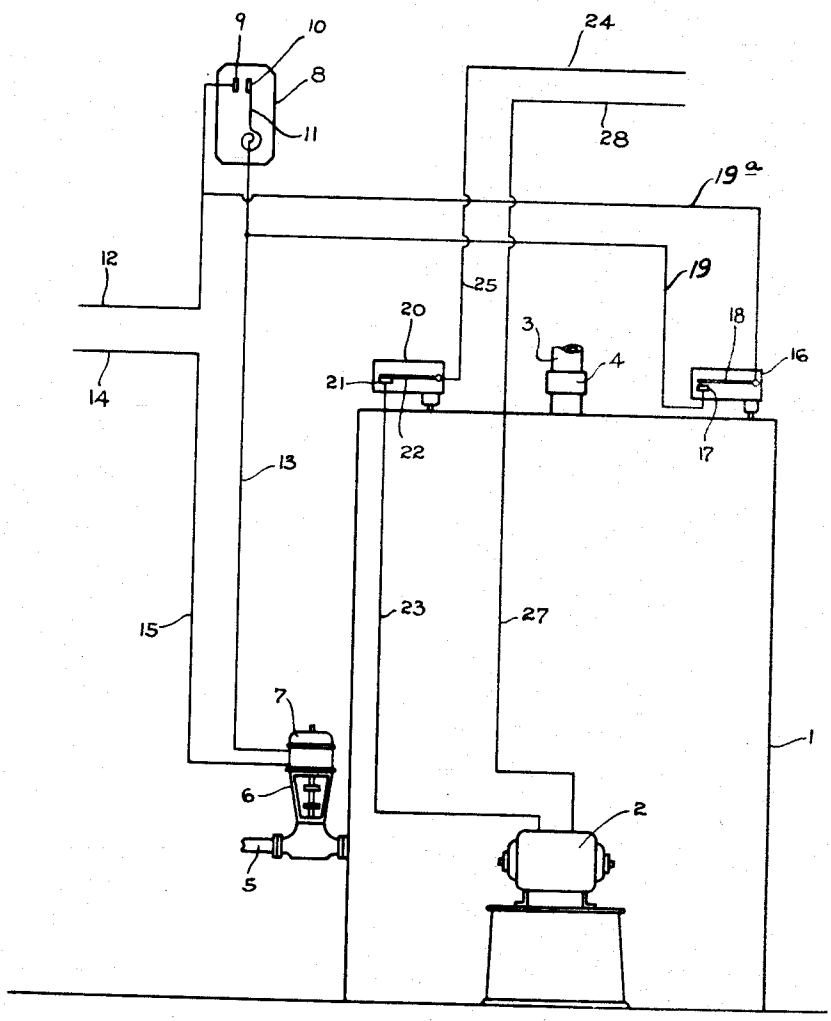
April 25, 1939. R. L. CAMPBELL 2,155,890

HEATING SYSTEM

Filed Jan. 15, 1936



INVENTOR
Richard L. Campbell
BY
Andrew K. Fruedo
his ATTORNEY

Patented Apr. 25, 1939

2,155,890

UNITED STATES PATENT OFFICE

2,155,890

HEATING SYSTEM

Richard L. Campbell, Birmingham, Mich., assignor to Detroit Lubricator Company, Detroit, Mich., a corporation of Michigan

Application January 15, 1936, Serial No. 59,176

1 Claim. (Cl. 236—9)

My invention relates generally to heating systems and more particularly to control systems therefor.

One of the objects of my invention is to provide a heating system having a new and improved control system for controlling the operation thereof and to prevent overheating of the boiler of the heating system.

Another object of my invention is to provide a simple and inexpensive control system for a heating apparatus and of a character such that overheating of the boiler is prevented.

The drawing shows a diagrammatic view of a heating system embodying my invention.

Referring to the drawing by characters of reference there is shown a hot water heating system including a boiler 1 in which water may be heated by a heating means including a fuel stoker operated by an electric motor 2. Any other suitable heat supplying means, such as an oil burner or gas burner, may be employed if desired. Leading out of the boiler 1 and preferably from the top thereof is an outlet or feed pipe 3 through which the hot water is supplied to the heat exchange, or transfer means or radiators (not shown) in a room or other enclosed space to be heated. A suitable check valve 4 is preferably provided and located in the feed line or riser pipe 3 to prevent back flow and circulation of the water by gravity.

Connected into and through the side wall of the boiler 1 there is a return pipe 5 through which the heating fluid or water returns to the boiler 1 from the radiators. In the return pipe 5 there is a pump means or water circulator 6 which is preferably located adjacent the boiler 1, as shown. The water circulator 6 may be of any suitable type and is operated by an electric motor which, in the present instance, is enclosed in a casing 7 and mounted on the upper end of the circulator 6.

In the room or other enclosed space, the air of which is to be heated, there is a thermostat, designated in general by the numeral 8, and which may be of any suitable type. The thermostat diagrammatically shown in the drawing includes a fixed contact 9 engageable with a contact 10 carried by an arm 11 of bi-metal, or other material movable in response to changes in ambient temperature of the air or any other medium to be heated. The fixed contact 9 of the room thermostat 8 is connected to a main lead wire 12, and the other or movable contact 10 is connected by a lead wire 13 to one terminal of the electric motor which drives the water circulator 6. The other terminal of the circulator motor is connected to the other main lead wire, designated at 14, by means of a lead wire 15. The circulator motor and room thermostat are thus in series circuit.

A control device, designated in general by the numeral 16, is provided for also controlling the operation of the water circulator 6. The control device 16 is preferably mounted on the top of the boiler 1 and is preferably of the type which is operable in response to boiler temperature. The control device 16, as shown diagrammatically, has a contact 17 and a movable arm 18 which is adapted to engage contact 17 at a predetermined boiler temperature. The contact 17 is connected to the lead line 13, which connects the room thermostat and circulator motor, by a lead wire 19, and the arm 18 is connected by a lead wire 19a to the lead wire which connects the contact 9 of the room thermostat 8 to the main line 12. Thus the control device 16 and the room thermostat 8 are in shunt circuit and either is adapted to control operation of the water circulator without the aid of the other.

The electric motor 2 of the fuel stoker is in a circuit which includes a control device, designated in general by the numeral 20. The control device 20, like the control device 16, is preferably mounted on the top of the boiler 1 and is preferably of the type which is operable in response to boiler temperature. The control device 20, as diagrammatically shown, includes a contact 21 engageable by a movable arm 22 at a predetermined boiler temperature for which the device is set to operate. A lead wire 23 connects the contact 21 and one terminal of the electric motor 2, while the arm 22 is connected to a main line 24 by a lead wire 25. The other terminal of the electric motor 2 is connected by a lead wire 27 to the other main lead wire, indicated at 28.

The operation of the herein described heating system is as follows: The control device 20 may be set to operate at a predetermined desired low temperature of the boiler, say 170° F., to close the circuit to the motor 2 of the fuel stoker, and may be set to operate and open the circuit thereto at say 175° F. boiler temperature. This differential in operation of the control device may be selected as desired, but a temperature differential in operation of from 5° F. to 8° F. is preferable. When the control device 20 is set, as above mentioned, the arm 22 will engage the contact 21 when the temperature of the boiler decreases to 170° F., and circuit will be completed to the stoker motor 2 from main line 24,

lead line 25, switch arm 22, lead line 23 to the motor 2 and from the motor 2 to the main line 28 by connecting lead wire 27. Additional heat will then be supplied to the water in the boiler and when the temperature of the water rises to 175° F., the control device will operate to stop operation of the stoker. The room thermostat 8 may be set to maintain a desired, substantially constant room temperature and when the thermostat becomes unsatisfied it closes circuit to the water circulator 6 which operates to supply hot water from the boiler to the radiator. The operation of the water circulator causes a reduction in temperature of the water in the boiler, which results in the control device 20 operating to close circuit to the stoker motor 2 to start the same. If the room thermostat 8 becomes satisfied during the operating period of the stoker, or shortly thereafter, the closing of the check valve restricts or stops circulation and the boiler water temperature is increased due to the fuel carry-over in the fire box. Control device 16 is set to operate to make contact, at a predetermined boiler temperature higher than the temperature at which the control device 20 operates to stop the stoker motor, or 175° F., and which temperature may be taken, for purposes of exposition, as 200° F. When the temperature of the water in the boiler reaches this high temperature the control device 16 will close the circuit to the circulator motor irrespective of the operation of the room thermostat, since the room thermostat and control device 16 are in shunt circuit. Preferably the control device 16 is set to have a temperature differential of operation from 8° F. to 10° F. so that it will close circuit to the circulator at say 200° F. and open the circuit when the temperature of the water decreases to say 190° F. The control device 16 thus operates at a predetermined boiler temperature to start the water circulator to reduce the temperature of the water, and stops the circulation at a temperature above that which would cause the stoker to be started.

What I claim and desire to secure by Letters Patent of the United States is:

In a hot water heating system, a hot water boiler, a mechanical fuel stoker for heating the water in said boiler, a feed line and a return line connected to said boiler for circulation of the water through a hot water radiating system for heating a closed space, a valve closed against flow of water by natural convection through the radiating system, electrically operated pump means operable to circulate the water through said boiler and to open said valve and discharge the water to the radiating system, thermostatic means sensitive to the temperature of the closed space and operable to control said pump means irrespective of the temperature of the boiler water, temperature means sensitive to the temperature of the water in said boiler and operable upon a predetermined high temperature of the water in said boiler to start said pump means and upon a predetermined low temperature to stop said pump means independently of said thermostatic means, and means operable to maintain the water in said boiler at a temperature sufficiently high for immediate supply to the radiating system upon operation of said thermostatic means to start said pump means.

RICHARD L. CAMPBELL.