

March 29, 1949.

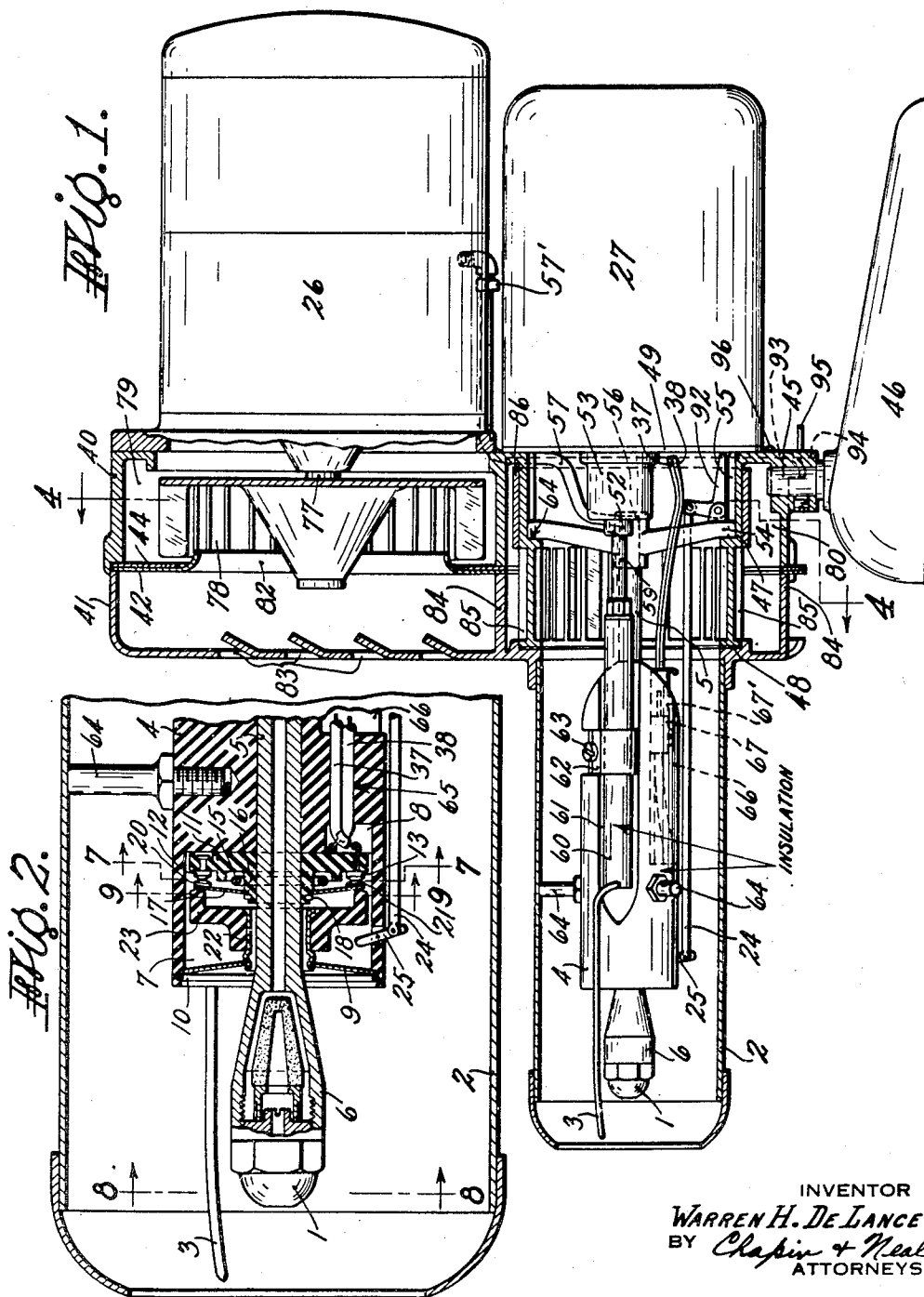
W. H. DE LANCEY

2,465,675

SAFETY CONTROL FOR OIL BURNERS

Filed Jan. 20, 1945

3 Sheets-Sheet 1



March 29, 1949.

W. H. DE LANCEY

2,465,675

SAFETY CONTROL FOR OIL BURNERS

Filed Jan. 20, 1945

3 Sheets-Sheet 2

Fig. 3.

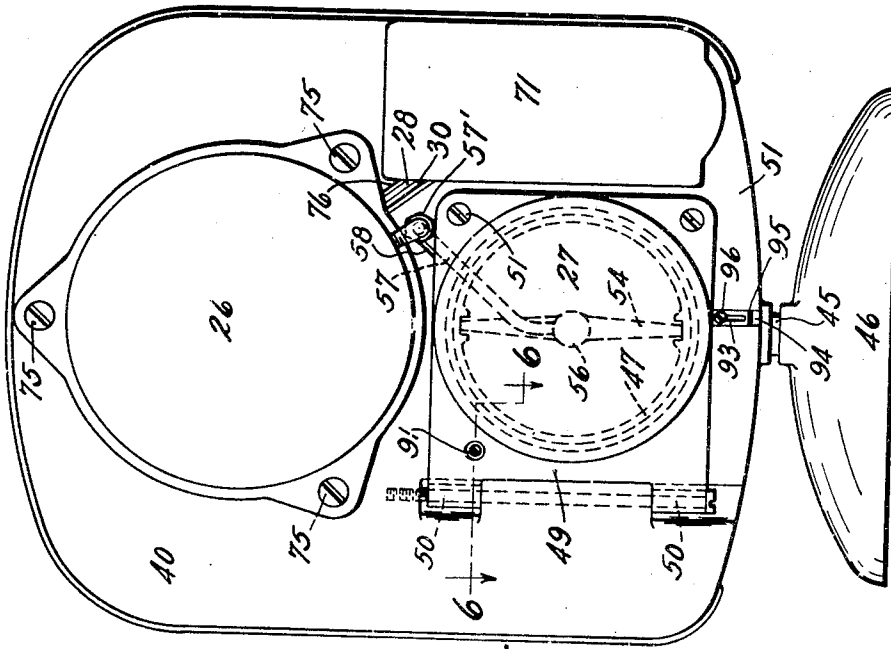
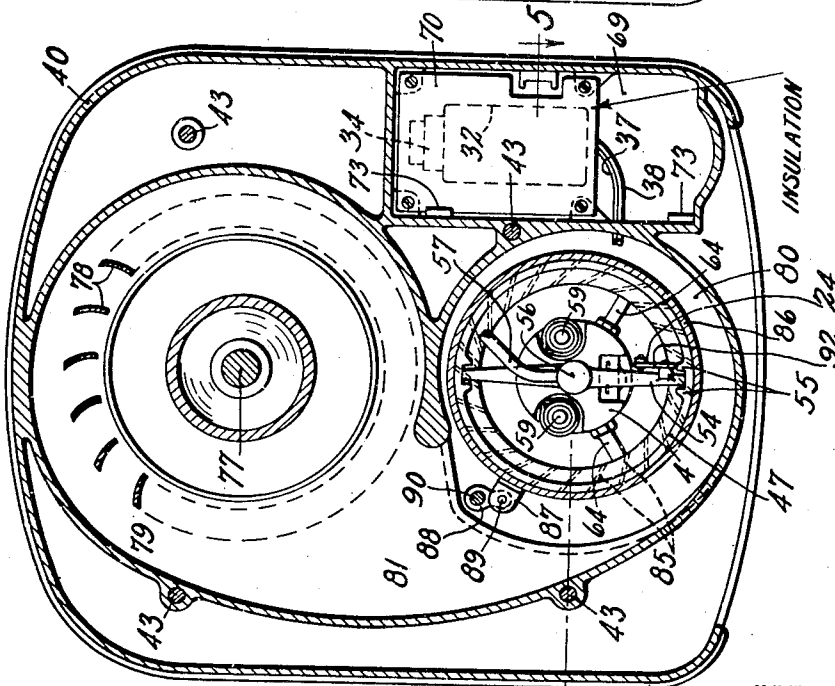


Fig. 4.



INVENTOR
WARREN H. DE LANCEY
BY *Chapin & Neal*
ATTORNEYS

March 29, 1949.

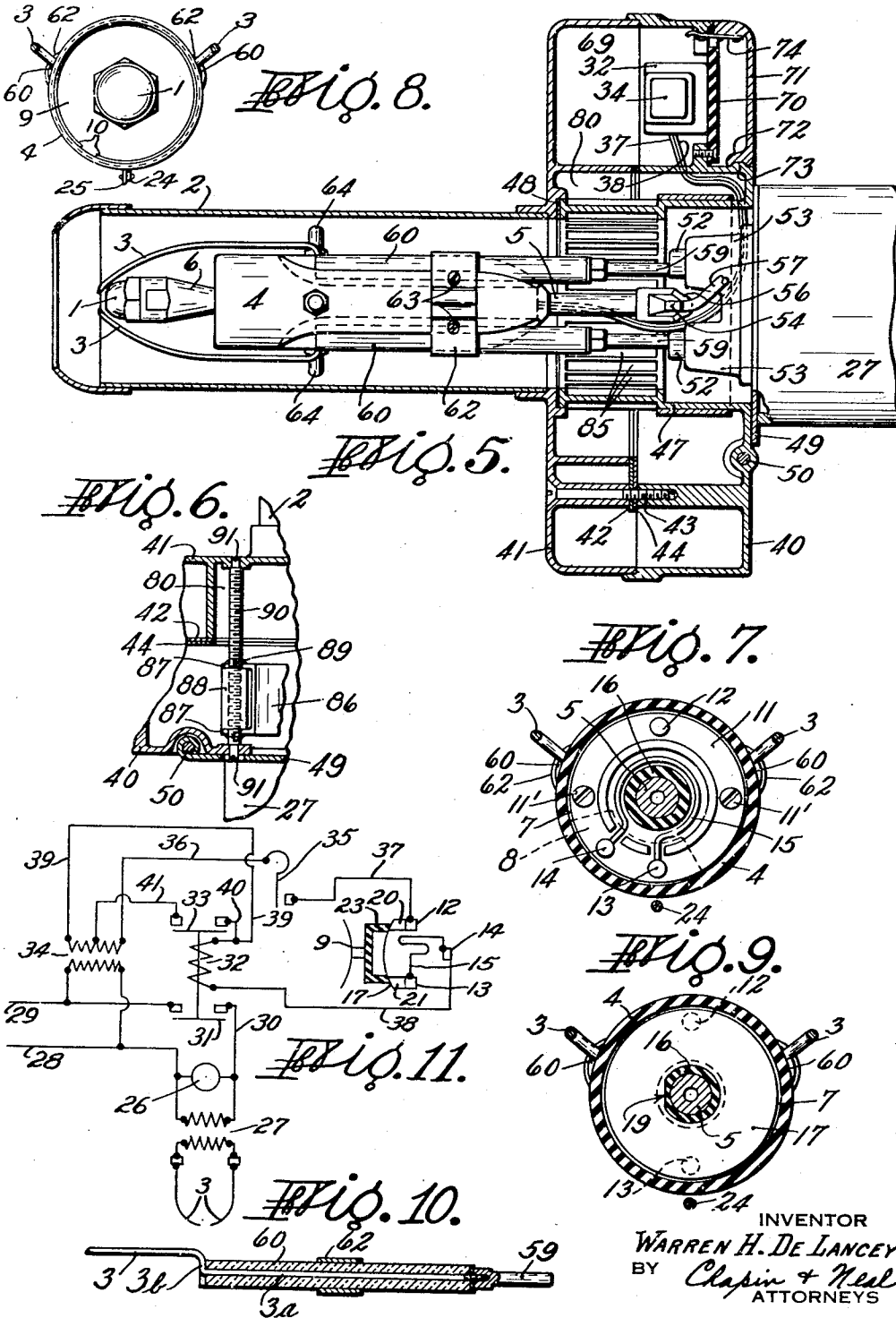
W. H. DE LANCEY

2,465,675

SAFETY CONTROL FOR OIL BURNERS

Filed Jan. 20, 1945

3 Sheets-Sheet 3



INVENTOR
WARREN H. DE LANCEY
BY *Chapin & Neel*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,465,675

SAFETY CONTROL FOR OIL BURNERS

Warren H. De Lancey, Springfield, Mass., assignor
to Gilbert & Barker Manufacturing Company,
West Springfield, Mass., a corporation of
Massachusetts

Application January 20, 1945, Serial No. 573,697

4 Claims. (Cl. 158—28)

1

This invention relates to improvements in the safety control mechanism of oil burners for stopping the burner on failure of combustion.

Safety control mechanism of this class is old and well known in the art. It generally comprises a time switch, effective to open the circuit to the burner motor in a predetermined time (say 30 seconds) after closing of such circuit by the room thermostat, or other control, provided that combustion does not occur, and a flame-responsive element or flame detector, which functions, on occurrence of combustion within the predetermined time, to prevent the opening of the time switch. The flame detector and the time switch mechanism may take various forms and operate in various ways but the general functions accomplished are as stated.

It has been customary heretofore to mount the flame detector, which is generally a thermostat, outside of and separately from the air tube of the burner. It has thus been necessary to cut two holes in the wall of the firebox, one to accommodate the inner end of the air tube of the burner and the other to accommodate the burner thermostat or other flame detector. The flame-responsive element should be sighted at the burner flame and yet it should be protected against all conditions which are likely to adversely affect its operation and prevent it from functioning in the intended manner.

This invention has for one object to mount the flame detector in the air tube of the burner, locating it so that it is sighted at the flame and yet so that it is sufficiently shielded from the air flow through the tube so as not to be unduly influenced by the presence or absence of a flow of relatively cool air through said tube.

Another object of the invention is to locate the burner thermostat in and symmetrically of the air tube of the burner near the outlet end of the tube so that the thermostat does not project into the air stream as an obstruction and cannot therefore interfere with the desired uniformity of flow of air to the fuel nozzle and cannot therefore disturb the resulting fire.

The invention has for another object the provision of a complete safety control mechanism, including a flame-responsive element, a safety thermostat or time switch, and a heating element for the safety thermostat, all located in the air tube of the burner and shielded from the air flow through such tube.

Another object of the invention is to locate the flame-responsive element, together with the safety thermostat, and its heating member if de-

2

sired, in a recess in the inner end of the member, which supports the oil nozzle, so that said element is completely shielded from the air flow through the tube and yet located back of the oil nozzle in confronting relation with the flame from the burner.

Another object of the invention is to utilize snap disc thermostats, one for the flame-responsive element and one for the time switch thermostat, and to mount these snap disc thermostats in opposed relation so that changes in ambient temperature balance out, leaving said element to react solely to the presence of flame at the burner, whereby the flame-responsive element may be mounted in the air tube of the burner and yet function satisfactorily.

The invention will be disclosed with reference to the accompanying drawings, in which—

Fig. 1 is a sectional elevational view of an oil burner embodying one form of the invention;

Fig. 2 is a fragmentary sectional elevational view drawn to a larger scale and illustrating the burner thermostat and safety switch;

Fig. 3 is an end elevational view of the burner;

Fig. 4 is a cross sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a sectional plan view taken on the line 5—5 of Fig. 4;

Fig. 6 is a fragmentary sectional view taken on the line 6—6 of Fig. 3;

Figs. 7, 8 and 9 are sectional views taken on the lines 7—7; 8—8; and 9—9, respectively of Fig. 2.

Fig. 10 is a sectional plan view showing the mounting of one of the ignition electrodes; and

Fig. 11 is a wiring diagram of a burner control system for the invention.

Referring to these drawings, the invention will be disclosed, by way of illustrative example, in connection with an oil burner of the so-called gun type. Such a burner has a pressure-atomizing nozzle 1 (Fig. 1) for producing a spray of finely atomized oil and a tube 2 through which air for combustion is supplied to the oil spray. The forward and open end of tube 2 is adapted to be inserted in an opening in the wall of the firebox of the furnace. The mixture of air and oil is ignited by an electric spark occurring between the electrodes 3 and combustion occurs beyond the end of tube 2 and in said firebox. The invention is not, however, limited to pressure atomization of the oil and is equally suitable for any burner, wherein an oil-spray-producing means of any type is surrounded by a tube through which air is supplied and wherein the open end of the tube is inserted in the wall of a firebox so that such

open end confronts the flame resulting from combustion of the oil and air mixture.

According to the broader features of the invention, in all its forms, the flame detector, such as a thermostat, is located in the air tube 2, confronting the open end of the latter so as to be sighted directly at the flame in the firebox, when combustion occurs. And the burner thermostat must be shielded sufficiently from the air supply flowing through tube 2 so as not to adversely effect its functioning in the intended manner. To secure these results, the burner thermostat or flame detector is mounted back of the spray nozzle 1 and in coaxial relation therewith and the air flow through the tube is directed away from the thermostat by a member 4, suitably supported in tube 2 in substantially coaxial relation therewith. The oil supply conduit 5 passes through member 4 (Fig. 2) and the nozzle 1 is threaded into the enlarged outer end 6 thereof. The member 4, as shown in Fig. 1, is approximately cylindrical and its outer end, which lies nearest nozzle 1, is provided with a cylindrical recess 7 (Figs. 2 and 8) having in its inner end wall an arcuate groove 8. The outer end of recess 7 is counterbored to receive an annular snap disk thermostat 9 which is held in place by a snap ring 10 or any other suitable means. This snap disk 9 is the burner thermostat or flame detector. This thermostat thus has an annular area which directly faces the flame produced by the burner. At the same time the thermostat, being located in the outer end of recess 7 is effectively shielded from the air flow through the tube 2.

In the form at present preferred, the safety thermostat switch and its heating element are also located in the recess 7. Mounted on conduit 5 in coaxial relation therewith and seated against the inner end of recess 7 is an annular disk 11 of suitable insulating material, such as Bakelite for example, suitably held in place as by the screws 11' (Fig. 7). This disk has three terminal buttons 12, 13 and 14, suitably fixed thereto, with extensions of the buttons 13 and 14 passing through the disk and into the arcuate groove 8. An electric heater, comprising a resistance wire 15 of suitable material is connected to and supported by the buttons 12 and 13. The disk 11 further has a circumferentially grooved hub 16 (Fig. 2) on which is mounted an annular snap disk thermostat 17. A snap ring 18 in the groove in the hub holds disk 17 in place axially while a flattened portion 19 (Fig. 9) on the hub 16 is engaged with a corresponding portion in the hole of the disk to prevent the latter from turning. The disk 17 carries two contacts 20 and 21 for engagement with contacts 12 and 13 on disk 11. The burner thermostat 9 has fixed coaxially thereto, a metal sleeve 22 to which is also suitably fixed an annular member 23 of suitable insulating material. As shown, the member 23 and the disk 9 are each held in place against a shoulder on the sleeve 22 by spinning one end of the sleeve against the member or disk as the case may be. The purpose of member 23 is to apply pressure against the outer rim of thermostat 17 and hold its contacts 20 and 21 engaged with the contacts 12 and 13, respectively, if combustion occurs. The two thermostats 9 and 17 are normally bowed in opposite directions, as shown, whereby changes in ambient temperature balance out as they tend to move the disks equally but in opposite directions. The safety thermostat 17, when heated by the electric element 15,

tends to move to the left as viewed in Figs. 1 and 2. If combustion does not occur, disk 17 will snap to the left and, through member 23, press against the central part of disk 9 and cause the latter to snap to the left. Thus, the hitherto engaged pairs of contacts 20, 12 and 21, 13, will be disengaged and the burner circuit, later to be described, will be opened. The burner thermostat 9, when subjected to the high heat of the flame produced by the burner, tends to move toward the right with the result that enough pressure is applied against thermostat 17 to hold it in its illustrated and switch-closing position even though thermostat 17 is fully heated by the heater 15.

The safety control described may be automatically or manually reset after having stopped the burner motor on a failure of combustion. These thermostat disks may be made so as to automatically move back from their abnormal to their normal position when the temperature falls sufficiently or they be so made as to remain in their abnormal positions until manually moved back in any suitable way. Thermostat 9 may be constructed in either of these ways although it is generally desired to compel a manual resetting. This may be done by any suitable means. For example, a push rod 24 (Fig. 1), mounted as will later be described in detail, for movement longitudinally of tube 2, has one end accessible from outside the rear end of the tube and the other end pivoted to one end of a lever 25. The latter (Fig. 2) is pivoted intermediate its ends to member 4 and its inner end is adapted to engage and push member 23 inwardly, when rod 24 is pushed inwardly, thereby pulling inwardly on disk 9 to snap it back from its left hand position into its normal and illustrated position and at the same time to snap back thermostat 17 and close the safety switch.

In Fig. 11, there is shown, by way of illustrative example, one form of burner control system with which the safety control mechanism of this invention may be used. The electric motor, which causes air and oil to be supplied to nozzle 1 and tube 2, respectively, is shown at 26 and the ignition transformer which supplies high tension electricity to the electrodes 3 is shown at 27. This motor and transformer are connected in parallel in an electric circuit—say a 110 volt circuit—comprising the wires 28, 29 and 30 and a switch 31, interposed between the wires 29 and 30. Switch 31 is operated by an electromagnet 32, which also actuates a second switch 33. When the magnet 32 is energized both switches will be closed and when it is deenergized both switches will open. The two switches and electromagnet form the so-called relay commonly referred to in oil burner controls. The magnet 32 is included in a low voltage starting circuit from the secondary of a transformer 34, the primary of which is connected to the supply wires 28 and 29. This starting circuit is usually closed by a room thermostat switch 35, although any other suitable means may be provided for the purpose. The starting circuit may be traced as follows, from one terminal of the secondary of transformer 34 by a wire 36 to one terminal of the room thermostat 35, from the other terminal of the latter by a wire 37 to button 12 of the safety control mechanism, through contact 20, disk 17 and contact 21 to button 13, through heater 15 to button 14, thence by a wire 38 to one terminal of magnet 32, and from the other terminal of magnet 32 by a wire 39 to the other

5

6

terminal of the secondary of transformer 34. When thermostat switch 35 closed, magnet 32 is energized and both switches 31 and 33 close. Closure of switch 31 starts motor 26 and energizes transformer 27 to supply the ignition spark across the electrodes 3. Failure of combustion, as heretofore described, causes contacts 20 and 21 to separate from buttons 12 and 13, respectively, and thus open the low voltage starting circuit described, whereupon the relay drops out, opening switch 31 and stopping the burner. Normally, the safety thermostat would be sufficiently heated by heater 15 to open the safety switch 17 in about 30 seconds. If combustion occurs within this time, the safety switch cannot open for the reason above described. Closure of switch 33 simply closes a second circuit of lower voltage sufficient to hold the relay closed once it is pulled in, but insufficient to initially pull the relay in. In place of the wire 39, which connects one terminal of magnet 32 to an end terminal of the secondary of transformer 34, wires 40 and 41 with the interposed switch 33 are provided to connect the same terminal of magnet 32 to a terminal of said secondary which lies intermediate those already described. It will be clear that both the starting and the holding circuits can be opened by the safety control mechanisms on failure of combustion. The invention is not limited to use in the one form of control circuit herein described. The one form of circuit described is merely one illustrative example of many control circuits with which the invention may readily be used.

Referring now to the details of the exemplary apparatus, the burner includes a hollow frame comprising end members 40 and 41 (Fig. 1), and a pair of abutting intermediate members 42 and 44 which are interposed between the end members. All these members are held together by a series of screws 43 (Figs. 4 and 5). This frame is supported by a post 45 from a pedestal 46, as indicated in Figs. 1 and 3. The tube 2 is fixed in an opening in the member 41 in axial alignment with a tubular extension 47 of the member 40. A gasket 48 is interposed between the inner end of extension 47 and the inner face of member 41 to make a tight joint between it and tube 2. The outer end of tubular extension 47 is closed by the ignition transformer 27 which is fixed to a plate 49, connected by a hinge pin 50 to member 40 and normally held in closed position by two screws 51 which pass through plate 49 and thread into member 40. The high tension terminals of transformer 26 are spring-pressed buttons 52 mounted in insulators 53 fixed to the transformer. These button terminals lie inside the air tube near its outer and closed end. The outer end of extension 47 is of larger diameter and receives a two armed spider 54, which spans the extension and has each outer end received between a pair of ribs 55 (Fig. 4) on the extension, thereby preventing the spider from turning. The spider (Figs. 1, 3 and 4) has a central hollow tubular portion 56 which is closed at its outer end and has fixed in its inner end the outer end of the described oil conduit 5. A flexible copper tube 57, connected to the portion 56, extends out of the air tube through a recess 58 in member 40 and is connected to the oil pump—a union 57' being interposed in the connection. The ignition electrodes consist of wires 3, each bent as best shown in Fig. 10 and inserted in a longitudinal hole in an insulator 60 with a right angularly bent portion 3b lying in a radial

groove in the insulator. A nut 59 threaded on the outer end of each wire 3 holds said bent portion in the groove and holds the wire against longitudinal movement in the insulator. These insulators lie in recesses 61 in the sides of member 4 and are held together by a metal strap 62 which is fixed as by screws 63 to member 4. This member 4 is supported near the inner end of tube 2 by three radial pins 64, the inner ends of which are screw threaded into member 4 and the outer ends of which bear against the inner peripheral wall of tube 2. The inner ends of the nuts 59 (Fig. 1) are engaged by the spring pressed transformer terminals 52, whereby the member 4 is thrust inwardly in tube 2 until the outer ends of the spider arms 54 abut the shoulder 64 on extension 47.

The wires 37 and 38 are connected to the portions of their respective buttons 12 and 14 that project into the arcuate groove 8 and these wires extend along the groove to a hole 65 (Fig. 2) through which they pass to a recess 66 (Figs. 1 and 2) in the bottom part of member 4. The wires pass through the tube 2 and include a separable connection comprising a plug 67 and socket 67' (Fig. 1), the former being suitably attached to the member 4. These wires pass radially out of the rear end of the air tube 2 (Figs. 1 and 5) into a compartment 69 (Figs. 4 and 5) which is formed in the hollow frame member. Fixed in this compartment is a panel 70, bearing the relay 32 and the transformer 34. This compartment is normally closed by a cover 71 (Figs. 1 and 5) having on one side spaced hinge lugs 72 (Fig. 5) bearing on ribs 73 on one wall of the compartment 69 and having on the other side a spring 74 which snaps into a recess in the other wall of the compartment to hold the cover closed.

The electric motor 26 (Fig. 3) is suitably secured to the frame member 40 as by a series of screws 75. The wires 28 and 30 extend from the compartment 69 through a groove 76 into the interior of the motor casing. This motor (Fig. 1) has fixed to the inner end of its shaft 77 a fan 78. Within the motor casing are an oil pump, also driven from shaft 4, an oil pressure-regulating valve, a burner cut-off valve for oil, and a strainer. These elements may, for example, be arranged in the motor casing as disclosed in the copending application of Virgil E. Duemler, Serial No. 529,048, filed April 1, 1944, now Patent No. 2,447,744 granted August 24, 1948 and owned by the assignee of the present application, or in any other suitable way.

The frame member 40 is recessed to form a scroll chamber 79 (Fig. 4), a plenum chamber 80, which encompasses the air tube extension 47 and a connecting passage 81 to deliver air from the fan tangentially into the plenum chamber. The plates 42 and 44, which are respectively of metal and of sound deadening material (the latter serving also as a gasket), serve to close the scroll chamber except for a central air inlet 82 (Fig. 1) from the space within the upper portion of the frame member 41. Louvers 83 in the latter serve to admit air to said space and thus to the fan. These plates 42 and 44 also form an inner wall for the passage 81 but not for the plenum chamber 80. The inner end of the walls of such chamber (Fig. 1) abut corresponding walls 84 on member 41 and provide for an axially inward extension of the plenum chamber. Air from the fan will thus be delivered into the plenum chamber and whirl around the air tube extension 47. The inner portion of

7

this extension has tangential slots 85 (Fig. 4) to direct air into the interior of the extension in a whirling stream which is advanced through tube 2 to the oil spray issuing from nozzle 1.

To regulate the volume of air supplied to tube 2, a sleeve valve 86 (Figs. 1 and 4) is mounted for axial sliding movement on the outer part of the outer periphery of extension 47. Fixed to this sleeve (Fig. 6) are two axially-spaced radially-outwardly extending lugs 87 which receive between them the lower part of a piece 88, which as shown in Fig. 4 is shaped roughly like the figure 8. A pin 89 (Fig. 4) passes freely through this piece 88 and has its ends fixed one in each lug 87. The upper part of piece 88 has a screw-threaded hole extending axially therethrough. A screw 90 (Fig. 6) is engaged in such hole. At each end of this screw, is a plain cylindrical portion 91 of smaller diameter than the screw. These portions 91 are rotatably mounted one in each of the two frame members 40 and 41. The outer end 91 of the screw is slotted (Fig. 3) to receive a screw driver and extends through an opening in the hinged and transformer-supporting plate 49. By turning screw 90, the nut piece 88 may be advanced to move sleeve valve 86 forwardly or backwardly in an axial direction to vary the area of the slots which communicate with the plenum chamber.

For actuating the resetting rod 24, a bell crank 92 (Figs. 2 and 4) is pivoted to one of the spider arms 54 with one of its arms pivotally connected to the outer end of rod 24 and the other of its arms disposed longitudinally of the extension 47 and closely adjacent the lower peripheral part thereof. The weight of the longer and horizontal arm of the bell crank is enough to normally hold it in the illustrated position in which it rests on one of the ribs 55. A slide 93 (Figs. 1 and 3) is slidably mounted in a groove 94 in member 40 and has an outturned end 95 by which it may be pushed upwardly. The upper end of slide 93 (Fig. 1) is movable into the interior of extension 47 between the transformer plate 49 and the bottom wall of the groove and can engage the horizontal arm of bellcrank 92 and move it to thrust rod 24 forwardly and reset the burner thermostat, when necessary. The slide is held in place by a small stud 96 which passes through a vertical slot in the slide.

The mounting of the electrodes is believed to be important. Each electrode consists simply of a wire, having a straight portion 3a to pass through the longitudinal hole in the insulator together with a right-angularly bent portion 3b at one end of the straight portion. The portion 3b fits into one half of a diametrical groove in one end face of the insulator and prevents the electrode from turning in the insulator and acts like the head of a bolt to be clamped against one end face of the insulator when the nut 59 is tightened. The exposed part of each electrode may be bent in any way to suit the requirements of each particular case. This mounting of an electrode in its insulator is simple, inexpensive and effective. The usual means of holding the insulators 60 in place is by set screws, which are threaded into the nozzle support, such as 4, and which press against the insulator either directly or through the intermediary of a bushing. The difficulty is to clamp the porcelain insulators firmly in position without cracking them. The present arrangement provides in the strap 62, two separate clamps, one to encompass each insulator, and by means of the screw 63 the

8

radially projecting parts of each clamp are drawn together to contract the clamp around its insulator so that the holding force is distributed around the periphery of the insulator instead of being concentrated at one location or localized as heretofore. The same screws, that serve to tighten the insulator clamps, also serve to bind the strap to the support 4 and hold the insulators and electrodes in position.

In the operation of the invention, when the room thermostat 35 closes on a demand for heat, a circuit is established through the relay 32 and through the safety switch 17, 20, 21 and the electric heater 15. The relay 32 closes switches 31 and 33, causing motor 26 to start and supply air and oil to tube 2 and nozzle 1, respectively, and causing an ignition spark to be produced at electrodes 3 to ignite the oil and air mixture issuing from tube 2. If combustion occurs, the burner thermostat 9 will be heated and through sleeve 22 and member 23 exert enough pressure on the thermostat 17 and safety switch to prevent the latter from opening. A failure of combustion, either initially or at any time during operation of the motor 26, will enable thermostat 9 to cool and then snap to the left and allow the safety switch to open under the heat supplied by heater 15.

According to the invention, the burner thermostat is located in back of the oil nozzle and in coaxial relation therewith and as near as possible in confronting relation with the burner flame so as to react to the heat therefrom and function efficiently as a flame detector. The location of the burner thermostat is of prime importance. What is desired, is a quick response of large magnitude following the occurrence of combustion and also following cessation of combustion. Cooling of the burner thermostat by exposure of it to a flow of relatively cool air would in any event act to delay the response of the thermostat to occurrence of combustion and the magnitude of such response. And if the cooling effect were great enough, the burner thermostat might never reach a temperature high enough to operate at all. On cessation of combustion, if the burner thermostat had been exposed to a flow of cool air, there would be a quick rise of temperature due to the heat from the combustion chamber following cessation of air flow rather than the quick drop in temperature that is desired. Hence, it is important if a quick response of large magnitude is to be secured on occurrence and on cessation of combustion, to shield the burner thermostat from the air flow through tube 2. It will be clear that the burner thermostat is completely shielded from the air flow through tube 2. So also is the thermostat of the safety switch.

The location of the burner thermostat symmetrically of the air tube and near the outlet end thereof is important all apart from the advantage of shielding the thermostat from the current of cool air. When the thermostat is located near the fuel nozzle and the outlet of the air tube, as it should be in order to have it function efficiently as a flame detector, it is essential that the thermostat be kept from interfering with the air flow. If the thermostat should project into the path of the air, the uniform flow of air would be disturbed by the obstruction at a time when it is too late to reform it. The fire would thus be disturbed. But by the described location, the thermostat presents no obstruction to air flow meeting the oil spray and such flow

remains smooth and uniform and the fire undisturbed.

The invention thus provides means whereby a burner thermostat may be located in the air tube of an oil burner and yet function properly with a quick and adequate response both to the occurrence and cessation of combustion.

I claim:

1. In an oil burner, a tube having inlet and outlet ends, the outlet end adapted to be inserted into an opening in the wall of a firebox, an oil supply conduit supported in part in said tube, a spray nozzle in the tube on the outlet end of said conduit, electrically-operated means for forcing oil through said conduit and nozzle, means connected to the inlet end of said tube for forcing air therethrough to mix with the oil emitted from said nozzle, means for igniting the air and oil mixture, a member located adjacent but back of said nozzle and encompassing said conduit, said member supported in said tube and spaced from the peripheral wall thereof and having a recess in that end which lies nearest the nozzle; and a safety control unit mounted in said recess and including a normally closed safety switch in circuit with said electrically-operated means and a snap disk thermostat to operate it both located in the inner end of said recess, an electric element in said recess for heating said disk and operable in a predetermined time after starting of said electrically-operated means if combustion does not occur to cause the disk to open said switch and stop said electrically-operated means, and a second snap disk thermostat mounted in the outer end of said recess in opposed relation to the first-named disk and in position to be exposed to the flame in the firebox, said second disk operable on occurrence of combustion to prevent the first disk under the heat of said element from opening said switch.

2. In an oil burner, a tube having inlet and outlet ends, the outlet end adapted to be inserted into an opening in the wall of a firebox, an oil supply conduit supported in part in said tube, a spray nozzle in the tube on the outlet end of said conduit, electrically-operated means for forcing oil through said conduit and nozzle, means connected to the inlet end of said tube for forcing air therethrough to mix with the oil emitted from said nozzle, means for igniting the air and oil mixture, a member located adjacent but back of said nozzle and encompassing said conduit, said member supported in said tube and spaced from the peripheral wall thereof and having a recess in that end which lies nearest the nozzle; a safety control unit mounted in said recess and including a normally closed safety switch in circuit with said electrically-operated means and a snap disk thermostat to operate it both located in the inner end of said recess, an electric element in said recess for heating said disk and operable in a predetermined time after starting of said electrically-operated means if combustion does not occur to cause the disk to open said switch and stop said electrically-operated means, a second snap disk thermostat mounted in the outer end of said recess in opposed relation to the first-named disk and in position to be exposed to the flame in the firebox, said second disk operable on occurrence of combustion to prevent the first disk under the heat of said element from opening said switch, and means manually operable from outside said tube for resetting said disks and closing said switch.

3. In an oil burner, of the type having a tube

which has an open delivery end adapted for insertion in an opening in the wall of the firebox and through which tube air for combustion flows, an oil supply pipe terminating with a part which is supported in said tube in substantially coaxial relation therewith and which has an oil-atomizing nozzle on its delivery end, a pump for forcing oil through said pipe, and a motor for driving the fan and pump; a casing having a cylindrical peripheral wall, a back wall and an opening at the front; said casing being mounted on said part of the oil pipe in back of said nozzle, said part of the conduit passing through said back wall into the casing and out through the front of the casing with the peripheral wall of the conduit spaced from the peripheral wall of the casing forming an annular recess, the front opening of said casing facing the delivery end of said tube in position to be exposed to the radiant heat from the flame in the firebox, an annular snap-disk thermostat located in said annular recess of the casing in encompassing relation with said part of the oil pipe, said thermostat being exposed through said front opening to said radiant heat and shielded by the peripheral wall and back wall of the casing from the air flow through said tube, and means controlled by said thermostat and operable on failure of combustion to stop said motor.

4. In an oil burner, of the type having a tube which has an open delivery end adapted for insertion in an opening in the wall of a firebox and through which tube air for combustion flows, an oil supply pipe terminating with a part which is supported in said tube in substantially coaxial relation therewith and which has an oil-atomizing nozzle on its delivery end, a pump for forcing oil through said pipe, and a motor for driving the fan and pump; a casing having a cylindrical peripheral wall, a back wall and an opening at the front; said casing being mounted on said part of the conduit passing through said back wall into the casing and out through the front of the casing with the peripheral wall of the conduit spaced from the peripheral wall of the casing forming an annular recess, the front opening of said casing facing the delivery end of said tube in position to be exposed to the radiant heat from the flame in the firebox, an annular snap-disk thermostat located in said annular recess of the casing in encompassing relation with said part of the oil pipe, said thermostat being mounted near the front of said casing and exposed through said front opening to said radiant heat, a second annular snap disk thermostat mounted in said annular recess in encompassing relation with said part of the oil pipe and located rearwardly of the first thermostat, an electric heater in said recess for the second thermostat, a control circuit for the burner motor including a safety switch located in said recess and operable by the second thermostat after the latter has been heated for a predetermined time interval to open and stop the motor, the first thermostat being connected to the second thermostat and operable on occurrence of combustion within said interval to dominate the second thermostat and prevent it from opening said switch, said thermostats being reversely arranged to compensate for changes in ambient temperature, said thermostats being shielded by the peripheral wall and back wall of said casing from the air flow through said tube.

WARREN H. DE LANCEY.

(References on following page)

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
343,282	Strong et al.	June 8, 1888
546,941	Smith	Sept. 24, 1895
801,242	Hochheimer	Oct. 10, 1905
1,565,800	Dzierzenga	Dec. 15, 1925

Number
1,640,728
1,835,097
1,904,549
1,945,385
2,048,495
2,149,853
2,162,098
2,212,312
2,313,072

5

10

Name	Date
Scott	Aug. 30, 1927
Scott	Dec. 8, 1931
Scognamillo et al. ...	Apr. 18, 1933
Schmidt	Jan. 30, 1934
Eaton	July 21, 1936
McCabe	Mar. 7, 1939
McCabe	June 13, 1939
Anderson	Aug. 20, 1940
Hotchkiss	Mar. 9, 1943