Oct. 5, 1943. M. L. MUELLER ET AL 2,331,219

THERMOSTATIC CONTROL FOR POT TYPE BURNERS

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Fig. 2

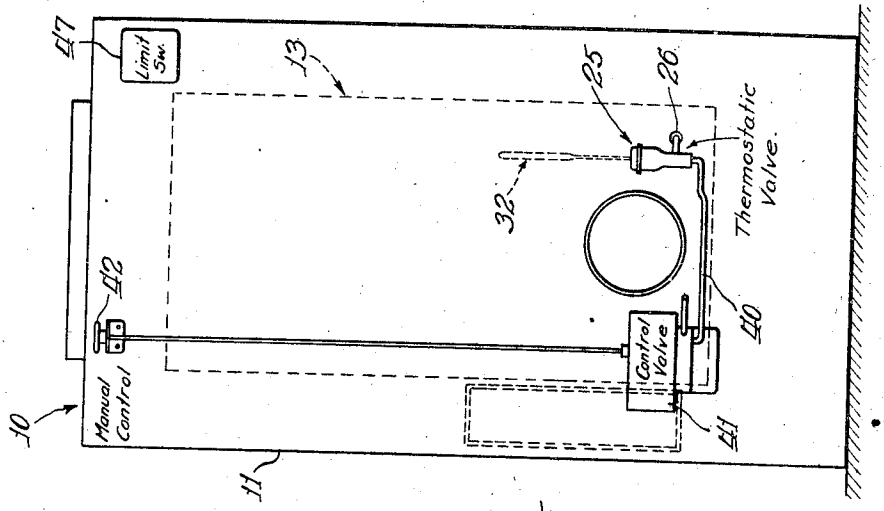
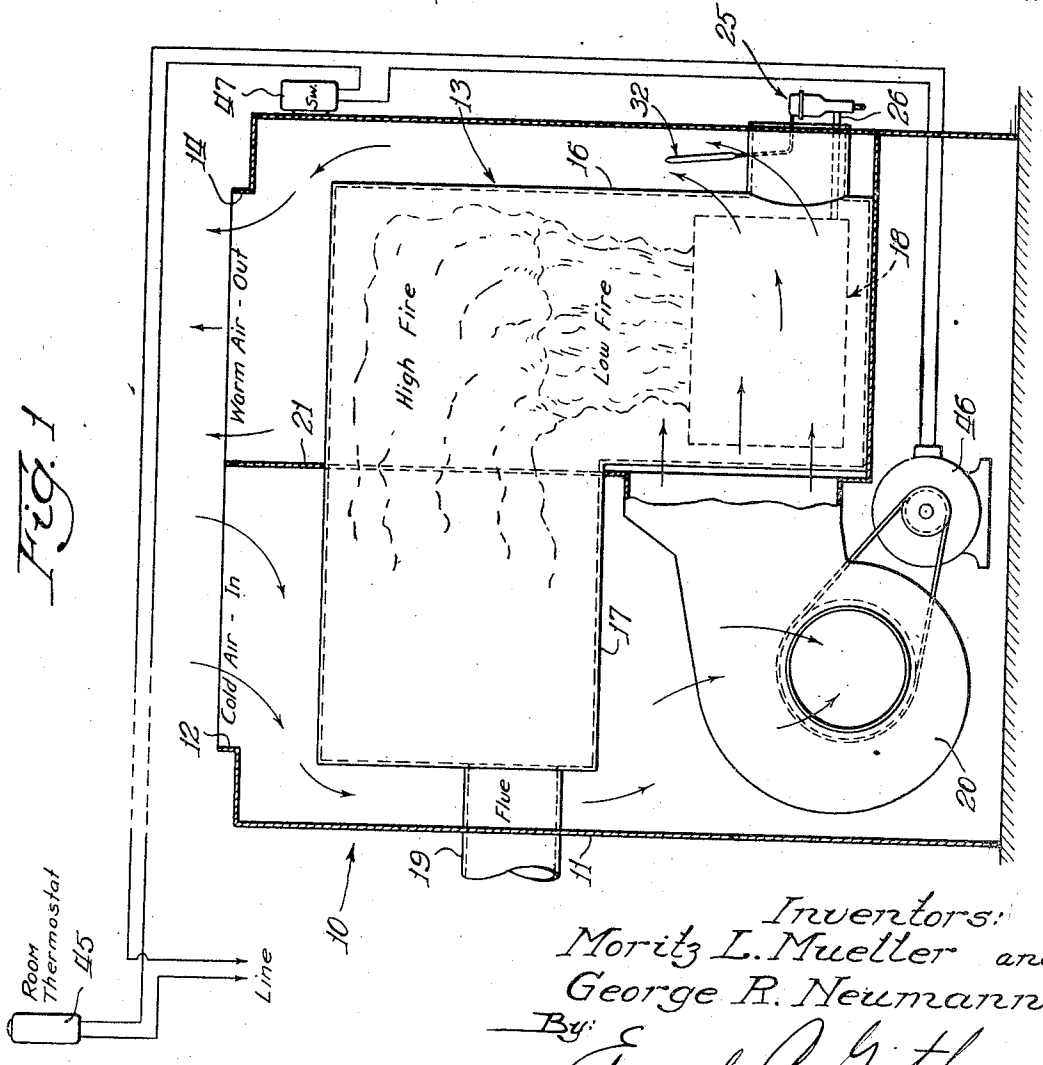


Fig. 1



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Fig. 3

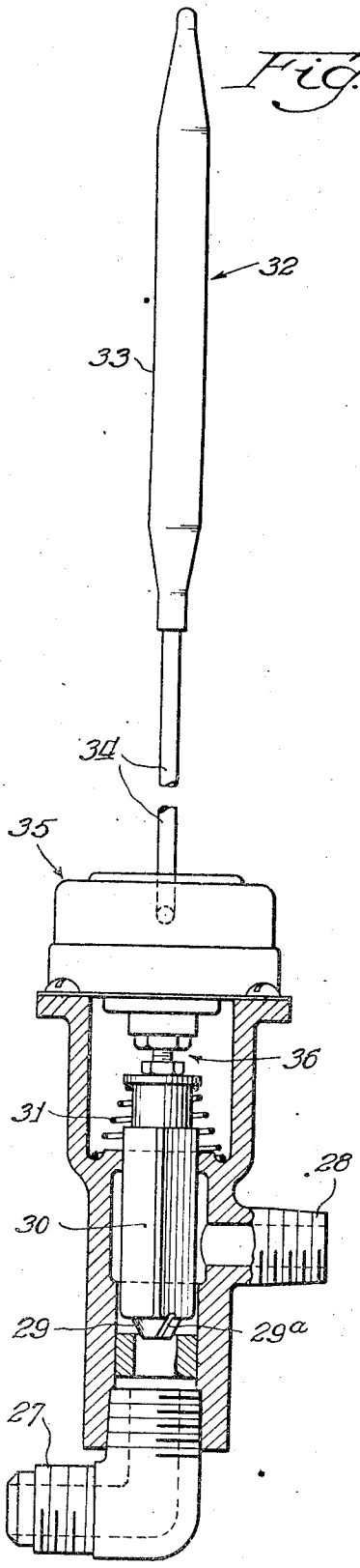
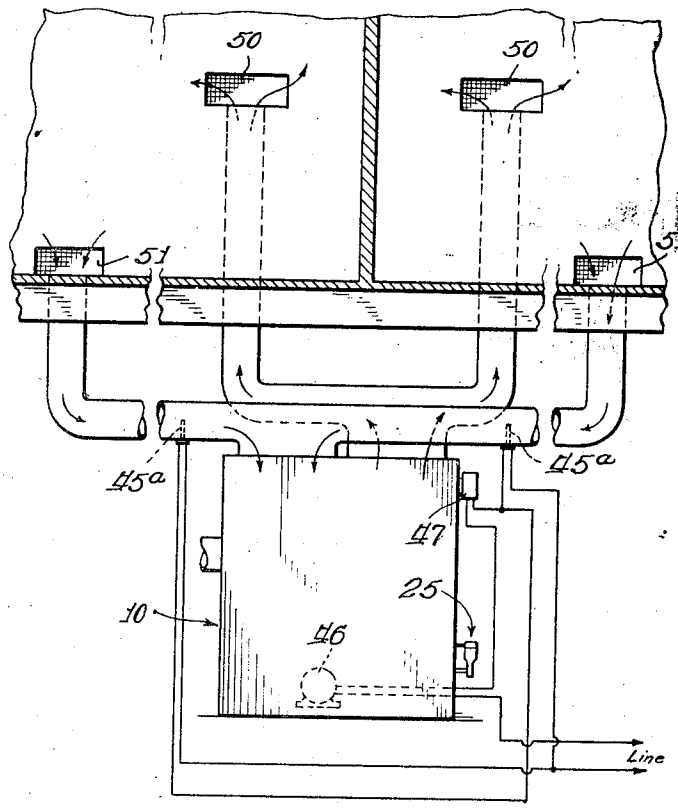


Fig. 4



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Patented Oct. 5, 1943

2,331,219

UNITED STATES PATENT OFFICE

2,331,219

THERMOSTATIC CONTROL FOR POT-TYPE BURNERS

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Application July 14, 1941, Serial No. 402,348

4 Claims. (Cl. 236—9)

This invention relates to hot air heater systems and particularly to an arrangement for effecting the transition from low fire to high fire and vice-versa, having special application to oil pot burner heaters.

The ultimate to be achieved in the operation of oil pot burners is complete combustion for all values of heat output varying from that at low fire to that at high fire. The difficulty in accomplishing this result is of course due to the several variables present in the operation of this type of system, these including the control of the variable rate of oil feed to the burner; and the degree of heat present in the space to be supplied with warm air circulated from the heater. Any over-feeding of the fuel oil in effecting a transition from low fire to high fire will of course result in incomplete combustion, formation of carbon deposits and possibly actually snuffing out the fire altogether.

The problem of how to properly control and correlate the flow of oil to the burner in effecting an increase or decrease in the rate of combustion therein has presented difficulty for a long time without being satisfactorily solved. This art is highly developed and many arrangements have been proposed with varying degrees of limited success. For example such proposals have included thermostatic means located in the space to be supplied with warm air and operable to control the oil feed to the burner, such means even including certain forms of limited delayed action means such as dash pots, and electrically heated warp elements.

It is an object of the present invention to provide an improved arrangement of control devices for correlating the supply of fuel oil to the burner pot and the circulation of heated air through the heater whereby the required relatively long delayed action of the fuel oil feed valve is accomplished during the transition from low fire to high fire and vice-versa to thus obtain complete combustion under all conditions of operation.

It is a more particular object to provide in a combination of the above type a definite correlation between the means for creating a forced draft and the means for regulating the flow of fuel oil to the burner pot this correlation including a relatively long delayed action between the operation of these two instrumentalities.

It is a still further detailed object to provide an air heater of the present type wherein the air is brought into contact with the exterior heating surface of the stove at least twice before acting on the heat sensitive fuel control device and wherein a forced draft producing means is incorporated in series with the means for effecting this plural contact.

The above and other objects, advantages and uses of our invention will become apparent from a reading of the following specification taken in connection with the accompanying drawings forming a part thereof and wherein;

Figure 1 is a schematic broken away cross section of a preferred embodiment;

Figure 2 is a right hand elevation of the assembly shown in Figure 1;

Figure 3 is an enlarged broken away section view of the thermostatic or heat controlled oil feed regulating valve assembly; and

Figure 4 is a schematic layout of a modified form of the present invention.

Referring in greater detail to the figures of the drawings and particularly to Figure 1, numeral 10 indicates generally a hot air heating and circulating assembly incorporating a preferred embodiment of the present improved control mechanism. Heater 10 includes essentially an inclosing housing 11 provided with a cold air inlet 12 for the introduction of air from the room or space to be heated, a stove assembly indicated generally at 13 located within the housing in spaced relation thereto for defining an air circulating and heating space therebetween and a warm air outlet 14 for removing the hot air to the room or space to be heated.

The stove assembly 13 is preferably in the form of a vertical drum-like section 16 merging with an elongated horizontally extending drum-like extension 17 resulting in a generally L shaped stove. Received in vertical drum section 16 is a pot type oil burner 18 the combustion gases from which pass up through vertical section 16, horizontal section 17 and out through a flue discharge connection 19.

A special arrangement is provided for feeding fuel oil to pot burner 18 in a manner which effects substantially complete combustion irrespective of the required heighth of fire varying from low fire to high fire or irrespective of transitions from low fire to high fire or vice-versa. This arrangement includes an improved construction and relation of structure for directing the air through the heater assembly in a predetermined path and comprises a device for providing a forced draft at selected intervals. This forced draft is established in response to a demand for increased temperature in the space or room to be heated and the resulting draft of air forced through the

assembly is made to operate a slow acting heat responsive device to effect a gradual increase in the oil supply to the pot burner following a relatively long time delay of about 4 to 6 minutes from the starting of the forced draft producing device.

In the preferred embodiment illustrated in Figure 1 cold air is drawn in through inlet 12 by means of a blower 20 and forced about the lower portion of vertical stove section 16 in juxtaposition to the pot burner 18 and sent upwardly and out of discharge outlet 14. Vertical partition 21 embraces the horizontal portion of the stove 17 at a point adjacent to vertical section 16 separating the cold air inlet from the warm air outlet making it necessary for all of the air circulated through the heater to pass through the blower 20 as indicated by the arrows.

For delivering fuel oil to burner pot 18 there is provided a thermostatically controlled valve assembly indicated generally at 25 communicating with the pot burner 18 through conduit 26. Valve assembly 25 includes an inlet port 27 and an outlet port 28 under the control of a metering valve 29 provided with a minimum flow orifice 29a effective to supply a minimum amount of oil to the burner 18 when the valve is completely closed to maintain a pilot flame. Valve stem 30 is normally urged in the open direction by a compression coil spring 31. The exact position of valve 29 is determined by a heat responsive device indicated generally at 32 and preferably including a tube 33 containing a heat responsive liquid such as ethyl alcohol or its equivalent connected through conduit 34 with a pressure responsive member indicated at 35 effective to urge valve 29 against compression spring 31 in accordance with the temperature to which tube 33 is exposed. Pressure responsive member 35 includes an adjustable assembly 36 varying the relationship to stem 30. The inlet port 27 of valve assembly 25 is arranged to be supplied through conduit 40 with a predetermined head of fuel oil maintained in a float control valve housing 41. This float control valve assembly is provided with the usual manual control 42 for varying the level of fuel maintained therein.

It has been found that particularly advantageous results are obtained where heat responsive tube 33 is positioned as shown in Figure 1 at a point within the hot air space between the stove section 16 and the surrounding housing in opposed relation to the pot burner and on the opposite side of stove section 16 from the discharge outlet of blower 20. This results in the very desirable prolonged time delay between the starting of the blower and the necessary cooling of the liquid within tube 33 for causing the opening of valve 29 to produce an increased flow of oil to pot burner 18. It will be noted that the air from the blower first passes in heat transmitting relationship with vertical stove section 16 before coming in contact with tube 33. In the more specific aspects of this invention it will be noted that the cold air entering through inlet port 12 first receives a certain amount of preheating from horizontal stove section 17 before passing through blower 20 and about vertical section 16 of the stove and finally in the contact with tube 33.

For the purpose of effectively initiating a transition period from low fire to high fire or the reverse an adjustable temperature control thermostat switch 45 is located at a desired point in the space or room to be heated and connected in the circuit of the motor 46 which drives blower 20. By having the thermostat 45 effect the closing and opening of the circuit to motor 46 it will now appear that the requisite correlation of oil flow to the burner pot in accordance with the condition of the flame for receiving the same will be effected and there will be a complete combustion of the oil. In addition to switch 45 there is provided a switch 47 responsive to a predetermined temperature for maintaining the blower circuit open in the absence of a minimum temperature within the space between vertical section 16 and the housing 11.

Turning to Figure 4 there is illustrated schematically a modified arrangement incorporating an alternative embodiment of the present invention. Instead of locating the thermostat 45 in the space or room to be heated there is provided an arrangement of conduits or ducts 50 for delivering hot air from the outlet of the heater to the respective rooms and additional ducts 51 for returning the cold air to the heater, the thermostatic control devices 45a being placed in the cold air return ducts for effecting starting and stopping of the blower motor in accordance with the temperature in these return ducts. While no arrangement has been indicated for adjusting the temperature to which the thermostats 45a are to respond it will be apparent that a conventional adjustable arrangement may be provided.

While the present invention has been disclosed in connection with certain specific embodiments thereof is to be understood that these are by way of example rather than by way of limitation and that the invention is to be defined by the attendant claims which should be given a scope as broad as is consistent with the prior art.

We claim:

1. In a hot air heating assembly for heating an inclosed space, including a pot burner heated stove and a surrounding cabinet defining an air heating chamber therebetween, means defining a cold air inlet from said space and a warm air outlet to said space, means including a valve for delivering fuel oil to said burner, a heat responsive device for controlling said valve, said device being located in the path of air circulation at a point subject to heat radiation from said stove, and an electric motor driven air blower for producing a forced circulation and means for selectively starting and stopping said blower, whereby the forced circulation of air produced by said blower upon the same being operated is effective to cool said heat responsive device which in turn causes the delayed opening of said fuel valve and the building up of said burner flame from low fire to high fire.

2. In a hot air heating assembly for heating an inclosed space, including a pot burner heated stove and a surrounding cabinet defining an air heating chamber therebetween, means defining a cold air inlet from said space and a warm air outlet to said space, means including a variable flow valve for delivering fuel oil to said burner, a first heat responsive means for controlling the degree of opening of said valve, said first heat responsive means being located in the path of air circulation at a point subject to heat radiation from said stove, an electric motor driven air blower for producing a forced circulation, a second heat responsive means for controlling said blower operation, said second heat responsive means being located in said inclosed space to be heated, whereby said second heat responsive means responds to a demand for heat in said

space to cause the starting of said blower, the circulation of air past said first heat responsive means resulting in a delayed gradual opening of said fuel valve to build up the burner flame from low fire to high fire.

3. In a hot air heating assembly for heating an inclosed space, including a pot burner heated stove and a surrounding cabinet defining an air heating chamber therebetween, means defining a cold air inlet from said space and a warm air outlet to said space, means including a variable flow valve for delivering fuel oil to said burner pot, the combination therewith of means for effecting a transition from low fire to high fire and the reverse with substantially complete combustion, said means comprising a first heat responsive device for controlling the degree of opening of said valve, said device being located in the path of air circulation at a point also subject to heat radiation from said stove, and an electric motor driven air blower located in said cabinet for producing a forced circulation from said cold air inlet to said warm air outlet, a second heat responsive device for controlling the operation of said blower, said second heat responsive device being located in said inclosed space to be heated, whereby the same responds to a demand for heat to cause the starting of said blower, the resulting circulation of air past said first heat responsive device effecting a delayed gradual opening of said fuel valve building up the burner flame from low fire to high fire.

4. In a hot air heating assembly for heating an inclosed space including a pot burner heated stove and a surrounding cabinet defining an air heating chamber thereabout, said stove being elongated in the horizontal direction and a vertically extending partition dividing said chamber into two vertical compartments intermediate the horizontal extremities of said stove, means defining a cold air inlet from said inclosed space to a first one of said compartments and means defining a warm air outlet from the other of said compartment to said inclosed space, an electric motor driven air blower for producing a forced circulation from said first compartment to said second compartment, a pot type oil burner in that portion of said stove located in said second compartment, means including an adjustable flow valve for delivering fuel oil to said burner, a first heat responsive means for controlling the degree of opening of said valve, said first heat responsive means being located in the path of air circulation through said second compartment at a point between said outlet and said stove also subject to the heat radiation from said stove, a second heat responsive means for controlling operation of said blower, said second heat responsive means being located in contact with the air from said inclosed space before the temperature of the same is changed by said heating assembly, whereby said second heat responsive means upon a predetermined drop in the temperature thereabout causes the starting of said blower, the resulting circulation of air past said first heat responsive means cooling the same and causing a gradual delayed opening of said valve to build up said burner flame from low fire to high fire.

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