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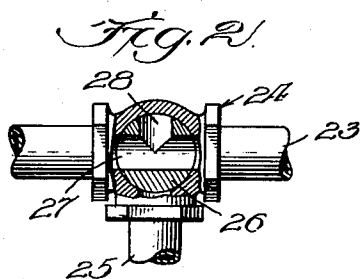
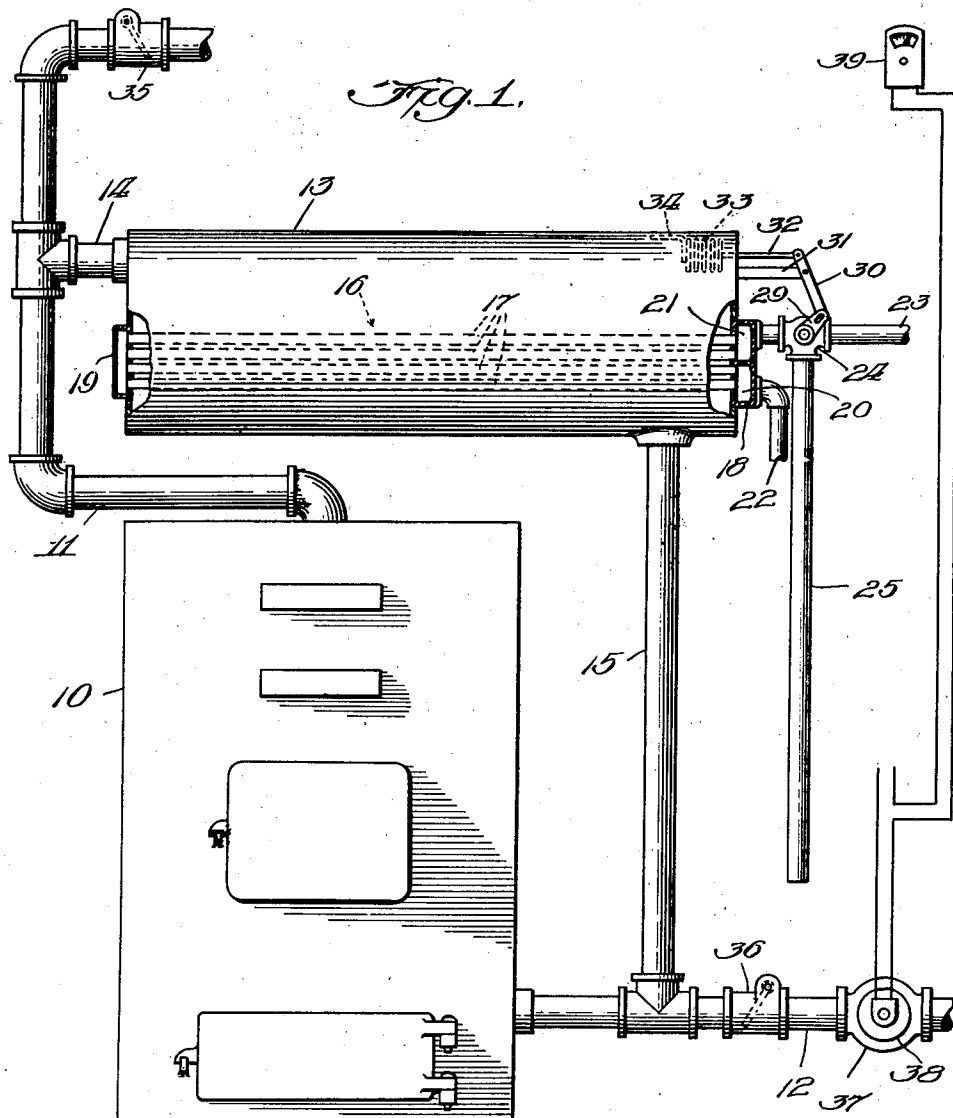
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2,176,539

HEATING SYSTEM

Filed July 9, 1937

2 Sheets-Sheet 1



Inventor:
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by Davis, Lindsey, Smith & Shonts

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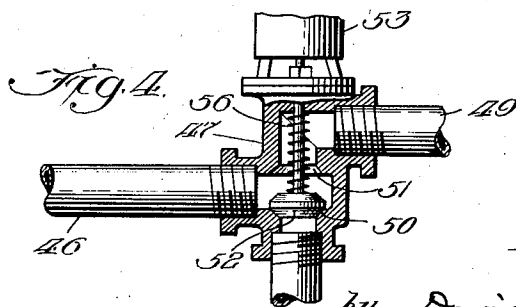
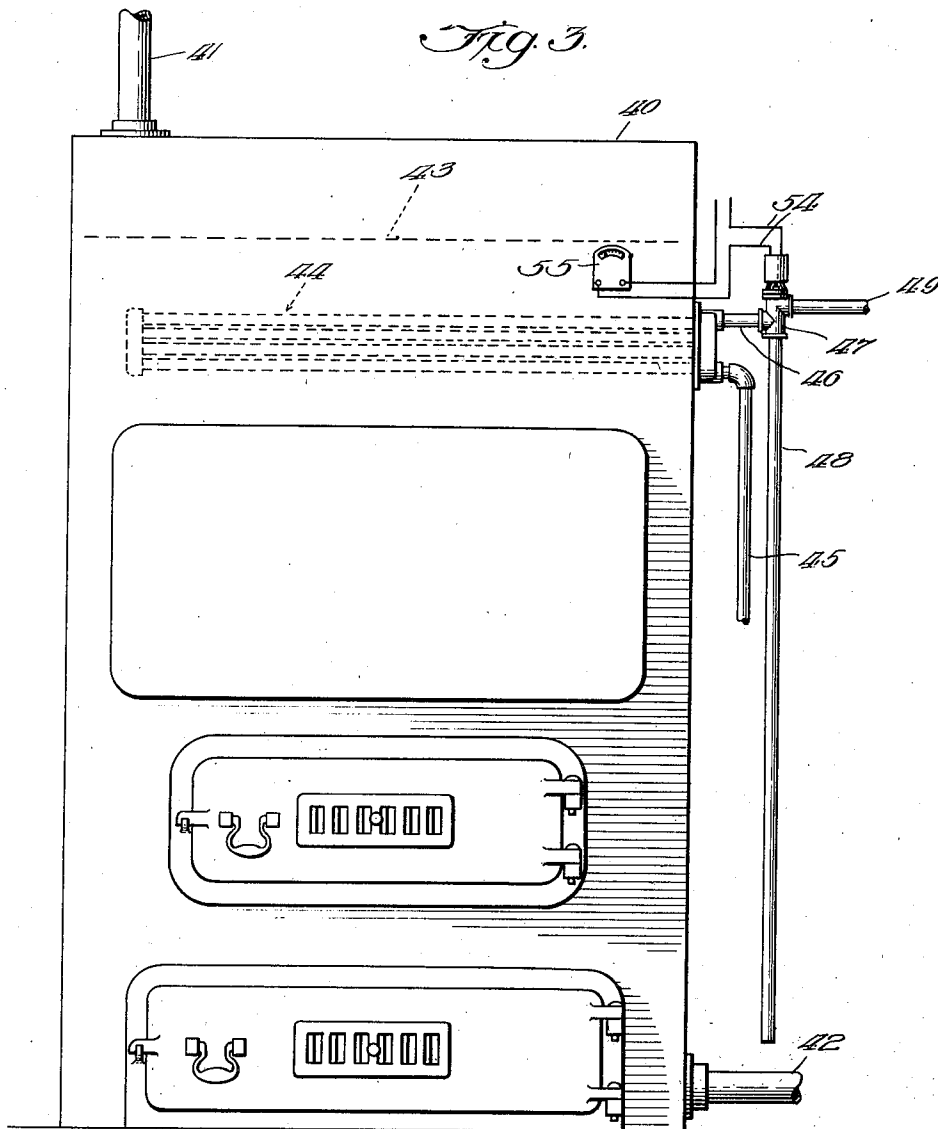
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UNITED STATES PATENT OFFICE

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HEATING SYSTEM

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Application July 9, 1937, Serial No. 152,695

2 Claims. (Cl. 237-19)

My invention relates to heating systems of the steam and hot water type and more particularly to an automatic arrangement for preventing overheating of the water in the system, whether oil, gas or coal fired.

During the heating season, steam and hot water heating systems occasionally become overheated due to the failure of thermostatic devices which are intended to regulate the temperature of the boiler water in gas and oil-fired boilers by controlling the operation of the burner. Particularly does this condition obtain in systems which are not equipped with aquastats, such as those incorporating hand-fired boilers in which the boiler water is subjected to continuous heat. Overheating presents a serious operating and economic problem in numerous localities because where the service water is indirectly heated by the boiler water to a temperature in excess of 140 degrees Fahrenheit, deposits of lime are formed rapidly in the coils or tubes of the heater, thus reducing the rate of heat 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 also desirable for the same reasons to prevent this overheating during the summer season, particularly in the case of steam boilers which are equipped with submerged heaters for heating service water. Otherwise, steam will pass to the radiators which is objectionable. With hot water systems, on the other hand, while the flow of hot water to the radiators can be prevented by the usual automatically controlled valves in the supply and return lines, the problem of overheating still remains as regards the boiler and the service water heating portion of the system.

It is therefore one object of my invention to provide means for automatically preventing overheating of the water in a heating system by utilizing the cold water supply as a cooling agent, and permitting this water to continuously circulate through tubes exposed to the heated water in the system until the desired temperature reduction is effected.

A further object is to accomplish this reduction by circulating the cold water through the coils or tubes forming a part of the heater which is ordinarily employed to heat the service water, and to automatically control this circulation by the temperature of the boiler water.

These and further objects of my invention will be set forth in the following specification, refer-

ence being had to the accompanying drawings, and the novel means by which said objects are effectuated will be definitely pointed out in the claims.

In the drawings

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

Fig. 2 is a fragmentary elevation, partly in section, of the thermostatically controlled valve which regulates the flow of water to the service fixtures or to a drain, dependent upon its position.

Fig. 3 is a view similar to Fig. 1, but showing my invention applied to a steam boiler provided with a submerged water heater.

Fig. 4 is a sectional elevation of one form of temperature controlled valve which may be employed with the system shown in Fig. 3.

By way of example, one form of my invention will be described in connection with a hot water heating system which incorporates a hand-fired boiler and an external water heater. The invention may also be used, however, in systems having stoker, oil or gas fired boilers and water heaters which are submerged directly in the boiler water.

Referring to the drawings, the numeral 10 designates a coal fired boiler 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 tank 13 is connected by an inlet pipe 14 to the supply line 11 and by an outlet pipe 15 to the return line 12, thus providing for a constant circulation of water at substantially boiler temperature through the tank 13.

An indirect water heater 16 is submerged within the tank 13 and it includes a plurality of tubes 17 which are supported at their ends by headers 18 and 19. The water heater 16 per se forms no part of my invention and it may in the usual manner be composed of two groups of tubes in order to provide for two traverses of the incoming flow of water through the hot water in the tank 13. Other tube arrangements may be adapted as desired. One of these groups of tubes have their inlet ends in communication with an inlet chamber 20 provided in the header 18, while the delivery end of the other group discharges into an outlet chamber 21 provided in the same header. The header 19 is common to the opposite ends of both groups of tubes.

A cold water supply pipe 22 is connected at one end to the chamber 20 and at the opposite end to a constant supply of cold water, such as a

city main (not shown). The outlet chamber 21 is connected by a pipe 23 to any desired number of service fixtures (not shown) and located in the pipe 23 is a valve body 24 which carries a

5 A valve plug 26 is rotatably mounted within the body 24 and it is provided with an inverted T-shaped passage comprising a horizontal passage 27 and a vertical passage 28, both of these passages connecting with each other. Externally
10 of the body 24, a rock arm 29 is secured to the valve plug 26 and the free end of this arm is pivotally connected to one end of a lever 30 which is intermediately pivoted on a bracket 31 carried
15 by the tank 13, while the opposite end of the lever is pivotally connected to a push rod 32 that extends through the adjacent end wall of the tank 13 for connection to a thermostatic device, represented generically to a Sylphon bellows 33 which may be filled with any suitable
20 liquid that expands with heat.

The opposite end of the bellows 33 abuts against a bracket 34 that is internally mounted in the tank 13, so that as the liquid within the
25 bellows expands, the latter will elongate toward the right and so rotate the lever 30. As the temperature falls, the bellows will automatically contract due to the characteristic construction of this device. Bellows of this type are in com-
30 mon use in hot water heating systems, so that it is unnecessary to enter into any detailed description of its construction. In place of this arrangement, an electrically operated valve controlled by an aquastat, similar to that illustrated
35 in Fig. 3, may be employed.

In the operation of the system shown, it will be assumed, for example, that the bellows 33 has been adjusted to actuate the valve when the temperature of the water in the tank reaches
40 215 degrees Fahrenheit. Below this temperature, the valve plug 26 occupies the position shown in Fig. 2 in which water from the heater 16 may pass freely through the pipe 23 to the service fixture, but denying passage of water to the drain
45 pipe 25. At the determined temperature, however, the elongation of the bellows 33 rocks the valve plug 26 in a counterclockwise direction, as viewed in Fig. 2, to thereby place the pas-
50 sage 28 in communication with the outlet chamber 21 and the passage 27 in communication with the drain pipe 25. Under these conditions, no water can pass to the service fixture, but cold water will flow continuously through the heater
55 16 directly to the drain 25 and will thus continuously abstract heat from the water in the tank 13 until the temperature of the water in this tank falls below the temperature at which the bellows 33 has been set to operate. When this
60 temperature is reached, the bellows 33 automatically retracts and places the valve plug 26 in the position illustrated in Fig. 2.

This arrangement for preventing overheating in hot water heating systems is therefore wholly independent of the type of firing employed for the boiler 10 and is also independent of any
65 failure of the electrical circuits which are commonly associated with automatically fired boilers. Regardless of whether or not the boiler is continuously fired my improved arrangement oper-
70 ates automatically to reduce the temperature of the water in the system to any predetermined point.

In accordance with standard practice, the hot water heating system illustrated in Fig. 1 may be provided with the usual flow control valves 35 and

36 in the supply and return lines 11 and 12, respectively, which normally close these lines, but are adapted to be opened by pressure established by a pump 37 that may be located in the return
5 line 12, or at any other convenient point in the system. This pump may be driven by a motor 38 which is electrically connected to a room thermostat 39.

These flow control valves do not form any part of my invention per se, but they afford a con-
10 venient arrangement for preventing passage of hot water to the radiators during the summer months. During this period, it will be understood that the room thermostat 39 would be set so that it would be incapable of initiating the
15 operation of the motor 38. Hence the valves 35 and 36 would then occupy the closed positions illustrated in Fig. 1 and the only circulation of hot water from the boiler 10 would be that through the tank 13.

In Fig. 3 is illustrated the application of my improved cooling arrangement to a heating system incorporating a steam boiler. This boiler
20 is designated by the numeral 40 and it may be connected to the usual radiators (not shown) by a supply line 41 and a return line 42. The numeral 43 designates the water line of the boiler.

Submerged in the boiler water is a water heater 44 whose construction may be similar to that of the heater 16, and to which cold water is fed
30 through a supply pipe 45. Hot water from the heater is delivered through an intermediate pipe 46 to a valve body 47 and to this body are also connected a drain pipe 48 and a pipe 49 that are connected to service fixtures (not shown). The
35 valve body is provided with a valve seat 50 adjacent the inlet end of the drain pipe 45 and also a valve seat 51 which is located adjacent the inlet end of the pipe 49. Preferably, for the arrangement shown, these seats are axially
40 aligned and they are intended to be engaged by one of the faces of a dual faced valve 52 whose stem extends outwardly of the valve body 47 for suitable connection to a motor 53. The motor
45 is electrically connected by a pair of wires 54 to any suitable form of aquastat 55 which extends through the boiler wall for submersion in the boiler water. The connection of the motor 53 to the valve 52 is in accordance with standard
50 practice for devices of this kind and the arrangement is such that when the motor is operated the valve 52 will be lifted from seating engagement with the valve seat 50 into seating engagement with the valve seat 51, and when the
55 current through the motor is interrupted, the valve 52 will be returned to the position illustrated in Fig. 4 by means of a coil spring 56 which encircles the stem of the valve with one end thereof abutting against the top surface of the valve and the opposite end against the in-
60 terior of the valve body 47.

During winter operation, the aquastat 55 may be set to close the circuit through the motor 53 when the temperature of the boiler water reaches
65 220 degrees Fahrenheit, or whatever temperature may be the design limit of the boiler. In any case, this temperature would be such as to provide for satisfactory steaming by the boiler in order to furnish steam for the radiating units
70 of the system. When the temperature of the boiler water reaches the point at which the aquastat has been set, the motor 53 will operate to raise the valve 52 from the normal position shown in Fig. 4 to thereby connect the cold water supply pipe 45 with the drain pipe 48, thus pro-
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viding for a constant circulation of cold water through the heater 44 until the temperature of the boiler water has been reduced below that at which the aquastat 55 has been set. It will be understood that, when the valve 52 is raised from contact with the seat 50, its movement is sufficient to seat the valve 52 against the valve seat 51 and thus interrupt the flow of the water through the pipe 49 to the service fixtures.

During summer operation, the aquastat 55 may be adjusted to a temperature just below that at which the water in the boiler would steam, thus assuring an adequate supply of hot water for the faucets, while preventing the generation of any steam that would otherwise pass through the radiators. The operation of the valve under these conditions is identical with that heretofore described, the only difference residing in the temperature at which the aquastat 55 closes the circuit through the motor 53.

I claim:

1. Apparatus for preventing overheating of the boiler water of a heating system and for providing hot service water comprising a hollow device having a heat transferring surface adapted for submergence in that water of the system which is substantially at boiler temperature, an inlet pipe for the device adapted for connection

to a cold water supply, an outlet pipe adapted for connection to a service fixture, valve means having a drain opening in the outlet pipe and shiftable between positions connecting the supply to the fixture to furnish hot water and to the drain to cool the boiler water when the temperature thereof attains a predetermined point, respectively, and thermostatic means responsive to the temperature of the boiler water for controlling the position of the valve means.

2. Apparatus for preventing overheating of the boiler water of a heating system and for providing hot service water comprising a tubular water heater adapted for submergence in that water of the system which is substantially at boiler temperature, an inlet pipe for connecting the heater with a cold water supply, an outlet pipe for connecting the heater to a service fixture, a drain pipe connected to the outlet pipe, a valve mounted at the junction of the outlet and drain pipes and shiftable between positions connecting the supply to the fixture to furnish hot water and to the drain pipe to cool the boiler water when the temperature thereof attains a predetermined point, respectively, and thermostatic means responsive to the temperature of the boiler water for controlling the position of the valve.

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