G. D. HOFFMAN.

AIR VENT VALVE.

APPLICATION FILED JAN. 24, 1907.

967,381.

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Fig. 2.

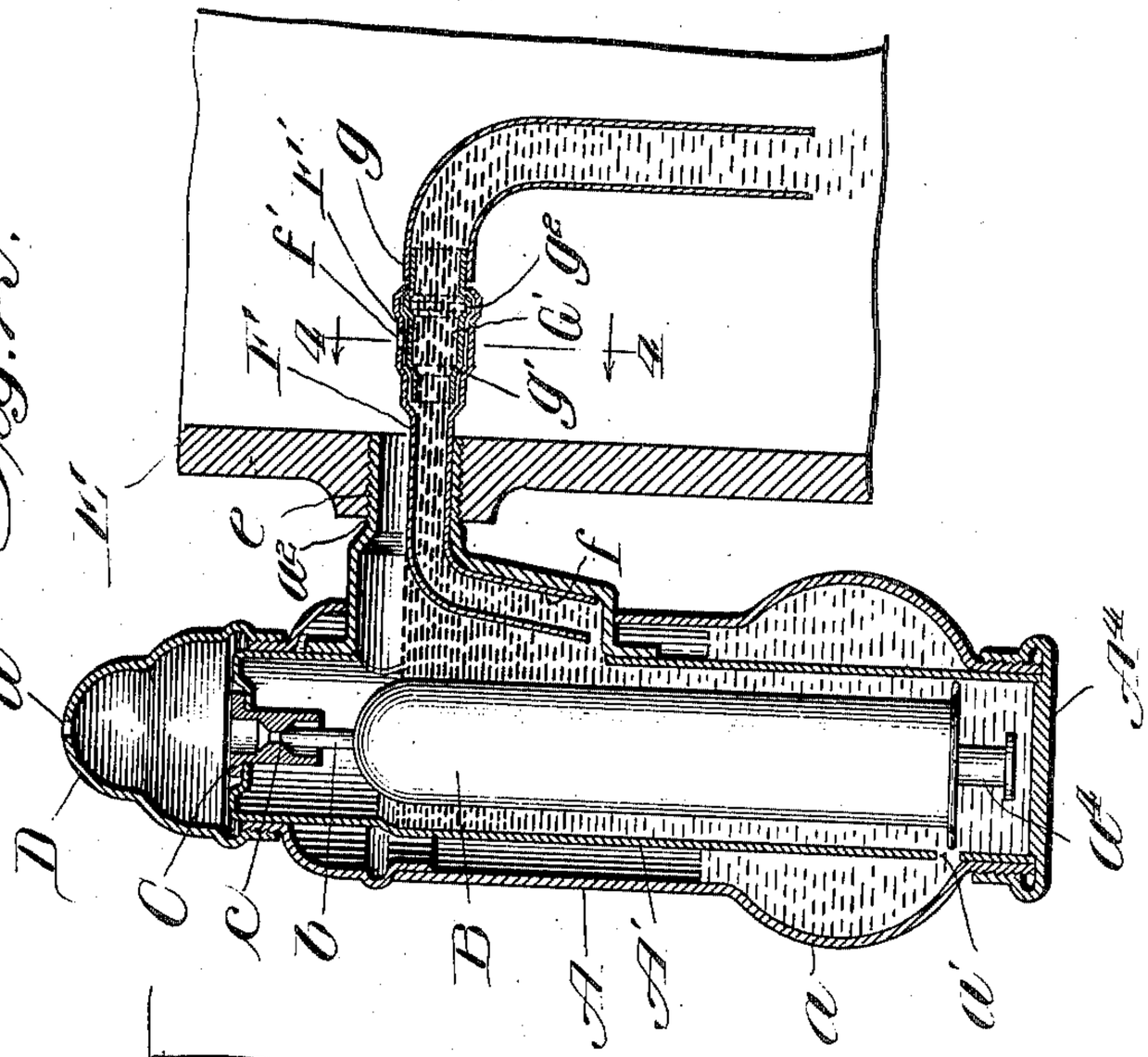


Fig. 4.

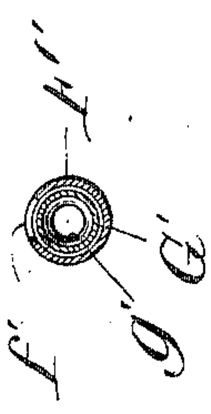


Fig. 1.

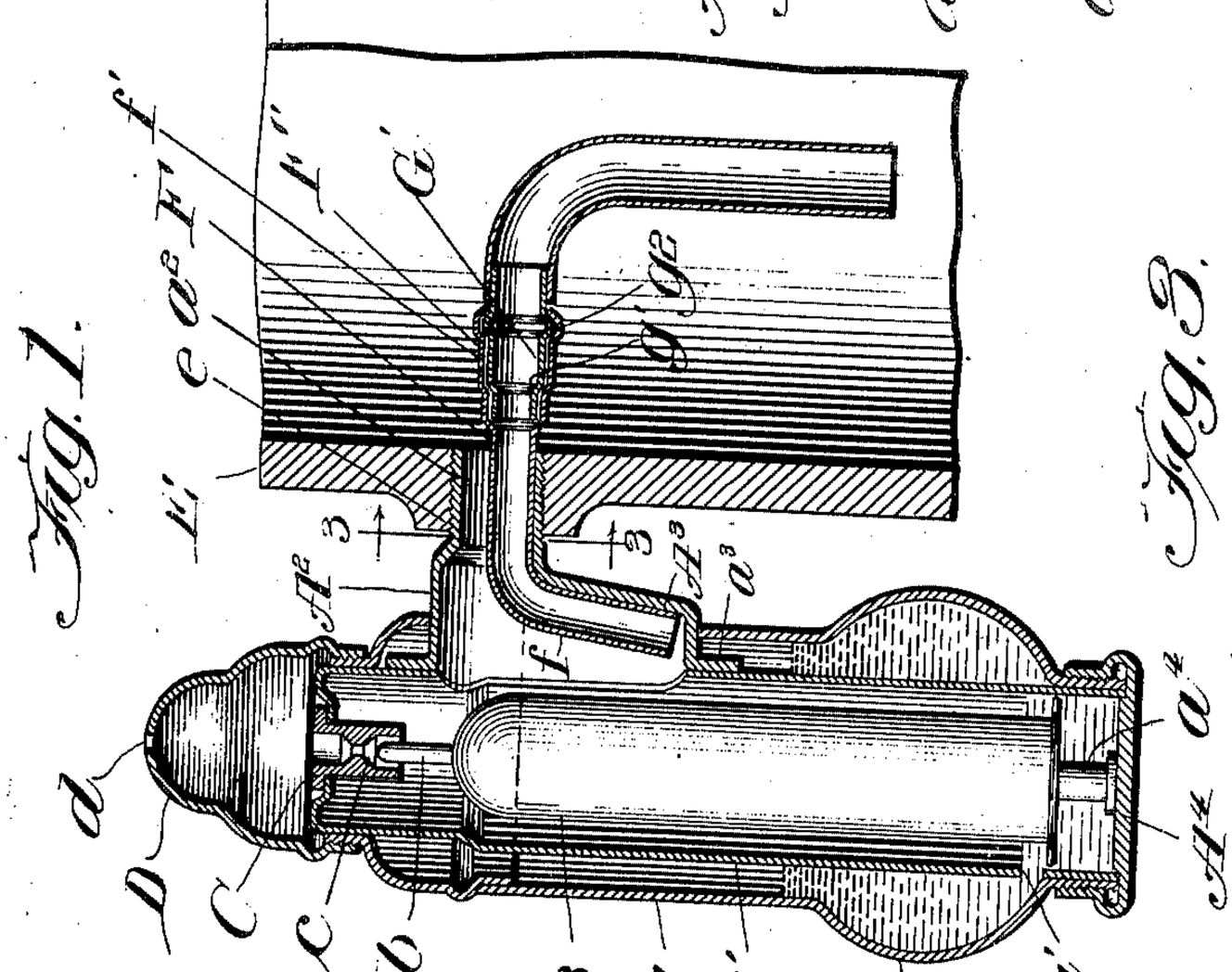
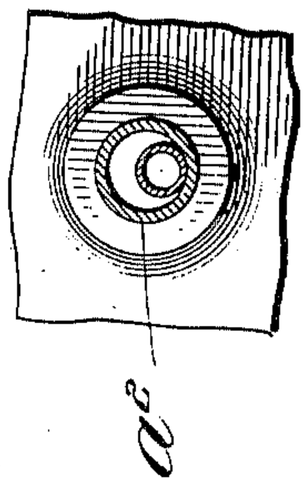


Fig. 3.



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UNITED STATES PATENT OFFICE.

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AIR-VENT VALVE.

967,381. Specification of Letters Patent. Patented Aug. 16, 1910.

Application filed January 24, 1907. Serial No. 353,789.

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 Air-Vent Valves, and declare the following to be a full, clear, and exact description of the same, 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 and hot water heating systems and more particularly to vent valves for permitting the expulsion of air, but preventing the escape of steam or the discharge of water from the systems.

In order that the radiating surfaces of radiator coils may be fully utilized it is necessary that air should be expelled from the radiators, thereby permitting the steam or hot water, to completely fill the coils. It is therefore customary to provide radiators with air vent valves which will automatically permit the escape of air upon the generation of steam in the heating system, but will prevent the escape of steam and the discharge of water. One type of such vent valves comprises a float for opening and closing the vent opening, the float being raised or lowered by water in the float chamber. An objection to this type of automatic air vent valves is that when water surges in the system it floods the float chamber and closes the valve so that it can not open until the water has been removed from the float chamber to a predetermined level. It has been proposed to obviate this difficulty by providing a siphon extending from the float chamber into the radiator to draw the water from the float chamber and permit the valve to open. The use of a siphon has, however, proved impractical heretofore as the siphon tube must be so small, in order to permit space for the passage of air between the same and the restricted surrounding coupling of the valve casing, that its capillarity prevents the flow of water through it.

The primary object of my invention is to provide an air vent valve for radiators of the float actuated type having a siphon for drawing the water from the float chamber to a predetermined level, in which the siphon will be so constructed as to be free from capillarity and at the same time sufficiently small to permit the free passage of air between the exterior thereof and the surrounding coupling nipple.

A further object of my invention is to provide an automatic vent valve with a siphon composed of relatively movable parts, thereby permitting the valve to be rotated into engagement with the radiator after the long leg of the siphon has been inserted through the opening to the interior of the radiator coil.

A still further object of my invention is to provide an air vent valve of the float actuated type which will be simple in construction, inexpensive in manufacture, and efficient in operation.

My invention may be generally described as consisting in an automatic vent valve of the float actuated type comprising a float chamber and a coupling nipple adapted to engage the usual screw-threaded hole in a radiator coil, a siphon comprising a short leg extending through the nipple and depending within the float chamber, such short leg being of a size to permit a free passage-way for air around the same through the nipple, and a long leg swiveled to the short leg and depending within the radiator coil, such long leg being of greater diameter than the short leg to eliminate capillarity which would prevent the operation of the siphon.

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

Figure 1 is a vertical sectional view through the valve and a portion of the adjacent coil of a radiator, the valve being shown as open; Fig. 2 a similar view to Fig. 1 the valve being shown as closed by water which has surged from the radiator into the float chamber; Fig. 3 a sectional view on line 3—3 Fig. 1; and Fig. 4 a sectional view on line 4—4 Fig. 2.

The same reference characters are used to designate the same parts in the several figures of the drawing.

Reference character A indicates the casing of an automatic air valve in which is mounted concentrically a cylinder A′ the interior of which communicates with the space

around the same inclosed by the casing through one or more ports a' extending through the cylinder adjacent the lower end thereof. The casing A is preferably enlarged adjacent its lower end as indicated at a in order that the air chamber between the casing and the cylinder A′ may be of such capacity as to perfectly control the water level within the cylinder A′ which serves as a float chamber.

B indicates a float made of suitable material such as hollow metal located within the cylinder A′. A valve b is carried at the upper end of the float B and coöperates with a valve seat c formed at the lower end of a passage-way extending through a plug C extending through and secured within an opening in the top wall of the casing A′. The bottom of the float is adapted to rest, when the valve is open, upon a post a^4 projecting above a cap A^4 which closes the lower end of the casing. The post a^4 serves as a stop for limiting the downward movement of the float.

D designates a cover having an interior screw-threaded flange which surrounds the upper end of the casing A.

d indicates an opening through the cap D through which the air passes when the valve is open.

A^2 indicates a coupling through which extends a passage-way from the interior of the cylinder A′. The coupling extends through the casing A and is secured around an opening through the cylinder A′ by means of a flange a^3. The coupling comprises an exteriorly screw-threaded nipple a^2 of a size to engage within the usual screw-threaded hole e in a coil E of a radiator.

F designates the short leg of a siphon which extends through the nipple a^2 and depends within a recess A^3 formed within the lower portion of the coupling A^2. The lower end f is preferably secured in any suitable manner within the recess A^3 so that the short leg F of the siphon is rigidly held within the coupling. The size of the short leg of the siphon is necessarily quite small as it must extend through the nipple a^2 and leave sufficient space around the same within the nipple to permit a free passage-way for air and steam to pass from the radiator to the float chamber within the cylinder A′. The interiorly screw-threaded openings in radiator coils to which the air vent valves are secured are of standard size and consequently the size of the siphon must be such as to conform therewith.

G designates the long leg of the siphon which is swiveled to the end of the short leg F and depends within the radiator coil. The long leg G of the siphon is of larger size than the short leg in order that it may be free from capillarity. It has been found in practice that a siphon the longer leg of which is the same size as the shorter leg must be in order to conform to the standard radiator hole, the siphon will not operate owing to the restricted opening through the long leg of the siphon, producing capillary action.

The upper end of the long leg G of the siphon surrounds and is rigidly secured to the coupling portion G′ rotatably supported within the end F′ of the short leg of the siphon. In order that the long leg of the siphon may rotate relatively to the short leg and at the same time be securely connected thereto, I provide shoulders g' and g^2 on the exterior of the coupling portion G′ which are engaged by corresponding shoulders on the interior of the end F′ of the short leg of the siphon. The long leg of the siphon may therefore be inserted within the coil of the radiator and will not rotate while the valve is being rotated to engage the screw-threaded nipple a^2 with the screw-threaded hole through the radiator coil. In order that air may be prevented from entering the joint uniting the two legs of the siphon, a hole f' is formed through an enlarged end F′ which admits water to the space between the overlapping ends of the two legs of the siphon.

The operation of my improved air vent valve is as follows. In order to attach the same to a radiator the long leg G of the siphon is inserted through the hole e in the radiator coil and the device is then rotated so as to engage the nipple a^2 of the coupling within the screw-threaded hole in the coil. The swivel connection between the two legs of the siphon permits the rotation of the valve relatively to the radiator coil while the long leg of the siphon does not rotate owing to the restricted size of the radiator coil. When the valve has been secured to the radiator the parts are in the position shown in Fig. 1 the valve being open so that steam in the system will expel the air from the radiator through the nipple a^2 and thence through the valve seat c. When the water of condensation accumulates within the float chamber to a level indicated by dotted line X—X Fig. 1 the float is elevated to a position to close the valve and prevent escape of steam. When the steam in the system is discontinued, the air within the chamber formed between the casing A and the cylinder A′ contracts so that the water within the float chamber is drawn through the holes a' into the air chamber to the position shown in Fig. 1, thereby permitting the float to fall and the valve to open. When steam is again generated in the system the air is expelled through the seat c until steam commences to escape when the heat imparted to the air within the air chamber causes the same to expand thereby forcing the water from the air chamber

through the holes a' into the float chamber and lifting the float so that the valve is closed and further escape of steam prevented.

A valve operating as above described does not in itself constitute my present invention, but is merely illustrated in order that the operation of my improved siphon may be fully disclosed. It is, of course, evident that my improved siphon is adapted for use in connection with any type of float actuated valve, and in fact wherever it is desired to employ a siphon the parts of which must be relatively movable.

It frequently happens in steam heating systems that water surges through the radiators, especially when the steam is first generated, thereby filling the float chamber and closing the valve, as shown in Fig. 2, so that it is impossible to open the vent valve and permit the escape of air until the water has been removed from the float chamber. In order to withdraw the water from the float chamber my improved siphon is provided. When the water surges into the float chamber as shown in Fig. 2, the lowering of the water in the radiator by the siphon results in the siphon operating to draw the water from the float chamber to such a level that the float will fall and the valve open. Prior to my invention the use of a siphon for this purpose was impossible because of the capillarity present, due to the siphon tube being necessarily small in order that it might extend through the nipple, and permit a free passage-way around the same within the nipple of such size as to avoid obstruction thereof by capillary action. By my invention the portion of the siphon extending through the nipple is of such a size as to leave the requisite passage-way around the same to avoid obstruction thereof by capillary action, while the long leg of the siphon is of such a size as to positively insure the water being drawn through the siphon from the float chamber.

While float valves to which my improvement relates are especially designed for use on radiators of steam heating systems, yet they may be used with good results on hot water heating systems as they permit the air to be expelled from the radiators when water is admitted to the system and permit air to flow into the system when the water is withdrawn, thereby facilitating the draining of the water from the system.

From the foregoing description it will be observed that I have invented an improvement in air vent valves for radiators of the float actuated type which prevents the valve from being permanently closed by water surging in the system, and which by means of a siphon having the legs thereof relatively movable, permits the valve device to be rotated to secure the same to the radiator while the long leg of the siphon remains immovable within the radiator coil.

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

1. In an automatic vent valve, the combination with a casing having an outlet port, of a float chamber in said casing, a nipple communicating with said float chamber and adapted to engage a hole in a radiator coil, a float in said chamber, a valve operated by said float to control said port, and a siphon extending from said float chamber through said nipple to the interior of the radiator coil, the legs of said siphon being united by a swiveled joint arranged to permit the legs to rotate independently of each other about axes transverse to the legs.

2. In an automatic vent valve, the combination with a casing having a port leading therefrom, of a float chamber within said casing, a nipple communicating with said float chamber and adapted to engage a hole in a radiator coil, a valve actuated by said float to control said port, and a siphon extending from said float chamber through said nipple and comprising one leg secured within said casing and a second leg swiveled to the first leg so as to be rotatable about an axis extending transversely of the legs and adapted to depend within the radiator coil.

3. In an automatic vent valve, the combination with a casing having an outlet port, of a float chamber in said casing, a float in said chamber, a nipple communicating with said float chamber and adapted to engage a hole in a radiator coil, a siphon extending through said nipple and having its short leg communicating with said float chamber and its long leg depending within the radiator coil, the long leg of said siphon being larger than the portion thereof within said nipple.

4. In an automatic vent valve, the combination with a casing having an outlet port, of a float chamber in said casing, a float in said chamber, a nipple communicating with said float chamber and adapted to engage a hole in a radiator coil, a siphon extending through said nipple and having its short leg communicating with said float chamber and its long leg depending within the radiator coil, the long leg of said siphon being larger than the portion thereof within said nipple, and means for rotatably connecting the two legs of said siphon.

5. In an automatic vent valve, the combination with a casing having an outlet port, of a float chamber in said casing, a float in said chamber, a valve operated by said float, to control said port, and a siphon leading from said float chamber comprising one leg extending within said float chamber and another leg adapted to be inserted in a radiator coil, the two legs of said siphon overlapping and rotatably united, the overlapping por-

tions being so proportioned as to form a space between them, a hole being formed through the outer of the overlapping portions to permit water to pass to the space between the overlapping portions.

6. In an automatic vent valve, the combination with a casing having an outlet port of a float chamber in said casing, means for connecting said casing with the radiator, a float actuated valve in said chamber controlling said port, and a siphon extending from said float chamber into the radiator, the legs of said siphon being relatively movable about an axis arranged transversely of the legs.

7. In an automatic vent valve, the combination with a casing having an outlet port of a float chamber in said casing, means for connecting said casing with the radiator, a float actuated valve in said chamber controlling said port, and a siphon extending from said float chamber into the radiator, the legs of said siphon being relatively movable, and means for forming a water seal around the joint between the relatively movable portions of said siphon.

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

GEO. D. HOFFMAN.

Witnesses:

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HARRY S. GAITHER.