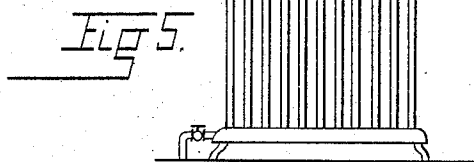
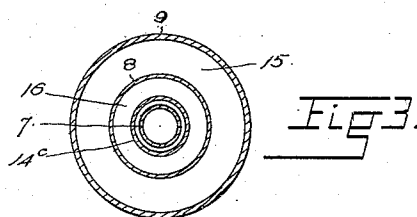
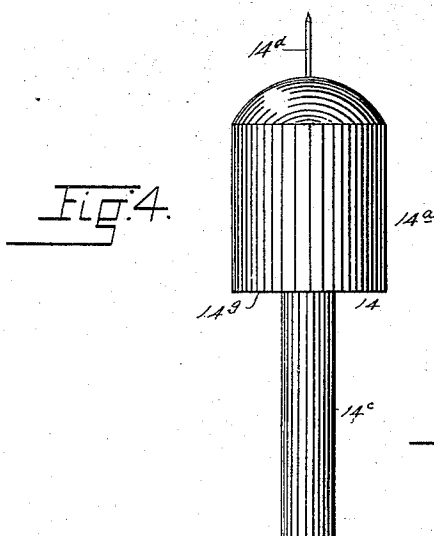
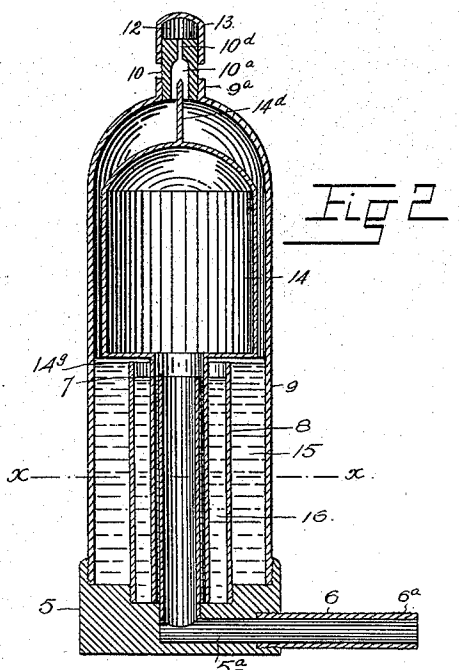
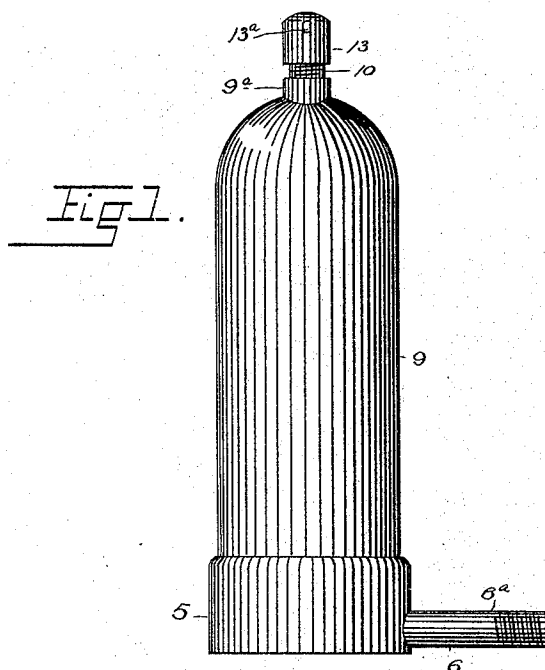


(No Model.)

C. F. PAIGE & E. P. ALLEN.
AUTOMATIC AIR VALVE.

No. 535,016.

Patented Mar. 5, 1895.



WITNESSES:

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UNITED STATES PATENT OFFICE.

CHARLES F. PAIGE AND EVERETT P. ALLEN, OF DENVER, COLORADO.

AUTOMATIC AIR-VALVE.

SPECIFICATION forming part of Letters Patent No. 535,016, dated March 5, 1895.

Application filed February 26, 1894. Serial No. 501,493. (No model.)

To all whom it may concern:

Be it known that we, CHARLES F. PAIGE and EVERETT P. ALLEN, citizens of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Automatic Air-Valves; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

Our invention relates to improvements in automatic air valves for use in connection with the radiators of steam or hot water heating systems; and its object is to permit the escape of air and prevent the escape of water or steam from the pipes of such systems; and to this end, the device consists of the features hereinafter described and claimed, all of which will be fully understood by reference to the accompanying drawings, in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a side elevation of the device. Fig. 2 is a vertical longitudinal section taken through the center of the same. Fig. 3 is a horizontal section taken on the line $x-x$, Figs. 1 and 2. Fig. 4 is a side elevation of the float in detail. Fig. 5 is a side elevation of a radiator, showing the device in place on a small scale.

Similar reference characters indicating corresponding parts or elements of the mechanism in the several views let the numeral 5 designate the base of the device provided with an opening 5^a communicating with a horizontal tube 6 screwed into the base, and exteriorly threaded to screw into the radiator 4. The base 5 is further threaded to receive a central vertical tube 7 whose opening communicates with the opening 5^a. Surrounding the tube 7, and also screwed into the base, is the larger tube 8, which is in turn surrounded by the shell 9, which is also screwed into the base. The top of this shell is dome-shaped and centrally apertured to coincide with an aperture 10^a in the plug 10 which is screwed into a collar 9^a formed on the casing. The opening 10^a merges into a very small orifice, or vent, 10^d

at the top of the plug leading to a small chamber 12 inclosed by the cap 13 screwed upon the plug, and provided with an aperture 13^a.

Within the shell 9 is the hollow float 14 composed of the enlarged top 14^a, and the reduced lower portion, or stem, 14^c. This stem is somewhat larger than the tube 7 which it surrounds when the parts are assembled.

The upper part 14^a of the float is provided with a pin 14^d which projects into the opening 10^a of the screw plug 10, and is adapted to close the small orifice 10^d, the plug being shaped around said orifice to form a seat for the pin extremity, which forms the valve proper, and closes the orifice against the escape of water or steam. Normally, however, or when the air is passing out of the pipes, the pin 14^d occupies a position below its seat, as shown in Fig. 2, whereby the orifice 10^d is open for the free escape of the air.

In describing the operation of our improved air valve, it will be assumed that the chamber 15 located between the shell 9 and the tube 8; and the chamber 16 located between the tubes 7 and 8, are filled with water to the top of the tubes. Now, as the air driven by the steam or water rises in the tube 7, it passes thence into the hollow float and down between the stem 14^c and the tube 7, and thence underneath the stem, the float being slightly raised by the air pressure, and thence up through the water in chamber 16, over the top of the tube 8, and up around the top 14^a of the float, thence into the top of the shell and out through the opening 10^a, the orifice 10^d, and finally through aperture 13^a in the cap 13. Since the pressure of air is approximately the same, both within and without the float, the latter will not be raised by the air sufficiently to close the orifice 10^d. When, however, the water or steam passes upward through the tube 7, the volume of water within the shell is increased directly, or by condensation, sufficiently to raise the float, seat the pin 14^d, and close the orifice against the escape of steam or water, and in advance of their upward passage.

The tube 8 serves a useful function in preventing all the water from escaping into the radiator whenever a vacuum is produced therein by the condensation of the steam. It

is evident that when such condensation occurs after the steam to the radiator has been cut off, the valve will open and the air will rush in through the valve, forcing back into the radiator, the water which is between the tubes 7 and 8; and, of course, if the tube 8 were not used, all the water in the chamber would be siphoned out, and this would be undesirable.

10 It is believed that the pressure which closes the float acts from the inside of the float, and must, therefore, be sufficient to overcome the gravity of the float and the air pressure on the outside thereof. Bearing in mind that
15 the object of the air valve is to automatically prevent the escape of steam or water through the air vent at the top, it follows that if the steam condenses and the resulting water of condensation, runs back into the radiator as
20 fast as said condensation takes place, the float will not need to operate, as there will be no steam to escape. If the water flows back into the radiator as fast as it rises in the valve there will be none to escape at the air vent,
25 and consequently, the float will not need to operate. When, however, the steam enters the valve faster than condensation takes place, or when the water is forced into the valve, but cannot immediately return by virtue of the pressure behind it, the float will be
30 operated by the steam pressure in one case and by the water pressure in the other case, thus preventing the escape of steam or water, as the case may be.

35 Having thus described our invention, what we claim is—

1. In an automatic air valve, the combination of the shell provided at the top with an orifice for the escape of air, a tube 7, inclosed by the shell and communicating with the interior of the radiator, and a hollow float having an enlarged top and a reduced stem inclosing the tube, the top of the float being provided with a pin adapted to close the air orifice against the escape of water or steam,
40 and a larger tube surrounding the stem of the float when the parts are assembled, the top of the tube 7 being always open and located below the level of the water in the outer chamber when the float is in the raised position
45 substantially as described.

2. The hollow float comprising the enlarged top, the reduced tubular stem, and the valve pin, substantially as described.

3. In an automatic air valve, the combination of a suitable apertured base, a shell attached to the base and provided with an orifice for the escape of air, an inner tube 7 also attached to the base, and a float surrounding the tube and having a valve adapted to close the orifice in the shell, the top of the tube 7 being always open and located below the level of the water in the outer chamber when the float is in the raised position substantially as
50 described.

In testimony whereof we affix our signatures in the presence of two witnesses.

CHARLES F. PAIGE.
EVERETT P. ALLEN.

Witnesses:

BRINTON GREGORY,
CHAS. E. DAWSON.