G. D. HOFFMAN.

VALVE.

APPLICATION FILED SEPT. 17, 1909.

992,195. Patented May 16, 1911.

Fig. 1.

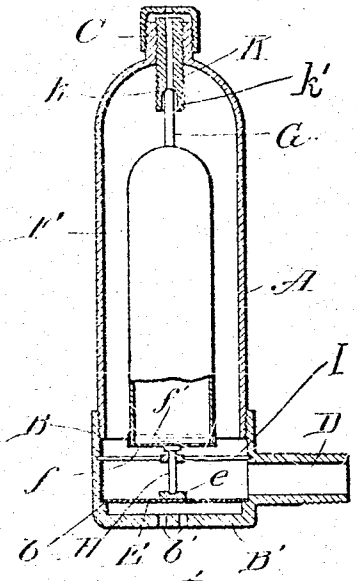


Fig. 3.

Fig. 2.

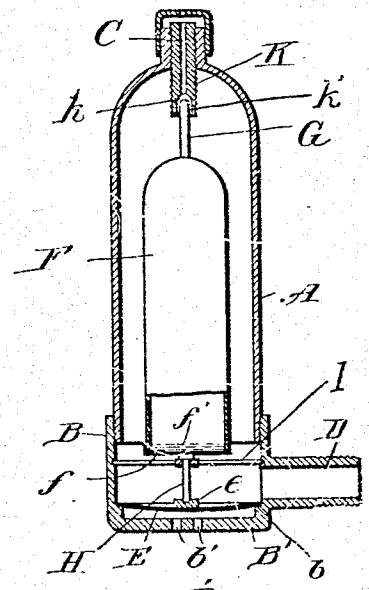
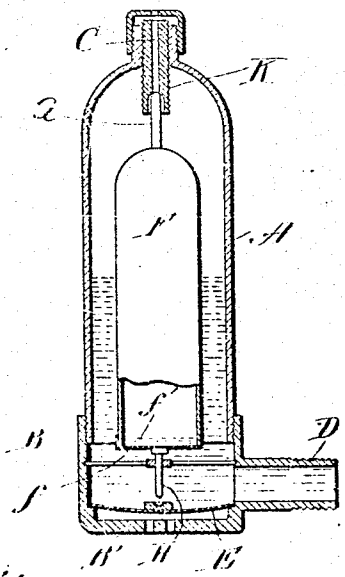
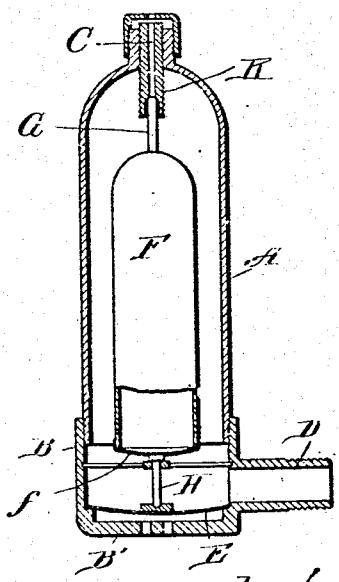


Fig. 4.





Witnesses:

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UNITED STATES PATENT OFFICE.

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VALVE.

992,195. Specification of Letters Patent. Patented May 16, 1911.

Application filed September 17, 1909. Serial No. 518,193.

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, 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 to air valves for radiators and the like, and has for its object to provide a simple and reliable device for permitting the air to escape from a radiator when steam is turned on, for preventing the discharge of steam or water and for maintaining a partial vacuum in the radiator when steam is turned off.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its object and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawing, wherein:

Figures 1 to 4 are longitudinal sections showing my improved device under different conditions.

Referring to the drawing, A represents a cylindrical shell closed at its lower end by a base member B and having an outlet C at the top. The member B is preferably in the form of a casting having a nipple D which is adapted to be screwed into a radiator so as to place the interior of the shell in communication with the interior of the radiator.

E is a flexible metal diaphragm arranged within the base member in the plane of the bottom of the nipple, the diaphragm being conveniently made to rest upon an annular shoulder or ledge *b* and being brazed or otherwise locked in place. It will be seen that the diaphragm forms the effective bottom of the casing, the bottom wall B^1 of the base member forming simply a protecting housing for the diaphragm and being perforated as at b^1 in order to permit the underside of the diaphragm to be subjected to the pressure of the surrounding atmosphere.

Arranged within the casing is a hollow expansible member F which is capable of acting as a float when water enters the casing. The member F preferably consists of an elongated cylindrical shell closed at its lower end by means of a flexible diaphragm *f*. The interior of the expansible member contains any suitable fluid, such as alcohol, which will expand when its temperature is raised so as to flex the diaphragm *f* outwardly. In the manufacture of the device I prefer to place a little alcohol f^1 in the expansible member and then heat it so as to expel the air before sealing. The sealing is then effected while the expansible member is still hot and consequently, when it becomes cool, a partial vacuum will be created in the interior and the diaphragm forming the lower wall will be forced inwardly positively by the pressure of the outside medium. Upon the upper end of the expansible member is carried a valve G which is adapted to coöperate with the port C. A stem H is secured to and extends downwardly from the diaphragm *f* and into proximity to the diaphragm E. The latter diaphragm may be provided with a button *e* for engaging with the lower end of the stem H.

I is a spider of any suitable type arranged within the casing, preferably by being sprung into place in the base member. The stem H passes through this spider which serves to maintain the lower end of the expansible float in proper alinement in the casing.

The port C is preferably formed in an adjustable sleeve K which may be screw-threaded into the upper end of the shell A, thereby making it possible to raise or lower the seat *k* with which the valve G coöperates. The end of the member K adjacent to which the seat *k* is placed, is preferably provided with a deep, concave recess k^1 surrounding and concentric with the port; this recess serving to form a guide for the valve to direct it toward its seat.

The parts are so proportioned that normally the stem H of the expansible float rests upon the button on the diaphragm E. In this position the valve is held against its seat, keeping the port C closed. Assuming that the device is attached to a radiator while in the condition shown in Fig. 1: when steam is turned on, the air in the radiator will rush through the nipple into the valve casing until the pressure becomes great,

enough to flex the diaphragm E downwardly, as indicated in Fig. 2, thereby permitting the air to be discharged through the port C. If water should enter with the air, the float will be raised as indicated in Fig. 3 and the port C closed, thereby preventing the escape of water. After all of the air has been expelled from the radiator so as to permit steam to enter the valve casing, the expansible float becomes heated and the diaphragm at the lower end thereof is caused to bulge outwardly, the parts being so proportioned that the valve G will be forced against its seat and thus close the radiator against escape of steam, the condition being now as indicated in Fig. 4. When steam is shut off, that remaining in the radiator condenses and a partial vacuum is immediately formed. Consequently the diaphragm E, by reason of its resiliency and the air pressure underneath, follows up the receding stem F as the float cools and maintains the valve against its seat, the final position, after cooling being that as shown in Fig. 1. It will thus be seen that the radiator is sealed against entrance of air so that, unless leakage occurs, there will be a partial vacuum in the radiator when steam is again turned on.

It will now be seen that I have produced a simple and compact device of great strength and durability. The casing and the float are in the form of long thin cylinders which eliminates waste space and makes the float easy to control. By placing the float above the diaphragm, it is possible to make all adjustments above the float by means of the single member K and without changing the normal position thereof; that is, after the parts are assembled no adjustment need be made which affects the sensitiveness of the float as such because it will always begin to rise when the water in the casing reaches a predetermined level regardless of the adjustment of the member K. Moreover the diaphragm may be fastened very securely in place because it is a permanent part which need not be disturbed in order to gain access to the float since the shell may be detached from the base for this purpose. Neither does the removal of the shell affect the spider which supports and guides the float, the spider being carried in the base member, so that upon removing and replacing the shell no adjustment need be made except perhaps of the member K. The diaphragm is housed beneath the spider even after removal of the shell so that there is little danger of injury thereto.

While I have described in detail only a single embodiment of my invention, I do not desire to be limited to this specific embodiment but intend covering all constructions and arrangements which come within the terms of the definitions of my invention constituting the appended claims.

I claim:

1. In a device of the character described, a two-piece casing comprising an elongated upright cylindrical shell and a detachable base member screw-threaded upon the lower end of the shell to close the same, a nipple extending from the base member for connecting the device with the radiator, a diaphragm housed within and extending across the base member in the plane of the bottom of the nipple, said base member being perforated beneath the diaphragm to permit atmospheric pressure to the underside of the diaphragm, said shell having a port in its upper end, an elongated expansible float within said shell, a valve upon the upper end of the float for controlling said port, and a spider detachably mounted in said base member between the float and the diaphragm, and a pin carried by the float and projecting through said spider into proximity to the diaphragm.

2. In a device of the character described, a two-piece casing comprising an upright shell and a detachable base member screw-threaded upon the lower end of the shell to close the same, a nipple extending from the base member for connecting the device with the radiator, a diaphragm housed within and extending across the base member in the plane of the bottom of the nipple, said base member being perforated beneath the diaphragm to permit atmospheric pressure to the underside of the diaphragm, said shell having a port in its upper end, an expansible float within said shell, a valve upon the upper end of the float for controlling said port, and a pin carried by the float and projecting into proximity to the diaphragm.

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

GEORGE D. HOFFMAN.

Witnesses:
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