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T. F. DEXTER.

AUTOMATIC RELIEF VALVE FOR STEAM HEATING SYSTEMS.

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FIG. 1.

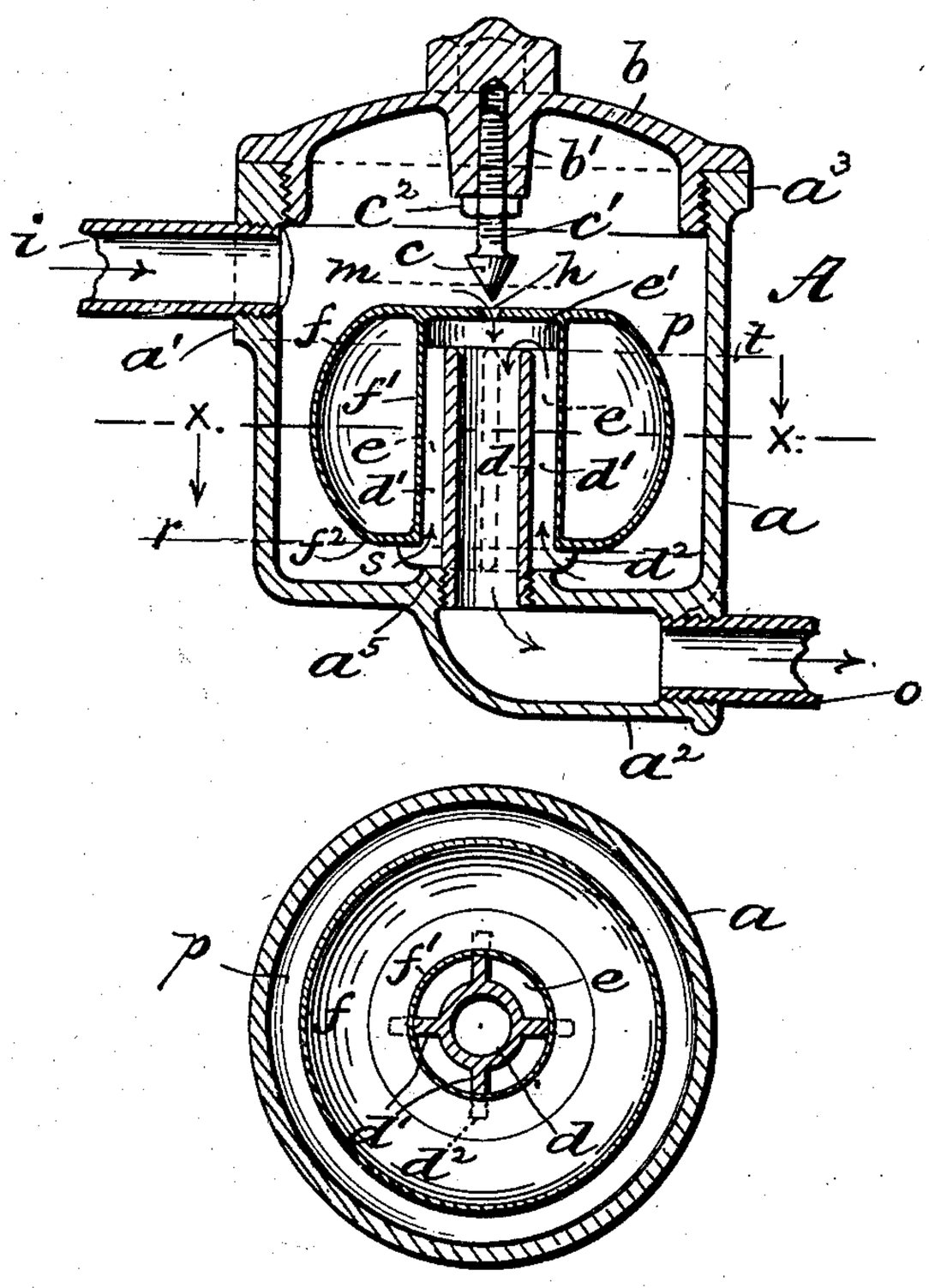

FIG. 2.

WITNESSES.

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AUTOMATIC RELIEF-VALVE FOR STEAM-HEATING SYSTEMS.

No. 840,304. Specification of Letters Patent. Patented Jan. 1, 1907.

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To all whom it may concern:

Be it known that I, THOMAS F. DEXTER, a citizen of the United States of America, and a resident of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Automatic Relief-Valves for Steam-Heating Systems, of which the following is a specification.

My present invention relates to "relief-valves," so called, for steam-heating systems; and it consists of certain novel features or improvements which are illustrated herewith and hereinafter fully set forth and claimed.

In steam-heating systems it is usual, so far as I am aware, to connect the discharge or outlet passages of radiators or other analogous heating devices with "vacuum-valves," so called, in which are movably mounted motor valves, pistons, or diaphragms, constructed and arranged so that said movable members when in use are adapted to normally close the discharge-openings leading from the valves to the exhaust or vacuum pumps of the systems and each vacuum-valve having a small normally open air-vent communicating both with the inlet and outlet passages of the valve. As thus heretofore constructed the devices are incapable of discharging the condensed steam (water) therefrom unless the motor valves, pistons, &c., employed rise or uncover the outlet-passages, because said movable members are, in effect, valves proper and open or become operative only by the accumulation of water in the valve casing or body.

The object I have in view is to produce a simple, inexpensive, and thoroughly-reliable relief-valve possessing advantages over other relief-valves of the class above referred to and also being adapted to positively prevent the flooding of the valve and radiator by an excess volume of water.

In my improved vacuum-valve, a valve proper not being used, I employ a guided vertically-movable float or buoyant member surrounding but not closing the discharge-outlet, the latter being normally open practically to its full area or extent at all times both to the inlet-passage leading from the radiator and to the exhaust or vacuum pump.

It is to be particularly noted that in my improved construction the full net area of the open main outlet-passages is maintained at all times and is not materially affected by the action of the float in any of its positions.

In the accompanying sheet of drawings, illustrating my invention, Figure 1 is a vertical central sectional view thereof, the parts being represented in the normal position ready for use or service; and Fig. 2 is a horizontal sectional view taken on line x x of Fig. 1.

Devices of the class herein referred to are generally termed "vacuum" or "relief" valves. In my improved vacuum-valve A (although, as before stated, a valve proper is not employed) a in the drawings indicates the body or casing provided with an inlet a' at or near the top and an outlet a^2, located at the bottom.

The top end a^3 of the casing has a cover b removably secured thereto. The center of the base of the body is provided interiorly with a short boss a^5, into which is firmly screwed the continuously-open vertical discharge or outlet pipe d, the latter being provided exteriorly with integral radially-projecting narrow ribs or wings d', the lower ends of which are still farther extended to form a support d^2 for the vertically-movable float. The said float member f is air-tight and annular, its inner wall f' being adapted to freely engage with and be laterally guided by the ribs d' of said stationary outlet-pipe d. When the float is in the normal or non-working position, its bottom f^2 rests upon the supports d^2. The top wall extends flatwise entirely across the float and is provided with a small central hole or air-vent passage h, all as clearly shown.

To the under side of the cover b a centrally-located downwardly-extending plug member c is adjustably secured, said plug having, as drawn, a screw-threaded shank c' screwed into the boss b', a lock-nut c^2 maintaining the plug in position with respect to said small air-vent h of the float.

In the improved device A thus constructed and arranged water discharged—say from a radiator via pipe i into the main chamber p of the casing—first gradually fills the spaces at the bottom (the air-vent h meanwhile being freely open to the exhaust) until it reaches the level r, (indicated by the dotted line,) thereby automatically sealing the vertical passages e at the bottom (formed between the adjacent surfaces of the parts d and f')

and preventing the entrance of air or steam at that point. When in normal action, the continued accumulation of water rising in said chamber *p* and passages *e* overcomes the weight of the float (at or near the level *x x*) and elevates it a short distance or to the previously-adjusted limit, (indicated by the dotted line *m*,) thereby at the same time completely closing the air-vent *h* through the medium of the interposed stop or plug *c*.

As hereinbefore stated, the outlet-passage *d* and its communicating pipe *o* are adapted to be connected with exhaust or suction means, whereby when the air-vent is closed and the float sealed at the bottom the differential in pressures is increased—that is, the degree of vacuum or minus pressure is increased—the result being to suck the water in the passages *e* upwardly into the top space or chamber *e'* and overflow into the mouth or inlet end of the stationary vertical pipe *d*, (see arrows,) or, in other words, a siphoning action is produced, since the outlet end is below the bottom of the device. Now in case the thus-outflowing water in the chamber *p* is again lowered to or nearly to the level *r*, the seal becomes broken, thereby at the same time admitting air or vapor under the float and into the vacuum-column. Previous to this, however, the falling float uncovers the air-vent *h*, thus destroying the siphon action and temporarily stopping the outflow of the water, the operation being automatically and intermittingly continued.

In case the float should fail to rise or become inoperative from any cause (a contingency not liable to occur) the water, upon reaching the level of the mouth of the outlet-pipe *d*, (indicated by the dotted line *t*,) overflows into said pipe by gravity, and since the area of the passages *e*, as well as that of the chamber *e'*, are equal to or exceed that of the discharge-pipe it follows that the water will not rise much, if any, above said level *t*, the latter being located below the main inlet-passage *i*, all as clearly shown.

While, as before stated, the passage of pipe *d* is continuously open and capable of discharging all the water of condensation irrespective of the position of the float, it may be added that when the latter is in the lowest position (shown in Fig. 1) the vent *h* permits the free passage therethrough of a small quantity of air and steam or vapor to the return-line of piping and circulating-pump, the latter then working idly. While the vent remains unclosed a sufficient vacuum or siphoning action cannot be maintained in the pump to lift the water from the chamber *p* to the inlet end of the pipe *d;* but whenever the water in said chamber rises therein sufficiently to elevate the float the vent-opening is thereby closed and the flow of steam or vapor to the pump cut off, thus reducing the latter's temperature and correspondingly increasing the degree of vacuum therein and re-establishing the siphon-column, whereby the pump action then operates to draw or lift the water upwardly in the passages *e* and overflows into the discharge-pipe *o*, adapted to be connected with the pump.

I may further state that in practice the water-level is always materially higher than the line *r* when the float is in its lower normal working position, (but not resting on the supports d^2,) thus forming a water seal at all times and preventing any escape of air or steam from the chamber *p* except through the small air-vent *h* at the top, which then may be open.

I claim as my invention—

1. As a new and improved article of manufacture, a relief-valve for steam-heating systems, the same comprising a chambered casing having suitably-arranged main inlet and discharge passages, a fixed vertical pipe or element *d* mounted in said casing and being in continuously-open communication with said discharge-passage, a movably-mounted air-vented float member enveloping the upper end and side portions of said pipe and forming a continuously-open way between the casing-chamber and the top of said member *d* for the flow of the water of condensation, and means for automatically closing the air-vent of the float when the latter rises to a predetermined point.

2. In a device of the character described, the combination of a chambered body or casing having open main inlet and discharge passages, a vertically-extending tube within the casing-chamber in open communication with said discharge-passage, an air-vented movable float member enveloping or surrounding the upper portion of said discharge-tube and forming therewith a practically unobstructed continuously-open duct for the flow of water from the chamber, and means coöperating with the float for automatically closing its air-vent when the float rises to a predetermined point.

3. In a device of the character described, the combination with the chambered casing having main inlet and discharge passages and an upwardly-extending central tube *d* communicating with said discharge-passage, of a vertically-guided air-vented movable float interposed between said inlet and discharge passages and loosely enveloping the member *d* and also forming therewith a continuously-open passage-way, and means for closing the said air-vent of the float.

4. In a device of the character described, the combination with a casing having an inlet *i* and an outlet at or near the base and below said inlet, a cover removably secured to the casing, an adjustably-mounted plug or vent-closure, and a vertically-arranged

ribbed continuously-open discharge-tube secured to the base of the casing and communicating with said outlet, of a movable float member having a small air-vent in its upper end, said float being supported and guided by said tube, all constructed and arranged so that a free passage-way is maintained at all times between the casing-chamber and said base-outlet for the passage of the water of condensation.

Signed at Providence, Rhode Island, this 24th day of November, 1905.

THOMAS F. DEXTER.

Witnesses:

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