

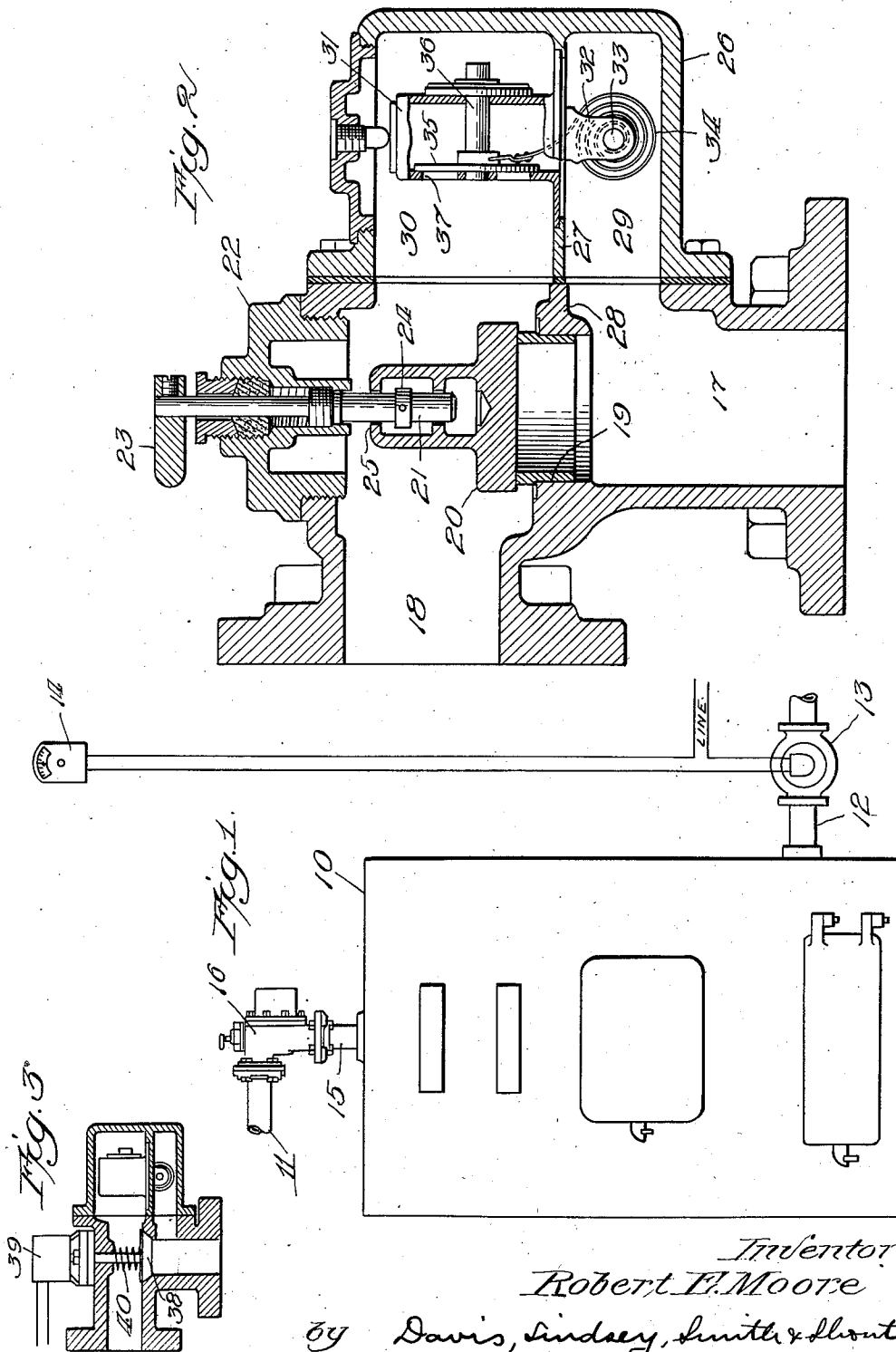
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HEATING SYSTEM

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HEATING SYSTEM

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5 Claims. (Cl. 237-8)

My invention relates to hand or stoker fired, hot water heating systems and more particularly to an arrangement for preventing the boiler water from reaching an excessive temperature.

5 In modernly equipped, hot water heating systems which are hand or stoker fired and in which the boiler water is therefore subjected to continuous heat, circulation of water through the system is effected by a pump which establishes a pressure sufficient to open a valve in at least the supply line to the radiator. This valve closes by gravity when the pump stops. The operation of this pump is either controlled by a room thermostat which is responsive to the demand of the associated space for heat, or by a boiler aquastat which serves as a high limit switch and closes the circuit to the pump when the temperature of the boiler water attains a predetermined maximum figure. In the former case, the pump acts to produce a beneficial heating effect in the radiating units of the system, while in the latter, the excess heat of the boiler water is dissipated through the same units so that abnormal heating of the boiler water is prevented.

25 In another type of system, the water is circulated thermogravitationally, but a motor operated valve is located in the supply line to the radiator which is controlled by the room thermostat.

One operating disadvantage of the foregoing systems is that, in the event of a failure of the electric power, the pump or the motor operated valve is unable to function and the temperature of the boiler water begins to rise. This rise may be accelerated by the fact that the valve in the supply line confines the boiler water to a relatively small space. Moreover, the failure of the electric power may continue unnoticed for such a time that the boiler water reaches a dangerous temperature, or may begin to steam. In any event, overheating of the boiler water presents a serious operating and economic problem because where the service water is indirectly heated by the boiler water to a temperature in excess of 140° Fahrenheit, deposits of lime and sediment are formed rapidly in the coils or tubes of the heater in numerous localities, thus reducing the rate of exchange and lowering the temperature of the water available at the service outlets. This liming condition is continuously aggravated by recurrent periods of overheating.

It is, therefore, one object of my invention to automatically prevent overheating of the boiler water in a hot water heating system by means whose operation does not require electric power, but is thermally responsive solely to the temperature of the boiler water.

A further object is to devise a flow control valve unit for use in such a system which is provided with a thermostatically operated, by-pass valve that is responsive to the temperature of the boiler

water and opens to permit a thermogravitational flow through the system when the boiler water attains a predetermined temperature.

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

In the drawing:

Fig. 1 is an elevation of a typical hot water heating system showing the application of my invention thereto.

Fig. 2 is an enlarged, sectional elevation of the flow control unit which regulates the flow of water to the radiating portion of the system.

Fig. 3 is a sectional elevation, similar to that shown in Fig. 2, showing a modified type of flow control unit.

Referring to the drawing, the numeral 10 designates a coal fired boiler which may be either hand or stoker fired and which is connected by supply and return lines 11 and 12, respectively, to any desired heating system provided with the usual radiators (not shown). A circulating pump 13 is located in the return line 12, but may be positioned at any other convenient portion of the system, for the purpose of establishing a forced circulation of the water through the system in response to the heat demands of a room thermostat 14 to which the pump is electrically connected.

A nipple 15, forming a part of the supply line 11, is mounted in the boiler and has its outer end fastened to a valve casing 16. The length of the nipple 15 is made sufficiently short to insure that the inlet passage 17 of the casing will always contain water substantially at boiler temperature, while the outlet passage 18 is connected to the portion of the supply line 11 leading directly to the radiators. In Fig. 2, the passages 17 and 18 are denoted as having a right angle relation, although this particular type of construction does not form an important part of the invention, and the junction of these passages defines a valve port 19 that is closed by a vertically reciprocal valve 20. This valve closes by gravity action and is opened by pressure established by the circulating pump 13. Its vertical movements are guided by a stem 21 that extends upwardly through a cap 22 which closes the top portion of the valve casing 16 and the valve may be manually raised to an open position by a hand grip 23 provided on the stem 21 acting in conjunction with a collar 24 provided on the stem which engages a shoulder 25 provided on the valve.

As noted in Fig. 2, the right side of the casing 16 is open and this opening is closed by a cover 26 having a horizontal wall 27 that registers with and provides a continuation of a wall 28 formed

within the casing 16 and through which the valve port 19 extends.

The wall 27 defines with the adjacent portion of the cover 26 a lower chamber 29 that is always in communication with the inlet passage 17 and is, therefore, continuously filled with water at boiler temperature, and also an upper chamber 30 that is always in communication with the outlet passage 18.

A valve housing 31 rests upon the top surface of the wall 27 and the interior of this housing is always in communication with the chamber 29 through an appropriate opening formed in the bottom of the housing and in the wall 27. A pair of spaced ears 32 depend from the housing 31 into the chamber 29 and bridged between these ears is a fixed rod 33 to which is secured the inner end of a spirally wound, bimetallic strip. The opposite end extends upwardly within the housing 31 for affixation to the hub of a secondary valve 35 that is slidably mounted upon a rod 36 which extends between and is supported in a pair of the opposite walls of the housing 31. Under normal operating conditions, the valve 35 closes an opening 37 in the housing 31 so as to prevent circulation of the water from the chamber 29 to the chamber 30 through the housing.

In the ordinary operation of the system, circulation of the water is effected by the pump 13 in response to the demands of the room thermostat 14 for heat. During pump operations, the valve 20 is raised by the pressure established in the system sufficiently to open the valve port 19 and permit flow from the passage 17 into the passage 18.

If the electric power which operates the pump 13 should fail for any reason, or if the thermostat 14 should be set sufficiently high, the secondary valve 35 provides the means for insuring a thermogravitational flow of the water through the system and thus prevents overheating of the boiler water. The thermostat 34 may be adjusted to open the valve 35 at any desired temperature of the boiler water, such as 220° F. or 225° F., for example, and when the boiler water reaches this temperature, the valve 35 will be shifted toward the right, as viewed in Fig. 2, to thereby communicate the chambers 29 and 30 and provide a by-pass around the closed valve 20.

The foregoing arrangement, as can be readily understood from an examination of Fig. 2, affords a convenient means of associating the primary valve 20 and the secondary valve 35 in a single unit that may be easily interposed in any hot water heating system with an absolute assurance that the boiler is effectively protected against all possibility of overheating, regardless of the failure of the electric power to the pump and regardless of the length of time during which such failure persists. Moreover, my improved device eliminates the high limit aquastat that is ordinarily mounted in the boiler to insure an operation of the pump whenever the boiler water temperature reaches a dangerous point.

In Fig. 3 is illustrated a modification of the flow control device which differs from that illustrated in Fig. 2 merely by the use of a valve 38 which corresponds in position and function to the valve 20, but which is moved to an open position by a motor 39 that is electrically connected to a thermostat (not shown), similar to thermostat 14. Closure of this valve is effected

by a spring 40. The remainder of the device and its operation is similar to that already described.

It will be understood that the application of the invention is not restricted to hand or stoker fired boilers, but that these terms are intended to be generally representative of any boiler forming part of a hot water heating system and which is continuously subjected to heat.

I claim:

1. In a hot water heating system, the combination of a boiler having supply and return lines adapted for connection to radiating devices, a pump for forcibly circulating water through the system in response to the demand of a room thermostat for heat, a first valve in the supply line normally closed to prevent passage of water and opened by pump pressure, and a second valve thermally responsive to the temperature of the boiler water and positioned to by-pass water around the first valve when the boiler water attains a predetermined temperature.

2. In a hot water heating system, the combination of a boiler having supply and return lines adapted for connection to radiating devices, the supply line having a section including parallel passages each having a valve for controlling flow therethrough, one valve being opened in response to the demands of a room thermostat for heat and the other valve being thermally responsive to the temperature of the boiler water and operable in an opening direction when the boiler water attains a predetermined temperature.

3. Apparatus for preventing overheating of the boiler water of a heating system comprising a casing for insertion in the supply line leading from and sufficiently close to the boiler to insure that the water in the casing inlet is substantially at boiler temperature, a primary valve for controlling flow through the casing and adapted to be opened in response to the demand of a room thermostat for heat, and a secondary valve thermally responsive to the temperature of the boiler water and positioned to by-pass water around the primary valve when the boiler water attains a predetermined temperature.

4. Apparatus for preventing overheating of the boiler water of a heating system provided with a pump responsive to a room thermostat for establishing a forced circulation of the water through the system comprising a casing for insertion in the supply line leading from and sufficiently close to the boiler to insure that the water in the casing inlet is substantially at boiler temperature, a primary valve for controlling flow through the casing and adapted to be opened by pressure established by the pump, and a secondary valve thermally responsive to the temperature of the boiler water and positioned to by-pass water around the primary valve when the boiler water attains a predetermined temperature.

5. In a hot water heating system, the combination of a boiler having supply and return lines adapted for connection to radiating devices, a first valve in the supply line for controlling flow therethrough and adapted to be opened in response to the demand of a room thermostat for heat, and a second valve thermally responsive to the temperature of the boiler water and positioned to by-pass water around the first valve when the boiler water attains a predetermined temperature.

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