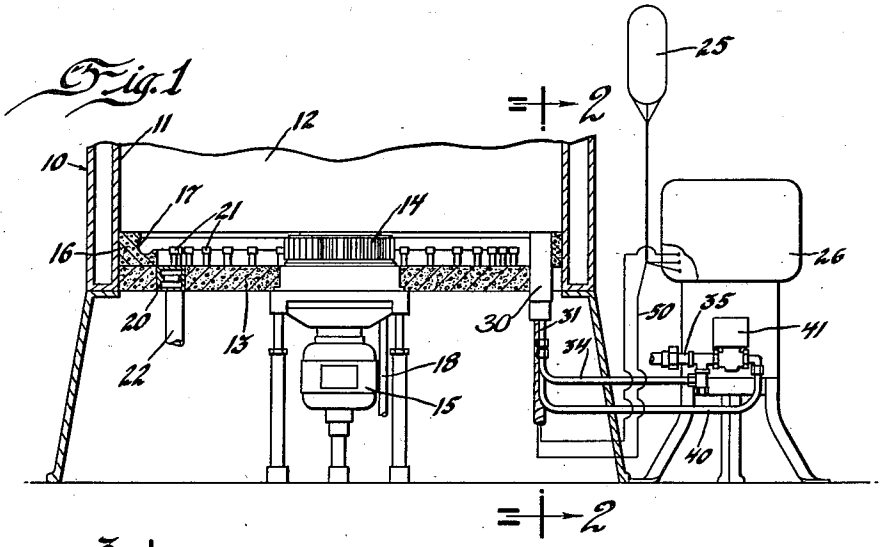
May 23, 1933. M. A. POWERS 1,910,362

CONTROL DEVICE

Filed Aug. 24, 1931

Fig. 1



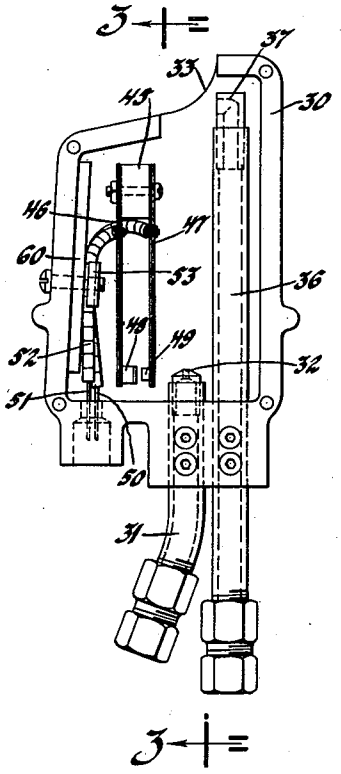


Fig. 2

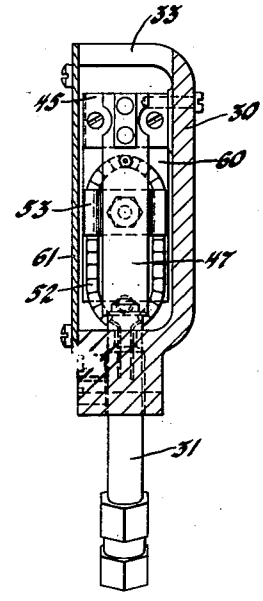


Fig. 3

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Patented May 23, 1933

1,910,362

UNITED STATES PATENT OFFICE

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CONTROL DEVICE

Application filed August 24, 1931. Serial No. 559,098.

This invention relates to a control device adapted more particularly for controlling the operation of a fluid fuel burner of the intermittently operating type.

One of the primary objects of this invention is to provide a control device of the above mentioned character which will be responsive to the condition of the continuous pilot light associated with the fluid fuel burner and to so construct this control device that the operation thereof will not be affected by the temperature of the control device as a unit.

More particularly the invention contemplates the provision of a control device of the thermostatic type and to provide means for automatically compensating for any change in temperature to which the control device as a unit is subjected.

Numerous other objects and advantages of this invention will become more apparent as the following description proceeds, particularly when reference is had to the accompanying drawing, wherein one embodiment of the inventive idea is disclosed in detail, and wherein:

Fig. 1 is a semi-diagrammatic vew partly in section showing a control device constructed in accordance with the teachings of this invention mounted in a furnace;

Fig. 2 is a sectional view taken substantially on the line 2—2 of Fig. 1; and

Fig. 3 is a sectional view taken substantially on the line 3—3 of Fig. 2.

Referring then particularly to the drawing wherein like reference characters designate corresponding parts throughout all views, the reference character 10 designates generally a furnace of any type having a wall 11 defining a combustion chamber 12. A hearth 13 is suitably located within the combustion chamber, and located centrally of this hearth is a rotary oil nozzle or distributor 14 operated by a suitable electric motor 15. The hearth 13 is provided near its periphery with a refractory ring 16 having a groove 17 therein into which is directed the spray of oil and current of air from the rotary member 14. A fluid fuel supply pipe 18 is provided for supplying liquid fuel such as oil to the rotary member 14, it being understood that the oil and air are discharged from the member 14 into the groove 17 to produce a radiant flame.

In the embodiment of the invention disclosed, there is imbedded in the hearth 13 adjacent the refractory ring 16 a gas manifold 20 which is provided at suitable intervals with upstanding burner nipples 21. Gas is supplied to this manifold by a supply pipe 22 so that, if desired, a gas flame may be produced within the furnace rather than an oil flame.

The reference character 25 designates a room thermostat which controls the operation of the burner, while the reference character 26 designates a control stand containing the relays and other control equipment necessary for the proper functioning of the burner. As such controls are of conventional type, it is not believed necessary to describe the same in detail, it being sufficient to state that, as disclosed in my copending application Serial No. 502,598, filed December 15, 1930, which matured into Patent No. 1,885,478 granted Nov. 1, 1932, means is provided whereby when the room thermostat calls for more heat, the operation of the burner is started and fuel will be supplied to the burner either by way of the oil supply conduit 18 or the gas supply pipe 22, dependent upon the actuation of a suitable switch or the like in the control mechanism. Thus the burner is automatic in its operation and is adapted to burn either oil or gas at the will of the user.

The conventional method of igniting by means of a gas pilot is to maintain a small continuous pilot light which serves to ignite a second gas jet during the starting cycle of the burner. The control system is arranged to cause gas to flow to this second pilot for a short period during the starting of the operation of the burner.

In the embodiment of the invention disclosed, the means for accomplishing this is disclosed as comprising a housing 30 located in the hearth 13 adjacent one side of the combustion chamber with its longer axis in the direction of the circumference of the

combustion chamber. Located in the bottom of the housing 30 is a continuous gas pilot supply line 31 provided with an upwardly directed orifice 32 which discharges the gas inside of the housing and near the bottom thereof. The discharge is directed vertically upwardly and when ignited, this pilot burns continuously with a long narrow flame, the upper end of which projects through the opening 33 in the top of the housing. The pipe 31 is connected by a conduit 34 to the supply side of the gas line 35 so as to be continuously supplied with gas from this line.

Located within the housing 30 adjacent the supply pipe 31 is the intermittent gas pilot supply line 36. This supply line projects upwardly to adjacent the opening 33 in the housing and is provided with the lateral discharge outlet 37 arranged to discharge horizontally through the outlet 33 and along the groove 17 in the refractory member 16. It will be noted that the horizontal discharge from the pipe 36 is across the top of the flame of the continuous pilot so that instantaneous ignition of the jet of gas from the line 36 is insured. It might further be noted that the jet 37 is so located that all of the gas discharged from this jet is discharged out of the housing 30.

The line 36 is connected by means of a conduit 40 to a suitable control valve 41 which is so connected to the control system of the burner that when the thermostat calls for more heat and the control functions to start actuation of the main burner within the furnace, the control valve 41 is actuated to supply gas to the intermittent pilot 36 for a short period of time or during the starting cycle of the main burner.

It will be apparent that if the continuous pilot 32 should become extinguished, a dangerous condition within the furnace would result should the thermostat operate to call for more heat. If the continuous pilot were extinguished and the thermostat 25 were to actuate the control system to start the burner in operation, gas would be supplied to the furnace by way of intermittent pilot 36 and also by way of manifold 20 if the system were set to burn gas rather than oil. Since the gas would not be ignited, the furnace chamber would become filled with gas with the result that any attempt to light the burner manually would result in an explosion.

The present invention contemplates, therefore, the provision of a control device which will be operable to cut off the operation of the main burner if this burner is operating and the pilot light is extinguished and which will prevent starting of the operation of the main burner if the pilot light is extinguished. Still further the present invention contemplates the provision of a control device for this purpose which will operate efficiently regardless of the temperature to which the control device as a unit is subjected.

Heretofore it has been customary to provide a thermostat which is responsive to failure of a gas pilot. These thermostats have been provided with suitable contacts for closing the circuit of the control for the main burner when subjected to the heat of the pilot flame and opening the circuit when such heat was removed upon failure of the pilot. As installed in the ordinary gas fired burners, constructions of this character work efficiently since the whole pilot unit is not subjected to any appreciable increase in temperature when the main burner is in operation. If, however, the pilot unit is subjected to a substantial increase in temperature when the main burner is in operation, there is considerable danger that the rise in temperature of the pilot unit will be sufficient to actuate the thermostat member to close the contacts even though the pilot itself were extinguished, the contacts being maintained closed not by the heat of the pilot, but rather by the heat from the main burner.

In a fluid burner capable of burning both gas and oil, as disclosed in the subject application, it is necessary to locate the pilot in the refractory hearth close to the combustion zone. When the main burner is operated, the hearth may increase in temperature to 600 or 700° F., and it is therefore apparent that the conventional thermostatic control would not truly interpret the condition of the continuous pilot and would not therefore function to shut down the operation of the main burner in the event that the continuous pilot was extinguished. The present invention therefore provides a thermostatic control which will be unaffected in its operation by the outside temperature or the temperature to which the unit as a whole is subjected, with the result that the control device may be mounted in a pilot housing which is imbedded in a highly heated hearth in the manner disclosed in this application.

Referring then particularly to Figs. 2 and 3 of the drawing wherein a control device constructed in accordance with the teachings of this invention is disclosed in detail, the reference character 45 designates a suitable insulated supporting post which is fixed within the housing 30 and adjacent the upper end thereof. Fixed at their upper ends to opposite sides of this support are two bimetallic members 46 and 47. These bimetallic members hang vertically downwardly and are provided on their lower ends with the contacts 48 and 49, respectively.

The bimetallic members 46 and 47 are electrically connected to the main control system of the burner by mounting the same in one of the leads of the room thermostat 25. Thus one lead 50 of the room thermostat

may be connected to one of the bimetallic members 47, there being a second lead 51 connected to the bimetallic member 46 which leads back to the control standard 26. It will be evident that even though the room thermostat should call for heat, if the contacts 48 and 49 are separated, it will be impossible for the burner to start. Still further, if the burner should be in operation and these contacts should open, immediate and permanent shut down of the burner would result. In view of the intense heat within the housing 30, the leads 50 and 51 are preferably protected by porcelain beads 52, and in order to prevent these leads from interfering with the actuation of the bimetallic members 46 and 47, the leads are preferably secured to one side of the casing by a suitable clamping plate 53.

When the temperature of both members 46 and 47 is the same, there is an opening between the contacts 48 and 49, and the control circuit above mentioned is broken. When, however, the continuous pilot is ignited, the flame of this pilot is projected upwardly in close proximity to the flat surface of the member 47. The member 46 is positioned on the opposite side of the member 47 from the continuous pilot flame, and the radiant heat from this pilot flame is therefore intercepted by the member 47. Since these bimetallic members are relatively wide, it will be apparent that the member 47 will function to shield the member 46 from practically all of the radiant heat emitted from the continuous pilot flame.

Both bimetallic members 46 and 47 have substantially the same flexing characteristics upon a change in temperature, and both are arranged so that their contact points move in the same direction upon changes in temperature. If, therefore, the continuous pilot is ignited while both bimetallic members are at the same temperature, member 47 will be heated to a greater extent than member 46, and member 47 will bend toward member 46 while the latter remains stationary to thus close the circuit through the contacts 48 and 49. As long as the continuous pilot flame is not extinguished, the contacts 48 and 49 will be closed, and the main burner may be operated in response to the demands of the room thermostat. If, however, the continuous pilot is extinguished, the member 47 will drop to the same temperature as member 46, and the circuit will be broken by separation of the contacts 48 and 49.

If, when the main burner is ignited, the temperature of the complete control unit is increased, both members 46 and 47 will move together, and as long as their temperatures remain the same, the opening between the contacts will remain constant. In other words, regardless of how hot the pilot housing becomes due to the heating of the same by means other than the continuous pilot, the contacts will remain in their same relative position. If, however, the continuous pilot is ignited, the member 47, being hotter than the member 46, will effect a closing of the circuit as above brought out.

For the purpose of protecting the member 46 from the heat of the adjacent wall of the housing 30, attention being directed to the fact that the member 46 is closer to the wall of the housing than is the member 47, there is provided an asbestos insulating plate or the like 60 which is fixed to the inner surface of the adjacent wall of the housing, as clearly illustrated in Fig. 2 of the drawing. The housing is also preferably closed by a removable cover 61 which extends upwardly to a sufficient distance to prevent oil from being thrown into the housing upon actuation of the rotary nozzle 14.

In operation, it will be apparent that when the bimetallic members 46 and 47 are at the same temperature, regardless of what this temperature may be, their relative positions will remain constant, and the contacts 48 and 49 will be separated so that the main burner may not be operated. When, however, the continuous pilot is ignited, the flame of this pilot will heat the bimetallic member 47 to a greater extent than the bimetallic member 46, and the circuit will be closed so that the main burner may be operated in dependence upon the actuation of the room thermostat. Thus the control device will be responsive only to the condition of the continuous pilot light and will automatically adjust itself to all variations of outside temperature.

While the invention has been described with some detail, it is to be understood that the description is for the purposes of illustration only and is not definitive of the limits of the inventive idea. The right is reserved to make such changes in the details of construction and arrangement of parts as will fall within the purview of the attached claims.

What I claim as my invention is:

1. The combination with a fluid fuel burner capable of burning both gas and oil, a hearth for said burner, and a control for said burner, of means including a pair of contacts for governing the actuation of said control, bimetallic members mounting said contacts, said bimetallic members being arranged to be flexed in the same direction and to the same degree when subjected to like temperatures, means in said hearth supporting said bimetallic members and normally maintaining said contacts in spaced relation to each other, and means providing a continuous pilot flame adjacent one of said bimetallic members to heat the same independently of the other whereby said heated bimetallic member is flexed to cause the contact

carried thereby to engage the contact carried by the other bimetallic member.

2. The combination with a fluid fuel burner capable of burning both gas and oil, a hearth for said burner, and a control system for governing the operation of said burner, of means including a pair of contacts for governing the actuation of said control system, a pair of thermoresponsive members mounting said contacts and normally maintaining the same in spaced relation to each other, said thermoresponsive members being located in said hearth being adapted to react substantially equally to like temperatures whereby the spaced relation of said contacts is not varied by heating of said thermoresponsive members incident to operation of said main burner, and a pilot burner for igniting said main burner arranged in proximity to one of said thermoresponsive members whereby when said pilot burner is ignited one of said thermoresponsive members is heated to a greater degree than the other and the contact carried by this thermoresponsive member is moved into engagement with the other contact.

3. The combination with a hearth, and a main burner associated with said hearth, of a housing in said hearth, means including a pair of contacts in said housing for controlling the operation of said main burner, bimetallic members mounting said contacts and arranged to normally maintain the same in spaced relation to each other, said bimetallic members being arranged to flex in the same direction and to the same degree when subjected to like temperatures whereby variations in the temperature of said housing incident to operation of said burner will not vary the spaced relation of said contacts, and a pilot burner located in proximity to one of said bimetallic members and adapted when ignited to heat the same, said last mentioned bimetallic member being adapted to shield the other of the bimetallic members from the radiant heat from said pilot burner.

4. The combination with a hearth, and a main burner associated with said hearth, of a housing partially imbedded in said hearth, an insulated support within said housing, a pair of bimetallic members fixed at their upper ends to said support and depending therefrom in spaced relation to each other, said bimetallic members being adapted to flex in the same direction and to the same degree when subjected to like temperatures, contacts carried by the lower ends of said bimetallic members and normally held in spaced relation to each other, a control for said main burner governed by said contacts, a pilot burner for igniting said main burner arranged adjacent one of said bimetallic members whereby the flame of said pilot burner will heat one of said bimetallic members to a greater degree than the other to cause a flexing of said heated bimetallic member independently of the other to cause engagement of said contacts with each other, and a heat insulating plate within said housing for protecting the bimetallic member which is spaced from said pilot flame from the heat of the adjacent portion of the hearth.

5. The combination with a fluid fuel burner having a hearth, and a control system for governing the operation of said burner, of a pair of thermoresponsive members located in said hearth and adapted to react substantially equally to like temperatures, and means dependent in operation upon unlike reactions of said members incident to their being subjected to unlike temperatures for governing the operation of said control system.

6. The combination with a fluid fuel burner having a hearth, a control system for governing the operation of said burner, and means providing a continuous pilot flame in said hearth, of a pair of thermoresponsive members located in said hearth adjacent said pilot flame, said thermoresponsive members being adapted to react substantially equally to like temperature changes whereby they react substantially equally upon variations in the temperature of said hearth incident to operation of said burner, one of said thermoresponsive members being so arranged with respect to said pilot flame as to be heated to a greater extent than said other thermoresponsive member, and means actuated by said thermoresponsive members for governing the operation of said control system.

In testimony whereof I affix my signature.

MILTON A. POWERS.