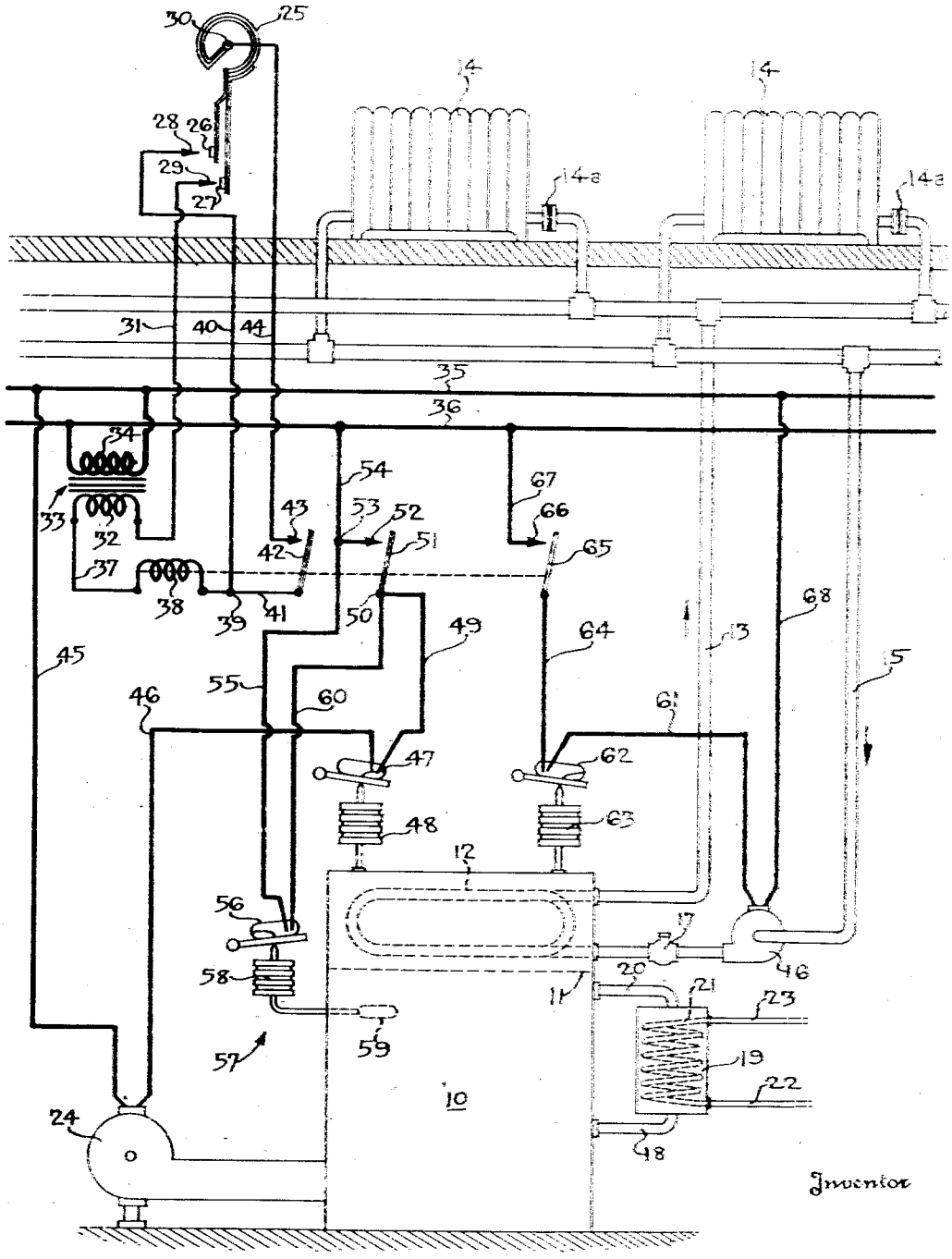
June 13, 1939. J. P. KRIECHBAUM 2,162,337

HEATING SYSTEM

Filed Sept. 24, 1936



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Patented June 13, 1939 2,162,337

UNITED STATES PATENT OFFICE

2,162,337

HEATING SYSTEM

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Application September 24, 1936, Serial No. 102,334

11 Claims. (Cl. 237—8)

This invention relates to heating systems and more particularly to a type of system wherein radiators or analogous devices are heated by a circulating fluid and wherein hot water is available for domestic purposes at all times.

One object of this invention is the provision, in an improved heating system of the character to be hereinafter described incorporating mechanism for accelerating the circulation of fluid to the radiators or analogous devices, of means to preclude the circulation of cold fluid.

An additional object is the provision in a system of the character to be described including a circulator of means to preclude the energization of the circulator until the fluid adapted to be circulated to the radiators has reached a predetermined temperature.

A more specific object is the provision, in a combined heating system of the hot water type including a circulator to increase the rapidity of flow of the heated water through the system of means controlled by boiler pressure or temperature to energize and/or deenergize the circulator in such manner that water below a predetermined temperature cannot be forced through the system by the action of the circulator.

A further specific object resides in the provision in a heating system of that type including means for ensuring a constant supply of hot water for domestic purposes of means controlled by boiler pressure or temperature to preclude the circulation of cool or cold water through the radiators of the house heating system.

Other objects will in part be obvious and in part pointed out hereinafter.

The invention, accordingly, consists in the combination and arrangement of elements all as will be more fully pointed out hereinafter and disclosed in the accompanying drawing and the scope of the application of which will be indicated by the appended claims.

The single figure of the drawing, wherein is shown an illustrative embodiment of the invention, is a schematic diagram disclosing a heating system incorporating the features of the instant invention.

For a more complete understanding of the invention, reference is now made to the drawing wherein a boiler 10 adapted to be filled with water to a fixed level 11 contains a coil 12 from which a riser 13 leads through a conventional pipe arrangement to radiators 14 from which in turn a return line 15 leads back to coil 12. Radiators 14 are provided with conventional venting orifices 14a. A circulator 16 of any desired type is shown as positioned in return line 15 as is a conventional check valve 17 adapted to preclude thermal circulation of water through the system in the absence of acceleration by circulator 16. It will, of course, be understood that while circulator 16 and valve 17 are shown as positioned in return line 15, they may be equally as well placed in any other desirable portion of the system. A pair of pipes 18 and 20 connected to boiler 10 below the water level 11 lead to a tank 19 wherein is positioned a heating coil 21 having an inlet pipe 22 and an outlet pipe 23. Water is supplied through pipe 22 from any suitable source and pipe 23 leads to faucets or analogous fixtures to provide hot water for domestic purposes. In the particular type of system disclosed in the accompanying drawing, water in boiler 10 is heated by means of a burner 24 of any suitable type and circulates thermally through pipes 18 and 20 and tank 19 to impart heat to water in coil 21.

When it is desired to supply heat to radiators 14, the temperature of the water in boiler 10 is increased until steam is formed in the space adjacent coil 12, which steam in turn imparts heat to the water in the closed system comprised of coil 12, riser 13, radiators 14 and return line 15. After the water in this closed system has been heated to a sufficient degree to heat the space in which radiators 14 are positioned, circulator 16 is energized to provide forced circulation of the water through the circuit above mentioned.

Suitable control means to be hereinafter described are provided whereby the temperature of the water below water level 11 is maintained constantly at a temperature sufficient to supply adequate hot water for domestic use. When it is desired to heat the space adjacent radiators 14, burner 24 is further energized and the temperature of the water is increased until steam forms in the manner above described.

The system is primarily under the control of a thermostat 25 which carries a pair of contacts 26 and 27 adapted to engage contacts 28 and 29 and has at its extremity opposite the contacts 26 and 27 a terminal 30. Contacts 26 and 28 are so positioned as to make and break at a slightly lower temperature than contacts 27 and 29 for a purpose to be described hereinafter. From contact 29, a wire 31 leads to the secondary 32 of a step-down transformer, generally indicated at 33, which also has a primary 34 to which power is supplied from line wires 35 and 36 leading from some source of power (not shown). From the opposite side of transformer secondary

32, a wire 37 leads to a relay coil 38, the opposite side of which is connected to a junction 39 from which a wire 40 leads to contact 28. A second wire 41 leads from junction 39 to a relay arm 42 adapted to engage a contact 43 from which a wire 44 leads to terminal 30. Thus it will be seen that as contacts 26, 28 and 27, 29 are made an energizing circuit is established in a well known manner comprising transformer secondary 32, wire 31, contacts 29, 27, 26 and 28, wire 40, junction 39, relay coil 38, wire 37, back to transformer secondary 32, which serves to energize relay coil 38 to pull in arm 42 to engage contact 43 as well as other relay arms to be described hereinafter.

A holding circuit is now established comprising transformer secondary 32, wire 31, contacts 29 and 27, thermostat 25, terminal 30, wire 44, contact 43, relay arm 42, wire 41, junction 39, relay coil 38, wire 37, back to transformer secondary 32. This circuit, as will be seen, is unaffected by the breaking of contacts 26 and 28 and, accordingly, since relay coil 38 is not energized until contacts 28 and 26 make and not deenergized until contacts 27 and 29 break, a slight operating differential, sufficient to prevent too frequent operation of burner 24 by thermostat 25, is provided.

The energization of relay coil 38 also serves to energize burner 24 which is connected by means of a wire 45 to line wire 35. A wire 46 leads from burner 24 to one terminal of a mercury switch 47 which is adapted to be tilted to open or closed position by a conventional pressure responsive control device 48 under certain circumstances to be pointed out hereinafter. A wire 49 leads from the other terminal of mercury switch 47 to a junction 50 from which extends a second relay arm 51 adapted to engage a contact 52 connected to a junction 53. Accordingly, if relay coil 38 is energized by thermostat 25 in the manner above described, burner 24 will be energized by a circuit comprised of line wire 35, wire 45, burner 24, wire 46, mercury switch 47, wire 49, junction 50, relay arm 51, contact 52, junction 53, wire 54 and line wire 36. From junction 53, a wire 54 leads to line wire 36. Likewise, a wire 55 leads to one terminal of a mercury switch 56 which comprises a part of a conventional thermostatic device, generally indicated at 57, including a bellows 58 and a remote control bulb 59, controlled by the temperature of boiler 10. From the other terminal of mercury switch 56, a wire 60 leads to junction 50.

Thus it will be seen that if the temperature in boiler 10 drops to such a point that mercury switch 56 is closed, burner 24 will be energized through a circuit comprised of line wire 35, wire 45, burner 24, wire 46, mercury switch 47, wire 48, junction 50, wire 60, mercury switch 56, wire 55, junction 53, wire 54 and line wire 36.

The arrangement is such that mercury switch 47 is normally closed and it will be seen from the foregoing that no circuit can be established to energize burner 24 when mercury switch 47 is in open circuit position.

From circulator 16 a wire 61 leads to one terminal of a mercury switch 62 which is adapted to be tilted by a pressure responsive device 63 energized by the steam pressure in boiler 10. From the other terminal of mercury switch 62, a wire 64 leads to a relay arm 65 controlled by relay coil 38 and adapted to engage a contact 66 from which a wire 67 leads to line wire 36. A wire 68 also leads from circulator 16 to line wire 35. It will thus be seen that circulator 16 may be energized only when mercury switch 62 is in closed position and also only when thermostat 25 through a call for heat causes engagement of relay arm 65 with contact 66.

The settings of the temperature responsive control 57 and the pressure responsive controls 48 and 63 are varied as will now be described. Mercury switch 56 is adapted to remain open so long as the temperature of the water contained in boiler 10 is above a predetermined minimum which may be, illustratively, 170°. Mercury switch 47 is adapted normally to be in closed position but upon an excess of steam pressure, as illustratively 10 pounds, in boiler 10, switch 47 is adapted to be tilted to open circuit position to deenergize burner 24 and maintain the same deenergized until the pressure has subsided to a safe maximum. In other words, the pressure responsive device 48 functions as a high limit control. Mercury switch 62 is adapted normally to remain in open circuit position and cannot close until the steam pressure in boiler 10 reaches a predetermined point as, illustratively, 4 or 5 pounds, reopening at a pressure of, illustratively, 3 or 4 pounds to provide an operating differential.

The operation of the system should now be obvious. It will be seen that the water in boiler 10 below water level 11 is always maintained above a predetermined minimum by means of temperature responsive control 57 which serves to energize the burner each time the temperature falls below said predetermined limit and maintain the same energized until the said temperature has again been achieved, in order that a constant supply of domestic hot water may be available regardless of the demand for heat by thermostat 25. Thermostat 25 controlled by the temperature of the space to be heated also energizes burner 24 when the temperature of this space drops below a desirable point. As the temperature of the boiler water thus increases and sufficient steam is formed to heat the water in coil 12, mercury switch 62 is tilted to closed circuit position by pressure responsive device 63 and relay arm 65 having been previously pulled in by the energization of relay coil 38 by thermostat 25 in the manner above described, circulator 16 is now permitted to operate to force water through the heating system to radiators 14. Pressure responsive device 48 will not open mercury switch 47 to deenergize burner 24 unless a dangerous pressure condition exists in boiler 10.

From the foregoing it will be seen that there is herein provided a system whereby the circulation of cold water through the radiators is positively precluded, since check valve 17 serves to prevent thermal circulation of the water at a low temperature and circulator 16 cannot be energized to provide forced circulation unless the steam pressure in boiler 10 has reached a point indicative of the fact that the water in coil 12 has been heated sufficiently to supply heat to the space adjacent radiators 14.

It will be understood while there has herein been shown a hot water system wherein hot water to circulate through the radiators is adapted to be heated by steam, the invention may be equally well applied to a conventional hot water system.

It will also be seen that there is herein provided a system accomplishing the objects of this invention and others including many advantages of great practical importance.

As many embodiments may be made of this invention and as many modifications may be

made of the embodiment herein shown and described, it is to be understood that all matter hereinbefore set out or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In a heating system in combination, a boiler, water in said boiler, a burner to heat said water, a coil in said boiler adapted to be heated by steam from said water in said boiler, radiators, a riser from said coil to said radiators, a return line from said radiators to said coil, a circulator in said return line, a check valve in said return line, water in said coil, radiators, riser and return line, a tank, a coil in said tank for heating domestic hot water, pipes from said tank to said boiler, means responsive to boiler temperature for controlling said burner to maintain said water in said boiler at a substantially constant temperature below the boiling point, a room thermostat adapted to energize said burner to generate steam to heat said first mentioned coil and hence said water therein, means responsive to steam pressure in said boiler and a call for heat by said room thermostat to energize said circulator, the arrangement being such that said circulator cannot be energized upon a call for heat by said room thermostat until a predetermined steam pressure in said boiler is achieved, and second means responsive to steam pressure in said boiler to positively deenergize said burner, said second means adapted to respond to a higher boiler pressure than said first mentioned pressure responsive means.

2. In a heating system in combination, a boiler, water in said boiler, a burner to heat said water, a coil in said boiler adapted to be heated by steam from said water in said boiler, radiators, a riser from said coil to said radiators, a return line from said radiators to said coil, a circulator in said return line, water in said coil, radiators, riser and return line, a tank, a coil in said tank for heating domestic hot water, pipes from said tank to said boiler, means responsive to boiler temperature for controlling said burner to maintain said water in said boiler at a substantially constant temperature below the boiling point, a room thermostat adapted to energize said burner to generate steam to heat said first mentioned coil and hence said water therein, and means responsive to steam pressure in said boiler and a call for heat by said room thermostat to energize said circulator, the arrangement being such that said circulator cannot be energized upon a call for heat by said room thermostat until a predetermined steam pressure in said boiler is achieved.

3. In a heating system in combination, a boiler, water in said boiler, a burner to heat said water, a coil in said boiler adapted to be heated by steam from said water in said boiler, radiators, a supply line from said coil to said radiators, a return line from said radiators to said coil, a circulator in one of said lines, a check valve in one of said lines, water in said coil, radiators, supply line and return line, a tank, a coil in said tank for heating domestic hot water, pipes from said tank to said boiler, means responsive to boiler temperature for controlling said burner to maintain said water in said boiler at a constant relatively high temperature, a room thermostat adapted to energize said burner to generate steam to heat said first mentioned coil and hence said water therein, means for energizing said circulator, means responsive to steam pressure in said boiler preventing energization of said circulator by said last mentioned means, until a predetermined steam pressure in said boiler is achieved, and second means responsive to steam pressure in said boiler to positively deenergize said burner, said second pressure responsive means adapted to respond to a higher boiler pressure than said first mentioned pressure responsive means.

4. In a heating system in combination, a boiler, fluid in said boiler, a burner to heat said fluid, a coil in said boiler adapted to be heated by steam from said fluid in said boiler, radiators for heating a space, pipes connecting said radiators to said coil, a circulator in one of said pipes, fluid in said coil, pipes and radiators, a source of domestic hot water supply, means connecting said source to said boiler whereby fluid in said boiler heats said domestic hot water supply, means responsive to boiler temperature to maintain said fluid in said boiler at a relatively constant high temperature to impart heat to said source at all times, means responsive to the temperature of said space to energize said burner to generate steam to heat said first mentioned coil and hence said water therein, means for energizing said circulator, means responsive to steam pressure in said boiler for preventing energization of said circulator until a predetermined steam pressure in said boiler is achieved, and second means responsive to steam pressure in said boiler to positively deenergize said burner, said second pressure responsive means adapted to respond to a higher boiler pressure than said first mentioned pressure responsive means.

5. In a heating system in combination, a boiler, water in said boiler, a burner to heat said water, a coil in said boiler above the water and adapted to be heated by steam from said water, radiators, supply and return pipes connecting said radiators to said coil, a heating medium in said coil, radiators, and pipes, a circulator in one of said pipes, a tank, a coil in said tank for heating domestic hot water, pipes connecting said tank to said boiler below the water line, means responsive to boiler water temperature for controlling said burner to maintain said water at a relatively high temperature below the boiling point, means responsive to room temperature, a circuit for said burner, a circuit for said circulator, said last mentioned means closing a switch in each circuit on a call for heat.

6. In a heating system in combination, a boiler, water in said boiler, a burner to heat said water, a coil in said boiler above the water and adapted to be heated by steam from said water, radiators, supply and return pipes connecting said radiators to said coil, a heating medium in said coil, radiators, and pipes, a circulator in one of said pipes, a tank, a coil in said tank for heating domestic hot water, pipes connecting said tank to said boiler below the water line, means responsive to boiler water temperature for controlling said burner to maintain said water at a relatively high temperature below the boiling point, means responsive to room temperature, a circuit for said burner, a circuit for said circulator, said last mentioned means closing a switch in each circuit on a call for heat, and means for opening the circuit to the burner when the steam pressure in the boiler rises beyond a predetermined degree.

7. In a heating system in combination, a boiler, water in said boiler, a burner to heat said water, a coil in said boiler above the water and adapted to be heated by steam from said water, radiators, supply and return pipes connecting said radiators to said coil, a heating medium in said coil, radia-

tors, and pipes, a circulator in one of said pipes, a circuit for controlling said burner, a circuit for controlling said circulator, means responsive to room temperature, means operated by said room temperature responsive means for closing a switch in each of said circuits, and means responsive to the steam pressure within said boiler for preventing energization of said circulator until said steam pressure is above a predetermined amount.

8. In a heating system in combination, a boiler, water in said boiler, a burner to heat said water, a coil in said boiler above the water and adapted to be heated by steam from said water, radiators, supply and return pipes connecting said radiators to said coil, a heating medium in said coil, radiators, and pipes, a circulator in one of said pipes, a circuit for controlling said burner, a circuit for controlling said circulator, means responsive to room temperature, means operated by said room temperature responsive means for closing a switch in each of said circuits, and means responsive to the steam pressure within said boiler for deenergizing said burner when said steam pressure rises beyond a predetermined degree.

9. In a heating system in combination, a boiler, water in said boiler, a burner to heat said water, a coil in said boiler above the water and adapted to be heated by steam from said water, radiators, supply and return pipes connecting said radiators to said coil, a heating medium in said coil, radiators, and pipes, a circulator in one of said pipes, a circuit for controlling said burner, a circuit for controlling said circulator, means responsive to room temperature, means operated by said room temperature responsive means for closing a switch in each of said circuits, means responsive to the steam pressure within said boiler for preventing energization of said circulator until said steam pressure is above a predetermined amount, and means responsive to the steam pressure within said boiler for deenergizing said burner when said steam pressure rises beyond a predetermined degree.

10. In a heating system in combination, a boiler, water in said boiler, a burner to heat said water, a coil in said boiler above the water and adapted to be heated by steam from said water, radiators, supply and return pipes connecting said radiators to said coil, a heating medium in said coil, radiators, and pipes, a circulator in one of said pipes, a circuit for said burner, a circuit for said circulator, a room thermostat, means operated by said thermostat for closing a switch in each circuit, and means responsive to boiler water temperature for energizing said burner independently of said room thermostat to maintain said boiler water above a relatively high value less than the boiling point.

11. In a heating system in combination, a boiler, water in said boiler, a burner to heat said water, a coil in said boiler above the water and adapted to be heated by steam from said water, radiators, supply and return pipes connecting said radiators to said coil, a heating medium in said coil, radiators, and pipes, a circulator in one of said pipes, a circuit for said burner, a circuit for said circulator, a room thermostat, means operated by said thermostat for closing a switch in each circuit, means responsive to boiler water temperature for energizing said burner independently of said room thermostat to maintain said boiler water above a relatively high value less than the boiling point, and means for deenergizing said burner when the steam pressure within the boiler exceeds a predetermined high value.

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