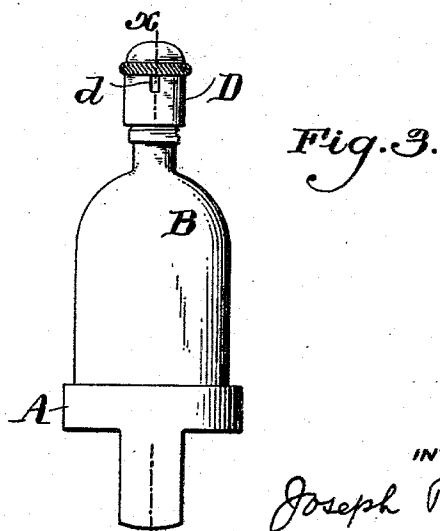
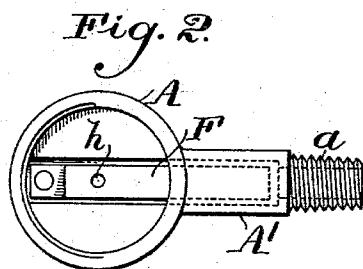
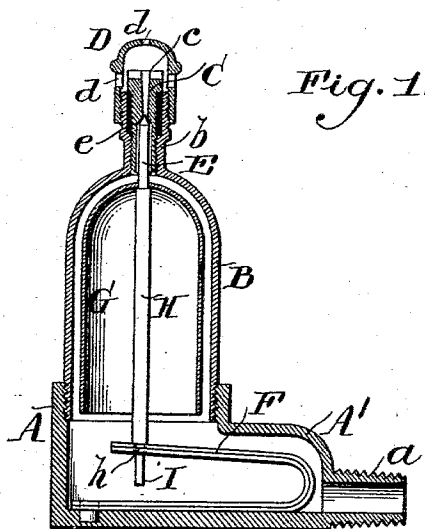
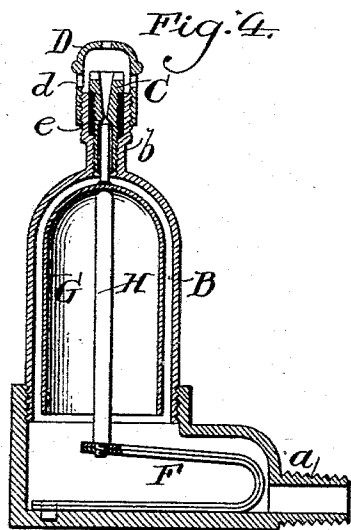


(No Model.)

J. POULSON.
AIR VALVE.

No. 553,041.

Patented Jan. 14, 1896.



WITNESSES:

Henry Dwyer
C. H. Furcomb

INVENTOR:

Joseph Paulson

By his atty Wm. H. Smith

UNITED STATES PATENT OFFICE.

JOSEPH POULSON, OF PHILADELPHIA, ASSIGNOR TO CHARLES S. ONDERDONK, OF WYNCOTE, PENNSYLVANIA.

AIR-VALVE.

SPECIFICATION forming part of Letters Patent No. 553,041, dated January 14, 1896.

Application filed April 1, 1895. Serial No. 543,955. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH POULSON, of the city and county of Philadelphia, State of Pennsylvania, have invented an Improvement in Air-Valves, of which the following is a specification.

My invention relates to air-valves particularly designed for steam-radiators; and it consists of certain improvements which are fully set forth in the following specification and are shown in the accompanying drawings.

It is the object of my invention to provide an air-valve of improved and simplified construction, which shall be certain and automatic in its action and not liable to get out of order.

It is also an object of my invention to remove the liability of the float (which controls the valve-outlet under the action of water-pressure) being held raised by the vacuum formed over its top, and to avoid the use for that purpose of the small air-tubes or passages heretofore employed.

In the accompanying drawings, Figure 1 is a longitudinal vertical sectional view of an air-valve embodying my invention, taken on the line *xx* of Fig. 3. Fig. 2 is a plan view of the lower body portion of the valve and expansible piece with the upper portions of the valve removed. Fig. 3 is a front elevation of the valve; and Fig. 4 is a sectional view similar to Fig. 1, illustrating a modification of my invention.

A is the body-valve which may be provided with the usual nipple *a*, for attachment to the radiator.

B is a dome or upper portion of the closed body carried by the part A and located over an opening in the upper portion thereof. My preferable construction is to make the dome B detachable, connecting it with the part A by screw-threads, as shown. The part B is provided with an air-outlet *c*. This is preferably a plug C, screwed into the opening *b* in the dome B, as shown.

D is a small detachable protecting-cap over the plug C, provided with a suitable orifice or orifices *d*.

E is the valve pin or piece adapted to close upon the seat *e* of the plug C and shut the outlet *c*.

So far as the valve has been described it is of well-known construction.

I shall now describe particularly my improvements, which, for purposes of illustration, I have shown applied to a valve of the general character mentioned.

F is an expansible piece located in the body of the valve so as to be directly subjected to the steam which enters the valve through the nipple *a*. The piece F is preferably composed of two metals having different coefficients of expansibility, (such as steel and brass,) so that a comparatively large resultant movement is obtained in the free end of the piece F under the action of heat.

The piece F, which is shown bent into a U shape, is fastened at one end to the base of the body A and the other or free end is located below the opening in the body. When subjected to heat it expands and the free end is thrown upward.

To permit the piece F to lie in a horizontal position and to be of sufficient length to impart the desired movement I prefer to extend the body A on one side, as at A', to receive the bent portion of the piece. In this manner the neat appearance of the valve is preserved and the upper portion is not made unduly large.

G is a float located within the closed body of the device and connected with the valve piece or pin E, so that when the float G is raised the piece or pin E will close upon the seat *e*. This float G is of the usual construction, except that the side groove generally employed to receive the small air pipe or passage is unnecessary.

Between the valve-pin and the free end of the piece F is an operative connecting piece or stem H, of such a character that it will be raised by the movement of the piece F and close the valve, but will not prevent the float from moving independently of the expansible piece when the float is actuated by the pressure of the water. In my preferred construction (shown in Fig. 1) this stem H is posi-

tively connected with the float at its upper end and its lower end is received loosely in a socket or aperture *h* in the expansible piece, so that the stem will be lifted by the spring, but may be lifted by the float when the spring is not actuated.

The end of the stem *H* may be extended, as at *I*, below the free end of the expansible piece *F*. This serves to guide the stem and maintain it in the socket and also prevents the piece *F* from being injuriously bent by the excessive screwing down of the plug *C*, as the extension *I* will strike the lower portion of the piece *F*, or the base of the case, and prevent further movement before the free end of the expansible piece has been injured.

In the modification shown in Fig. 4 the stem *H* is secured to the upper end of the piece *F* at its lower end and the upper end bears upon the float, but is not positively connected with it.

The operation of the air-valve will be readily understood by those skilled in the art. While the valve is cold the outlet *c* is open. When the steam rises in the radiator and enters the valve it will expel the air through the open outlet, and at the same time will heat the compound metallic piece *F* and bend it, causing the free end to rise and through the stem *F* force the pin *E* on the seat *e*. If water is forced into the valve before the steam enters, and while the spring *F* is cold, it will act on the float and close the outlet *c* in the well-known manner.

Heretofore the water of condensation about the top of the float *G* has collected between the walls of the outer casing or dome and the float and formed a seal with the creation of more or less vacuum in the space above the top of the float, and the vacuum thus created had the effect of holding the float in an elevated position with the valve-pin closed, even after the expansible piece had contracted. This was due to the fact that the contraction and expansion of the pieces employed was so gradual and the extent of possible movement so slight that the water was allowed to collect and produce the vacuum above the float before the operating-piece had contracted sufficiently to permit the float to fall. To overcome this effect it has been usual to employ a small auxiliary pipe or passage-way leading from the radiator through the valve to a point over the top of the float, so that air from the radiator might enter and destroy the vacuum above the float and thus permit it to fall. It is one of the advantages of my improved valve that this difficulty is avoided.

The compound metallic spring *F*, having its end arranged to operate the float in the manner heretofore described, gives such an extent of movement and responds so quickly to the variations in temperature that it will

contract and permit the float to fall before water can collect and produce the vacuum above it.

The minor details of construction shown may be varied without departing from the invention.

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

1. An air valve composed of a closed body having a steam inlet and an air outlet, a valve piece adapted to close the air outlet, a float within the closed case arranged to act on said valve piece, a metallic compound expansible piece located within the closed case supported at one end and having its free end located below the air outlet and valve piece and adapted when expanded by heat to move toward the outlet, and a connecting stem between the valve piece and expansible piece, loosely connected with one of said parts at one end, said expansible piece being arranged transversely to the connecting piece and adapted to lift it and press the valve piece on its seat.

2. An air valve composed of a closed body having a steam inlet and an air outlet, a valve piece adapted when actuated to close the outlet, a float located within the closed case and arranged to act on said valve piece and move it to close the outlet when the float is moved, a metallic compound expansible piece located within the closed case supported at one end and having its free end below the valve outlet and arranged so as to move toward the outlet when expanded by heat, and a stem connected at one end with the float and having its lower end loosely connected with the free end of the expansible piece so as to be lifted thereby when the said piece expands, but free to move independently thereof when the float is moved.

3. An air valve composed of a closed body having a steam inlet and an air outlet, a valve piece adapted when actuated to close the outlet, a float located within the closed case and arranged to act on said valve piece and move it to close the outlet when the float is moved, a metallic compound expansible piece located within the closed case supported at one end and having its free end below the valve outlet and arranged so as to move toward the outlet when expanded by heat, and a stem connected at one end with the float and having its lower end loosely connected with the free end of the expansible piece so as to be lifted thereby when the expansible piece expands, but free to move independently thereof when the float is moved and having an extension projecting below the free end of the expansible piece.

4. The valve device consisting of the body *A* provided with a steam inlet and having the hollow extension *A'*, an upper closed dome or portion having an outlet, a valve piece adapted when actuated to close the outlet, the float within the closed dome or upper portion car-

rying the valve piece, the bent expansible
piece supported by the body A at one end,
having its bent portion extending into the
hollow extension A' and its free end located
5 below the float, and an operative connection
between the float and the free end of the ex-
pansible piece.

In testimony of which invention I have
hereunto set my hand.

JOSEPH POULSON.

Witnesses:

ERNEST HOWARD HUNTER,
WM. L. EVANS.