water of condensation from steam-heating systems by differential pressure, comprising a float-chamber, a liquid-discharge passage communicating therewith, a float for governing said discharge-passage, a conduit adapted to provide communication between a radiator and said float-chamber, and opening into said float-chamber above the line of flotation of said float, a liquid seal arranged to be sealed by the accumulation of water of condensation in said conduit, thereby increasing the differential pressure on opposite sides of said liquid seal, whereby a portion of the accumulated water of condensation is forced into said float-chamber, and an air-discharge passage arranged to discharge the air after it has passed said liquid seal.

6. Valve mechanism for discharging air and water of condensation from steam-heating systems by differential pressure, comprising a float-chamber, a liquid-discharge passage communicating therewith, a float for governing said discharge-passage, a conduit adapted to provide communication between a radiator and said float-chamber, and opening into said float-chamber above the line of flotation of said float, a liquid seal arranged to be sealed by the accumulation of water of condensation in said conduit, thereby increasing the differential pressure on opposite sides of said liquid seal, whereby a portion of the accumulated water of condensation is forced into said float-chamber, an air-discharge passage arranged to discharge the air after it has passed said liquid seal, said air-discharge passage communicating with the liquid-discharge passage beyond the float-chamber, and automatic means for restricting the flow of steam through said air-discharge passage.

7. Valve mechanism for discharging air and water of condensation from steam-heating systems by differential pressure, comprising a float-chamber, a liquid-discharge passage communicating therewith, a float for governing said discharge-passage, a conduit adapted to provide communication between a heating system and said float-chamber, and opening into said float-chamber above the line of flotation of said float, a liquid seal arranged to be sealed by the accumulation of water of condensation in said conduit, thereby increasing the differential pressure on opposite sides of said liquid seal, whereby accumulated water of condensation is forced into said float-chamber, an air-discharge passage arranged to discharge the air after it has passed said liquid seal, said air-discharge passage communicating with the liquid-discharge passage beyond the float-chamber, and automatic means for restricting the flow of steam through said air-discharge passage.

8. A valve mechanism comprising a shell having a float-chamber, such shell provided with a conduit uniting the float-chamber and the radiator, an outlet-passage and an automatically-controlled air-discharge passage, the air-discharge passage leading from the upper end of the float-chamber, and such conduit comprising a horizontal passage, a well, and a passage from the well to the float-chamber, such passage discharging into the float-chamber above the level of the water required therein to lift the float in such chamber, a weir in said well located with its lower end below the top of the horizontal passage, a float in the float-chamber and a valve for closing said outlet-passage, said valve actuated by said float; substantially as described.

9. A valve mechanism comprising a shell having a float-chamber, such shell provided with a conduit uniting the float-chamber and the radiator, an outlet-passage and an automatically-controlled air-discharge passage, the air-discharge passage leading from the upper end of the float-chamber and discharging into a passage leading to a point below the outlet-passage of the float-chamber, and such conduit comprising a horizontal passage, a well, and a passage from the well to the float-chamber, said passage discharging into the float-chamber above the level of the water required therein to lift the float in such chamber, a weir in said well located with its lower end below the top of the horizontal passage, a float in the float-chamber and a valve for closing said outlet-passage, said valve actuated by said float; substantially as described.

BYRON E. VAN AUKEN.

In presence of—
CHARLES TURNER BROWN,
THOMAS J. LEONARD