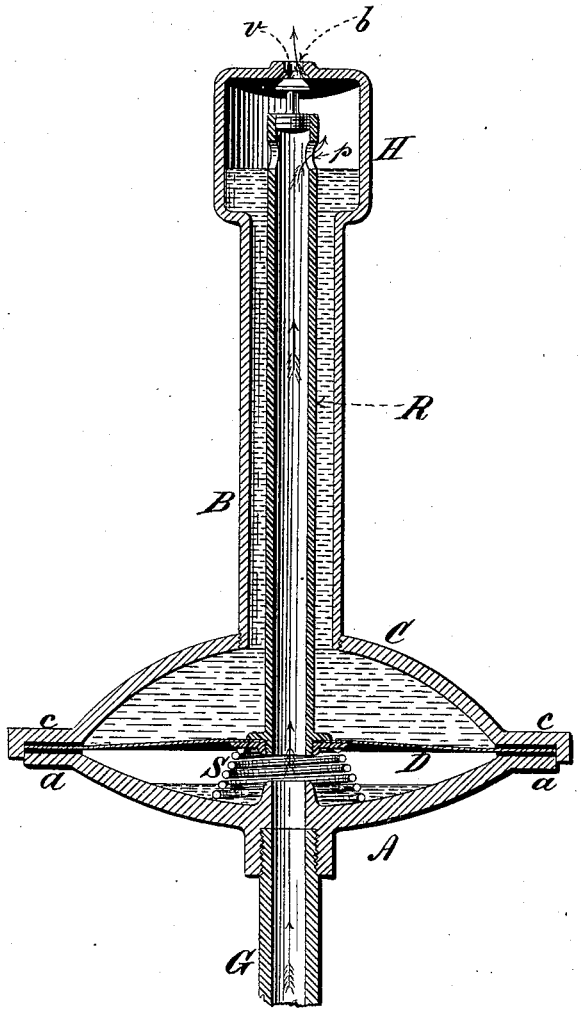
2 Sheets—Sheet 1.

J. H. BLESSING.

Air-Valve.

No. 207,481 Patented Aug. 27, 1878.

Figure 1.



Witnesses:
Geo. W. Miatt
Geo. H. Evans

Inventor:
James H. Blessing
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2 Sheets—Sheet 2.

J. H. BLESSING.

Air-Valve.

No. 207,481. Patented Aug. 27, 1878.

Figure 2.

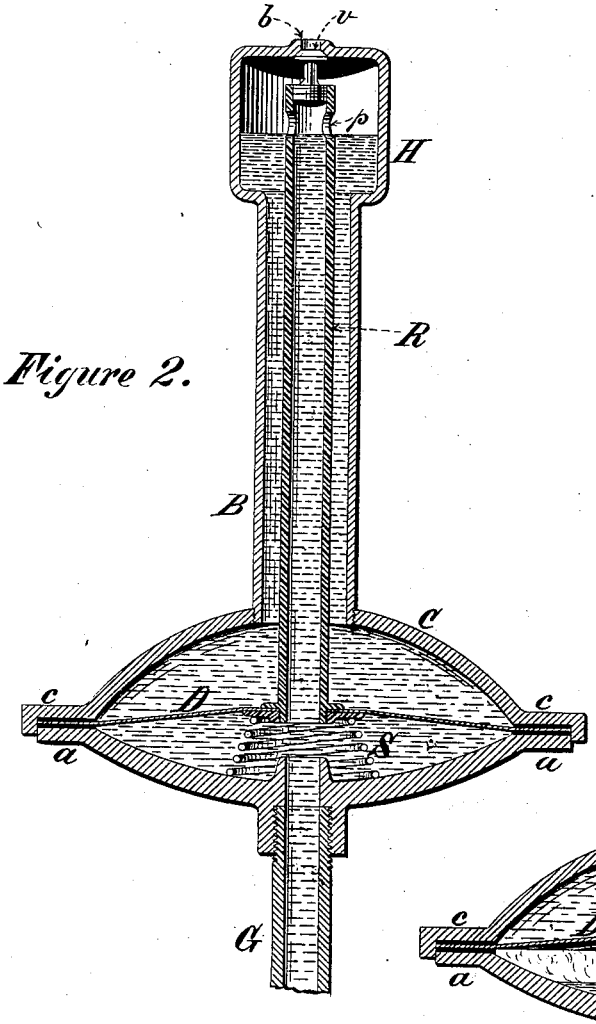
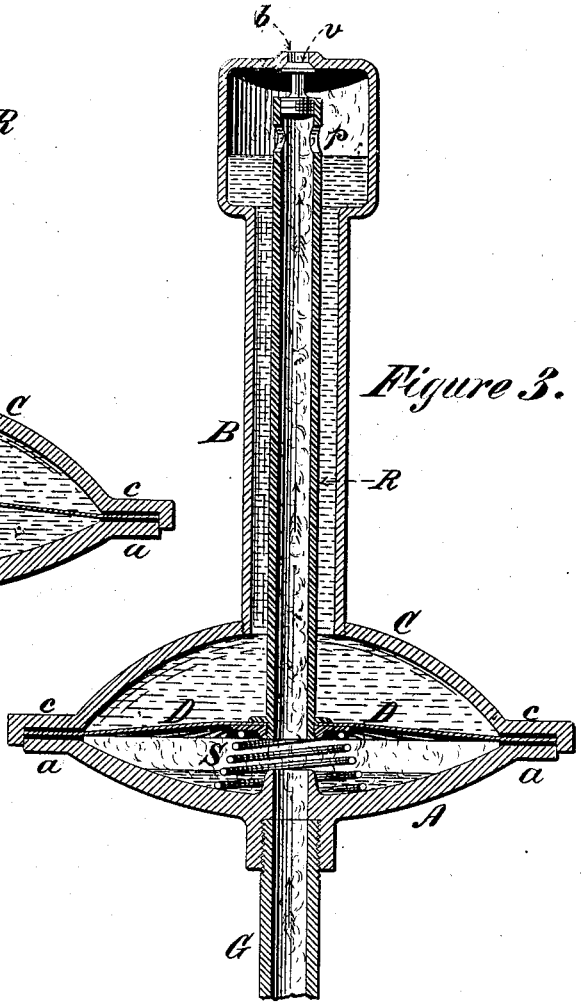


Figure 3.



Witnesses:
Geo. H. Miatt
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UNITED STATES PATENT OFFICE.

JAMES H. BLESSING, OF ALBANY, NEW YORK.

IMPROVEMENT IN AIR-VALVES.

Specification forming part of Letters Patent No. **207,481**, dated August 27, 1878; application filed December 21, 1877.

To all whom it may concern:

Be it known that I, JAMES H. BLESSING, of the city of Albany, county of Albany and State of New York, have invented a new and useful Improvement in Air-Valves, of which the following is a full, true, and exact description, reference being had to the accompanying drawings.

The object of my invention is to produce an apparatus which, when attached to a heating-coil or any similar apparatus, will permit the passage through it of any air which may be present and contained within the heating-coils, but will prevent the escape of either steam or water from such coils.

In the ordinary apparatus for heating houses by steam a low pressure of steam is used, and it frequently occurs that both free air and condensed water are present in the radiators. It is very desirable to get rid of the air, for the reason that its presence prevents the free circulation of steam through the apparatus. By attaching this apparatus to any other apparatus in which steam is contained, any air which may be present mingled with the steam will be automatically allowed to escape, but both steam and water will be retained. It is plain that this invention can not only be advantageously applied to heating-coils, but to almost any other apparatus in which steam is used as a heating agent, and from which it is desirable that all air should escape.

The nature of my invention will be clearly understood from the accompanying drawings, in which Figure 1 represents my apparatus as it is when air is escaping from it. Fig. 2 represents my apparatus when water is present within the circulating-coil. Fig. 3 represents my apparatus when steam is present in the same.

My apparatus consists, generally, of two saucer-shaped flanged vessels, A and C. These vessels are attached together by means of the flanges *a* and *c*. Packed between these flanges is the elastic diaphragm D, which I prefer to make of metal, Munn's metal being the best of which I have knowledge. Tapped into the upper saucer-shaped vessel, C, is the pipe B, having a port, *b*, which is closed by the puppet-valve *v*. Tapped into the lower vessel, A, is the pipe G, which is connected to the apparatus which it is desired to free of accumulated air. Attached to the diaphragm D, by means of flanges or in some other suitable way, is the stand-pipe R. This pipe communicates with the chamber H, which is formed on the upper part of the pipe B, by means of ports or openings *p*. Attached to the upper end of the pipe R is the valve *v*, as is clearly shown in the drawings. Through this valve *v* the air escapes. Beneath the diaphragm, resting against the vessel A and against a ring or collar attached to said diaphragm, is the counterbalancing-spring S, the object of which will be presently explained.

The operation of my apparatus can now be clearly understood. Water entering the pipe G passes through the port *p* and fills the annular space above the diaphragm and between the pipes R and B, when the apparatus is in the condition shown in Fig. 2.

It will now be seen that there are two columns of water acting against each other, one within and one without the pipe R, so that this pipe is in equilibrium, and the spring S, acting against it, raises the diaphragm and pipe together and closes the valve *v*, thereby preventing the escape of the water. This spring is made of sufficient tension to more than counterbalance the weight of the pipe R and the diaphragm D. Now, if air present in the radiator should gradually pass up the pipe G it would gradually displace the water in the pipe R, leaving, however, an external annulus of water between the pipe R and the pipe B, which remains constantly in this apparatus.

When air displacing the water enters the pipe R the apparatus will be in the condition shown in Fig. 1, in which the weight of the water in the annular space between the pipes B and R depresses the diaphragm and compresses the spring and opens the valve *v*, when it is obvious that air can now flow through this valve freely; but if water should follow, it would rise within the pipe R and a point would be reached when its floating-power on the diaphragm D, together with the elevating-power of the spring S, would be sufficient to raise the diaphragm and the pipe R, and to close the valve *v*, as is shown in Fig. 2. It is probable, however, that the valve *v* would close before the level of the water in the pipe

R had reached the port *p*, and that there would be some intermediate point in the pipe R where the spring and the floating water would counterbalance the weight of the diaphragm D, pipe R, and contained annulus of water. Then, if a few bubbles of air should escape from beneath and enter by the pipe G into the chamber H, the level of the water in the pipe R would fall slightly, the valve *v* would open instantly and allow the escape of a bubble of air, when the water in the pipe R, passing upward, would again close the valve *v*. But suppose, when the apparatus was in the condition shown in Fig. 1, the valve *v* being open, that steam instead of air should take the place of the water in the pipe R, then the apparatus would be in the condition shown in Fig. 3. Steam passing up the pipe G escapes into the vessel A beneath the diaphragm D, acts against this diaphragm, and expands it, and also expands the pipe R, so that the apparatus comes into the position shown in Fig. 3. The presence of this steam once more closes the valve *v*.

The diaphragm D is constructed so as to be slightly dished, as shown in Fig. 1, so that its center never falls below a plane passed through its circumference, supported by the flanges *a* and *c;* otherwise the expansive power of the steam might cause the diaphragm to expand downward instead of upward, thereby opening the valve *v* and allowing the escape of the steam.

From this explanation it will be clearly seen that if my apparatus is attached to a vessel in which there is occasionally steam, occasionally water, and occasionally air, air only will be allowed to escape, and that whenever steam or water be present the valve *v* will be closed, and that this result is obtained by means of the floating-power of the water and the heat of the steam, the water floating the diaphragm and the steam expanding it by its higher temperature. It will also be seen that the movement of the air, water, or steam through the apparatus is in a straight line, so that in case water should follow the escaping air it would strike against the diaphragm, and by its momentum, as well as by its floating-power, tend to close the valve *v*, and the same fact is true of the steam, so that this apparatus is very certain and quick in its operation; and, although it will completely clear the radiator or coil of air, it will never allow any portion, either of steam or of water, to pass through the valve *v*.

I am aware of the patent to Nichols, No. 129,291, July 16, 1872, and I do not claim anything there shown.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. An apparatus, constructed substantially as described, which allows air to pass freely through it, but closes a valve whether either steam or water enters.

2. An automatic air-valve which consists of an escape-valve controlled by apparatus which consists of a float or diaphragm adapted to be operated by flotation when water enters, and an apparatus connected to the automatic air-valve, operated by expansion, and closing said valve on the entrance of steam, substantially as described.

3. An automatic air-valve provided with an escape-valve attached to a diaphragm, the elevation of which diaphragm closes the escape-valve, substantially as described.

4. An automatic air-valve provided with an escape-valve attached to an expansible diaphragm, whereby the presence of steam expands said diaphragm and closes the valve, substantially as described.

5. An automatic air-valve which consists of an escape-valve attached to a diaphragm, which is elevated by the presence of either water or steam in the valve, substantially as described.

6. The combination of the vessel A C, containing a diaphragm, D, supported by the spring S, and sustaining the pipe R and valve *v*, substantially as described.

7. An automatic air-valve provided with a diaphragm which operates an escape-valve and has both its surfaces exposed to the action of water, substantially as and for the purposes described.

JAMES H. BLESSING.

Witnesses:
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