

March 29, 1938.

V. O. BEAM

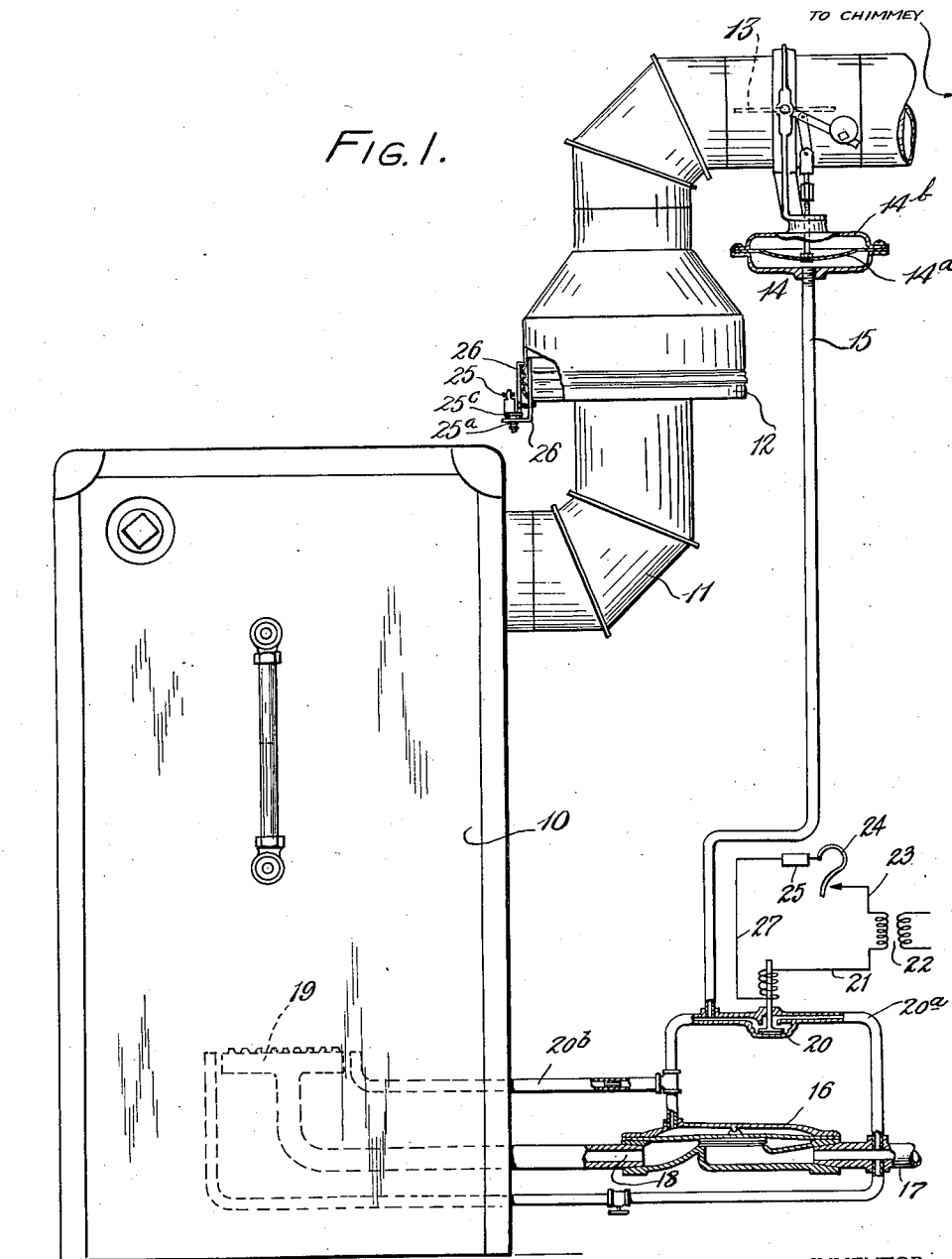
2,112,554

AUTOMATIC CONTROL FOR FUEL BURNING APPARATUS

Filed July 17, 1936

2 Sheets-Sheet 1

FIG. 1.



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2 Sheets-Sheet 2

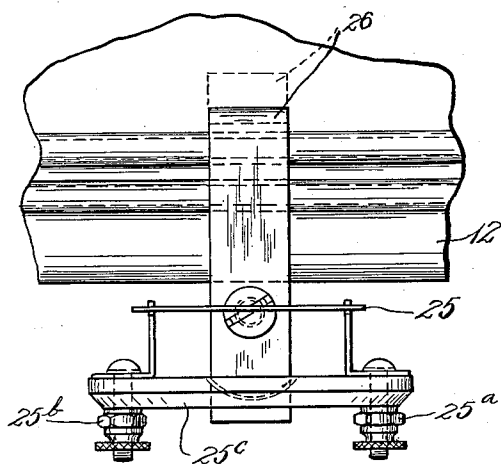


FIG. 3

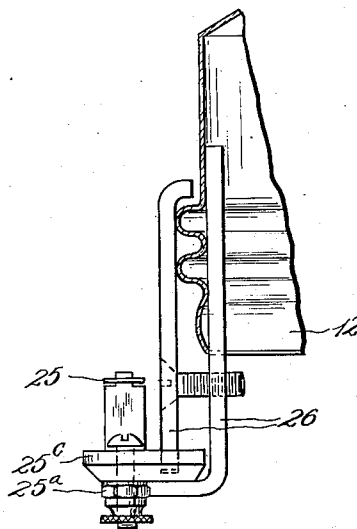


FIG. 2

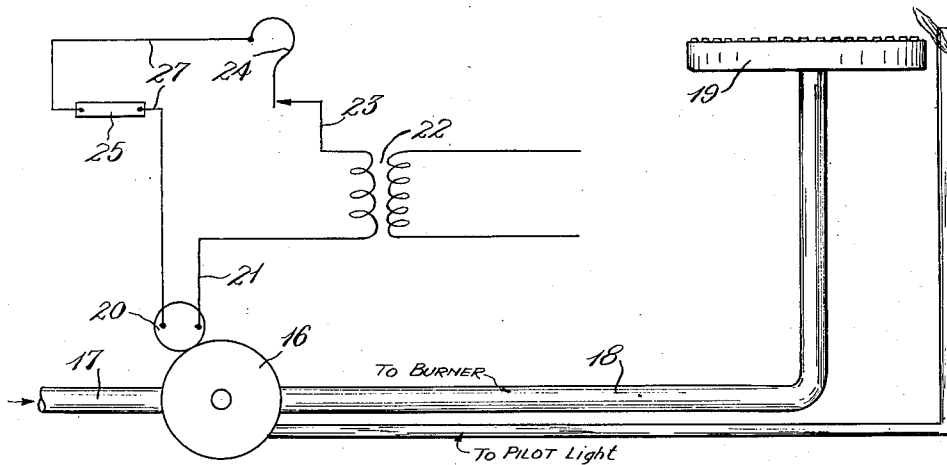


FIG. 4

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AUTOMATIC CONTROL FOR FUEL BURNING
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Application July 17, 1936, Serial No. 91,149

2 Claims. (Cl. 158—1)

This invention relates to an automatic control for fuel burning apparatus and especially boilers and furnaces fired with gas or other fluid fuel having an electrically operated or an electrically controlled main valve for controlling the flow of fuel to the burner or burners.

More particularly the invention relates to an automatic control which becomes effective to stop the flow of fuel to the burner or burners upon the clogging of the flue or chimney to which the boiler or furnace is connected or otherwise upon the occurrence of the reversal of the products of combustion and the outward flow thereof from the draft hood which is provided in the flue pipe between the boiler or furnace and the chimney to deflect any down drafts that might come down the chimney and also to admit air from the boiler or furnace room into the chimney thereby breaking the effect of the chimney draft on the boiler or furnace itself, and neutralizing the effect of variable chimney draft.

Should the products of combustion thus flow out into the furnace or boiler room by way of the draft hood, the lives of the occupants of the dwelling in which the apparatus is installed is obviously endangered, at least it would result in considerable discomfort to them.

One of the objects of the present invention is to provide means for automatically shutting off the flow of fuel to the heating unit in the event the flue or chimney becomes clogged for any reason.

A further object is to provide a safety device for use in connection with an automatic flue damper such as shown in the Stark Patent No. 1,982,031 of November 27, 1934, so as to cause the main valve to be closed and thereby shut off the flow of fuel to the heating apparatus if for any reason the damper fails to open when the main valve is opened.

A further object is to provide a simple but reliable device which will cause the closure of an electrically controlled or an electrically operated valve, such as a valve of the diaphragm type, if the products of combustion do not flow freely through the flue pipe for any reason, such as the clogging of the chimney or failure of the automatic damper to open, and the invention aims to accomplish this preferably by opening the circuit of the solenoid or other motive device which causes the operation of the main valve.

My invention therefore comprises means for automatically causing the closure of the valve if the flow of the products of combustion through the flue is prevented. A convenient way to ac-

complish this result is to cause the circuit which controls or operates the main valve to be opened, thereby causing the closure of the valve. While this circuit may be controlled in different ways, I have discovered that the best mode of attaining the results by following this procedure is to provide a fuse in the control circuit and to locate this fuse at a suitable point along the flue, as, for example, at the lower edge of the draft hood, so that it will be subjected to the flow of hot products of combustion as they spill out of the draft hood when their normal passage through the flue and the chimney is prevented.

The invention may be further briefly summarized as consisting in certain novel combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the accompanying sheets of drawings wherein I have illustrated my invention applied to a gas-fired heating unit,

Fig. 1 is a side view of a gas boiler equipped with my invention;

Fig. 2 is an enlarged sectional view through a portion of the draft hood showing the mounting of the fuse;

Fig. 3 is a side view of the same looking toward the right of Fig. 2; and

Fig. 4 is a diagrammatic view showing a solenoid-controlled valve in the gas supply pipe leading to the burner with a room thermostat and the fuse of the present invention in the solenoid circuit.

Referring now to the drawings, 10 is a conventional gas-fired boiler or furnace from which extends the usual flue which is provided with the customary draft hood 12 and will be connected to a chimney in the usual manner. The draft hood has two primary functions, one being to deflect any down drafts that may come down the chimney allowing them to flow out through the relief opening at the bottom of the draft hood and thus prevent their admission to the combustion chamber which would otherwise interfere with proper combustion. The other function of the draft hood is to admit air from the boiler room through the opening at the bottom of the draft hood into the flue pipe and subsequently into the chimney, thereby tending to break the effect of chimney draft on the boiler or furnace 10.

In the flue beyond the draft hood is an automatic flue damper 13 similar to that described and claimed in Patent No. 1,982,031. This flue damper is adapted to be moved by gravity to

open position indicated in Fig. 1, in which case a weighted lever may be attached to the pintle of the damper, as indicated in Fig. 1, and it is moved to closed position by a pressure responsive device 14 preferably in the form of a diaphragm 14a in a chamber 14b. Gas pressure is adapted to be supplied to the lower part of the chamber or beneath the diaphragm so as to close the damper 13 by a supply pipe 15. I have shown conventionally in Figs. 1 and 4 at 16 a diaphragm valve which controls in a well known manner the supply of gas from the supply pipe 17 to the delivery pipe 18 leading to the burner or burners 19. 20 is a solenoid valve located in a by-pass pipe 20a extending from supply pipe 17 to the upper chamber of diaphragm valve 16, and communicating with pipe 15. A bleeder pipe 20b with a constriction 20c therein extends from by-pass pipe 20a into the furnace. The chamber in the upper part of the diaphragm valve 16 and the chamber in the lower part of the device 14 are therefore in communication at all times with the bleeder pipe 20b. It will be apparent that when solenoid valve 20 is open, as in Fig. 1, pressure from the gas main builds up in pipe 15, causing the main valve 16 to close and raising the diaphragm 14a in the device 14, thereby closing damper 13, and that when the solenoid valve 20 is closed the pressure in pipe 15 is quickly dissipated through constriction 20c and pipe 20b, permitting the diaphragm of valve 16 to open by rising away from its seat under the influence of gas pressure, and permitting the weighted diaphragm 14a to descend by gravity, thereby opening the damper 13. Normally the damper 13 is opened simultaneously with the opening of the main gas valve and is closed simultaneously with the closure of the main gas valve.

The solenoid valve 20 may have simply a single circuit, i. e., an energizing circuit, which is effective to cause the solenoid to relieve the pressure from the upper chamber of the diaphragm valve 16, thereby causing it to open and permit the flow of gas to the burner or burners and which when deenergized allows the plunger of the valve to move by gravity or by the action of a spring or both to a position to admit pressure to the upper chamber of the valve 16 and thus cause the latter to close. That arrangement is shown in this case. On the other hand, the solenoid of the control valve may have two circuits, as shown in the Stark Patent No. 1,982,031, in which event one circuit when energized moves the control valve to a position to cause the main valve 16 to open, and the other circuit when energized moves it to its other position to cause the main valve 16 to close.

Coming now to the feature more directly involving the present invention, it will be noted that one terminal of the solenoid of valve 20 is connected by a conductor 21 to a source of current which may be a battery, but in this instance it is connected to the secondary of a transformer the primary of which may be connected to an ordinary lighting circuit. The other terminal of the secondary of the transformer is connected by a conductor 23 to one terminal of a room thermostat 24. The other terminal of the thermostat is ordinarily connected to the second terminal of the solenoid of valve 20. As is well understood, when the thermostat calls for heat, the circuit is closed at the contacts of the thermostat, causing the energization of the solenoid of the control valve 20, and this results in the opening of the main valve 16 and the flow of gas to

the burner or burners, this circuit remaining energized so long as contact is made at the thermostat, but when the room temperature rises to a point above that at which the thermostat is set, the contacts of the thermostat open and the circuit is deenergized.

In accordance with the present invention, I introduce in this circuit a control member which responds in a suitable manner upon the reversal of the flow of the products of combustion preferably at the draft hood so as to deenergize the circuit and cause the valve 16 to close independently of the room thermostat. This device is preferably in the form of a fuse 25 which in this instance has two terminals 25a and 25b mounted on a bar 25c which is attached by means of a suitable clamp 26 to the lower edge of the draft hood preferably with the fuse just below the lower edge of the hood and outside the same. The two terminals of the fuse 25 are connected respectively by conductors 27 to one terminal of the thermostat and to one terminal of the solenoid of the control valve as indicated in Fig. 4.

Ordinarily, when the products of combustion flow freely through the flue, the fuse is unaffected thereby particularly as relatively cool air from the furnace or boiler room is at such time flowing around the lower edge of the hood into the same. However, if the furnace or boiler should be lit at a time when the flue or chimney is obstructed by a collection of soot or the like or by the failure of the automatic damper to open when the main valve is opened, the hot products of combustion flow out from beneath the draft hood, envelop the fuse, and quickly blow it, causing the solenoid circuit of the control valve to be opened, resulting in the immediate closure of the main valve. Thereafter, the main valve cannot be opened until a new fuse is put in position which of course will ordinarily not be done until the fault is remedied.

Thus it will be seen that the objects of the invention are attained very effectively, and while I have shown only one embodiment of the invention, I do not desire to be confined thereto but aim in my claims to cover all modifications which do not involve a departure from the spirit and scope of the invention in its broad aspects.

Having thus described my invention, I claim:

1. In heating apparatus fired with fluid fuel, a heating unit having a flue extending therefrom provided with a draft hood, a valve controlling the supply of fuel to the heating unit, electrical means including a circuit for controlling the valve, an automatic flue damper which is normally closed and opened concurrently with the closing and opening of the valve, and means comprising a thermally responsive element adjacent the draft hood for causing the closure of the valve if the heating unit is operated following the opening of the valve and the damper fails to open.

2. In gas-fired heating apparatus, a heating unit having a flue extending therefrom and provided with a draft hood, a fuel supply pipe having a valve, electrical means and a circuit therefor for controlling the valve, a flue damper in the flue beyond the draft hood, means for opening and closing the damper concurrently with the opening and closing of the valve, and a fuse in said circuit adjacent the draft hood and adapted to be blown if the flow of the products of combustion through the flue is prevented by the failure of the damper to open when the valve is opened.

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