Jan. 9, 1945. M. E. MILLER 2,366,746

EQUALIZING RETURN TRAP

Filed Oct. 22, 1941 2 Sheets-Sheet 1

Fig. 1

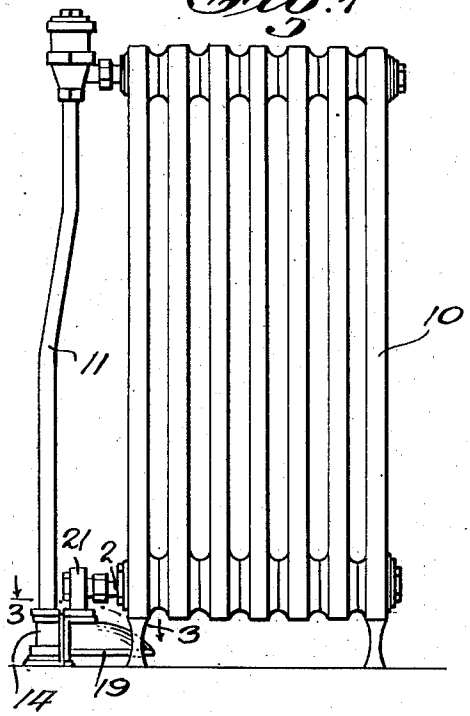


Fig. 2

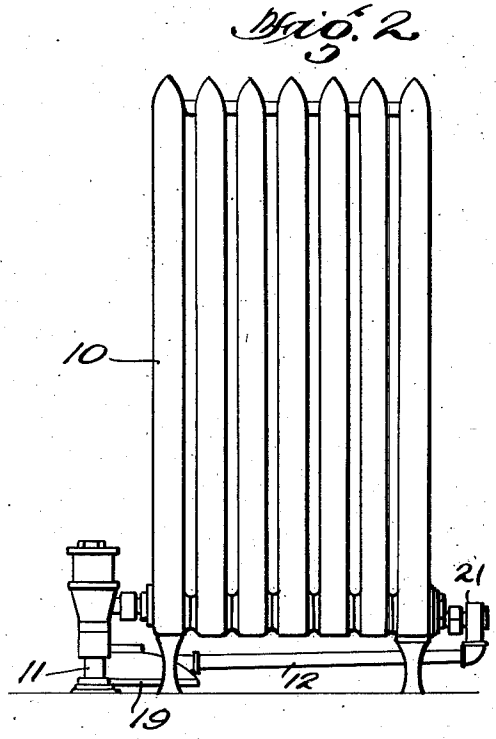
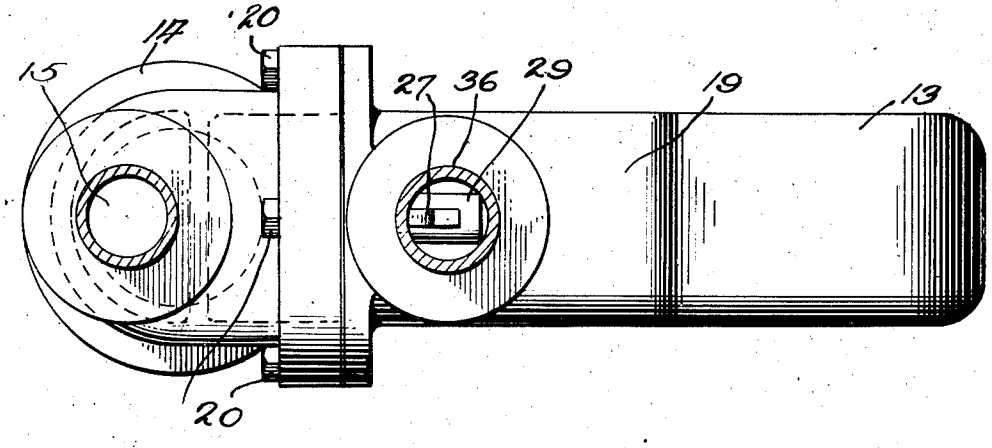


Fig. 3



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Filed Oct. 22, 1941 2 Sheets-Sheet 2

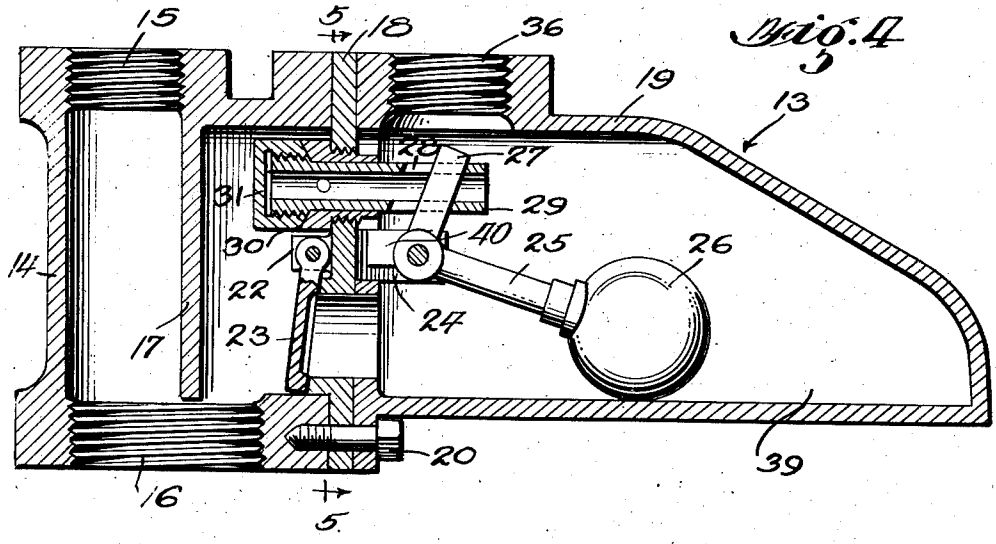


Fig. 4

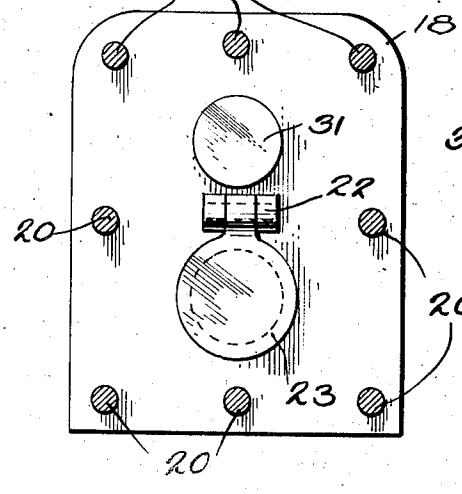


Fig. 5

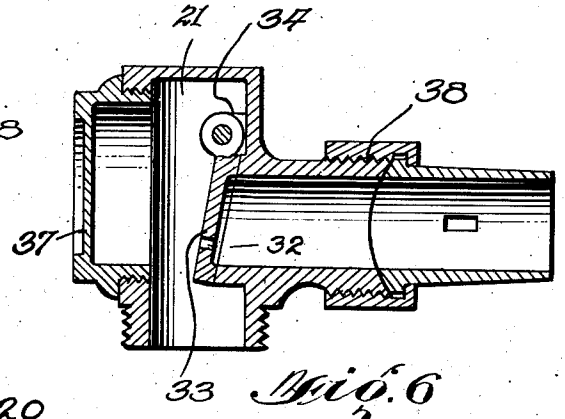


Fig. 6

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UNITED STATES PATENT OFFICE

2,366,746

EQUALIZING RETURN TRAP

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Application October 22, 1941, Serial No. 416,054

9 Claims. (Cl. 237—73)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein, if patented, may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

This invention relates to an equalizing return trap and more particularly to a return trap for use in one pipe steam heating systems.

The control of steam supplied to a radiator of a one pipe heating system has never been satisfactorily accomplished because the steam to the radiator and the water condensed by the radiator must pass through to the radiator and leave the radiator through the same valve opening. Therefore the valve must be either fully opened or closed. For this same reason it is not practical to thermostatically control the steam to the radiators of a one pipe heating system.

Therefore, an object of the invention is to provide an improved trap for use in connection with a one pipe heating system to control the passage of steam therethrough in one direction toward a radiator or the like and also to control the flow of condensate therethrough in the opposite direction.

A further object of the invention is to provide an improved trap for use in a one pipe modulating steam system that is manually controlled or thermostatically controlled. The device, therefore, contemplates the provision of an equalizing return trap which may be used on the radiator of a one pipe heating system which will make it possible not only to control the steam supply to the radiators by manually controlled radiator valves but also by thermostatic radiator valves.

It is to be understood that the invention is capable of numerous mechanical expressions, one of which, for purposes of illustration, is shown in the accompanying drawings, but it is to be understood that this is for purposes of illustration only and is not to be construed as a limitation of the invention, since slight changes in form and minor details of construction may be resorted to without departing from the spirit of the invention.

Referring now to the drawings, in which similar characters and references in the figures indicate identical parts:

Fig. 1 is a side elevation of a radiator illustrating the application of the trap.

Fig. 2 is a side elevation of a radiator illustrating a modified form of the trap.

Fig. 3 is a top plan view of the invention taken on line 3—3 of Fig. 1.

Fig. 4 is a vertical section of the trap.

Fig. 5 is a vertical transverse section taken on line 5—5 of Fig. 4.

Fig. 6 is a vertical section of the check valve.

Reference now being had to the drawings by numerals, in Fig. 1 10 designates a radiator and valve of common construction, 11 a feed pipe and 2 the return connection, both of which are adapted to be connected to the radiator in any suitable manner. Between the main steam supply pipe, not shown, and the feed pipe 11 and return connection 2 is the equalizing return trap 13, which is composed of a steam separating fitting 14 having an outlet 15, an inlet 16 and a baffle plate 17, which divides the fitting 14 into two parts, one for the steam supply to the radiator and the other for discharging the condensate to the one pipe supply, a valve mechanism plate 18 and the trap body 19. Bolts 20 are provided to connect the above parts together as a unit.

The return trap 13 contains the mechanism for seating and unseating the valve, which controls the passage of the equalizing steam and the discharge of the condensation respectively. A check valve housing 21 is mounted on the trap 13 as shown in Fig. 1, and interposed between it and the return connection 2. The trap shown in Figs. 1 and 2 is duplicate in construction except that the check valve 21 is directly connected to the trap in Fig. 1 and is connected to the radiator 10 and then to the trap 13 by return pipe 12 in Fig. 2.

The plate 18 is provided with arms 22 on which is pivotally mounted a flap or check valve 23, while on the opposite side of the plate 18 arms 24 are provided to pivotally receive the float lever 25 on which is mounted a float 26. A projection 27 provided on the opposite end of the float lever 25 is adapted to reciprocate in the slotted opening 28 in the valve stem 29, thereby reciprocating the valve stem 29 in the valve seat 30. A cap 31 having a beveled rim is threaded on the stem 29 immediately beyond the apertures provided in the stem for the passage of the steam into the trap. These apertures are closed when the valve is in its right hand position, as seen in Fig. 4, both by the cylindrical bore of the bushing providing the valve seat 30 and by the beveled rim of the cap 31, which is adapted to seat on valve seat 30. A check valve 33 is pivotally mounted on arms 34 within a housing 21, which is adapted to be threaded into opening 36 of the trap body 19. One side of the housing 21 is closed by a plug 37 and the other side of the housing 21 is adapted to be connected to the return connection 2 by means of union 38.

As shown in Fig. 2, a modified assembly, the check valve housing is connected to the radiator 10 and to a return pipe 12 which extends beneath the radiator to the connection 36 of the trap.

As the steam within the radiator condenses, the weight of the water overcomes the differential in steam pressure and discharges to the reservoir 39 of the trap body. The swingable check valve 33 has a small vent 32 drilled therein so that no vacuum can be formed in the radiator to hold the valve shut. This opening is so small that no substantial amount of steam and water escapes from the trap and quick equalization of the pressure in the pipe and trap results when the pressure equalizing valve is opened, in spite of its presence. When the water in the reservoir reaches a certain level, the float 26 reciprocates the valve stem and admits steam on top of the water in the trap at the same time and the steam holds the check valve 33 shut to the radiator. Therefore, when the steam in the trap and in the supply line are equalized the water will raise the flap or check valve 23 and discharge to the supply line by way of outlet 16 and be returned to the boiler. The float 26 has a counterweight 40 formed integrally with the projection 27 and float lever 25 for counterbalancing the float assembly. The slotted connection between the valve stem 29 and the arm 27 of the float lever assembly provides for shifting the valve only at the extremity of the movements of the float, thus insuring the discharge of a substantial quantity of condensate at each operation of the device. The length of the slot 28 determines the high and low levels of condensate in the trap, though the position of the valve stem in the seat 30 may also be controlled by adjustment of the cap 31 on the stem.

In this manner there is provided a steam equalizing trap which returns the water condensed by the radiator back into the one pipe steam connection to the radiator without requiring that the steam supply to the radiator be either on or off or in any particular adjustment.

The operation of the device should be understood from the previous description and it is not thought necessary to go into a detailed account of said operation.

While only one embodiment of the invention has been described and illustrated in the drawings, it will be apparent that the invention is capable of a wide variety of mechanical expressions and that changes may be made in the form and details of construction and arrangement of parts without departing from the spirit of the invention and the scope of the appended claims.

Having thus described the invention, what is claimed as new and desired to secure by Letters Patent is:

1. An equalizing condensate return trap for a one pipe steam heating system comprising a housing having an opening adapted to be connected to the bottom of a radiator and having two openings for connection to the pipe adjacent the radiator, and means controlled by accumulated condensate in the housing to admit steam from the pipe into the trap through one opening and allow the condensate to escape into the pipe through the other.

2. An equalizing condensate return trap for a one pipe heating system comprising a housing having two chambers, one having two openings adapted to be connected to the pipe to form a section thereof and the other having an opening for connection to the lower portion of a radiator, the second chamber serving as a trap for condensate, and two valved passages between the chambers, one valve operated by accumulated condensate to equalize the pressure between the pipe and the trap and the other valve permitting outflow of the condensate when the pressure is equalized.

3. An equalizing condensate return trap for a one pipe steam heating system comprising a housing having openings adapted to be connected to the bottom of a radiator and the steam pipe therefor, and having a check valve in between the housing and the pipe opening with the flow of condensate and against the pressure of the steam in the pipe, and means controlled by the accumulation of condensate within the housing for equalizing the pressure between the pipe and the housing, thereby permitting the condensate to flow through the check valve.

4. An equalizing condensate return trap adapted to be connected between the lower part of a closed heating system and a steam pipe feeding the same, comprising a chamber having a passage leading from the system with a check valve therein and two passages to the steam pipe, one with an outwardly opening check valve and the other with a valve automatically opened by accumulated condensate to admit steam from the pipe to equalize the pressure between the trap and the pipe, the first-mentioned check valve preventing back flow of steam and condensate into the system.

5. The combination of a radiator having a steam inlet pipe and a trap for returning condensate to the steam pipe comprising two chambers communicating with the radiator and the steam pipe respectively, said chambers having two valved passages between them, one automatically controlled by the trapped condensate for equalizing the pressure between the chamber and the pipe and the other opened by the pressure of the condensate when the vapor pressures are equalized between the trap and pipe.

6. A radiator having a steam inlet pipe and a condensate return trap connected between the lowest point of the radiator and the pipe, said trap having a wall forming a pipe wall and provided with two valved passages, one automatically controlled by the condensate in the trap for admitting steam from the pipe to the trap, the other for releasing the condensate when the pressure in the trap is substantially equal to that in the pipe, and a baffle shielding the passage openings on the side of the wall within the pipe.

7. A steam circulating system having a steam supply line and a closed area in which condensation takes place and means for returning condensate from the lower part of the area to the steam supply line, said means comprising a chamber having a passage from the closed area containing a check valve opening toward the chamber and a small vent between the chamber and said area, said chamber being connected to the steam line by two passages, one having an outwardly opening check valve for condensate flow and the other having a valve automatically opened to admit steam to the trap when it is full of condensate and closed when the condensate has drained away.

8. The combination of a one pipe steam radiator and a condensate return trap, said trap having a passage connected to the bottom of the radiator and two valved passages to the steam pipe, one valve being controlled by the liquid level in the trap and the other being operated by the

pressure of the condensate, the first-mentioned valve comprising a cylindrical casing forming one of the passages between the trap and pipe and a hollow tubular valve slidable in said casing and projecting at both ends, said valve having a cap on the end projecting into the pipe, the flange of said cap seating on the casing when the valve is closed, the tubular wall of said valve having apertures adjacent said cap for the passage of steam and an elongated slot at the trap end, said end being open, and operating means for the valve comprising a triple-armed lever, one arm carrying a weight, one a float, and one passing through the slot in the valve to form a lost motion operating connection.

9. The combination of a one pipe steam radiator and a condensate return trap, said trap having a passage connected to the bottom of the radiator and two valved passages to the steam pipe, one valve being controlled by the liquid level in the trap and the other being operated by the pressure of the condensate, the first-mentioned valve comprising a tubular hollow valve closed at one end and slidable in the connecting passage and projecting therefrom at both ends, said valve having apertures near the closed end alternately closed by the passage or being projected therefrom, and float-lever operating means having a lost motion connection with the other projecting end of the valve.

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