C. FEUSER.

RADIATOR AIR VALVE.

APPLICATION FILED APR. 30, 1918.

1,340,439. **Patented May 18, 1920.**

Fig. 1.

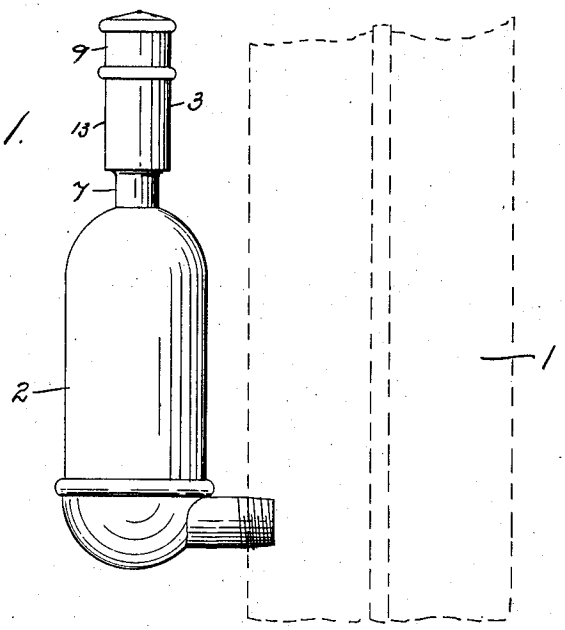


Fig. 6.

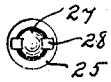


Fig. 5.

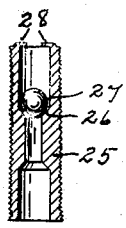


Fig. 2.

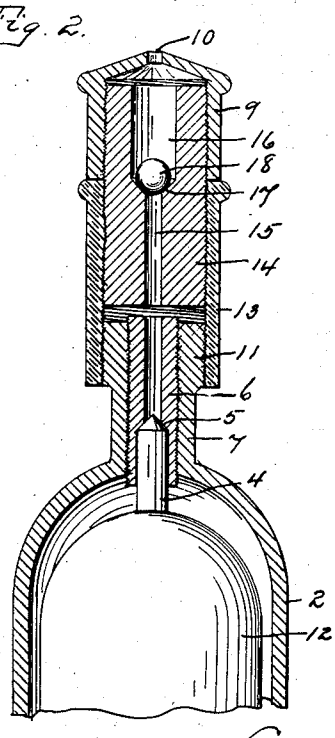


Fig. 3

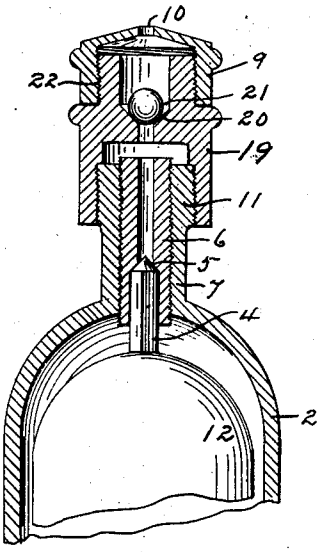
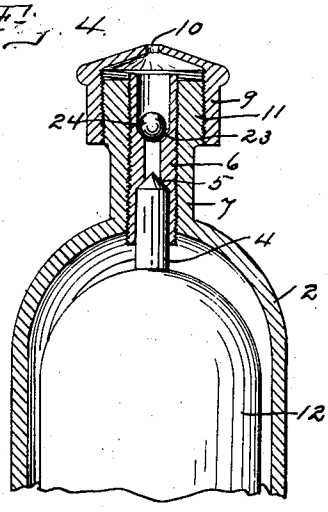


Fig. 4.



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RADIATOR AIR-VALVE.

1,340,439. Specification of Letters Patent. Patented May 18, 1920.

Application filed April 30, 1918. Serial No. 231,601.

To all whom it may concern:

Be it known that I, CONRAD FEUSER, a citizen of the United States, residing in the town of Bloomfield, county of Essex, and State of New Jersey, have invented a new and useful Improvement in Radiator Air-Valves, of which the following is a specification.

In modern steam heating systems, it is the common practice to provide each radiator with a thermostatic air valve whereby, when the temperature and steam pressure falls below a predetermined point, the valve will open and admit air to the radiator and steam pipes. On the other hand, as the temperature and pressure rises from the minimum, the air contained in the system is gradually vented through the air valve, until it is all driven out by the rising and advancing steam and at a predetermined point the valve will close, thus preventing the escape of steam. This system possesses the disadvantage that when the temperature and pressure are at the right point for the valve to open, the inrush of the cooler air condenses the steam in the system and thus the heat "goes down", at times when it is desired to "run under check". In large heating plants it is often found that radiators nearest the furnaces are hot while those more remote are cold, and it is almost impossible to run the furnace "under check" and still have a uniform temperature throughout the plant.

By my improvement I am able to overcome this objection, and at the same time take advantage of a well known principle in physics, which may be stated as follows: "Water boils when the tension of its vapor is equal to the pressure it supports, and the boiling becomes more violent as the tension and the pressure falls."

In carrying out my invention I make use of the several structures described in the following specification and illustrated in the accompanying drawing.

Figure 1, is a side view of a well known radiator air valve, attached to a radiator coil with my improvement secured thereto.

Fig. 2, is an enlarged central vertical section of the device.

Fig. 3, is a similar view of a slight modification.

Fig. 4, is a section of a still further modification.

Fig. 5, is a section of a detached valve plug, as shown in Fig. 4, but having ball retaining tangs thereon.

Fig. 6, is a plan of the plug.

In Fig. 1, I have shown a radiator section 1, with the common air valve 2, attached thereto, and also having my improved valve 3, attached to and coöperating with said air valve.

The air valve 2 is of general cylindrical form having within its chamber, what is sometimes called a float valve, but more properly called a thermostatic valve 4. The valve seat 5 is formed in an adjustable screw threaded plug 6, which is fitted into the neck 7. A cap 9, having a small vent 10, is usually screwed down upon the head 11, to protect the plug 6, from accidental disarrangement after it has been properly adjusted. These parts compose the usual equipment of a radiator air valve. The peculiar feature of the valve 4, is that with the heat "off," it is withdrawn from its seat 5, thus leaving the entire system open to the atmosphere and consequently when the system is idle it is filled with air. However, as the steam is generated in the boiler it rises throughout the system, driving the air through the several air valves 2, until such time as it is completely expelled and the steam begins to escape. If the plug 6, is properly adjusted the valve 4 will seat itself upon the seat 5, when the steam has just begun to escape, *i. e.*, the thermostatic action of the float 12, due to the rise of temperature is sufficient to actuate the valve, and it will remain seated so long as the temperature and pressure behind it remain at or above a predetermined point. When the temperature and pressure fall below that point the valve 4, will be unseated and permit an inrush of air which, being at a temperature considerably lower than that of the steam or vapor within the system rapidly condenses the steam and quickly drives it back to the boiler, leaving the system cold and filled with air. This happens as often as the furnace is run under check, for with a reduction of steam pressure in the system there is a corresponding reduction in the vapor tension due to condensation resulting in the production of a partial vacuum in the system, and the consequent inrush of air through the air valve. This is due to the structure of the air valve.

If some means can be supplied for checking the inrush of air, the production of the

partial vacuum can be made to aid in the maintenance of a considerable degree of heat in the system, and the furnace may be run under check without a corresponding material reduction of temperature in the radiator coils. This means I provide in my present improvement. It consists primarily in providing a check valve in conjunction with the present form of air valve, so located as to permit the free escape of air from the heating system, but preventing its reëntrance into the radiator coils upon the reduction of pressure and temperature therein.

In the form illustrated in Figs. 1 and 2, the cap 9 is removed, and a coupling thimble 13 is substituted therefor. Within this thimble is screwed the threaded plug 14, which latter has the central aperture 15, and its enlarged bore 16, with the valve seat 17, upon which rests the ball valve 18. The cap 9, may then be screwed upon the projecting end of the plug 14, as shown.

In the form shown in Fig. 3, I provide a thimble 19, having its internal valve seat 20, and ball valve 21, as a substitute for the corresponding parts described in connection with Fig. 2. The thimble is internally threaded to fit the head 11, and externally threaded as at 22 to receive the cap 9.

In the form shown in Fig. 4, the usual plug 6, is counterbored to form the valve seat 23, for the ball valve 24. Since facilities are not always at hand to so counterbore the plug 6, I may accomplish the same final result by removing the old plug from the air valve and replacing it with plug 25, already provided with the valve seat 26, and ball 27 as shown in Figs. 5 and 6. Since these parts are quite small, they are liable to separation and may be lost, unless provision is made to keep them together, as a single article of manufacture. This may be readily done, by providing the plug 25, with a pair of tangs 28, which are bent over as shown, after the ball 27 is in place. After the plug 25 is inserted and adjusted for coöperation with the valve 4, as clearly indicated in Fig. 4, the cap 9 may be replaced, and the device is then ready for use.

With the valve 4 inserted, the ball valves of the several forms offer no resistance to the free expulsion of air from the system. However, when the tension of the steam within the radiator falls below atmospheric pressure, the ball valve will be seated, and a further reduction of tension due to falling pressure will create a partial vacuum within the system. But this reduction of tension results in a lowering of the boiling point, and as a consequence steam will continue to be generated in the boiler although the fires may be under check. And while the resulting steam temperature may be considerably below normal steam temperature at atmospheric pressure, yet the heat given off at the radiator is sufficient to maintain an equable temperature in the room in which it is located.

I have not deemed it necessary to further illustrate the internal details of the air valve 2; they are well known in the art, and form no part of my present invention except as a general element of the combination with the check valve.

I claim:

1. As an article of manufacture, a valve case having its lower end internally threaded to receive the screw threaded head of a thermostatic radiator valve and to provide a chamber thereover, and its upper end threaded to receive said radiator valve cap in combination with a ball check valve within said case, whereby air may be expelled from but prevented from returning to said radiator valve.

2. As an article of manufacture, a valve case having a central counterbored aperture therethrough forming a valve seat therein, a ball check valve coöperating with said seat, the upper end of said case having an external thread to receive the cap of a radiator valve, and its lower end being internally threaded to receive the head of said radiator valve and to provide a chamber thereover.

3. As an article of manufacture, a valve case having a counterbored central aperture therethrough forming a valve seat, a ball valve resting upon said seat, said case being externally threaded at its upper end and internally threaded at its lower end whereby the cover cap of a steam radiator air valve may be fitted to said upper end, and said valve case may be screwed upon the head of said radiator air valve and to provide a chamber thereover for coöperation with the thermostatic valve thereof for the purposes set forth.

4. As an article of manufacture, a valve case having a central aperture therethrough, said aperture being counterbored at its upper end to form a conical valve seat, and counterbored and threaded at its lower end to receive the nipple of a thermostatic radiator air valve and to provide a chamber thereover, a ball valve upon said valve seat and a retaining cap screwed upon the upper end of said valve case, said cap having a vent therein for the escape of air through said case.

CONRAD FEUSER.