April 27, 1937. N. C. PRICE 2,078,341

BOILER CONTROL

Filed Sept. 30, 1933

FIG. 1

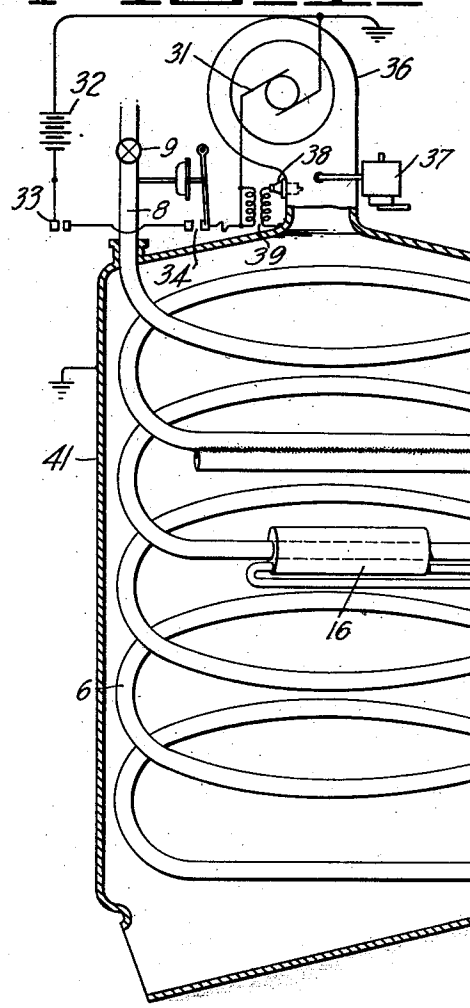
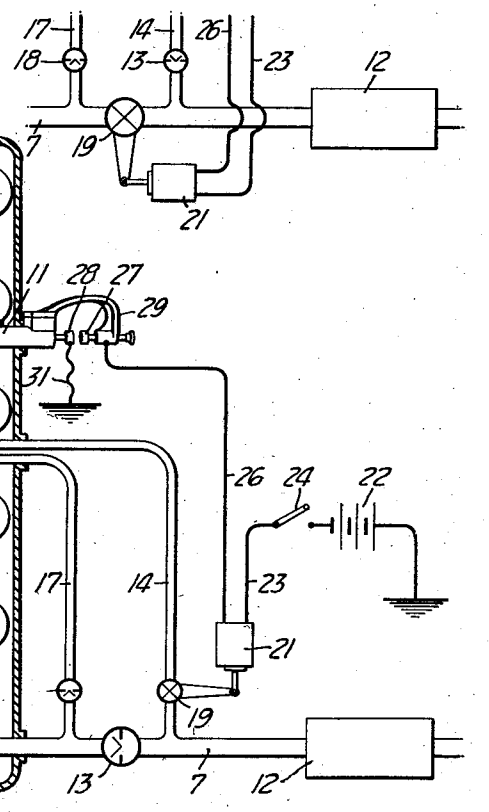


FIG. 2



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BOILER CONTROL

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1 Claim. (Cl. 122—479)

My invention relates to means for governing the temperature of superheated steam flowing from a boiler variously designated as of the semi-flash, series tube, or forced circulation type. Boilers of this type usually comprise at least one tube of considerable length heated by a heating mechanism such as a hydrocarbon burner. Feed water is introduced into the inlet end of the tube and is heated as it progresses through the tube, finally issuing from the tube outlet as superheated steam.

An object of my invention is to provide means for governing or controlling closely the temperature of steam generated by a boiler of the mentioned type.

The foregoing and other objects are attained in the embodiment of the invention shown in the drawing, in which

Figure 1 is a diagrammatic showing of a forced circulation boiler with the boiler control of my invention incorporated therewith.

Figure 2 is a diagram of a modified valve arrangement adjacent the inlet of the boiler.

In its preferred form, the boiler control of my invention includes a forced circulation type boiler having adjacent its steam zone a thermostat effective above a predetermined temperature to permit the flow of relatively cool water into a jacket in thermal union with a portion of the boiler tube in advance of or at the thermostat.

Forced circulation boilers are customarily provided with regulators for controlling in general the pressure and temperature of the steam issuing therefrom. Such regulators usually govern the supply of heat from the burner and the supply of feed water. Some of them include means for injecting additional feed water into the boiler tube just in advance of the thermostat for minimizing the fluctuations in temperature of the issuing steam. Exemplary regulators and controls for forced circulation boilers are shown in the various patents of Abner Doble, particularly No. 1,955,274, dated April 17, 1934 and Warren Doble, particularly No. 1,898,083, dated February 21, 1933.

In embodying my own invention I utilize any suitable general regulating or control system and any suitable heating and feed water supplying means, such for example as show in the patent of Marcus Lothrop, No. 1,935,981, dated November 21, 1933. Since any suitable boiler details and control system can be utilized they are not illustrated especially herein.

The present mechanism is incorporated with a heated boiler coil 6 of considerable length; the coil having an inlet 7 and an outlet 8, flow from which is governed by a throttle valve 9. Between the inlet 7 and the outlet 8 but near the outlet is a thermostat 11 arranged in thermal union with the boiler tube 6 to be responsive to the temperature therein. Since the coil 6 is properly heated, water which is introduced into the inlet from a force pump 12, flows past a check valve 13 and through the tube, being gradually heated and converted into steam and finally issues from the outlet 8 under control of the valve 9. The heating means for example includes an electric motor 31 deriving electricity from a battery 32 under control of a manual switch 33 and a switch 34 opened by steam pressure in excess of a predetermined amount. The motor 31 drives a blower 36 to aspirate fuel from a carburetor 37. This is ignited by spark plug 38 energized by an electric coil 39 so that the products of combustion travel through the boiler casing 41 over the tube 6.

In accordance with my invention I provide means for damping or suppressing major fluctuations in the temperature of the outflowing steam. A duct 14 is connected to any suitable source of water, such as the discharge side of the pump 12, and leads to a jacket 16 in thermal union with an appropriate portion of the coil 6 preferably slightly in advance of the thermostat 11. A return duct 17 extends from the jacket to any suitable point of discharge, usually being connected through a check valve 18 to the inlet 7 of the boiler tube 6 beyond the valve 13. Flow through the ducts 14 and 17 and the jacket 16, the resistance being less than through the valve 13, is under the control of a valve 19 actuated by a solenoid 21. The electric circuit for the solenoid is traced from a grounded battery 22 through a lead 23 including a master switch 24 to the solenoid and from the solenoid by a lead 26 to a pair of electrical contacts 27 and 28. The contact 27 is adjustably mounted on an insulated arm 29, while the contact 28 is mounted to move with the movable member of the thermostat 11 and is connected to ground by a wire 31.

In the operation of the device, as the temperature of the fluid passing the thermostat 11 exceeds a predetermined temperature, the contact 28 is moved to abut contact 27 and since the master switch 24 is closed, the electrical circuit from the battery 22 to the solenoid 21 is completed and the solenoid is actuated to open the valve 19. Some of the feed water discharged by the pump 12 is shunted through the duct 14 to the jacket

16. The relatively cool water in the jacket being in thermal contact with the fluid flowing through the tube 6 reduces the temperature of the tube fluid. The shunted and heated fluid from the jacket 16 enters the boiler coil at the inlet 7 beyond the check valve 18 thereby supplying relatively warm feed water.

When sufficient heat has been absorbed by the liquid flowing through the jacket 16, the temperature of the tube liquid is reduced below the predetermined temperature and the responsive thermostat 11 separates the contacts 27 and 28. The solenoid 21 is deenergized and the valve 19 is closed interrupting the supply of fluid to the jacket 16. The temperature of the fluid flowing through the tube 6 is therefore again permitted to rise.

In Figure 2 there is illustrated a modification in which the chief alteration is a transposition of the valves 13 and 19, the remainder of the structure being identical except that the valve 19 is moved toward closed position when the solenoid 21 is energized. The resistance to flow through the open valve 19 is less than through the shunt path formed by the ducts 14 and 17 and the jacket 16 so that little or no water flows to the jacket, but when the valve 19 is closed or partially so, water is diverted to flow through the shunt path.

In accordance with these arrangements there is a continual hunting or variation of the temperature adjacent the thermostat 11 either side of the predetermined temperature but such hunting or fluctuation is of relatively small magnitude so that the temperature of the steam issuing from the outlet 8 is relatively constant within very close limits. There is no alteration of the mass of fluid flowing in the tube 6 adjacent the thermostat because there is no addition of liquid for temperature correction purposes and the operation of the boiler is not upset from that aspect. Since there is no introduction into the tube 6 of a small additional quantity of water which must almost immediately be evaporated there is no deposit of carbon or scale in the main tube adjacent the thermostat 11. While the quantity of water flowing through the jacket 16 is relatively small and can in fact be so small as to be evaporated in the jacket 16, I ordinarily prefer that the quantity of liquid be sufficiently large so that its temperature is not greatly increased but increased just sufficiently to heat the feed water going into the inlet 7 in an amount which will not impair the general efficiency of the structure.

It is to be understood that I do not limit myself to the form of the boiler control shown and described herein, as the invention, as set forth in the following claim may be embodied in a plurality of forms.

I claim:

A control for a boiler characterized by a long, heated tube having an inlet and an outlet, comprising a heat exchanger intermediate the ends of the tube, a thermostat near the outlet end of said tube and responsive to the temperature thereof, means for forcing fluid into the inlet of said tube, means for diverting part of said fluid from the inlet through the heat exchanger and directly back to said inlet, and means under the control of said thermostat for controlling said diverting means to increase the quantity of water diverted through the heat exchanger upon increase of said temperature.

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