

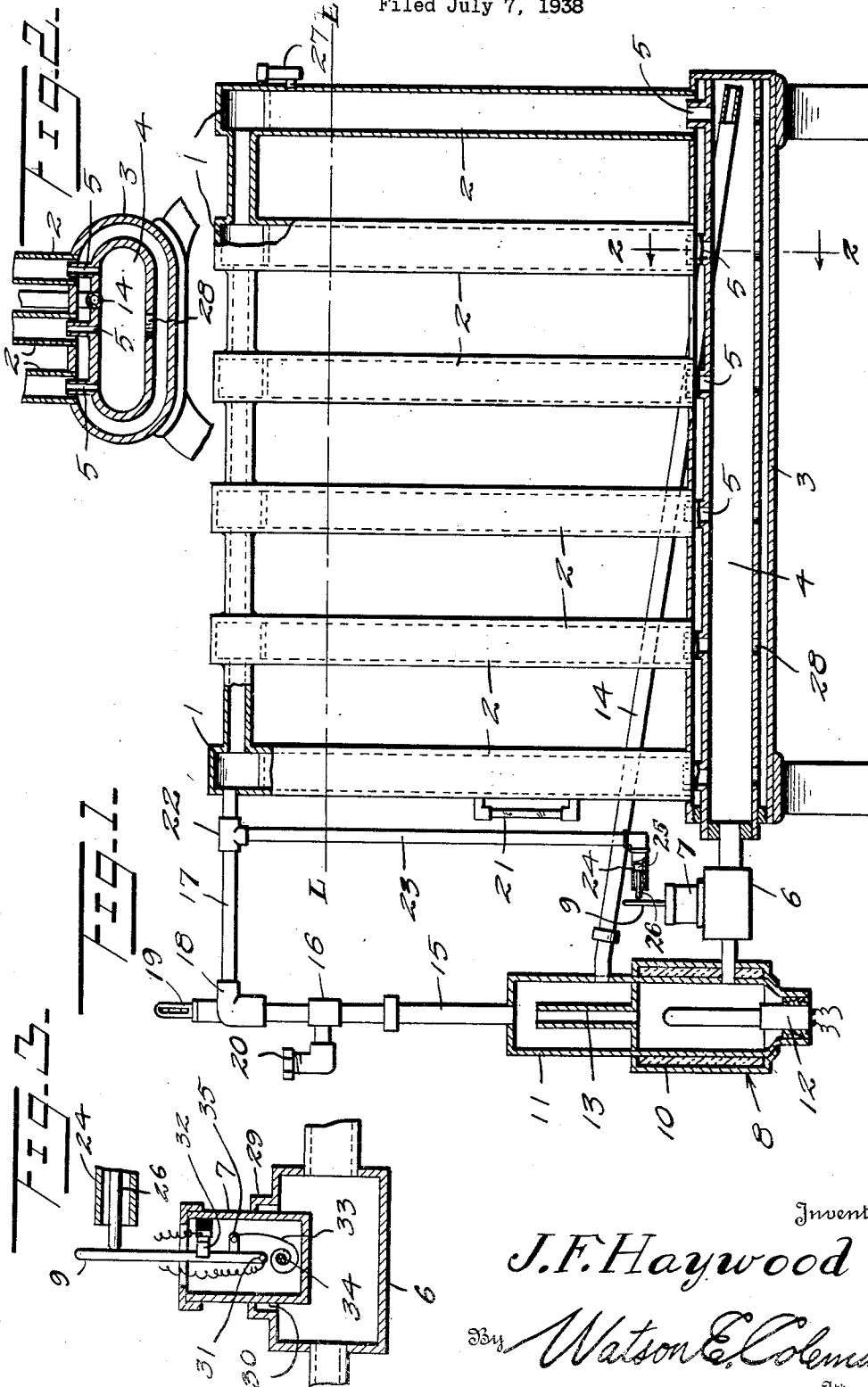
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J. F. HAYWOOD

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HOT WATER HEATING RADIATOR

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Inventor

J. F. Haywood

By *Watson E. Coleman*
Attorney

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HOT WATER HEATING RADIATOR

John F. Haywood, Lewistown, Pa., assignor of
one-third to Oscar F. Brush and one-third to
Hugh B. McMeen, both of Lewistown, Pa.

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This invention relates to heating devices and pertains particularly to improvements in water and steam heating radiators.

The present invention has for its primary object to provide an improved radiator structure of novel form in which an electrical heating means is directly associated therewith for raising the temperature of water therein for the purpose of heating surrounding atmosphere, the device being designed also to function as a steam heater under certain conditions and having mechanism associated therewith to prevent the development of an excessively high steam pressure in the device.

Another object of the invention is to provide a heating radiator employing water as the heating medium therefor, in which novel means is provided for effecting a quick distribution of hot water from a heating unit through the sections of the radiator structure so that the water contained in the units will be raised to the desired temperature in a minimum of time.

Still another object of the invention is to provide a radiator structure of the type described in which an electrical means is employed for heating the water in the sections of the radiator and a novel means is made use of for shutting off the electrical heating means in the event of the development of an undesirable pressure within the radiator structure.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawing forming part of this specification, with the understanding, however, that the invention is not to be confined to any strict conformity with the showing of the drawing but may be changed or modified so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawing:—

Figure 1 is a view in side elevation of the heating structure or radiator embodying the present invention, portions of the same being in section to show details of construction.

Figure 2 is a sectional view on the line 2—2 of Figure 1.

Figure 3 is a vertical sectional view through the thermostat control device.

Referring now more particularly to the drawing, the radiator illustrated comprises a number of vertically disposed units 1 each of which is made up of a series of vertical tubes 2, the units being disposed in the usual side by side relation

with the tubes arranged in a plane extending transversely of the structure. The tubes 2 of the units join and extend at their lower ends into the bottom manifold 3 which extends the length of the radiator structure.

Extending longitudinally through the manifold chamber 3 is a tube, preferably of copper, which is indicated by the numeral 4, and which has fluid discharge nipples 5 extending upwardly from the top part thereof and arranged in groups of three, the nipples of each group being disposed across the tube 4 and each nipple being directed upwardly into a tube 2 of an overlying unit 1. This tube 4 is supported in the manifold 3 so that there will be a space completely around it that it may be completely submerged in water filling the manifold.

One end of the tube 4 is closed, while the opposite end connects with a chambered unit 6 in which a thermostat is housed for the control of a switch in the switch casing 7, the switch being employed for controlling the flow of electric current to the electric heating structure, which is indicated as a whole by the numeral 8. The switch structure includes a stem or arm 9 which projects upwardly above the housing 7 and is arranged to be engaged under certain circumstances by an operator, hereinafter described, which functions to shut off the current supply to the heater 8 in the event that steam pressure develops in the radiator structure above a safe point.

The electrical heating unit comprises a lower chamber 10 and an upper chamber 11 and the lower chamber has extended thereinto an electrical resistance heater 12 of the immersion type.

Extending from the top of the lower chamber 10 of the electrical heater and into the upper chamber 11 is a pipe 13 which may be referred to as an overflow pipe, the upper end of this pipe being disposed just below the top of the upper chamber. This pipe forms the sole communicating passage between the upper and lower chambers and as the lower chamber is filled with water when the heater is in operation, this water as it expands will rise through the pipe 13 and overflow into the upper chamber 11.

Connected with the lower part of the upper chamber 11 of the heating unit 8 is a water return pipe 14 by which the heated water passes back into the radiator structure, this pipe leading from the upper chamber 11 of the heating unit to the far end of and discharging into the manifold enclosed tube 4.

Connected with the top of the upper chamber

11 is a steam pipe 15 which is joined by a union 16 with the horizontal upper pipe 17 which leads into the top of the adjacent one of the tube units 1. In the elbow coupling 18, a safety or pressure release valve 19 is connected so that if for any reason the other safety features of the device should fail to function excessive pressure would be relieved by this valve. The union 16 has a filling nozzle 20 connected therewith by which water may be introduced into the system and when the water in the system becomes low this fact may be determined by means of the water gauge 21 which is mounted upon the side of one of the tubes 2 of the first one of the units 1, as shown.

The pipe 17 has the union 22 therein for connection with the pipe 17 of the depending pipe 23. At its lower end this pipe 23 has the horizontal terminal cylinder 24 with which it communicates and in this cylinder is a piston 25 having a stem 26 which is so arranged that when the piston is moved outwardly in the cylinder or toward the free end thereof, the stem will engage the arm 9 of the switch structure and shift it to switch-off position.

Connected with the upper part of one of the tubes 2 of one of the radiator units, preferably a tube of the last unit from the heater unit 8, is a vent 27 which is of standard construction and of the type which closes as the heat within the radiator develops.

Figure 3 shows the interior construction of the switch and thermostat control which is housed in the casing 7, by which the flow of current to the heating unit 8 is regulated in accordance with the heat developed in the water in the radiator structure and by which, also, the current flow may be shut off in the event that the steam pressure develops to an undesirable point in the radiator. This control is so connected with the chambered unit 6 that the casing 7 will depend to a substantial extent into the unit 6 so that the lower portion thereof will be effectively heated by the water which passes through the chamber from the tube 4 to the heating unit 8. The top part of the chamber 6 has the vertical sleeve 29 through which the lower part of the switch casing 7 extends, the sleeve 29 being joined with the switch casing to form a water tight connection. There is thus provided the narrow area 30 between the sleeve and the switch casing into which the heated water from the radiator may extend. The switch arm 9 extends downwardly into the casing 7 and is pivotally mounted at its lower end, as indicated at 31, so that it may oscillate in the plane of the piston stem 26 and for electrical connection with the switch blade 32 which is supported upon and in insulated relation with the wall of the switch casing 7, as shown. The switch arm 9 and blade 32 are connected in electric circuit with the electric heater 12 so that when the arm 9 is in contact with the blade 32, current will flow to the heater 12 and when the arm 9 is shifted away from the blades 32, the current flow to the heater will be interrupted.

Within the casing 7 is a suitable heat responsive unit for actuating the switch arm 9 to circuit open position when the temperature of the water gets higher than is desired. Such heat responsive unit is here illustrated as being in the form of the usual bimetallic coil 33 which has one end joined to a suitable support 34, while the other end is connected to the switch arm 9, so that as the unit becomes heated, it will

tend to straighten out and will eventually, if the heat continues to rise, exert sufficient force against the switch arm 9 to swing it out of contact with the switch blade 32. When the temperature of the water in the radiator drops back to normal the unit 33 will return the switch to closed position or it may be manually closed if necessary.

In the operation of the present heating radiator the sections or units 1 are filled with water to a level just below the vent 27 or approximately to the level L, and when the switch structure 7 is closed, electric current will flow into the immersion heater 12 and this will heat the contents of the chamber 10. As the water in chamber 10 begins to heat up, the expansion taking place will cause it to rise through the pipe 13 and pass into and through the upper chamber 11. The heating action of the device 12 will be extended to the water in the chamber 11 and in the pipe 15 and the entire body of water will thus expand and rise because of its decreased density as its temperature increases. This decrease in density and tendency of the water to rise from the chamber 10 as it becomes more highly heated, will cause the unheated denser water to flow from the tube 4 into the lower part of the chamber 10 and this will bring about a downward movement of the water in pipe 14 into tube 4, producing a siphoning off of the heated water from the chamber 11 into the pipe 14. However, there will remain a proportion of the water in the pipe 15 which will not alter its position but will stay substantially stationary above the water in the chamber 11. This action of the water flowing from the tube 4 and from the pipe 14 into the tube will thus be helped to some extent by this body of water which has risen in the pipe 15 for, as the water in chamber 10 continues to increase in temperature and rise through the tube 13, it will pull or draw more water from the tube 4 and reduce the pressure in the pipe 14, thus bringing about a circulation through the chamber 11 to the receiving end of pipe 14.

It will be understood that in practice the water level in the radiator will be maintained so that when the water in the chambers 10 and 11 has expanded to the desired extent as determined by the reaction of the thermostat 7 to the heat of the water, it will not rise high enough to flow through pipe 17 into the sections 2.

As the water in the chambers 10 and 11 heats up and circulation becomes established in the manner described, some of the heated water passing into the tube 4 will rise through the nipples 5 into the water contained in the sections 2 and the cooler water dropping to the bottom of the manifold 3 will eventually be drawn into the tube 4 to mix with the warmer water passing therethrough as this water is caused to move through the thermostat chamber 6 into the heater chamber 10. After the water in the entire radiator structure has reached the desired temperature, it will bring about an operation of the thermostat in the casing 7 so as to open the switch and discontinue the heating action of the heater 12.

Should the water in the system become heated to the boiling point where steam would be evolved, this will pass upwardly through the pipe 17 and over into the water-free upper ends of the sections 2 where it will condense and flow down into the water contained in the lower part of these sections. If the thermostat should fail

to operate, steam will develop or collect in the upper ends of the sections 2 and create a back pressure which will be transmitted through the pipe 23 against the piston 24 which will be forced outwardly and open the switch through its pressure against the switch arm 9. If, for any reason, this safety measure should fail, then the blow-off valve 19 would operate to relieve the pressure.

If the steam pressure operates the piston 24 to disconnect current from the heater, then as the pressure is reduced and steam cools and condenses, sufficient suction will be exerted upon the piston 24 to restore it to its normal position, thus permitting the closing of the switch by means of the arm 9 when it is desired to start the system up again and the piston will be ready for repeated operation if such becomes necessary.

I claim:

1. A hot water radiator comprising a plurality of units consisting of a series of tubes, the units being disposed in vertical side by side relation, a manifold connecting the lower ends of said tubes, a water heater, a water conductor leading from said heater to an end of the manifold remote from the heater, means in said manifold for receiving and distributing the received water to the tubes of the units, and a water return connection between said receiving means and said heater, the said water conductor leading from said water heater at a downward inclination to the water receiving means.

2. A hot water radiator comprising a plurality of units consisting of a series of tubes, the units being disposed in vertical side by side relation, a manifold connecting the lower ends of said tubes, a water heater, a water conductor leading from said heater to an end of the manifold remote from the heater, means in said manifold for receiving and distributing the received water to the tubes of the units, a water return connection between said receiving means and said heater, the said water conductor leading from said water heater at a downward inclination to the water receiving means, said water heater including an electrically operated heating unit, an electric current control switch governing the flow of current to said unit, and thermostat control means in the water return connection between the heater and the water receiving means for actuating said switch in accordance with the temperature of the water.

3. A hot water heating radiator comprising a plurality of units disposed in side by side relation and each consisting of a series of vertical tubes, a water manifold common to said tubes and joining the lower ends thereof, a water receiving tubes in and extending throughout the length of said manifold, a water lead-off at one end of said tube, a water heating unit connected with said lead-off and including an upper and lower portion and an electrically operated heater in said lower portion, a thermostat controlled switch governing the flow of current to said heater and operated in accordance with the temperature of water in said lead-off, a pipe leading from the upper portion of said water heating unit at a downward inclination to the end of

the water receiving tube remote from the lead-off, said water receiving tube having a plurality of upwardly directed discharge nipples each leading into a tube of a unit and having a series of lower water inlet apertures for the entrance of water therein from the manifold.

4. A hot water heating radiator comprising a plurality of units disposed in side by side relation and each consisting of a series of vertical tubes, a water manifold common to said tubes and joining the lower ends thereof, a water receiving tube in and extending throughout the length of said manifold, a water lead-off at one end of said tube, a water heating unit connected with said lead-off and including an upper and lower portion and an electrically operated heater in said lower portion, a thermostat controlled switch governing the flow of current to said heater and operated in accordance with the temperature of water in said lead-off, a pipe leading from the upper portion of said water heating unit at a downward inclination to the end of the water receiving tube remote from the lead-off, said water receiving tube having a plurality of upwardly directed discharge nipples each leading into a tube of a unit and having a series of lower water inlet apertures for the entrance of water therein from the manifold, a steam pipe connected with the upper ends of the units, said last pipe having an end formed to provide a cylinder, a piston in the cylinder adapted to be shifted in one direction by pressure developed by an excess of steam in the units, and means for establishing connection between the piston and said switch to effect the opening of the switch when the piston is moved by steam pressure.

5. A water radiator comprising a plurality of water tube units, a water manifold connecting said units and communicating with each, a water receiving tube within the manifold and extending throughout the length thereof, a water heater disposed at one end of said tube and consisting of a lower chamber and an upper chamber, water transfer means between the lower chamber and the adjacent end of said manifold enclosed tube, an electric heating unit within said lower chamber, an overflow pipe extending from the upper part of the lower chamber to the upper part of the upper chamber and discharging into the latter chamber, a pipe communicating at one end with said upper chamber and extending downwardly therefrom to the remote end of said last tube and opening therein, said last tube having a plurality of upwardly discharging nipples each communicating with a unit tube and having a series of bottom openings communicating with the manifold, a steam pipe connecting the upper chamber with the upper part of one of the units, a control switch for regulating the flow of current to said electrical heating unit, thermostatic means for opening said switch upon development of excessive temperature in the water, and steam operated means connected with said steam pipe for opening said switch upon the development of excessive steam pressure in the units.

JOHN F. HAYWOOD.