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VALVE MECHANISM FOR DISCHARGING AIR AND WATER OF CONDENSATION FROM STEAM HEATING SYSTEMS.

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951,752. Patented Mar. 8, 1910.

Fig. 1.

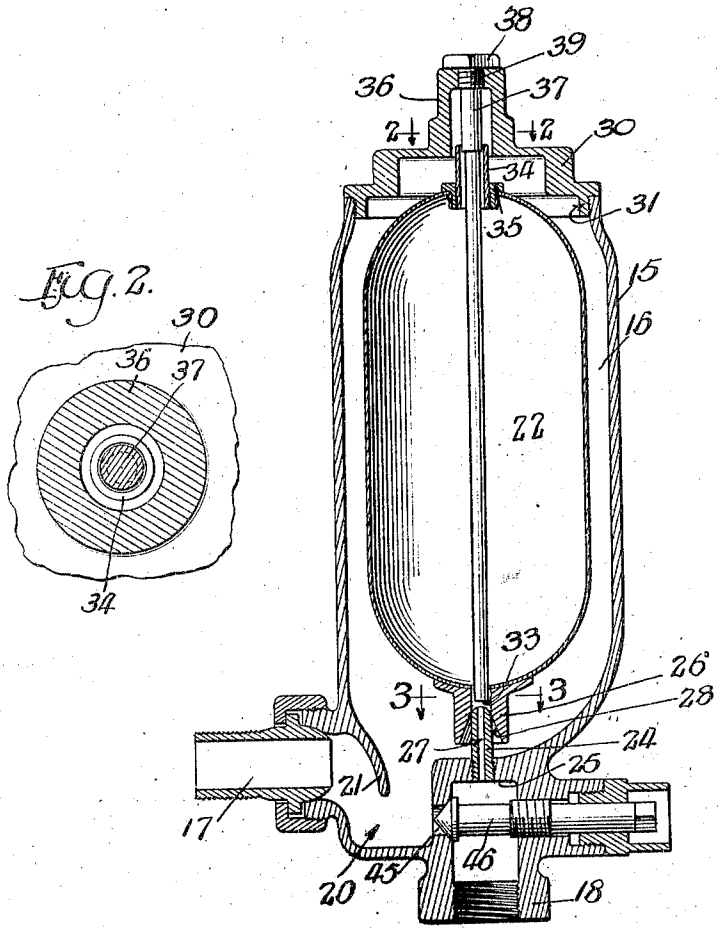
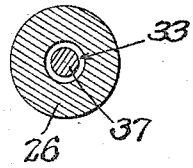



Fig. 2.




Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## VALVE MECHANISM FOR DISCHARGING AIR AND WATER OF CONDENSATION FROM STEAM-HEATING SYSTEMS.

951,752. Specification of Letters Patent. Patented Mar. 8, 1910.

Application filed October 12, 1908. Serial No. 457,251.

*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, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Valve Mechanism for Discharging Air and Water of Condensation from Steam-Heating Systems; 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 numerals of reference marked thereon, which form a part of this specification.

This invention relates to improvements in float controlled valve mechanisms for governing the discharge of air and water of condensation from steam heating systems or other inclosures wherein steam condenses. The invention refers to improvements in valves of this character and to means for avoiding clogging of the air passage in the valve mechanism through which air is drawn from the steam heating system or other inclosure.

My improvements are herein shown as applied to the valve mechanisms of the general character illustrated in my prior application for U. S. Patent No. 305,657, filed March 12th, 1906, but may be applied to other constructions of the same general type. In valve mechanisms of this general character some trouble and annoyance has been found to exist by reason of clogging of the restricted air passage through which the air is withdrawn from the float chamber. In order to overcome this objection I propose to provide means for automatically cleaning the air passage by the rising and falling movement of the valve actuated float.

The invention consists in the matters hereinafter set forth and more particularly pointed out in the appended claims.

As shown in the drawings:—Figure 1 is a vertical axial section of a valve mechanism embodying my invention. Figs. 2 and 3 are transverse sections taken on lines 2—2 and 3—3, respectively, of Fig. 1.

The casing 15 of the valve mechanism is vertically elongated and incloses a float chamber 16. The said float chamber is adapted for communication through a conduit 17 with the radiator of a steam heating system, or other inclosure in which steam condenses. It is provided with a discharge or outlet branch 18 through which air and water of condensation are discharged. The said branch 18 is adapted for connection with a pipe in which is maintained a pressure less than the normal operating pressure within the radiator or other inclosure in which the steam condenses. The casing is formed at its lower side, at the inner end of the conduit 17, to provide a well or pocket 20 into which dips a depending lip or inverted weir 21. The said well or pocket is adapted to be filled by water of condensation which accumulates therein from the radiators, whereby is formed a seal between the conduit 17 and the float chamber. A hollow vertical tube 24 which extends through and upwardly from and has screw-threaded engagement with the horizontal wall 25 of the casing between the float chamber and discharge passage 18 affords communication between said float chamber and passage, and a valve 26 carried by the lower end of the float controls the flow of water through the passage 27 in said tube 24. The said tube 24 is of relatively small diameter and the valve 26 is formed on its lower end to provide a downwardly flaring opening 28 at the smaller, upper end of which is formed a valve seat that engages the upper end of the tube 24 to cut off the passage of water from the float chamber to the discharge branch 18. The downwardly flaring shape of the opening in the valve has the effect to automatically center the valve over the valve tube 24 when the float drops to its lowermost or closing position of the valve and thereby insure the closing of the valve.

The top wall of the valve casing 15 comprises, as herein shown, a removable cap 30 which has an annular depending flange 31 that enters the upper end of the casing and has screw-threaded engagement therewith. The removable cap 30 permits ready access to the float and the interior of the float chamber.

The float is hollow and a passageway for air is provided through the hollow float between the discharge branch 18 of the valve and the interior of the float chamber so as to place the interior of the float chamber in constant communication with the low pressure pipe connected with the discharge branch 18 and, thereby maintain the necessary low pressure of the float chamber to

afford differential pressure on opposite sides of the seal at the inner end of the conduit 17 to insure the discharge of air and water of condensation from the heating unit or the like to the said float chamber. The said air passage is formed in the present instance by providing the valve 26 with a passage 33 which coincides with the passage 27 of the tube 24, and by providing at the upper end of the hollow float a short tube 34 which is in open communication with the upper end of the float chamber. The tube 34, is attached to the float by having screw-threaded engagement with a ring or bushing 35 which is fitted in the upper end wall of the float. The said tube constitutes also a guide stem which has guiding engagement with a vertical opening formed in a vertical reduced extension 36 of the cap 30.

In order to prevent the passages in the valve 26 and tube 34 from being clogged by the lodgment of foreign particles therein I provide a cleaning device which is made as follows: 37 designates a rod which extends downwardly from the cap 30 of the casing, through the tube 34 and float and partially into the passage 33 of the valve. The said cleaning rod is provided at its upper end with a head 38, and beneath said head with a screw-threaded portion 39 that engages a screw-thread in the upper end of the reduced extension 36 of the cap 30. The said cleaning rod is made of such exterior diameter relatively to the interior diameter of the tube 34 as to provide between the rod and wall of the tube a restricted annular passage through which air passes from the float chamber to the hollow float. At its lower end the cleaning rod is made relatively smaller than the passage 33 of the valve thereby providing around the cleaning rod an annular passage through which air passes from the float to the passage 27 of the tube 24. The relative areas of the passages in the tube 34 and valve 26 are substantially the same as that shown in my prior construction, the upper passage being considerably smaller than the lower passage for the purpose set forth in my aforesaid application.

The operation of the valve mechanism, so far as concerned its function to control the discharge of water of condensation and air from the steam heating unit or other inclosure in which steam condenses is the same as set forth in my aforesaid application. The cleaning rod 37, which is stationary with respect to the casing, serves to clean and keep open the passages at the upper and lower ends of the float by reason of the movement of the float relatively thereto, such relative movement of the parts serving to dislodge any foreign particles that may tend to find lodgment in said passages. In this manner a very simple and economical arrangement and construction maintains the valve free from obstruction and the cleaning device is always in position to effectively perform its cleaning function. So far as this feature of my invention is concerned it will be understood that the same results may be secured by constructions differing somewhat from that herein shown, and that the cleaning device may be applied to valves differing somewhat in construction from the valve mechanism illustrated.

The arrangement of the downwardly flaring recess in the valve 26 which passes over the tube 24 is advantageous when used with the cleaning device herein shown, as compared to a construction wherein the flaring recess is formed upwardly on the upper part of the tube 24, inasmuch as it enables both parts of the valve to be made relatively smaller, while at the same time providing ample room to receive the lower end of the cleaning rod 37. Moreover, the arrangement of the downwardly opening flaring recess avoids tendency of small particles to accumulate on the wall of said recess and to interfere with the action of the valve, such as may tend to occur if the recess opens upwardly. Furthermore, it sometimes occurs in the use of constructions where the movable valve is a plain tube, careless or inexperienced users of the device do not readily distinguish between the ends of the float in replacing after it has been removed for the purpose of cleaning the same or the float chamber, with the result that it often occurs that the float is placed in the casing in an inverted position. With the present construction the difference between the two ends of the float is readily noticeable so that such accidental reversal of the float does not occur.

A by-pass is provided between the well or pocket 20 in the conduit 17 and the branch 18 consisting, as herein shown, of an opening 45 in the wall between said parts which is closed by a valve 46 at the end of a stem that has screw-threaded engagement with the casing.

It will be noted that the opening in the short tube 34 surrounding the enlarged upper end of the cleaning rod 37 is a restricted opening and as the float moves upwardly, the enlarged end of the rod 37 projects farther into this short tube 34, thereby increasing the resistance of the flow of air or vapor from the upper part of the float chamber into the float. At the same time it will be noted that because of its size the opening in the lower part of the float does not become restricted or offer a materially greater resistance to the flow of water from the float chamber into the float when the float is raised and hence when the float is raised

water can flow freely through the opening in the lower part of the float past the lower end of the rod 37 from the float chamber into the float when the float is raised. The result of this construction is that when the float is raised some of the water in the float chamber flows into the float and part flows through the passage 27 into the outlet 18. The water which enters the float causes said float to become heavier and thus makes it fall more quickly than it otherwise would. When the float has fallen the passage 27 is no longer in communication with the float chamber, but is in communication with the float so that water which had flowed from the float chamber into the float when said float was raised, now passes from the float through the passage 27 into the outlet opening 18. This action brings about a quicker falling of the float and also a more continuous discharge of water from the valve mechanism. Water is being discharged from the float chamber whenever the float is raised and it is also being discharged a part of the time at least from the float through the passage 27 when the float is down. This more continuous discharge of water from the valve mechanism through the passage 27 tends to keep this passage 27 closed and hence there is less leakage of steam from the float chamber through the float and its passageways.

I claim as my invention:—

1. A valve mechanism for the purpose described, comprising a float chamber provided with liquid inlet and discharge passages, the latter operating under a pressure less than that of the former, a hollow float in said chamber, a valve attached to said float for controlling the liquid discharge passage, said float being provided at its upper end with a restricted opening through which air is discharged from the float chamber to the interior of the hollow float and being provided at its lower end with an opening through which air is discharged from the hollow float into the liquid discharge opening, the lower opening of the float being sealed by the water in the float chamber when the float is raised, and means whereby the resistance to the discharge of air or vapor from the float chamber to the interior of the hollow float is increased when said float is raised.

2. Valve mechanism for discharging air and water of condensation from steam heating systems by differential pressure, comprising a float chamber, 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, a liquid discharge passage communicating with the float chamber, a hollow float for governing said discharge passage, said float being provided with an air passage extending through the float and discharging into said liquid discharge passage, the upper part of said air passage being a restricted opening and the lower part of said air passage being adapted to be sealed by water in the float chamber when the float is raised, and means whereby the resistance to the discharge of air or vapor from the float chamber is increased when said float is raised.

3. Valve mechanism for discharging air and water of condensation from steam heating systems by differential pressure, comprising a float chamber, a conduit 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 seal whereby a portion of the accumulated water is forced into said float chamber, a liquid discharge passage communicating with said float chamber, a hollow float in said float chamber provided with a valve for controlling said discharge passage, said float being provided also with an upper restricted air and vapor opening and with a larger lower opening whereby water will more freely pass through the lower opening from the float chamber into the float when the float is raised than the air or vapor will pass from the float chamber into the float through the said upper restricted opening, and means whereby the resistance to the discharge of air or vapor to the interior of the hollow float is increased when said float is raised.

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 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, a hollow float for governing said liquid discharge passage, said float being provided at its upper end with a restricted opening through which air and vapor is discharged from the float chamber to the interior of the hollow float and being provided at its lower end with an opening through which air is discharged from the hollow float into the liquid discharge passage, said lower opening being sealed by the water in the float chamber when the float is

raised, and a guide rod extending downwardly through the said restricted opening and adapted to increase the resistance to the discharge of air or vapor from the float chamber to the interior of the float when said float is raised.

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 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, a hollow float for governing said liquid discharge passage, said float being provided at its upper end with a restricted opening through which air and vapor is discharged from the float chamber to the interior of the float and being provided at its lower end with an opening through which air is discharged from the float into the liquid discharge passage, the lower opening of the float being sealed by the water in the float chamber when the float is raised, and a guide rod extending downwardly through said restricted opening and into the lower opening of said float and adapted to increase the resistance to the discharge of air or vapor through said restricted opening when the float is raised.

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, 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, said float being provided with an air passage extending downwardly through the float and discharging into said liquid discharge passage, the upper part of said air passage being a restricted opening and the lower part of said air passage being adapted to be sealed by water in the float chamber when the float is raised, and a guide rod extending through the restricted part of said air passage and adapted to increase the resistance to the discharge of air or vapor from said float chamber when the float is raised.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 10th day of October A. D. 1908.

BYRON E. VAN AUKEN.

Witnesses:
GEORGE R. WILKINS,
G. J. BRYCE.