(No Model.)

# J. POULSON.

## AIR VALVE FOR STEAM RADIATORS.

No. 442,912. Patented Dec. 16, 1890.

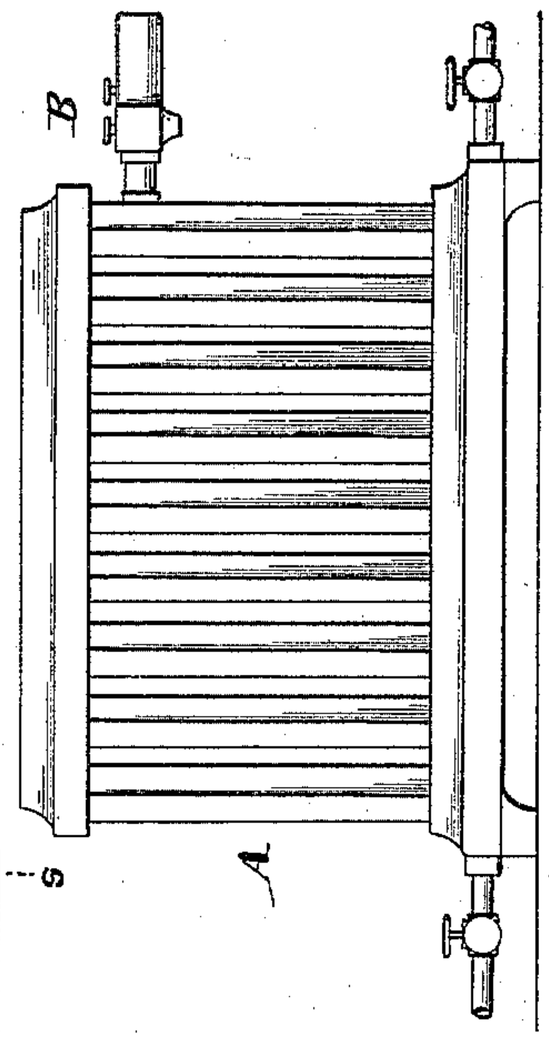



FIG. 1

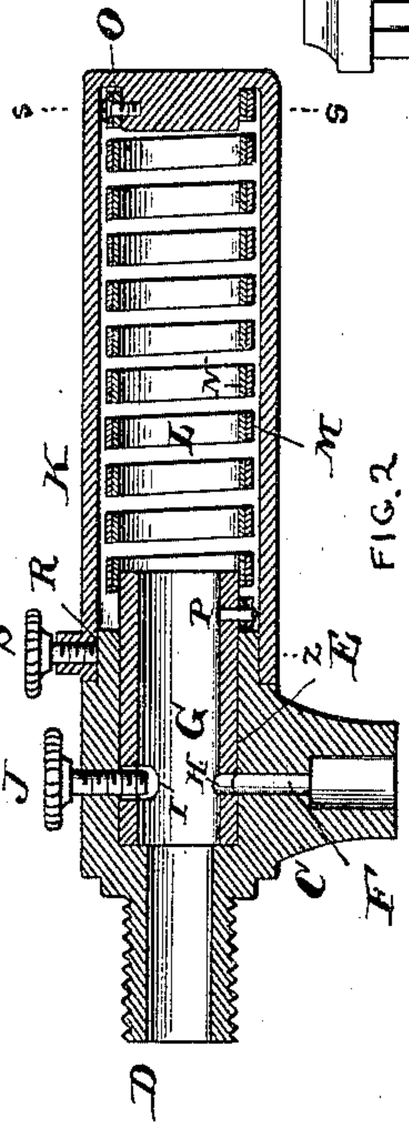



FIG. 2

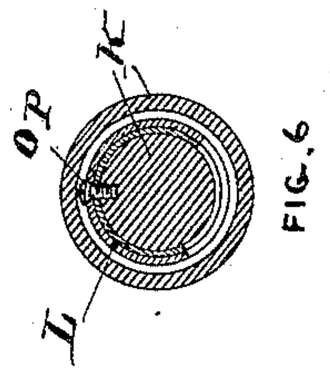



FIG. 6

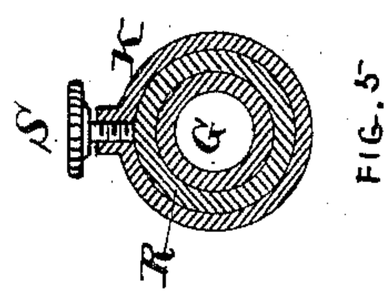



FIG. 5

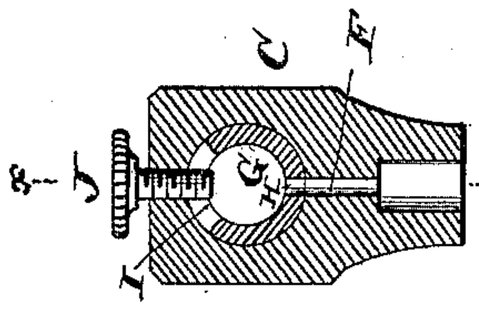



FIG. 4

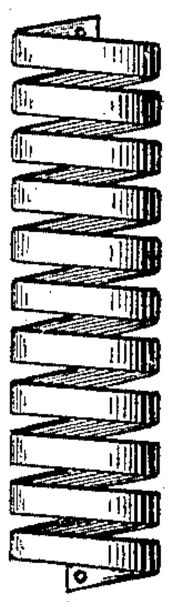



FIG. 3

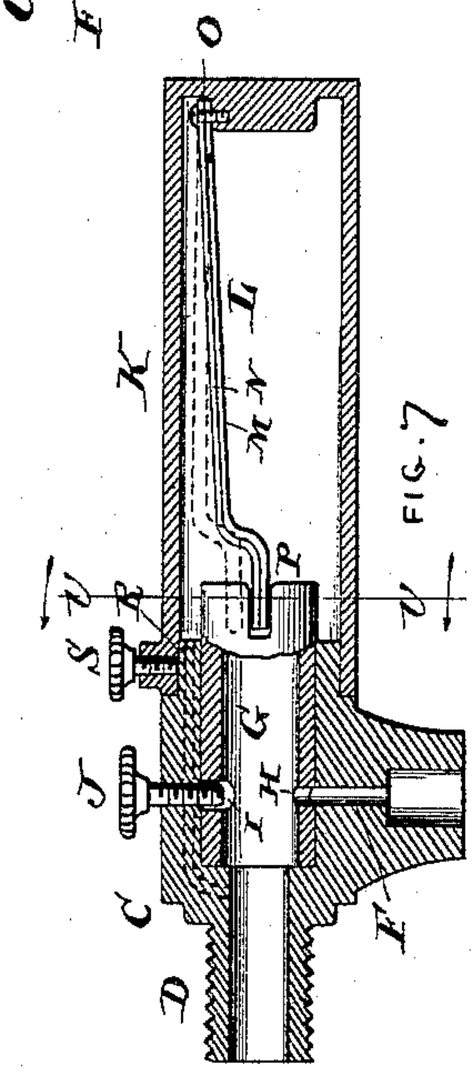
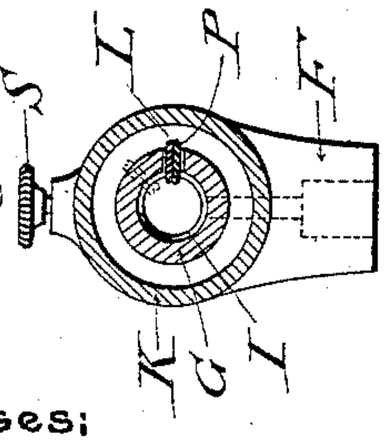



FIG. 7

Fig. 8.

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# UNITED STATES PATENT OFFICE.

JOSEPH POULSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE PHILADELPHIA EXHAUST VENTILATOR COMPANY, OF PENNSYLVANIA.

## AIR-VALVE FOR STEAM-RADIATORS.

SPECIFICATION forming part of Letters Patent No. 442,912, dated December 16, 1890.

Application filed June 20, 1890. Serial No. 356,162. (No model.)

*To all whom it may concern:*

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

My invention has reference to air-valves for steam-radiators; and it consists of certain improvements, which are fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

The object of my invention is to provide a suitable construction which shall be automatic in its action, opening a vent for the escape of air from the interior of the radiator to the atmosphere when the radiator is cold and when steam is being forced into the radiator and closing said vent immediately upon the expulsion of the air and the filling of the radiator with steam, whereby provision is made for the proper entrance of steam to the radiator when the latter is in a cold condition filled with air.

In carrying out my invention I provide a valve-chamber with a port and rotary valve adapted to open or close said port and actuated by a spring affected by the temperature of the air or steam within the valve-chamber. The actuating-spring may be made of two pieces of metal having different expansibilities and preferably formed in the shape of a spiral or helix, so as to tend to wind up or unwind under the influence of varying temperatures.

Referring to the drawings, Figure 1 is an elevation of a steam-radiator having an air-valve applied thereto. Fig. 2 is a sectional elevation of my improved air-valve on line *x x* of Fig. 4. Fig. 3 is an elevation of the spring. Fig. 4 is a cross-section of my improved air-valve on line *y y* of Fig. 2. Fig. 5 is a cross-section of same on line *z z*. Fig. 6 is a cross-section of same on line *s s*. Fig. 7 is a view similar to Fig. 2, showing a modified construction embodying my invention; and Fig. 8 is a cross-sectional view of the same on the line *v v* of Fig. 7.

A is the radiator, which may be of any suitable construction. B is the air-valve applied thereto, so as to permit the escape of air from its interior through the nozzle D and port F of the air-valve to the atmosphere. The nozzle D supports the valve-chamber C, containing the valve-seat E, in which is fitted a rotary valve G, provided with a port H and having a slot I, in which a pin or screw J in the chamber C passes to prevent the longitudinal movement of the valve and yet permit its rotation for the purpose of bringing the port H over the port F or moving so as to make the cylindrical part of the valve G come over the port F to seal it.

Adjustably fitted to the chamber C is a cap K, which is held in position by a clamping-screw S. The cap K fits tightly over the cylindrical portion R on the chamber C, and it may be rotated thereon for adjustment and clamped in any desired position by means of the said screw S. Located within the cap K is a helical or coil spring L, one end of which is connected at O to the cap K and the other end at P with the cylindrical valve G. This spring L is preferably formed of two strips of metal N M of different expansibilities under the same temperature and brazed together. Copper and iron may be used for this purpose. When the spring is affected by heat, it untwists or twists, according as to whether the metal of greatest expansibility is located on the inner side of the spring or upon the outside thereof, and in so untwisting or twisting it rotates the valve G and closes or opens the port F.

The parts being in the relative arrangement shown in Fig. 2, and steam being admitted to the radiator A, the air contained in the radiator is blown through the port F, escaping into the atmosphere. As soon as the air is expelled steam finds its way into the cap K and heats the spring L, causing it to rotate the valve G to automatically close the port F. So long as the radiator is kept hot the spring L will maintain the valve in position to seal the port F; but just as soon as the steam is shut off from the radiator and it becomes cold the spring L reverses its movement and brings the port H in line with the port F, allowing the inward passage of air to destroy the vacuum within the radiator. By loosening the screw S and rotating the cap K upon the chamber C any adjust-

ment may be given to the spring with reference to the valve G, so as to insure its positive working and proper movement over the port F.

In place of the coil-spring L, a flat spring such as illustrated in Fig. 7 may be employed, the end of said spring working in a notch on one side of the rotary valve, so that when it is caused to assume the position of the dotted lines the valve is rotated to close the port F, and vice versa.

While I prefer to make the spring L compound or of two metals of different expansibility, it may be formed of a single piece of metal, as the heating tendency will tend to uncoil it, and thereby cause a rotation of the valve G; but I prefer to form the spring as first described. The valve G is made tubular, so as to allow the passage of steam to the spring L; but it is quite evident that any other passage or connection might be made between the nozzle D and the interior of the cap K to permit the passage of steam—such, for instance, as is indicated in dotted lines in Fig. 7—obviating the necessity of the steam passing through the rotary valve.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a steam-radiator, of an air-valve consisting of a valve-chamber having a valve-seat and a port opening to the atmosphere, a rotary valve to open or close said port, located within said valve-chamber, a spring to rotate said rotary valve, connected directly therewith and having substantially the same axis of rotation, and an inclosing chamber or cap surrounding said spring and communicating with the interior of the radiator.

2. An air-valve for a steam-radiator, consisting of a valve-chamber having a valve-seat and a port opening to the atmosphere, in combination with a rotary tubular valve to open or close the said port, located within said valve-chamber, a spring to rotate said rotary valve, and an inclosing chamber or cap surrounding said spring, having connection with the steam entering the air-valve by means of the orifice through the tubular rotary valve.

3. An air-valve for a steam-radiator, consisting of a valve-chamber having a valve-seat and a port opening to the atmosphere, in combination with a rotary valve to open or close said port, located within said valve-chamber, a spring to rotate said rotary valve, an inclosing chamber or cap surrounding said spring, a connection between the one end of the spring and the inclosing chamber or cap, a connection between the other end of the spring and rotary valve, and means to adjust the inclosing chamber or cap about the axis of rotation of the rotary valve.

4. An air-valve for a steam-radiator, consisting of a valve-chamber having a valve-seat and a port opening to the atmosphere, in combination with a rotary valve to open or close said port, located within said valve-chamber, a spring to rotate said rotary valve, an inclosing chamber or cap surrounding said spring, a connection between one end of the spring and the inclosing chamber or cap, a connection between the other end of the spring and rotary valve, means to adjust the inclosing chamber or cap about the axis of rotation of the rotary valve, and a projecting pin or screw to prevent the longitudinal movement of the rotary valve.

5. An air-valve for steam-radiators, consisting of an air-nozzle for attachment to a radiator, a chamber or cap communicating with the air-nozzle, a valve-chamber located between said chamber or cap and the air-nozzle, provided with a valve-seat and a port opening to the atmosphere, a valve in said valve-chamber, and a spring to operate said valve, located in the chamber or cap, whereby the steam from the radiator may pass from the air-nozzle into said chamber or cap to expand the spring therein and thereby operate the valve in the valve-chamber.

6. An air-valve for steam-radiators, consisting of an air-nozzle for attachment to a radiator, a chamber or cap communicating with the air-nozzle, a valve-chamber located between said chamber or cap and the air-nozzle, provided with a valve-seat and a port opening to the atmosphere, a rotary valve in said valve-chamber, and a coiled spring to operate said valve, located in the chamber or cap and having one end attached to said cap and the other end to the valve, whereby the steam from the radiator may pass from the air-nozzle into said chamber or cap to expand the spring therein and thereby operate the valve in the valve-chamber.

7. An air-valve for a steam-radiator, consisting of an air-nozzle for attachment to the radiator, a valve-chamber adjacent thereto provided with a valve-seat and an outlet-port leading to the atmosphere, a second chamber opening from said valve-chamber, a tubular rotary valve located in said valve-chamber and connecting the air-nozzle and second chamber, and a spring located in said second chamber and connected with the rotary valve in the intermediate valve-chamber to operate it, whereby the steam from the air-nozzle may pass through the tubular rotary valve into the second chamber to act upon the spring therein.

8. In an air-valve for steam-radiators, the combination of an air-nozzle for attachment to the radiator, a valve-chamber adjacent thereto and provided with a valve-seat and air-port, an adjustable cap carried by said valve-chamber and forming a chamber or compartment, the valve-chamber being intermediate between said cap and air-nozzle and being provided with an opening or passage-way between said air-valve and chamber formed by the cap, a valve in said valve-chamber, and a spring in the chamber formed by the cap, connected at one end with said cap and the

other end with the valve, whereby the tension of said spring may be varied by the adjustment of the cap.

9. In an air-valve for steam-radiators, the combination of the valve-chamber C, having the nozzle D, for attachment to the radiator, and provided with the valve-seat E and air-outlet port F, the cap K, carried by the valve-chamber C, the adjusting-screws S to adjust the cap K, the tubular valve G, provided with the valve-orifice H and the slot I, the pin or screw J, to prevent longitudinal movement of the valve G, and the spring L, having one end connected with the adjustable cap K and the other end with the valve G, whereby the tension of the spring upon the valve may be varied by the adjustment of the cap K.

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

JOSEPH POULSON.

Witnesses:
CHAS. F. SIMMONS,
ALEXANDER RICKEY.