Aug. 4, 1942. H. A. LOCKHART ET AL 2,292,138

HOT WATER HEATING SYSTEM

Filed March 18, 1940 3 Sheets-Sheet 1

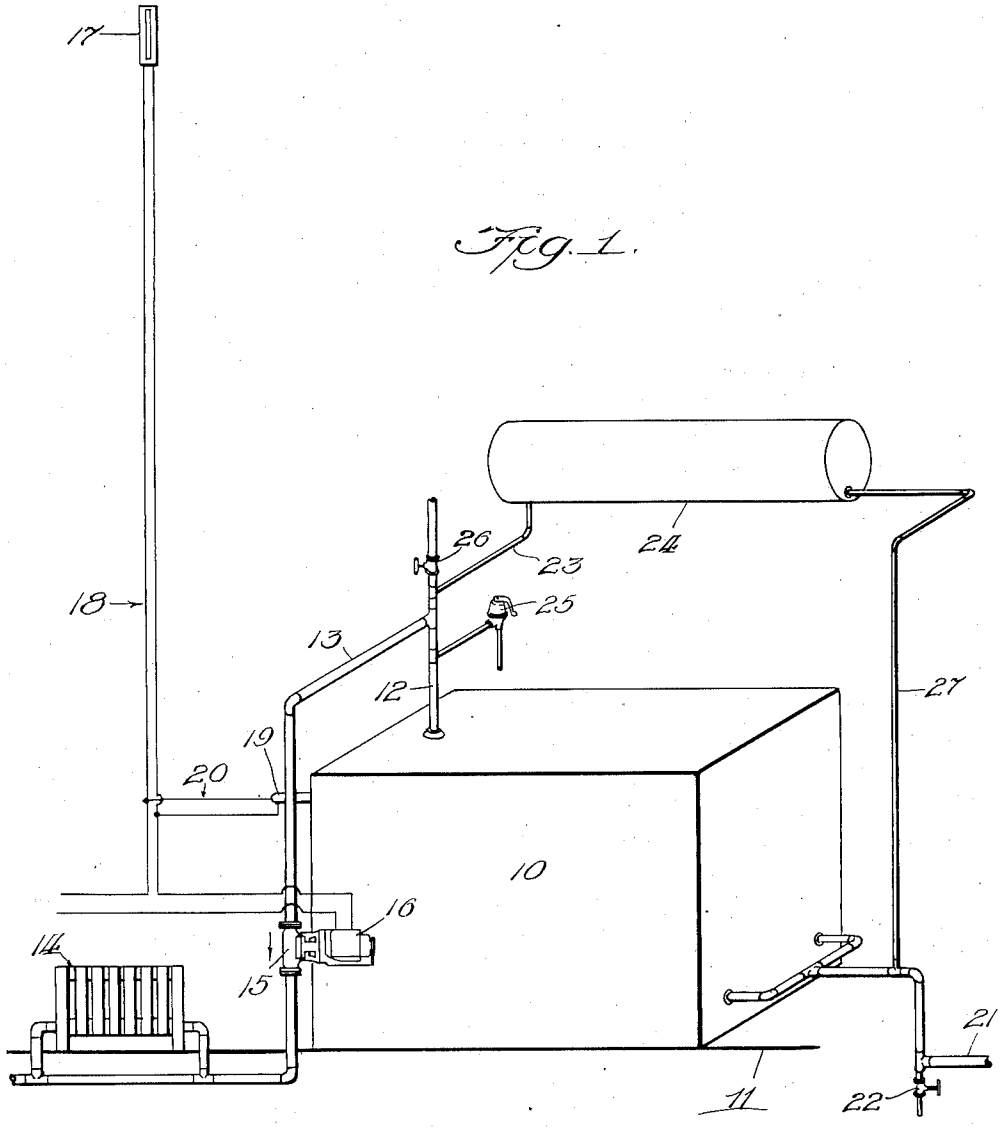


Fig. 1.

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HOT WATER HEATING SYSTEM

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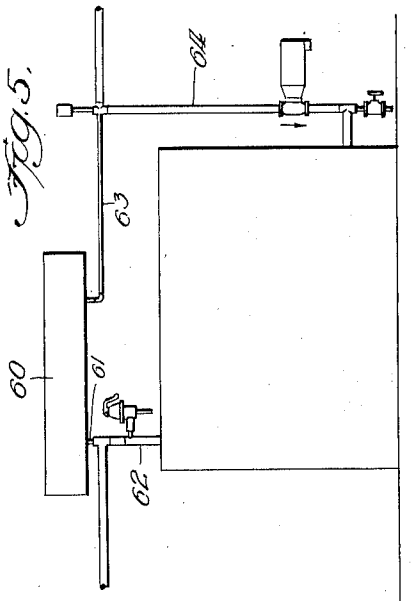


Fig. 5.

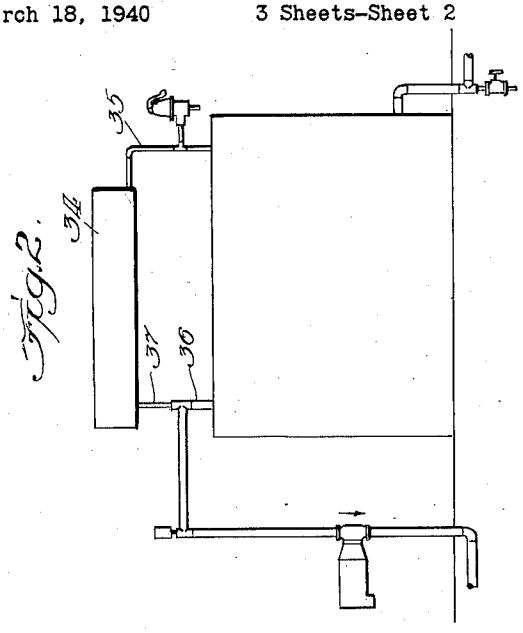


Fig. 2.

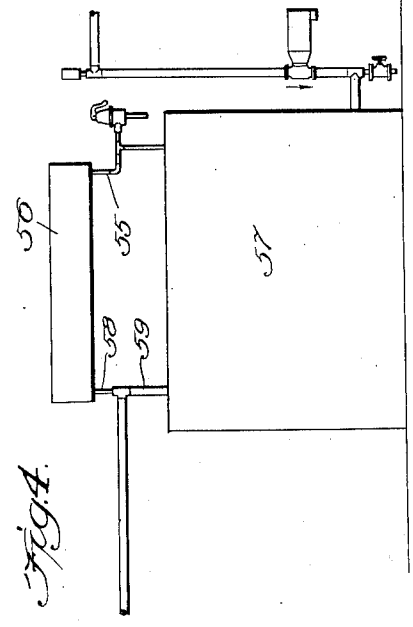


Fig. 4.

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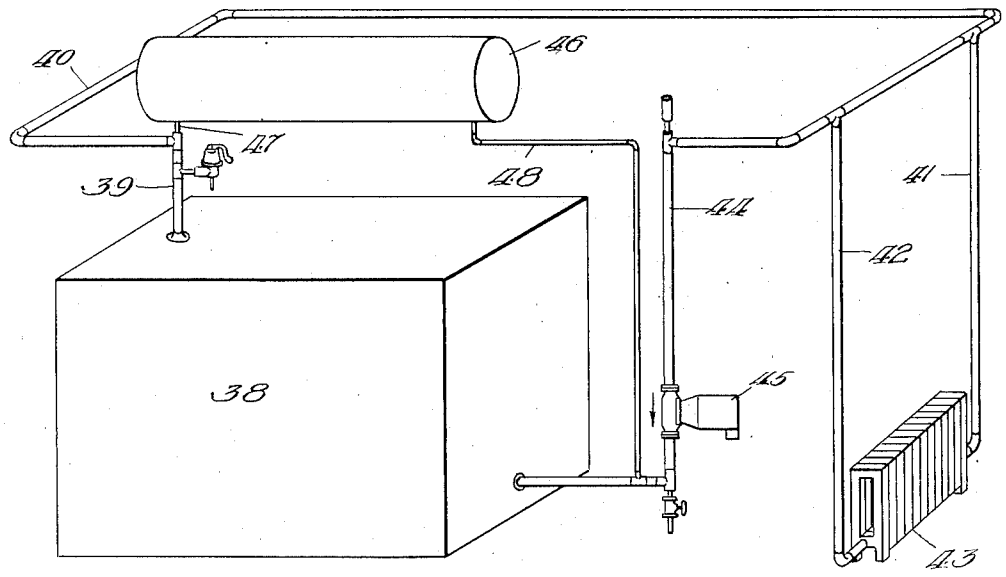
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HOT WATER HEATING SYSTEM

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Fig. 3



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UNITED STATES PATENT OFFICE

2,292,138

HOT WATER HEATING SYSTEM

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Application March 18, 1940, Serial No. 324,478

11 Claims. (Cl. 237—63)

Our invention relates to closed hot water heating systems and more particularly those of the hand fired, down-feed type in which the supply and return lines are located below the boiler, or the radiating devices are disposed below the supply and return lines.

Closed systems are customarily provided with an expansion tank which accommodates the expansion of the water when heated without losing water from the system and which is ordinarily mounted above the boiler and connected to the supply main issuing from the top of the boiler. A system of this type in which the mains are disposed below the boiler or the radiators below the mains also employs a circulating pump, responsive to a room thermostat or an aquastat in the boiler acting as a high limit switch, because the water will not circulate thermogravitationally. Notwithstanding the positive circulation of the water and the accompanying dissipation of heat, excessive temperatures and pressures are occasionally built up in this type of system, due to lack of care in firing. It has been observed that under these conditions the circulation of the water stops, although the pump may be operating, and that accordingly the boiler is placed under such a strain due to the overheating that it may be ruptured.

It is therefore the principal object of our invention to insure a forced circulation of the water through the system under all conditions of excessive or "run-away" firing.

These and further objects of our invention will be set forth in the following specification, reference being had to the accompanying drawings, and the novel means by which said objects are effectuated will be definitely pointed out in the claims.

Fig. 1 is a diagrammatic, perspective view of one form of our improved heating system in which the supply and return lines are disposed below the boiler.

Fig. 2 is a modification of the system shown in Fig. 1.

Fig. 3 is a further modification of the system shown in Fig. 1 and in which the supply and return lines are disposed generally above the boiler with down-feed connections to the boilers.

Figs. 4 and 5 are modifications of the system illustrated in Fig. 3.

In Fig. 1 the numeral 10 designates a hot water heating boiler of any approved type which rests upon a floor 11 and from the top of which extends a riser pipe 12. A supply pipe 13 is connected to the riser 12 and extends below the floor 11 for connection to any desired number of heating units, such as the usual radiator 14. A circulating pump 15 may be mounted in the supply line 13 and may be driven by a motor 16 whose operation is responsive to a room thermostat 17 that is exposed in the space where the radiators are situated, the thermostat and the motor being included in an electrical circuit designated generally by the numeral 18. The motor is also responsive to a reverse action aquastat 19 that is mounted in the boiler 10 and acts as a high limit, safety switch, the aquastat being wired in parallel with the room thermostat as designated generally by the numeral 20. The return line from the heating units is indicated by the numeral 21 and may enter the boiler 10 adjacent the lower portion thereof. This return line may also include the usual drain valve 22.

One end of a pipe 23 is connected to the riser 12 and the opposite end to the usual expansion tank 24 that may be disposed above the boiler and which is intended to accommodate the expansion of the water in the system when heated. If desired, a relief valve 25 may be connected to the riser 12 and the latter, above the connection of the pipe 23 thereto, may be provided with an air vent 26.

So far as described, the system is the customary, forced circulation, down-feed type of hot water heating arrangement in which the pump 15 acts to circulate water through the system in response to the demand of the thermostat 17 for heat, or to dissipate heat through the system in response to the demand of the aquastat 19 whenever the boiler water attains a predetermined, maximum temperature, regardless of whether the room thermostat is demanding heat at the same time.

It has been ascertained that under certain conditions of careless or "run-away" firing and notwithstanding the continued operation of the circulating pump which endeavors to dissipate the heat through the system, a condition may be reached such that no water is circulated through the system, even though the pump may then be operating. Obviously, if this situation persists for an indefinite time, the boiler may be ruptured by the high pressure.

The exact reason for this phenomenon is not known, but we have ascertained that the fault can be corrected by connecting one end of a pipe 27 to the lower portion of the tank 24 and the opposite end to the return line 21. With this pipe installed, the pump 15 will always circulate wa-

ter through the system regardless of continued and excessive firing.

In Fig. 2 the tank **34** is also disposed above the boiler and is connected to the upper portion thereof by a pipe **35** and to the riser **36** by a second pipe **37**. Otherwise this system is identical with that shown in Fig. 1.

In Fig. 3 there is illustrated a modification of the system shown in Fig. 1, the variation consisting in disposing the supply and return lines above the boiler with downfeed connections therefrom to the usual radiators. To this end the numeral **38** designates the boiler from which issues a riser pipe **39** that is connected to a supply line **40** disposed above the boiler and from which extend downfeed supply and return pipes **41** and **42**, respectively, to a radiator **43**. The supply line finally connects with the return line **44** which may include the usual circulating pump **45** and the terminal end of the return line **44** is connected to the lower portion of the boiler. In order to lighten the load on the pump and to facilitate flow through the radiators, the pipes **41** and **42** may be connected to the supply line by fittings of the type disclosed in Patent No. 1,663,271.

As in the preceding types of systems an expansion tank **46** is disposed above the boiler and has its lower portion connected to the riser **39** by a pipe **47** and a second pipe **48** also connects the lower portion of the tank **46** with the return line line **44**. Otherwise the system is identical with that illustrated in Fig. 1 including the electrical circuits for controlling the operation of the pump and the aquastat (not shown).

The system shown in Fig. 4 is similar to that illustrated in Fig. 2 in that a pipe **55** corresponding to the pipe **35** in Fig. 2 connects the lower portion of the tank **56** directly with the upper portion of the boiler **57**. The other pipe connection **58** leading to the lower portion of the tank **56** is in communication with the usual riser **59**.

In Fig. 5 the tank **60** is connected by a short pipe **61** to the usual riser **62** and also by a pipe **63** to the return line **64**.

Any of the modifications illustrated in Figs. 1 to 5, inclusive, are effective to insure a forced circulation of the water through the system at all times, regardless of any condition of excessive or "run-away" firing.

For purpose of illustration, each of the modifications incorporates the so-called one pipe system, but it will be understood that the two pipe system in which the radiators are bridged between the supply and return pipes is regarded as being the full equivalent. In each case, a flow circuit leads from and returns to the boiler.

We claim:

1. A closed hot water heating system of the downfeed, forced circulation type comprising in combination, a boiler, supply and return lines connected to the boiler to form a main heating system with a portion of each line disposed below the upper part of the water space of the boiler, an expansion tank connected to the supply line, and a separate pipe connecting the lower portion of the tank with the return line.

2. A closed hot water heating system of the downfeed, forced circulation type comprising in combination, a boiler, supply and return lines connected to the boiler to form a main heating system with a portion of each line disposed below the upper part of the water space of the boiler, an expansion tank located above the boiler, a first pipe connecting the tank to the supply line, and a second pipe connecting the lower portion of the tank with the return line.

3. A closed hot water heating system of the downfeed, forced circulation type comprising in combination, a boiler, supply and return lines connected to the top and bottom of the boiler, respectively, to form a main heating system with a portion of each line disposed below the upper part of the water space of the boiler, an expansion tank, a first pipe connecting the expansion tank to the supply line, and a second pipe connecting the lower portion of the tank with the return line.

4. A closed hot water heating system of the downfeed, forced circulation type comprising in combination, a boiler, supply and return lines connected to the top and bottom of the boiler, respectively, to form a main heating system with a portion of each line disposed below the upper part of the water space of the boiler, an expansion tank located above the boiler, a first pipe connecting the tank to the supply line and a second pipe connecting the lower portion of the tank with the return line.

5. A closed hot water heating system of the downfeed, forced circulation type comprising in combination, a boiler, a continuous pipe external of the boiler and having its inlet and discharge ends connected, respectively, to the upper and lower parts of the boiler, a radiating unit connected to the pipe, the unit and pipe being so related to the boiler that hot water moving to the unit is characterized by a downfeed flow, a closed expansion tank connected to the pipe, and a separate pipe connecting the lower portion of the tank with the first-named pipe adjacent its connection to the lower part of the boiler.

6. A closed hot water heating system having a pump for circulating water therethrough comprising in combination, a boiler, and a pair of flow circuits connected in parallel relation to the boiler, a radiating unit being connected to one of the circuits and the other circuit including a closed expansion tank, the unit and its connected circuit being so related to the boiler that hot water moving to the unit is characterized by a downfeed flow.

7. A closed hot water heating system having a pump for circulating water therethrough comprising in combination, a boiler, and a pair of flow circuits connected in parallel relation to the boiler, a radiating unit being connected to one of the circuits and the other circuit including a closed expansion tank located above the boiler, the unit and its connected circuit being so related to the boiler that hot water moving to the unit is characterized by a downfeed flow.

8. A closed hot water heating system of the forced circulation type comprising in combination, a boiler, a flow circuit leading from and returning to the boiler to form a main heating system, a radiating unit connected to the circuit, the unit and circuit being so related to the boiler that hot water moving to the unit is characterized by a downfeed flow, a closed expansion tank communicating with the boiler, and a separate pipe connecting the boiler to the lower portion of the tank.

9. A closed hot water heating system of the forced circulation type comprising in combination, a boiler, a flow circuit leading from and returning to the boiler to form a main heating system, a radiating unit connected to the circuit, the unit and circuit being so related to the boiler that hot water moving to the unit is char-

acterized by a downfeed flow, a closed expansion tank located above the boiler, a first pipe providing means of communication between the tank and boiler, and a second pipe connecting the lower portion of the tank with the circuit.

10. A closed hot water heating system of the forced circulation type comprising in combination, a boiler, a flow circuit leading from the top and returning to the bottom of the boiler to form a main heating system, a radiating unit connected to the circuit, the unit and circuit being so related to the boiler that hot water moving to the unit is characterized by a downfeed flow, a closed expansion tank, a first pipe providing means of communication between the tank and boiler, and a second pipe connecting the lower portion of the tank to the circuit.

11. A closed hot water heating system of the downfeed forced circulation type comprising in combination, a boiler, a flow circuit leading from and returning to the boiler to form a main heating system with a portion of the circuit disposed below the upper part of the water space of the boiler, a closed expansion tank communicating with the boiler, and a separate pipe connecting the lower portion of the tank to the circuit.

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