

Dec. 12, 1933.

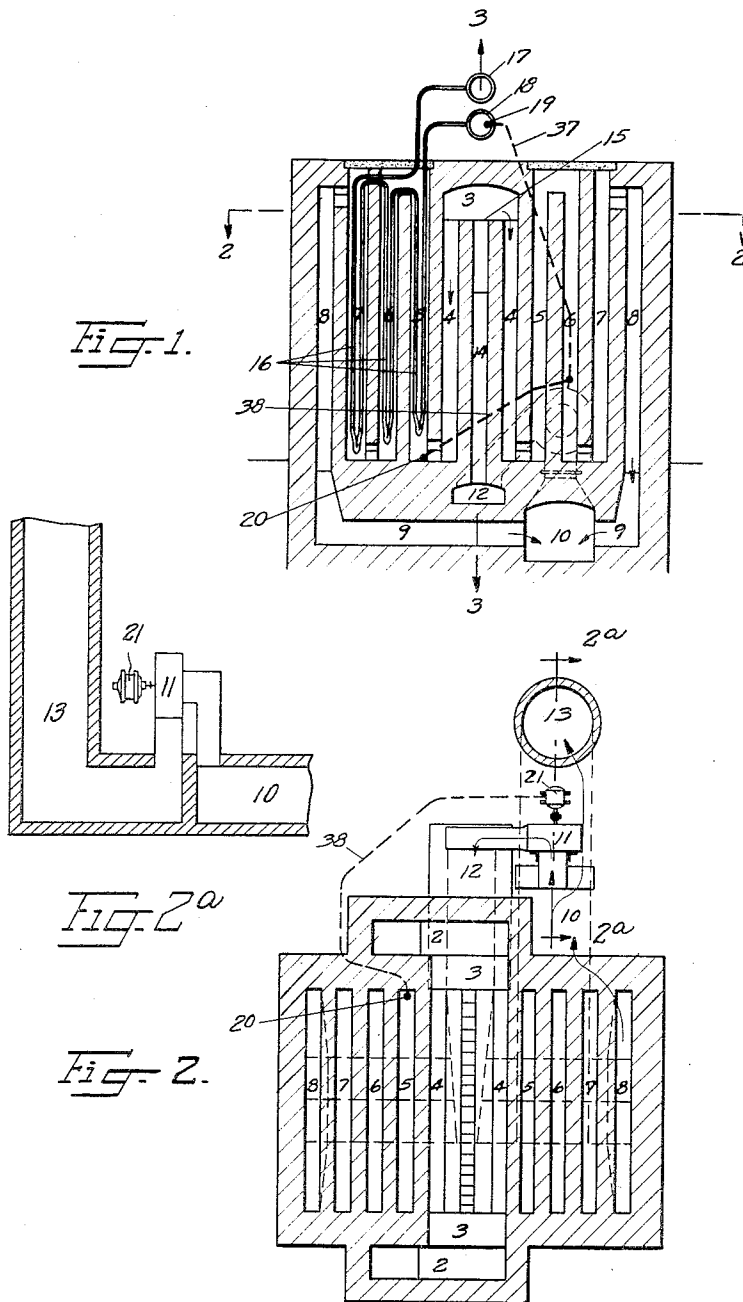
A. HUET

1,938,699

SUPERHEATER

Filed Aug. 30, 1930

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

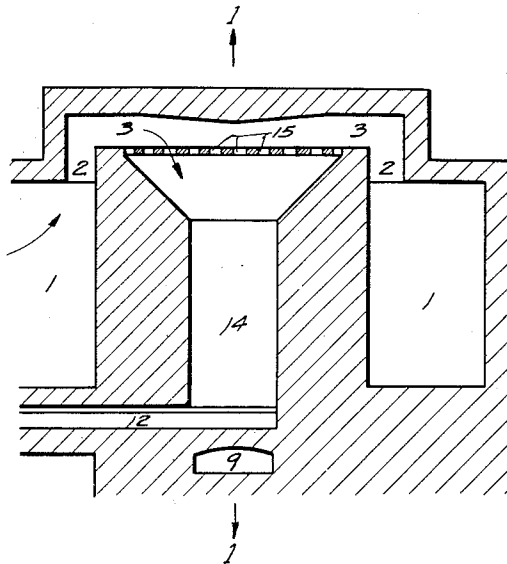


Fig. 3.

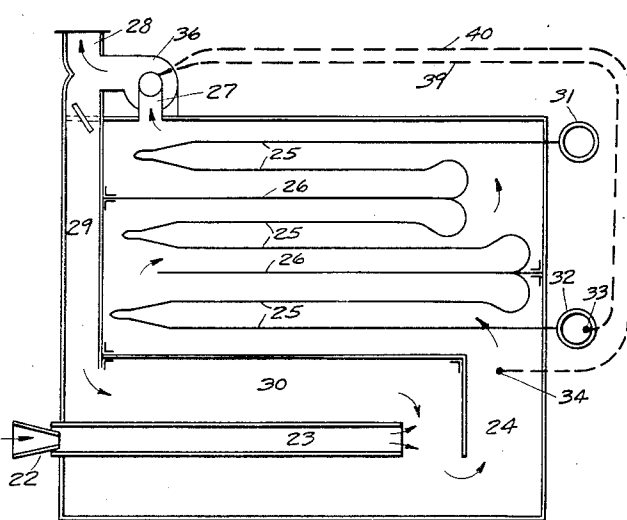


Fig. 4.

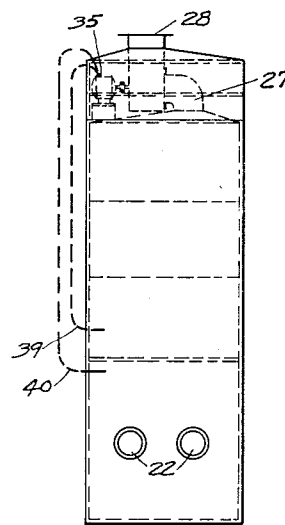


Fig. 5.

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UNITED STATES PATENT OFFICE

1,938,699

SUPERHEATER

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Application August 30, 1930, Serial No. 478,935,
and in France April 17, 1930

5 Claims. (Cl. 122—485)

Heating apparatus such as separate recuperative superheaters, in which a part of the gases leaving the apparatus is returned to the inlet by mechanical means such as fans, are known. The present invention has for its purpose the provision of an arrangement for regulating the recuperation in such heating arrangements. The arrangement comprises essentially one or several thermostats for automatically controlling a variable speed motor thereby forcing gases to the inlet of the apparatus and to the stack, this thermostat or these thermostats being arranged at a suitable place, as, for example, at the point where the gases enter the apparatus or in the header to which the fluid heated by the apparatus is delivered or in both places. The variations in speed of the fan will determine the quantity of the gas returning into the apparatus and will simultaneously vary the quantity of new hot gases introduced into the apparatus.

The quantity of new hot gases produced may in turn be changed either by the personnel attending to the heating apparatus or preferably automatically. Thus, if the source of heat is a liquid fuel burner, this burner may be of the aspiration type so that a simple change in the gas volume sent by the fan to the heating apparatus will result in the introduction of a smaller amount of the combustible and in a corresponding lowering of the heat. If, on the other hand, the source of heat is fed by mechanical means, for example by a liquid fuel pump, a pulverized fuel nozzle or a traveling grate for solid fuel, the thermostats mentioned or other thermostats may act at the same time on the fan motor and on a similar variable speed motor actuating the mechanical feeding means.

The ensuing description which refers to the accompanying drawings and which is given by way of example will make clear the manner in which the invention may be carried out.

Fig. 1 is a longitudinal section of a separate recuperative superheater with the invention applied;

Fig. 2 is a horizontal section on line 2—2 of Fig. 1 looking in the direction indicated by the arrows;

Fig. 3 is a transverse section of the same apparatus on line 3—3 of Fig. 1;

Fig. 4 is a longitudinal section of a separate recuperative superheater of a different system than that of Figs. 1, 2 and 3; and

Fig. 5 is a front view of the superheater shown in Fig. 4.

In Figs. 1, 2 and 3 hot gases are produced on a grate or by a burner of any desired type in the combustion space 1, whence they pass by the conduits 2 and 3, descending by the conduits 4 and thereafter circulating through the conduits 5, 6 and 7 in which the superheater elements 16 are arranged after which the gases pass through the channels 8 and 9 to the duct 10.

A fan 11 draws the gases from the duct 10 and sends them in part to the conduit 12, while the remainder of the gases is delivered from the fan to the atmosphere by the stack 13.

From the conduit 12 the gases delivered by the fan 11 rise through the conduit 14 passing out through the openings 15 and mixing with the gases coming from the conduit 3 flowing together with the latter through the various passages in contact with the superheater elements. Header 17 is the header for saturated steam feeding the superheater elements 16. The steam after it has been superheated in these elements returns to the outlet header 18. According to the present invention a thermostat 19 is installed in the header 18 and between this thermostat and a motor 21 which actuates the fan, a connection is provided including, for example, a relay causing variations of speed in the desired direction of the motor 21 which is of a variable speed type.

Further, in conformity with the invention, a second thermostat 20 is provided at the bottom of one of the conduits 5, that is to say, at the entrance of the hot gases into the compartments containing the superheater elements, and this thermostat can also vary the speed of the motor 21 through the connection 33 which may act through a relay. It will readily be seen that, the thermostats 19 and 20 having been properly adjusted, they will increase the speed of the fan 21 when the temperature becomes too high either at the point where the hot gases enter into the chambers containing the elements or in the header for the superheated vapor, and will thereby increase the volume of the gases forced toward the inlet of the superheater after having traversed it, and, vice versa, they will decrease the speed of the motor in the opposite sense, and thus by reducing the volume of the gases returned permit the flow of a greater quantity of new hot gases and therefore an increase of the temperature in the entire apparatus.

In Figs. 4 and 5 a separate recuperative superheater is illustrated of a type different from the first. Here hot gases produced by the burner 22, which is shown as of the aspiration type, flow through the tubes 23 and the conduit 24 and then

circulate around the superheater proper composed of tubes arranged in horizontal planes, some of these tubes being bent back on themselves and placed in adjacent relation to form baffles 26. The hot gases thereafter pass through the duct 27 to the fan 36 which sends a part of them to the stack 28 and returns the remainder through the conduits 29 and 30 to the conduit 24 and to the superheater proper. 31 is a saturated steam header and 32 the superheated steam header. 33 and 34 are two thermostats placed respectively in the superheated steam header and in the gases at their entrance into the chamber containing the superheater proper. 39 and 40 show diagrammatically the connections between the thermostats and the variable speed motor 35 driving the fan 36. It will be seen that the area for the admission of air thru and around burner 22 to conduit 23 is much smaller than the opening for admission of gases from fan 36 to conduit 29 and that conduit 23 is smaller in free area than conduits 29 and 30 so that when the speed of fan 36 is increased the flow thru conduits 29 and 30 is increased more readily and therefore more rapidly than that thru conduit 23 to thereby increase the proportion of recirculated gases in the mixture flowing thru chamber 24 to the superheater elements. It will be understood without its being necessary to show it in the drawings, that the same thermostats may at the same time that they act in one direction on the motor driving the fan for forcing the gases, act in the contrary direction on the fuel fed to the furnace, accelerating or reducing the speed of a variable speed motor which actuates either a pump for a liquid combustible or a distributor for pulverized fuel or a mechanical stoker if a solid fuel is used such as coal.

In the case of a liquid combustible, it will be simpler to use burners of the aspiration type whose delivery will vary according to the suction to which they are subjected. In any event, when the temperature rises too high in the superheater, it will be brought back to the proper point both by an increase in the volume of the gases returned to the entrance to the superheater and by a diminution of the production of the new hot gases in the combustion chamber.

What I claim is:

1. The method of operating a superheater comprising contacting heating gases with the elements of the superheater and circulating over said elements an amount of said gases which have once passed over the elements increasing with increase in temperature of the steam at the out-

let of the superheater, and increasing with increase in temperature of the heating gases at the point of their first contact with the superheater elements.

2. The method of operating a separately fired fluid heater having a furnace, a recirculating means for mixing cooled gases of combustion with freshly formed gases of combustion coming directly from said furnace and for passing such mixture through said heater, and an aspirator arranged to draw through itself the entire body of said mixed gases, comprising flowing said cooled gases of combustion toward the mixing point at a lower rate of speed than that of said freshly formed gases and controlling the proportion of said cooled gases in the said mixture by varying the aspirating action of said aspirator.

3. The combination of a separately fired fluid heater having a furnace, a recirculating means for mixing cooled gases of combustion with gases coming directly from said furnace and for passing such mixture through said heater, the passage for said cooled gases having an area such that the cooled gases have normally a lower velocity than said gases coming directly from said furnace an aspirator arranged to draw through itself the entire body of said mixed gases, and means for controlling the action of said aspirator in response to the temperature of the fluid being heated at the outlet of the heater to vary the proportion of said cooled gases in said mixture.

4. The combination as set forth in claim 3 together with means for controlling the action of the aspirator in response to the temperature of the mixed gases at a point close to but ahead of the entire heater surface in the path of the gases.

5. The combination of a separately fired fluid heater having a furnace, means for admitting air and fuel thereto, a recirculating means for mixing cooled gases of combustion with gases coming directly from said furnace and for passing such mixture thru said fluid heater, said admitting means having an area for gas flow relative to that of said recirculating means such that the gases flowing from the furnace to the mixing point have a higher velocity than said cooled gases flowing toward the mixing point, an aspirator arranged to draw thru itself the entire body of said mixed gases and means for controlling the action of said aspirator in response to the temperature of the fluid being heated at the outlet of the heater to vary the proportion of said cooled gases in said mixture.

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