

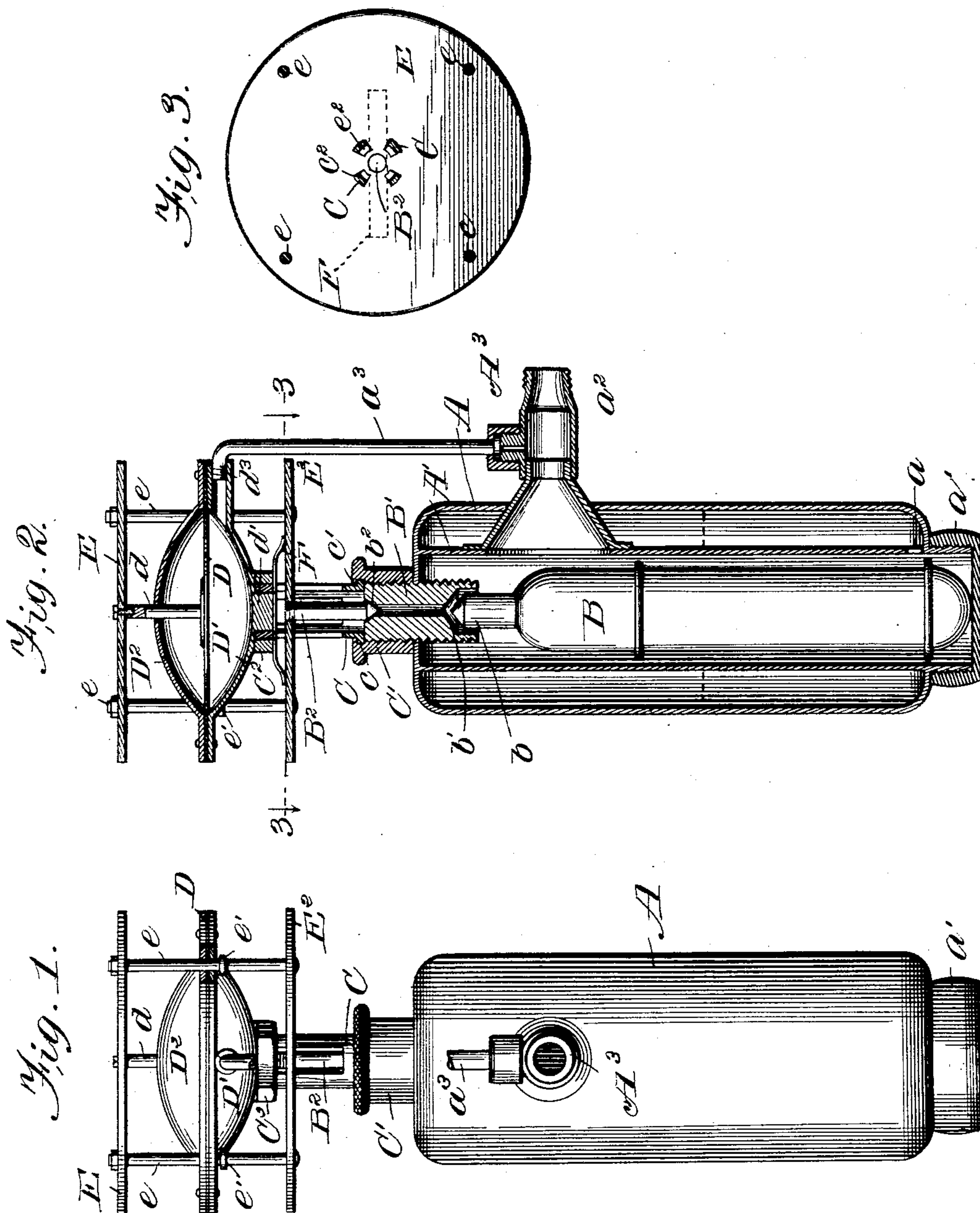
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VALVE FOR STEAM HEATING SYSTEMS.

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NO MODEL.



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UNITED STATES PATENT OFFICE.

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VALVE FOR STEAM-HEATING SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 751,853, dated February 9, 1904.

Application filed February 14, 1903. Serial No. 143,299. (No model.)

To all whom it may concern:

Be it known that I, GEORGE D. HOFFMAN, a citizen of the United States, residing at Chicago, county of Cook, State of Illinois, have invented a certain new and useful Improvement in Valves for Steam-Heating Systems; and I 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 pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates in general to steam-heating systems, and more particularly to mechanism for permitting the expulsion of air from the system upon the generation of steam and for preventing the admission of air into the system when the condensation of the steam produces a pressure less than that of the atmosphere.

It is well known that the lower the pressure to which water is subjected the lower will be the temperature necessary to convert the water into steam. It is consequently desirable in steam-heating systems to maintain the lowest pressure possible in order that steam may be more quickly generated and put in circulation throughout the system.

The primary object of my invention is to provide a steam-heating system with means for permitting the air in the system to be expelled upon the generation of steam and for preventing the return of air into the system upon the condensation of the steam.

A further object of my invention is to provide an attachment to steam-radiators which will freely permit the discharge of air therefrom by the generated steam and which will positively prevent the passage of air into the radiator when the condensation of the steam produces partial vacuum.

My invention further consists in a device of the character above referred to which will be simple in construction, inexpensive in manufacture, and efficient in use.

My invention, generally described, consists in a valve for controlling a port leading from a steam-heating system to the atmosphere,

means for unseating the valve by the pressure of steam in the system, and means for automatically seating the valve upon the discontinuance of steam in the system.

My invention will be more fully described hereinafter, with reference to the accompanying drawings, in which the same is illustrated in a convenient and practical form, and in which—

Figure 1 is an elevational view of my improvement applied to an automatic radiator-valve; Fig. 2, a sectional view on a plane at right angles to Fig. 1; and Fig. 3, a sectional plan view on line 3 3, Fig. 2.

Similar reference characters are used to designate similar parts in the several figures of the drawing.

My invention is preferably used in connection with an automatic radiator-valve, and I therefore so illustrate the same. It is obvious that any type of radiator-valve may be used in connection with my improvement and, in fact, that my improvement might be used to control a port leading directly from a heating system.

Reference character A indicates the casing of an automatic radiator-valve, in which is mounted concentrically, a cylinder A', the interior of which communicates with the space between the outer casing and the exterior of the cylinder by means of one or more ports *a*, located at the bottom of the cylinder. A float B is located within the cylinder A', which supports at its upper end a valve *b*, adapted to coöperate with a seat *b'*, formed at the bottom of a plug B' in screw-threaded engagement with the exterior casing A at the top thereof.

A³ indicates a passage leading to the interior of the cylinder A' and which is provided with a screw-threaded coupling *a*² for engaging the radiator or other part of the heating system.

The valve above described operates as follows: Upon the generation of steam in a system the air is forced out through the port leading from the valve-seat *b'*. The heat of the steam causes the air contained between

the outer casing A and inner cylinder A' to expand, thereby forcing the water through the port *a* and elevating the float, thereby seating the valve *b* and preventing the escape
5 of the steam to the atmosphere.

C indicates a tube provided with slots extending longitudinally thereof. The lower end of the tube C is provided with a radial flange *c*, which projects flush with the periph-
10 ery of the screw-threaded plug B'.

C' indicates a thimble in screw-threaded engagement with the plug B' and provided with a flange *c'*, which overlies the flange *c* and thereby retains the tube C, fixed upon the
15 plug B'. The upper end of the tube C surrounds and is in screw-threaded engagement with a projection *d'*, extending beneath the lower half D' of a chamber. A lock-nut C² surrounds the upper end of the tube C and
20 retains the same in engagement with the projection *d'*. A diaphragm D is interposed between the lower and upper parts D' and D², respectively, of a chamber. A conduit *d*³ extends through the lower part D' of the cham-
25 ber and communicates at its opposite end with a conduit *a*³, the lower end of which communicates with the coupling A³, interposed between the screw-threaded coupling *a*² on the automatic valve and the radiator or other part
30 of the heating system. A post *d* is secured to the top of the diaphragm D and projects upwardly through an opening in the upper part D² of the chamber. A plate E' is located above the chamber and is rigidly secured to
35 the upper end of the post *d*. A second plate E² is located beneath the chamber and is provided with slots *e*², through which extend the portions *c*² of the tube C. The plates E' and E² are united by a plurality of rods *e*, which
40 pass through registering openings formed in the flanges around the peripheries of the upper and lower parts D' and D² of the chamber. A valve B² depends from and is supported by the lower plate E² and is adapted
45 to engage a seat *b*², formed in the upper end of the plug B'. A spring F is interposed between the upper surface of the plate E² and the projection *d'* on the under side of the lower part D' of the chamber. Stops *e'* are
50 preferably fixed to the rods *e* below the flanges on the two parts of the chamber to limit the upward movement of the plates relatively to the chamber.

The operation of my invention is as follows:
55 The parts are in the position shown in Fig. 2 prior to the generation of steam in the system. The steam-pressure forces air from the system through the coupling A³, conduit *a*³, and conduit *d*³ beneath the diaphragm D.
60 The pressure of the steam deflects the diaphragm upwardly, thereby elevating the plate E' through the interposed post *d* and also elevating the lower plate E² by means of the rods *e* until the stops *e'* engage the under surface
65 of the flange around the lower part D' of the

chamber. The elevation of the plate E² lifts the valve B², connected thereto above the seat *b*², permitting the air to be blown out of the system, owing to the float B being in its lower position, in which the valve *b* uncovers the
70 seat *b'*. When the steam passing through the casing A and cylinder A' expands the air located in the space between the exterior of the cylinder and interior of the casing, the water is forced through the port *a* beneath the float
75 B, elevating the latter so that the valve *b* engages the seat *b'*, thereby discontinuing the flow of steam to the atmosphere. When the steam in the system is discontinued, the pressure exerted on the under side of the diaphragm
80 D is relieved, which permits the spring F to force downwardly the plate E² and the valve B², depending therefrom, until the latter engages the seat *b*², thereby preventing the air from flowing into the system when the pres-
85 sure therein falls below that of the atmosphere, owing to the condensation of the steam. The absence of steam from the vent-valve permits the air to contract, so that the water is drawn from beneath the float and the valve
90 *b* thereby unseated, so that when steam is again generated air may be expelled from the system upon the elevation of the valve B² above its seat by the exertion of steam beneath the diaphragm D.
95

From the foregoing description it will be observed that I have invented an attachment for steam-heating systems by means of which the air may be freely expelled from the sys-
100 tem by the steam therein, but which upon the discontinuance of steam prevents air from being drawn into the system when partial vacuum is formed by the condensation of the steam.

While I have described more or less precisely the details of construction, I do not wish
105 to be understood as limiting myself thereto, as I contemplate changes in form, the proportion of parts, and the substitution of equivalents as circumstances may suggest or render expedient without departing from the spirit
110 of my invention.

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

1. A steam-heating system having a port
115 leading therefrom to the atmosphere, a valve controlling said port, means actuated by steam in the system for unseating said valve, means for automatically seating said valve upon the discontinuance of steam, and automatic mech-
120 anism for closing communication between the system and said port upon the generation of steam in the system and for opening communication between the system and said port upon the discontinuance of steam in the system.
125

2. In a steam-heating system, the combination with a radiator having a port leading therefrom to the atmosphere, a valve control-
130 ling said port, means actuated by steam from the radiator for unseating said valve, means

for automatically seating said valve upon the discontinuance of steam in the radiator, and automatic mechanism for closing communication between the radiator and said port when steam is present in the radiator and for opening communication between the radiator and said port upon the discontinuance of steam in the radiator.

3. In a steam-heating system, the combination with a radiator having a port leading therefrom to the atmosphere, a valve controlling said port, a spring normally retaining said valve seated when there is no steam in the system, means actuated by steam-pressure in the system for unseating said valve against the tension of said spring, and automatic mechanism for closing communication between the radiator and said port when steam is present in the radiator and for opening communication between the radiator and said port upon the discontinuance of steam in the radiator.

4. In a steam-heating system, the combination with a radiator having a port leading therefrom to the atmosphere, a valve controlling said port, a chamber supported adjacent to said valve, a diaphragm located in said chamber, operative connections between said valve and diaphragm, a conduit leading to said chamber from the heating system whereby said valve is unseated by pressure exerted upon said diaphragm, means for automatically seating the valve upon the discontinuance of steam in the system, and automatic mechanism for closing communication between the radiator and said port when steam is present in the radiator and for opening communication between the radiator and said port upon the discontinuance of steam in the radiator.

5. In a steam-heating system, the combination with a radiator having a port leading therefrom to the atmosphere, a valve controlling said port, a chamber supported adjacent to said valve, a diaphragm located in said chamber, a conduit leading to said chamber from the system, a bodily-movable frame surrounding said chamber, connecting means interposed between said diaphragm and said frame for supporting the latter, and means for operatively connecting said frame to said valve.

6. A steam-heating system having a port leading therefrom to the atmosphere, a valve controlling said port, a chamber rigidly supported adjacent to said port, a diaphragm in said chamber, a conduit leading to said chamber from the system, plates on either side of said chamber rigidly connected together, a rigid connection between said diaphragm and one of said plates, a rigid connection between said valve and the other plate, and a spring

interposed between the adjacent wall of the chamber and said latter plate for seating the valve upon the discontinuance of steam-pressure.

7. A steam-heating system having a port leading therefrom to the atmosphere, a valve controlling said port, a chamber rigidly supported adjacent to said port, a diaphragm in said chamber, a conduit leading to said chamber from the system, plates on either side of said chamber, rods connecting said plates and extending adjacent to the side walls of said chamber, stops upon said rods to limit the movement of said plates relatively to said chamber, a rigid connection between said diaphragm and one of said plates, a rigid connection between said valve and the other plate, and a spring interposed between the adjacent wall of the chamber and said latter plate for seating the valve upon the discontinuance of steam-pressure.

8. In a steam-heating system, the combination with a radiator having a port leading therefrom to the atmosphere, a valve-seat surrounding said port, a tube having longitudinal slots supported around said valve-seat, a chamber supported by said tube, a diaphragm in said chamber, a conduit leading from the system to said chamber beneath the diaphragm, a post connected to the top of said diaphragm and extending through said chamber, a movable frame surrounding said chamber and connected to said post, a valve depending from said frame and surrounded by said tube, and a spring interposed between said frame and the bottom wall of said chamber for automatically seating said valve upon the discontinuance of steam-pressure in the system.

9. In a steam-heating system, the combination with a radiator, of a valve-casing communicating with the interior of the radiator and having a port leading to the atmosphere, a vent-valve within said casing automatically closing said atmospheric port upon the generation of steam in the system and automatically opening said port upon the discontinuance of steam in the system, a second valve located outside of said casing and adapted to control said atmospheric port, means for unseating said second valve by the pressure of steam in the heating system, and means for automatically seating said second valve upon the discontinuance of steam-pressure in the heating system.

In testimony whereof I sign this specification in the presence of two witnesses.

GEORGE D. HOFFMAN.

Witnesses:

E. H. BELL,

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