No. 795,448. PATENTED JULY 25, 1905.

A. McGONAGLE.

RELIEF VALVE FOR HEATING SYSTEMS.

APPLICATION FILED SEPT. 21, 1904.

2 SHEETS—SHEET 1.

Fig. 1,

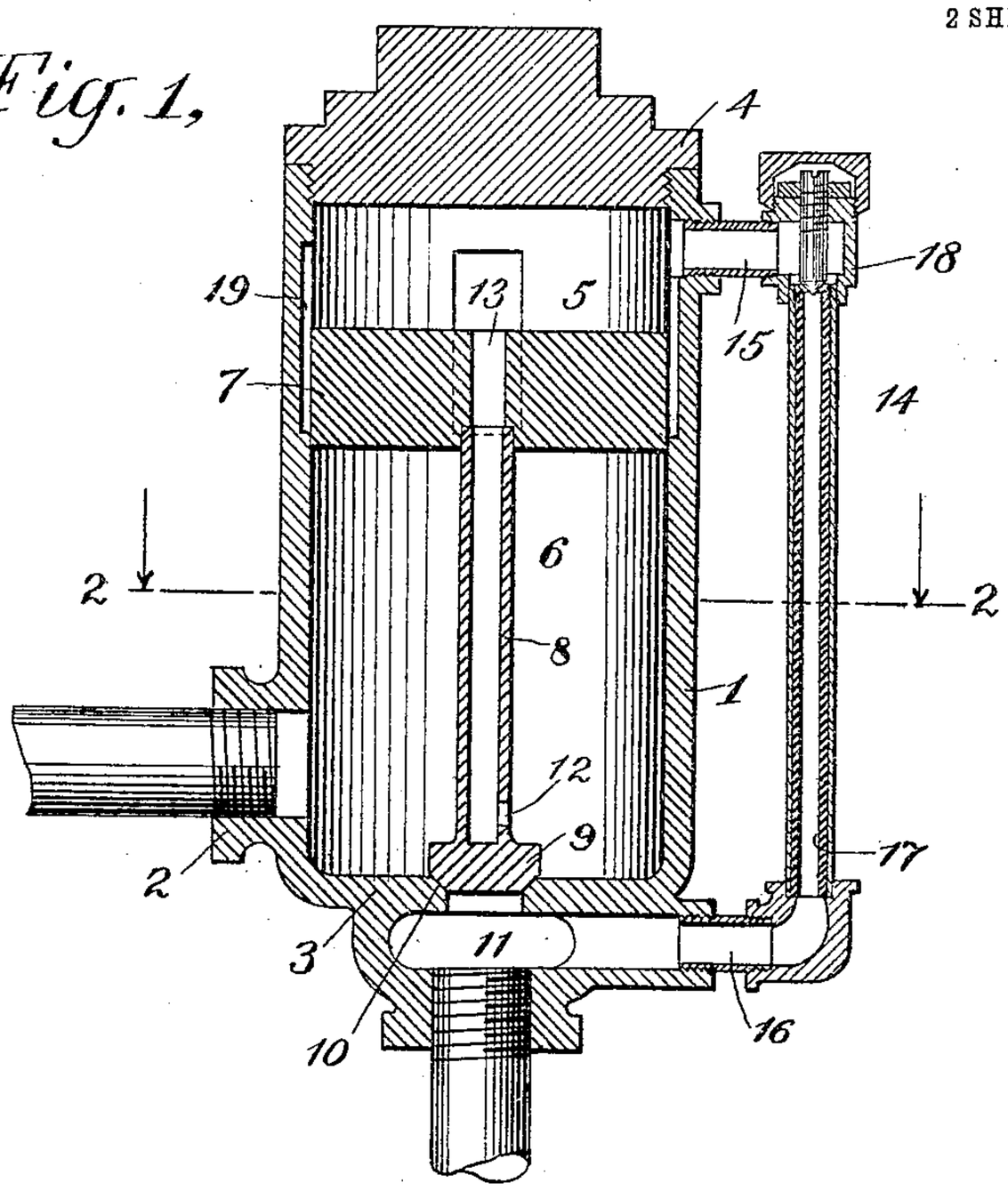

Fig. 2,

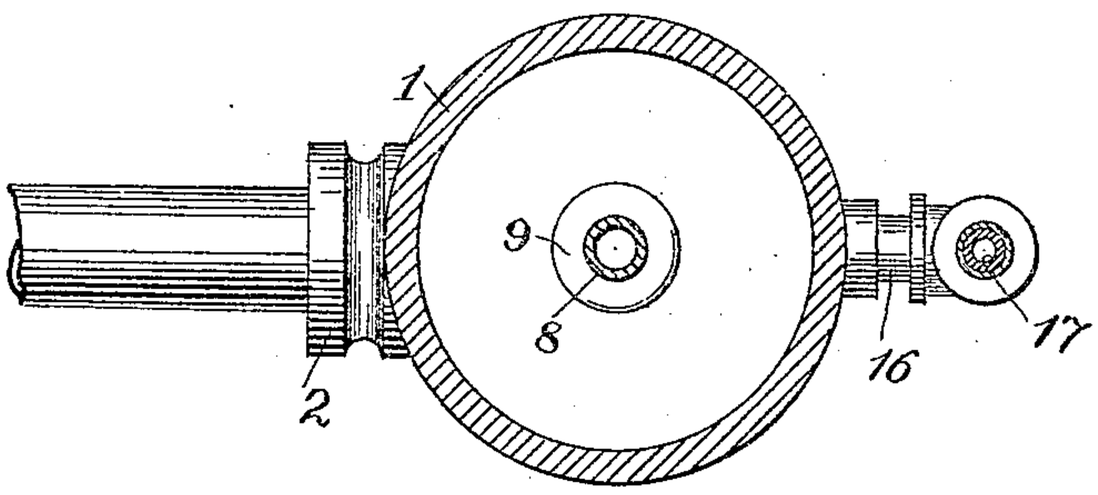

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Fig. 3,

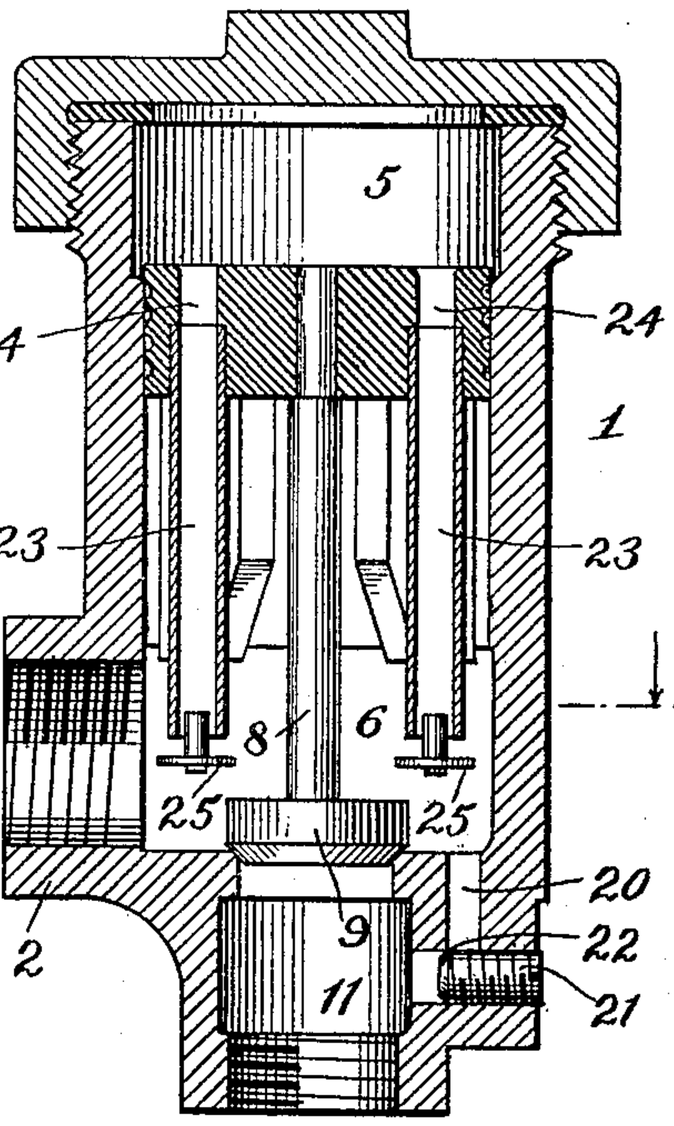


Fig. 5,

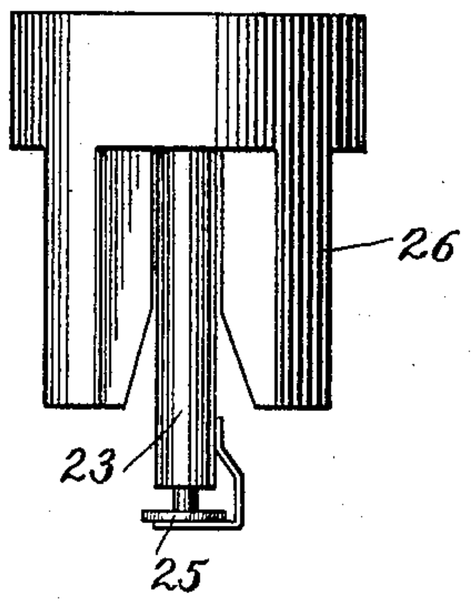
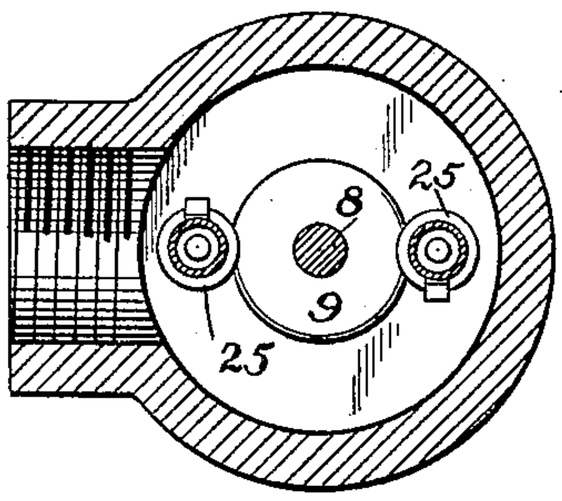


Fig. 4,



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RELIEF-VALVE FOR HEATING SYSTEMS.

No. 795,448. Specification of Letters Patent. Patented July 25, 1905.

Application filed September 21, 1904. Serial No. 225,305.

To all whom it may concern:

Be it known that I, ARTHUR McGONAGLE, a citizen of the United States of America, and a resident of East Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Relief-Valves for Heating Systems, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to relief-valves for heating systems, and particularly to devices for permitting the discharge of air and water, while preventing waste of steam.

A device constructed according to the preferred form of my invention permits free discharge of air, but automatically closes against the discharge of steam, and means is provided in the device for opening a valve to intermittently discharge water which may collect therein.

In carrying out my invention I employ a valve-casing, a valve, and a pressure-operated device for controlling said valve. A passage is provided affording communication between opposite sides of the pressure-operated device, which passage is arranged to be closed or sealed at its lower end by water in the casing, whereby the pressure-operated device may be moved to open the valve by inequality of fluid-pressure upon the opposite sides thereof. In this form of my invention air is allowed to discharge through a by-pass, while steam is prevented from passage therethrough by a thermostatic device.

I have shown a modified form of my invention in which water accumulating in the device is freed in substantially the same manner, but in which a constantly open but restricted by-pass permits the escape of air and while not fully preventing the escape of steam restricts such escape to but a small leakage.

My invention also consists in certain novel details of construction and combination of parts, as will be hereinafter more fully set forth.

I will now proceed to describe a device embodying my invention and will then point out the novel features in claims.

In the drawings, Figure 1 is a view in central vertical section of a relief-valve embodying my invention. Fig. 2 is a view in horizontal section of the same, the plane of section being taken upon the line 2 2 of Fig. 1. Fig. 3 is a view in central vertical section of a modification of my invention. Fig. 4 is a view in horizontal section therethrough, the plane of section being taken upon the line 4 4 of Fig. 3. Fig. 5 is a detail detached view of a pressure-operated piston employed in the construction shown in Fig. 3.

Referring first more particularly to Figs. 1 and 2, the device illustrated will be seen to comprise a casing 1, having a connection 2, by which it may be connected with a radiator or other portion of a steam-heating system and having a closed bottom 3 and a removable top cap 4. The casing 1 is divided into upper and lower chambers 5 and 6, respectively, by a piston 7, constituting a pressure-operated means. To the bottom of the piston 7 is secured the upper end of a hollow valve-stem 8, carrying at its lower end a valve 9. The valve 9 is fitted to a valve-seat 10, formed in the bottom 3 of the casing 1. The valve-seat opens into a discharge 11, which may run to waste or elsewhere, as may be desired. Near its lower end the valve-stem 8 is provided with an opening 12, which opens into the chamber 6 of the casing 1, while the piston has an opening therethrough, as at 13, which communicates with the interior of the hollow stem 8 and with the upper casing-chamber 5.

A by-pass 14 communicates with the upper chamber 5 through a short section of pipe 15 and with the discharge 11 through a short section of pipe 16. A hollow thermostatic tube 17 is arranged in the by-pass and is arranged upon expansion to close passage past a conical valve-plug 18, whereby passage through the by-pass will be closed. When contracted, free passage will be allowed through the said by-pass.

The operation of the device is as follows: Air from the radiator or other portion of the heating system entering through the connection 2 to the chamber 6 will pass freely through the opening 12, up through the hollow valve-stem 8, through the opening 13 in the piston into the chamber 5, thence through the by-pass 14 to the discharge 11. Steam entering the casing and attempting to pass through the same channel will expand the thermostatic member 17, so as to close the by-pass and prevent the escape of the steam to discharge. Water collecting in the chamber 6 will seal the opening 12 and prevent further steam from passing into the upper chamber 5. The steam in the upper chamber 5 will gradually then condense and will

hence lower the pressure in the said chamber below atmospheric pressure, whereby the piston 7 will be lifted by pressure beneath same. Atmospheric pressure would so lift the piston; but the pressure beneath same will be above atmospheric pressure at such time, and hence there will be an excess of power to lift the piston, resulting in the lifting of the valve 9 away from its seat 10 and the discharge of water from the chamber 6. After the water is discharged the piston will again descend and the valve close. I have shown channels 19 in the side walls of the casing 1, whereby a communication will be quickly afforded between the chambers 5 and 6 when the piston is lifted, because the excess pressure in the lower chamber 6 may be sufficient to hold a small column of water in the hollow valve-stem 8, such as would otherwise prevent proper establishment of communication between the chambers 5 and 6 to balance the piston. The weight of the piston, valve-stem, and valve will ordinarily be sufficient to return the parts to normal position by gravity, but other means may be employed, if desired.

In the construction shown in Figs. 3, 4, and 5 I have dispensed with the thermostatically-controlled by-pass and have provided in lieu thereof a by-pass 20, which affords communication between the chamber 6 and the discharge 11. This by-pass 20 is controlled by an adjustable plug 21, which will provide a restricted opening 22 therein readily adjustable to the required area. In this construction the valve-stem 8 is solid and the piston is provided with two depending tubes 23, open at their upper and lower ends and at their upper ends communicating with openings 24, leading through the piston into the chamber 5. At their lower ends the tubes 23 preferably carry light valves 25, which under certain conditions will close the ends of the said tubes, so as to close communication between the upper and lower chambers 5 and 6. The operation of this construction is as follows: Air entering the chamber 6 through the connection 2 will pass through the by-pass 20, past the restricted orifice 22, into the discharge 11. The restricted orifice 22, however, may be so small that while it will fully permit the escape of air it will permit but a slight leakage of steam therethrough, it being understood that air will pass very much more quickly through a restricted opening than will steam. Water accumulating at the lower end of the chamber 6 will seal the lower ends of the tubes 23, and upon the steam condensing in the chamber 5 the pressure beneath the piston 7 will cause the same to lift, opening the valve 9 to permit the water to pass into the discharge 11. The small valve-disks 25, which will remain open so long as the passage of fluid past same in an upward direction is not too rapid, will be immediately closed by the rapid passage of fluid, so that a suction in the chamber 7, which would tend to cause water to rise rapidly in the tubes 23, will immediately close the valve 25, so as to prevent further passage of water past same. The valves are provided in this case as an additional precaution, it being understood that the weight of the column of water in the tubes might be sufficient to prevent more than a limited amount of water being thus lifted, and the length of the tubes may be so regulated as to provide for this, if desired. Two tubes are shown in this construction instead of a single tube—namely, the hollow valve-stem provided in the other construction, so as to give a circulation from one chamber to the other in order to expel the air in the upper chamber, such circulation being provided in the construction shown in Figs. 1 and 2 by the escape of air through the thermostatically-controlled by-pass. In this particular construction I have shown the chamber 5 as somewhat enlarged, as will be seen, and have provided the piston with downwardly-extending guide-wings 26, whereby in its extreme upward movement circulation will be established around the piston-head between the upper and lower chambers 5 and 6.

What I claim is—

1. In a valve device of the character described, the combination with a valve-casing, of a fluid-pressure-operated means dividing the casing into upper and lower chambers, the lower chamber being provided with an intake connection and a valve-seat opening into discharge, a valve fitted to said valve-seat and connected to said fluid-pressure-operated means, said device having a passage leading through the fluid-pressure-operated means from front to rear thereof, said passage arranged to be sealed by entrance of water therein from the lower chamber of the casing, whereby a difference in pressure thus permitted between the opposite sides of the fluid-pressure-operated device may operate same to lift the said valve, the water contained in said lower chamber emptying into said discharge when said valve is lifted.

2. In a valve of the character described, the combination with a casing, a piston dividing said casing into upper and lower chambers, and a valve carried by said piston, said piston having an opening therethrough and a hollow depending stem affording communication between the two chambers on opposite sides of the said piston, the passage therethrough arranged to be sealed by water in the lower chamber of the casing, of a by-pass leading around said valve and said piston, said by-pass including means for permitting the passage of air therethrough, but substantially preventing the passage of steam.

3. In a valve device of the character de

scribed, the combination with a valve-casing, of a piston therein dividing the casing into upper and lower chambers, and a valve and stem secured to and carried by said piston, said piston and valve-stem having a passage therethrough affording open communication between the upper and lower chambers, substantially as set forth.

4. In a valve device of the character described, the combination with a valve-casing, of a piston therein dividing the casing into upper and lower chambers, and a valve and stem secured to and carried by said piston, said piston and valve-stem having a passage therethrough affording open communication between the upper and lower chambers, and said casing provided with a by-pass around said valve.

5. In a valve device of the character described, the combination with a valve-casing, of a piston therein dividing the casing into upper and lower chambers, and a valve and stem secured to and carried by said piston, said piston and valve-stem having a passage therethrough affording open communication between the upper and lower chambers, and said casing provided with a by-pass around said valve, said by-pass including means for permitting the passage of air therethrough, but preventing the passage therethrough of steam.

6. In a valve device of the character described, the combination with a valve-casing, of a piston therein dividing the casing into upper and lower chambers, and a valve and stem secured to and carried by said piston, said piston and valve-stem having a passage therethrough affording open communication between the upper and lower chambers, and said casing provided with a by-pass around said valve, said by-pass including thermostatic means for closing same.

7. In a valve device of the character described, the combination with a valve-casing, of a piston therein dividing the casing into upper and lower chambers, and a valve and stem secured to and carried by said piston, said piston and valve-stem having a passage therethrough affording open communication between the upper and lower chambers, the walls of said casing having a channel affording communication between the upper and lower chambers only when the piston is lifted.

ARTHUR McGONAGLE.

Witnesses:
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C. F. CARRINGTON.