June 3, 1930. W. A. RUSSELL 1,761,685

AIR RELIEF VALVE

Filed Aug. 18, 1926

Fig. 1

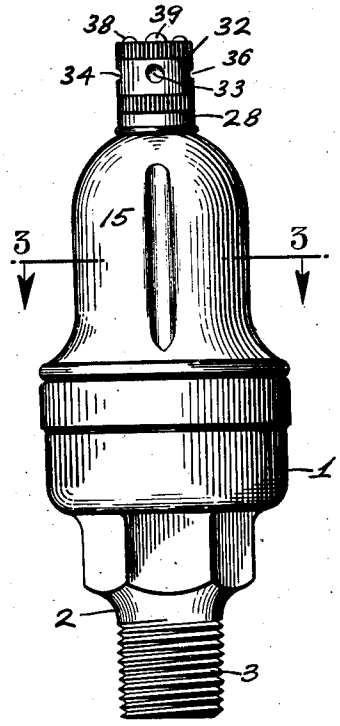


Fig. 2

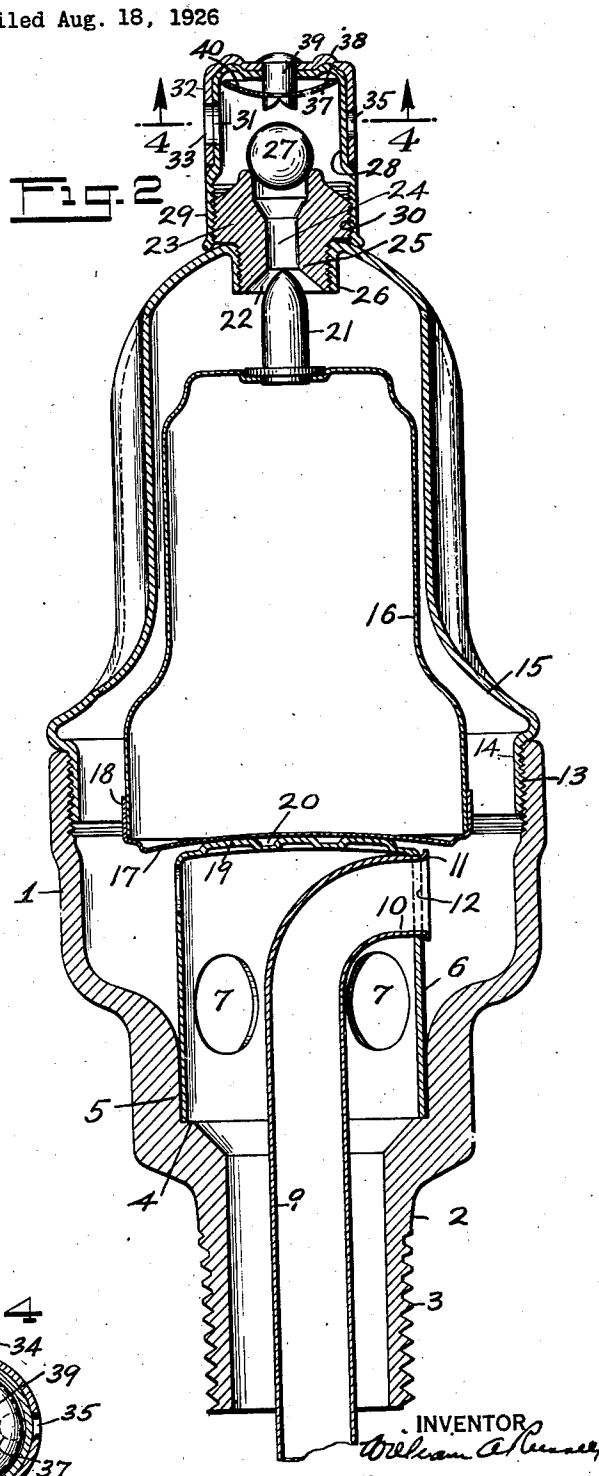


Fig. 3

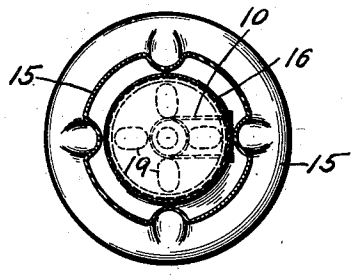
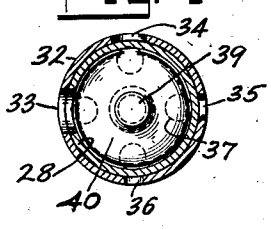


Fig. 4



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Patented June 3, 1930 1,761,685

UNITED STATES PATENT OFFICE

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AIR-RELIEF VALVE

Application filed August 18, 1926. Serial No. 129,967.

This invention relates to certain improvements in air valves designed particularly for use in situations where there is necessity for proper venting of considerable quantities of air, as, for instance, in steam mains and the like.

It is an especial object of the invention to produce an air valve of large capacity which will act to expel the air in the system with which it is used, which shall be sufficiently sensitive and delicate to close quickly after the air is vented and steam is passing through the valve, and which will effectually prevent any discharge of water or steam.

A further object of the invention is to provide a valve which will permit a quick and ready adjustment of the amount of air discharged from the valve, so that the valve may be adjusted for different conditions which may arise in the system with which it is used.

A further object of the invention is to provide an improved means for seating the float used to control the air vent.

With these and other objects not specifically referred to in view, the invention consists in certain novel parts, arrangements and combinations which will be described in connection with the accompanying drawings and the novel features pointed out in the claims hereunto annexed.

In the drawings—

Figure 1 is a side view of the improved valve;

Figure 2 is a central vertical section on an enlarged scale, the valve being shown as open;

Figure 3 is a horizontal sectional view, the section being taken on the line 3—3 of Fig. 1, and

Figure 4 is a detail horizontal sectional view taken on the line 4—4 of Fig. 2.

Referring now to these drawings, the improved valve will include a casing 1, the interior walls of which gradually slope downwardly so that condensed water will readily drain from the casing by gravity. This casing terminates in a nipple 2 which is exteriorly threaded at 3 for attachment to the main or other part of the system in which the valve is to be used. At a suitable intermediate point above the nipple, the interior walls of the casing are formed with a flat 4 and above the flat with a short vertical portion indicated at 5. Supported on the flat 4 and frictionally held by engagement with the part 5 of the walls is an inverted hollow casing or baffle 6 which is provided with openings 7 to permit condensed water to pass therethrough down the inside of the nipple 2 to the main or other part of the system. Supported in this baffle is an air pipe 9, this air pipe having an end 10 terminated in a flange 11 and passing through a suitable aperture 12 in the baffle casing and supported therein by the flange 11. It will be observed that the air pipe 9 opens into the casing above the opening 7 for the water, so that free passage of both air and water is provided through independent channels. This baffle and air pipe may be inserted through the open end of the casing.

The upper or outer end of the casing is threaded, as indicated at 13, to receive the threaded flange 14 of a shell 15, the shell and casing thus forming the outer members of the valve. Supported within the casing is a float 16 which is hollow and contains a suitable volatile liquid which will volatilize at a point slightly less than the temperature of steam under atmospheric conditions, as, for instance, alcohol. This float has secured thereto, or formed as part thereof, a diaphragm 17 which is sufficiently sensitive as to flex under change of pressures. This diaphragm is, as shown, provided with a side flange 18 by which it may be soldered to the bottom of the float 16, and when the parts are sealed the float is buoyant in water. This diaphragm is, as shown, located at the bottom of the float and is supported on the top of the baffle 6. These diaphragms will not always flex under pressure in the same place, or in the same part of their surfaces. As the flexing of the diaphragm against its support is depended upon for lifting the float, it might happen that the part of the diaphragm which flexes under pressure would be at a place where there is no sup-

port beneath it, so that the flexing of the diaphragm would not operate the float. In the best constructions, therefore, the diaphragm is supported at a plurality of points and, while this may be effected in various ways, a convenient way is that shown in which the top of the baffle is formed with ridges or lumps 19 with depressions 20 therebetween, these depressions being provided so that any water may drain off and prevent the diaphragm from sticking to the support.

The upper part of the float carries a stem or valve 21 which closes an opening 22 formed in the lower end of a block 23, this block being provided with a transverse opening 24. The block 23 is provided with a threaded extension 25 which is screwed into a threaded depending flange 26 conveniently formed in the top of the shell 15, and the upper end of the transverse opening 24 is closed by a check valve shown in the form of a ball 27.

In heating systems, it is difficult to determine the point in the system where the air will accumulate in the greatest quantities and, to vent a large main, it is necessary to install a valve of large capacity. If, however, the valve is of too great capacity for the amount of air passing through it, the valve will open and close very quickly, which will cause a clatter. To avoid this, it is desirable that a valve be provided in which the capacity may be varied so that it will remain open longer and thus avoid the objectionable clattering. In valves constructed in accordance with the present invention, means are provided whereby the valve can be readily and quickly adjusted to accommodate itself to the amount of air being vented up to the capacity of the valve. While this may be effected in various ways, the valve will be provided with a throttling device by which the air vent may be throttled down or opened up, as may be necessary or desired. The specific construction of this throttling device may be somewhat varied. As shown, there is provided an inner cap 28 which is provided with a threaded flange 29 by which it may be screwed onto a threaded portion 30 of the block 23, before referred to. This cap 28 is provided with an air vent 31 of the maximum size for which the valve is capacitated. Cooperating with this cap 28 is a throttle or controller in the form of a cap 32, which is provided with a plurality of air vents 33, 34, 35 and 36, see Fig. 4, of different sizes, this throttling cap having a rotary movement with respect to the cap 28, so that any one of the desired air vents thereof can be brought into register with the air vent 31 and thus throttle the air escaping from the vent 31, as may be desired. The throttle cap 32 may be secured to the cap 28, so as to have this rotary movement, in any suitable manner, but, in the best constructions, it will be so arranged that it will be held in adjusted position. As shown, the cap 28 is provided with knobs 37, four such knobs being shown, see dotted lines in Fig. 4, which fit into recesses 38 in the cap 32, the parts being held together by a spring pin 39 controlled by a spring 40. With this construction, it will be seen that by rotating the cap 32 any of its ports may be brought into register with the vent 31, the spring permitting the two caps to yield sufficiently relatively to each other to permit the cap 32 to slide over the holding knobs 37 of the cap 28. This pin 39 also acts to limit the upward movement of the valve 27, and keep it in place.

The operation of the valve may be briefly set forth as follows: When the valve is cold, the parts are in the position shown in Fig. 2, the stem 21 being withdrawn and the opening 22 being open and the check valve 27 being in its seat. If now the system with which the valve is used is heated up, air passes through the casing through the opening 22 and the air pressure is sufficient to lift the check valve 27, the air then escaping through the vent 31 and whichever one of the vents in the cap 32 is in register therewith. As the air is expelled from the system and steam starts to enter the valve, the heat of the steam volatilizes the liquid in the float, thereby creating an internal pressure in the float which flexes the diaphragm and lifts the float to cause the valve or stem 21 to close the opening 22. As soon as the opening 22 is closed, there being no pressure below the check valve, the check valve seats itself by gravity, and this relation of the parts remains as long as steam is present in the valve.

If now the heat is cut off from the steam boiler or other source of supply, the steam in the system condenses and the pressure as well as the temperature gradually decrease until the point is reached at which the gas in the float again liquefies. When this occurs, the internal pressure in the float is reduced and the diaphragm returns to its original shape and opens the port 22. As the pressure inside the valve casing at this time is atmospheric or less, the check valve 27 being under atmospheric pressure remains in its seat, preventing the entrance of outside air. In the event of an undue amount of water entering the valve chamber, such water will raise the float 16, thus closing the opening 22 and preventing the escape of water from the valves.

It will be seen with the construction described that an air valve has been provided which will take care of the air in large systems under any ordinary operating conditions, and venting of the air from the valve may be controlled as desired.

The invention has been shown and described in its preferred form, but it will be understood that certain changes and variations may be made in the structure without departing from the invention as defined in the appended claims.

What I claim is:

1. An air valve having in combination a casing, a float in the casing, a valve operated by the float through which air may pass to the casing, a member associated with the casing and provided with a plurality of air ports, and a second member movably associated with the ported member for controlling the flow of air from the ports.

2. An air valve having in combination a casing, a float in the casing, a support for the float, a valve operated by the float, a valve block having an air passage one end of which is closed by the valve, a check valve closing the other end of the air passage, and means for throttling the air as it escapes from the casing.

3. An air valve having in combination a casing, a float in the casing, a support for the float, a valve operated by the float, a valve block having an air passage one end of which is closed by the valve, a check valve closing the other end of the passage, a cap over the block having an air outlet, and a rotary member having a plurality of air outlets of different sizes over the cap.

4. An air valve having in combination a casing, a float containing a volatile liquid in the casing, a diaphragm associated with the float, means for supporting the float at a plurality of points intermediate its sides to permit flexing of the diaphragm at different points and prevent its sticking to the support, a valve carried by the float, and a cooperating valve seat having an air passage through which air may escape from the casing.

5. An air valve having in combination a casing, a float containing a volatile liquid in the casing, a diaphragm associated with the float, a support in the casing having a surface provided with a plurality of projections intermediate its sides to permit flexing of the diaphragm at different points and prevent its sticking to the support for supporting the float at a plurality of points, a valve carried by the float, and a valve seat having an air passage through which air may escape from the casing when the valve is open.

6. An air valve having in combination a casing, a baffle in the casing provided with independent air and water vents, projections on the surface of the baffle, a float in the casing and supported on the projections of the baffle, a valve carried by the float, and a cooperating valve seat therefor having an air passage through which air may escape from the casing.

7. An air valve having in combination a casing, a float, the bottom of which forms a diaphragm, in the casing, means for supporting the float at a plurality of points intermediate its sides to permit flexing of the diaphragm at different points and prevent its sticking to the support, a valve carried by the float, a cooperating valve seat therefor having an air passage through which air may escape from the valve, and means for varying the amount of air escaping from the casing.

8. An air valve having in combination a casing, a float in the casing supported at a plurality of points, a valve operated by the float, a cooperating valve block having an air passage one end of which is closed by the valve, a check valve for closing the other end of the passage, and means for varying the amount of air which may escape from the casing.

9. In an air valve, the combination of a valve and means for operating it, a casing inclosing the valve, a member associated with the casing and having an air passage through which air may escape from the casing, and a member having a plurality of air outlets of different sizes for varying the amount of air as it escapes from the air passage of the casing.

10. In an air valve, the combination of a casing, a valve therein, means for operating the valve, a member having an air passage controlled by the valve, a member into which the passage leads provided with a vent opening, and a member having a plurality of vent openings of different sizes, any one of which may be brought into registration with the vent in the other member.

11. In an air valve the combination of a casing, a float therein, a baffle supporting the float, a water passage through the baffle from the casing, and an air tube opening into the casing above the water passage and extending below the water passage.

12. In an air valve the combination of a casing, provided with a nipple for securing it in position, a float in the casing, a baffle supporting the float, a water passage through the baffle from the casing, and an air tube opening into the casing above the water passage and extending below the end of the nipple.

In testimony whereof, I have hereunto set my hand.

WILLIAM A. RUSSELL.