Feb. 29, 1944. R. W. JOHNSON ET AL 2,343,188

CONTROL MECHANISM FOR BURNERS

Filed July 19, 1941 3 Sheets-Sheet 1

Fig. 1.

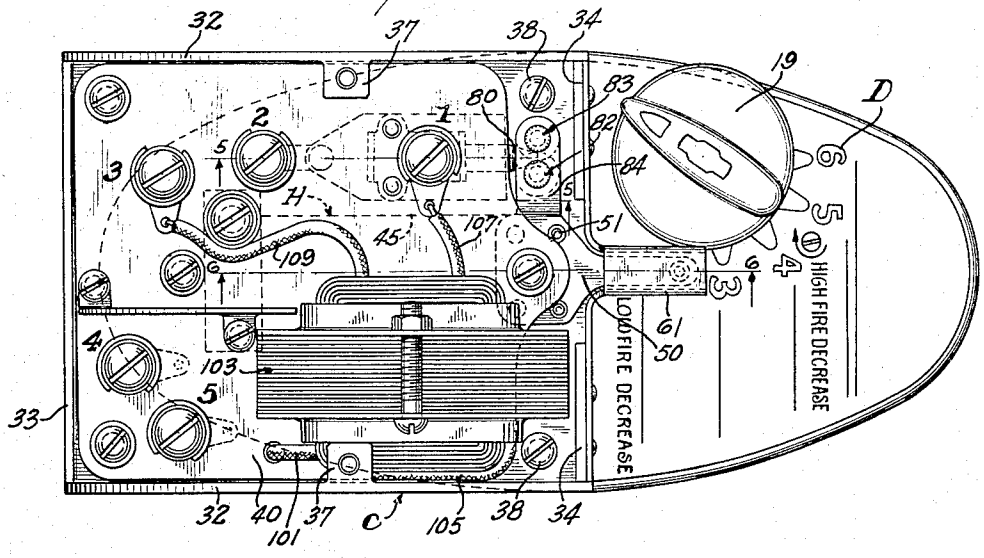
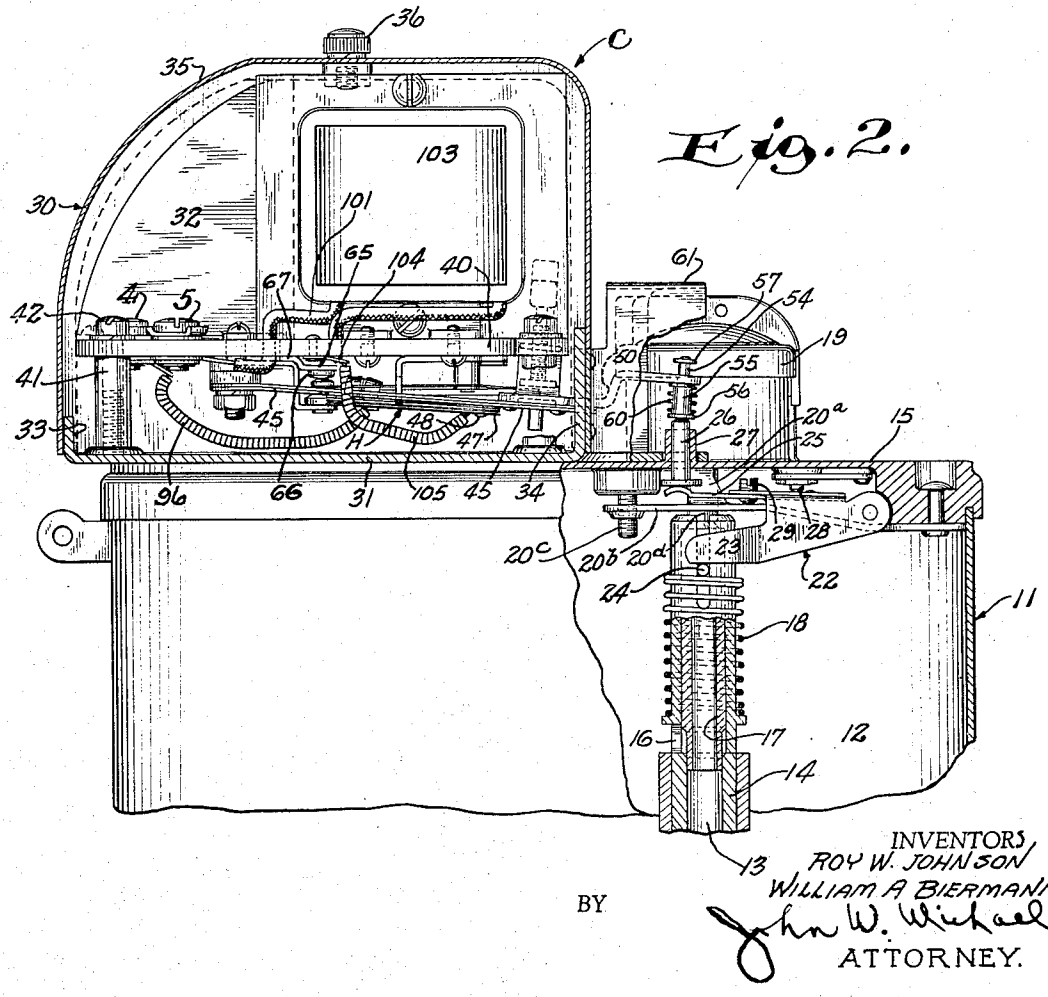


Fig. 2.



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Fig. 3.

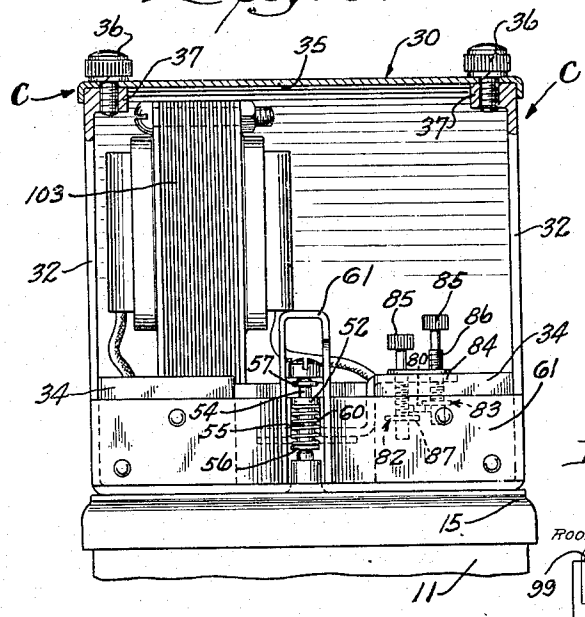


Fig. 10.

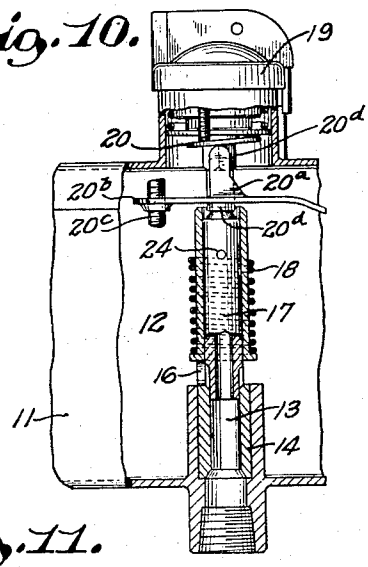
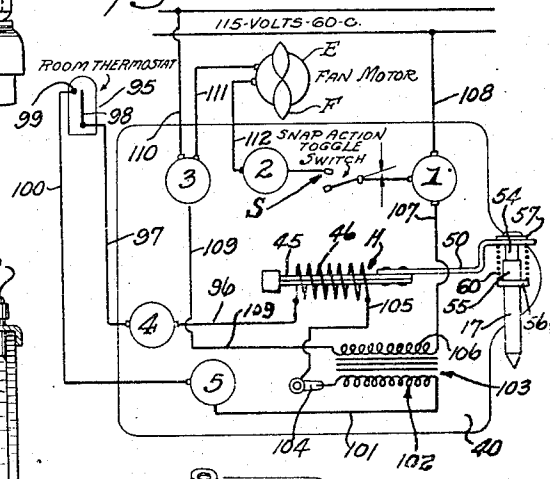


Fig. 11.



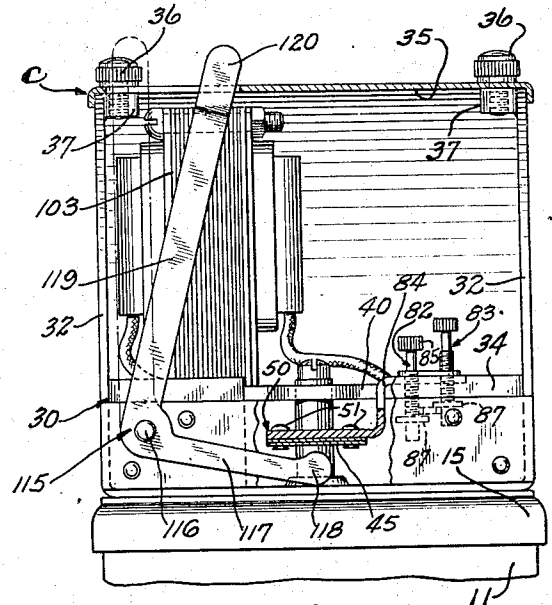


Fig. 12.

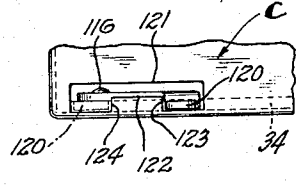


Fig. 13.

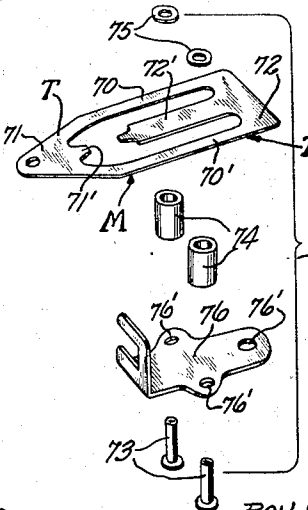


Fig. 9.

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CONTROL MECHANISM FOR BURNERS

Filed July 19, 1941 3 Sheets-Sheet 3

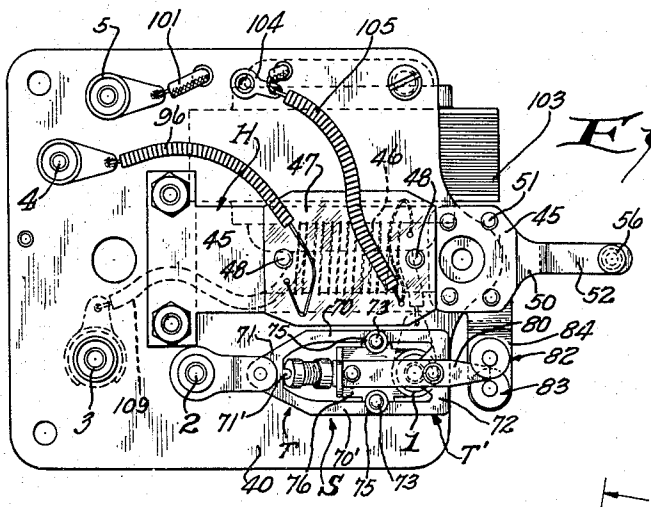


Fig. 4.

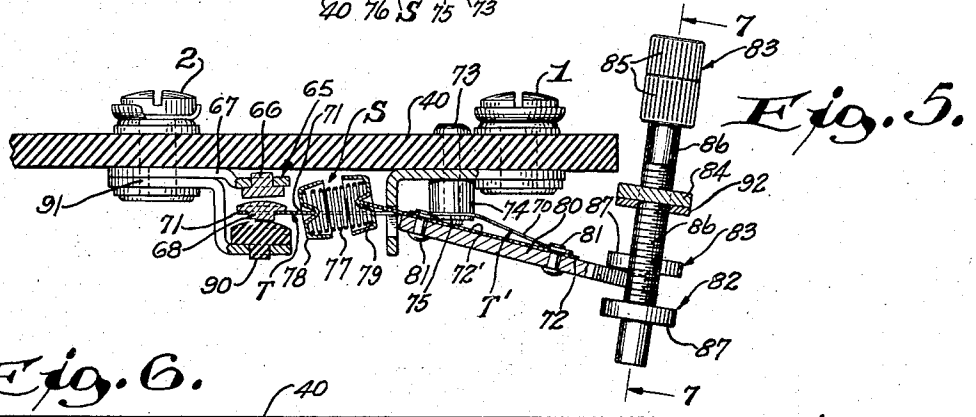


Fig. 5.

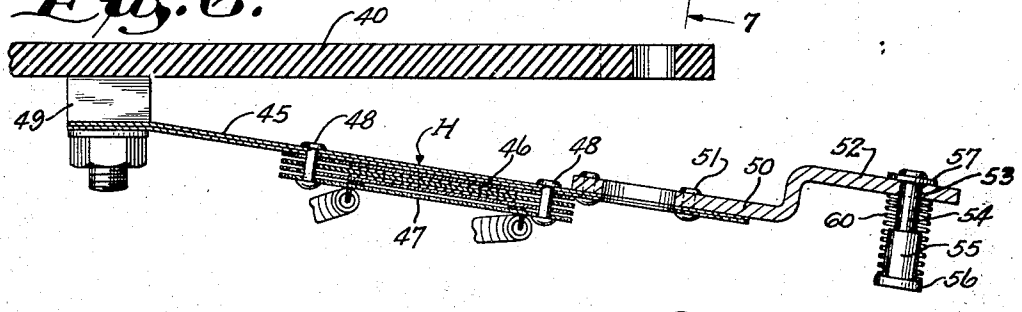


Fig. 6.

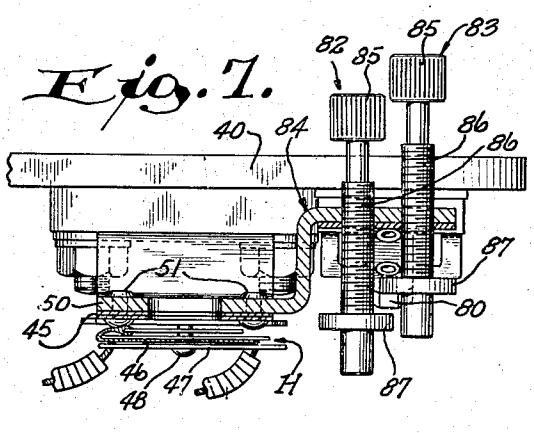


Fig. 7.

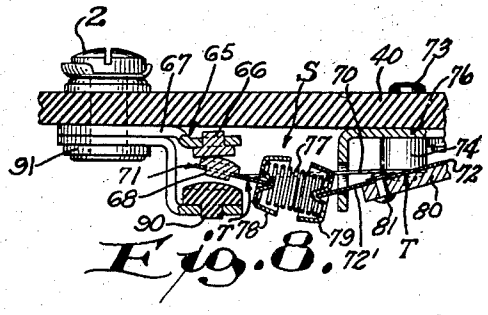


Fig. 8.

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Patented Feb. 29, 1944 2,343,188

UNITED STATES PATENT OFFICE

2,343,188

CONTROL MECHANISM FOR BURNERS

Roy W. Johnson and William A. Biermann, Milwaukee, Wis., assignors to Automatic Products Company, Milwaukee, Wis., a corporation of Wisconsin

Application July 19, 1941, Serial No. 403,120

17 Claims. (Cl. 158—28)

This invention relates to an improvement in a control mechanism especially designed and adapted for use with heaters of the type wherein the heater is fired by a liquid fuel oil burner.

A typical installation is one in which a hot air furnace or heater employs a "pot" type burner, or its equivalent, to which oil or liquid fuel is fed by gravity under the control of a metering valve embodied in a constant level oil control device, and in which air to support combustion is supplied to the combustion chamber of the burner by means of an electric motor-driven fan.

One of the objects of the present invention is to provide a control mechanism of this character which automatically regulates the action of the metering valve and the electric motor-driven fan in such fashion that the fan is not turned on until the metering valve has been open sufficiently to raise the flame to an extent necessary to require the forced draft to sustain proper combustion, and, also, to an extent which precludes the possibility of the forced draft extinguishing the flame.

Another object of the invention is to provide a control mechanism of this character and having the advantages mentioned, which also provides for continued operation of the fan after the metering valve has been shifted to low or pilot fire position, thereby preventing the formation of carbon or soot and insuring clean, complete, and odorless combustion at all times.

A further object of the invention is to provide a control mechanism of this character, which is simple, compact, and closely organized in construction, easy and comparatively inexpensive to manufacture and install, and safe, reliable and efficient in operation.

A still further object of the invention is to provide a control mechanism of this character wherein the operation of the electric motor-driven fan is controlled by a special type of snap action switch adapted to effectively control the operation of the fan motor and be responsive to the control or regulation of the other elements of the mechanism to effect the desired mode of operation.

Other objects and advantages reside in certain novel features of the construction, arrangement, and combination of parts, which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings forming a part of this specification, and in which:

Figure 1 is a view in top plan of a control mechanism embodying the present invention applied to the top of a constant level control device, the cover of the control housing being removed for the sake of illustration;

Figure 2 is a view partially in side elevation and partially in longitudinal, vertical, cross section, further illustrating the device shown in Figure 1;

Figure 3 is a view in end elevation looking toward the left in Figure 2 with the manually adjustable control knob removed and with the cover for the control housing shown in transverse section, all for the sake of illustration;

Figure 4 is a view in bottom plan of the terminal board of the control mechanism and of the parts carried thereby;

Figure 5 is a view partly in side elevation and partly in vertical, longitudinal section, taken on line 5—5 of Figure 1, parts being omitted for the sake of simplicity in illustration;

Figure 6 is a fragmentary section view taken on line 6—6 of Figure 1, parts being omitted for the sake of simplicity in illustration;

Figure 7 is a view in transverse, vertical cross section, taken on line 7—7 of Figure 5, with parts shown in elevation for the sake of simplicity in illustration;

Figure 8 is a fragmentary, sectional view similar to Figure 5 and illustrating the snap-acting switch in its closed position;

Figure 9 is a group view in perspective of parts of the snap-acting switch;

Figure 10 is a fragmentary view in vertical cross section illustrating the metering valve construction and the manually operable cam means for adjusting the same;

Figure 11 is a diagram of the electric circuits embodied in the control mechanism;

Figure 12 is a view similar to Figure 3 showing a modified form of the invention; and

Figure 13 is a fragmentary view in top plan illustrating the keeper slot for the heat motor latching lever.

Referring to the drawings it will be seen that the constant level oil control device in which the present invention is embodied comprises a main casing, designated generally at 11, and having a liquid supply chamber 12 therein. Liquid fuel is supplied to and maintained at a constant level in said chamber 12 by mechanism (not shown) but well known and widely used in this art and fully disclosed and claimed in United States Letters Patents 2,068,138, granted January 19, 1937, and 2,120,364, granted June 14, 1938.

The liquid flows out of the main chamber 12 through an outlet passage 13 which is connect-

ed to the burner (not shown). A tubular valve guide 14 has its lower end press-fitted or otherwise suitably secured in the upper portion in the outlet passage 13, the valve guide 14 extending vertically in the casing 11 and terminating a short distance below the cover 15 of the main casing 11. The valve guide is provided with lateral port or opening 16 which establishes communication between the interior of the valve guide 14 and the liquid supply chamber 12.

A metering valve 17 is slidably fitted in the tubular guide 14 and meters or regulates the flow from the supply chamber 12 to the burner. A spring 18 biases the metering valve 17 to open position.

A manually adjustable control knob 19 is mounted on the cover 15 of the main casing above the metering valve 17 and acts through a cam 20 with which it is interconnected to control the position of the metering valve 17. The active face of the cam 20 rides on an abutment lug 20*a* which may be integrally formed with an adjustable abutment supporting arm 20*b*. An adjusting screw 20*c* controls the position of the supporting arm 20*b* and consequently the position of the abutment lug 20*a*. When the knob 19 is turned, the cam 20*a*, riding on the abutment lug 20*a*, will raise or lower the knob 19, depending upon the direction of rotation of the knob, and will also correspondingly raise and lower a valve-operating stud 20*d* fixed to and movable with the knob 19, and having its lower end bearing on the upper end of the metering valve 17 so as to control the position thereof. The knob 19 may be adjusted to cause the cam 20 to move the metering valve to completely closed or shutting off position, or it may be adjusted to allow the valve 17, under the regulation of its thermostatic control means to be hereinafter more fully described, to move to full open position, or to any one of several intermediate positions, as indicated by the scale or dial designated at D in Figure 1.

In addition to the manually operable cam means, lever mechanism, designated generally at 22, is provided, the lever mechanism 22 having a lever arm 23 engageable with the laterally extending guide pin 24 of the metering valve 17, and also having a lever arm 25 engageable with the lower headed end of a pin 26 slidably fitted in a bearing 27 provided therefor on the cover 15 of the main casing 11. High and low fire stops, designated at 28 and 29, control the extreme position of the lever mechanism 22.

Details of the construction of the metering valve 17 and its lever mechanism 22 need not be further described since per se they are not part of the present invention and are fully disclosed and claimed in the application of Roy W. Johnson, one of the joint inventors of this case, for "Conversion oil control devices," filed April 4, 1940, Serial No. 327,789.

A control unit, designated generally at C, is supported on and detachably secured to the cover 15 of the main casing 11. The control unit C includes a sheet metal casing or housing, designated generally at 30, which may comprise a bottom plate, parallel, vertical side walls 32, upturned cross flange 33 extending transversely of the rear edge of the bottom plate 31, and transversely extending and spaced upright front pieces 34 integral with the front edge of the bottom plate 31. A removable top or cover 35 completes the enclosure afforded by the housing 30. The cover 35 is removable, but when assembled is detachably secured in position by screws 36 passing through the openings in the cover 35, and is threadedly engaged with internally threaded openings provided in attaching lugs 37 fixed to the side walls 32 of the housing 30. Screws 38 detachably secure the control unit to the cover plate 15 of the main casing 11.

A horizontally disposed terminal board or panel 40 of insulating material is supported within the control housing 30 above the bottom plate 31 thereof by means of posts 41, the terminal board 40 resting on the tops of the posts 41 and being secured in position thereon by screws 42.

A heat motor of the relay, auxiliary heater type, designated generally at H, is supported on the under side of the terminal board 40. The heat motor H includes a bimetallic or thermostatic strip or leaf 45, which has combined therewith an electric heating element or resistance 46 engaged in a wrapping 47 of mica or other suitable electric insulating material. Rivets or the like 48 coact with the mica casing or wrapping 47 of the heating element 46 and with the bimetallic leaf 45 to secure the heating element in position on the bimetallic leaf in heat interchanging relationship therewith. One end of the leaf 45 is fixed to a bracket 49 suitably secured to the under side of the panel 40. A valve-operating arm 50 is riveted as at 51 to the free end of the bimetallic leaf 45. This arm 50 projects through an opening provided therefor in the front of the control housing and has its outer end upwardly offset, as at 52, and overlying the motion transmission pin 26. The portion 52 of the arm which overlies the pin 26 is provided with a vertical opening 53 in which the stem 54 of a slidable valve-operating stud 55 is fitted. The lower end of this stud 55 is headed, as at 56, and bears against the upper end of the pin 26. The portion of the stem 54 above the valve-operating arm is equipped with a washer or collar 57 to retain it assembled with the arm. A coil spring 60 encircles the stud below the arm 52 and has one arm bearing against the head 56 of the stud 55 and its opposite arm bearing against the under side of the upwardly offset end 52 of the valve-operating arm 50. The stud 55 and its spring 60 provide a yieldable or lost motion connection between the valve-operating arm 50 and the motion transmission pin 26, for a purpose which will hereinafter more clearly appear. A sheet metal guard 61 secured to the front-pieces 34 of the control housing 30 surrounds and protects the valve-operating arm 50, its valve-operating stud 54, and the pin 26.

A snap-acting toggle switch, designated generally at S, is connected in controlling relation to the electric motor E, which drives the fan or blower F.

The snap-acting switch S includes a fixed contact, designated generally at 65, the fixed contact 65 having a contact button 66 supported by a contact carrier strip 67 which is secured to and supported on as well as in good electrical contact with the terminal or binding post 2 carried by the panel 40. A movable contact button 68 is cooperably related to the fixed contact button 66.

The movable contact button 68 of the switch S is controlled by a toggle mechanism of special construction. As illustrated in Figures 4, 5, 8, and 9, this toggle mechanism comprises stiffly resilient toggle members T and T′ constituted by portions of a one-piece sheet metal stamping M. The stamping M is stamped or punched out of

a thin sheet of spring steel or other appropriately resilient metal of good electrical conductivity, and is fashioned with side members 70 and 70' cross connected at its ends by integral end members 71 and 72. The end member 71 is tapered and apertured as shown to adapt it to be supported and be fixedly connected to the shank of the movable contact button 68 and also has a centrally disposed, inwardly directed tapered projection 71' integrally formed therewith. The end member 72 has a centrally disposed, inwardly directed finger 72' integrally formed therewith, the inner end of the finger 72' being tapered and being longitudinally alined with, though slightly spaced from, the tapered projection 71'. Intermediate portions of the side members 70 and 70' are fixedly supported on, though in spaced relation to, the under side of the terminal board 40, and this may be conveniently accomplished by means of rivets 73, spacing sleeves 74, and washers 75, which also serve to secure a stop bracket 76 in position. The rivets 73 have their upper ends headed, and in the assembly these rivets have their shanks extended through openings provided therefor in the terminal board 40, through alined openings 76' in the body portion of the stop bracket 76, through the spacing sleeves 74, past intermediate portion of the inner edges of the side members 70 and 70' of the sheet metal stamping M and then through the washers 75. The lower ends of the rivets are staked or riveted over into tight and secure engagement with the washers 75 so as to clamp intermediate portions of the side members 70 and 70' of the sheet metal stamping M between the lower ends of the spacing sleeves 74 and the washers 75, and incidentally also clamp the stop bracket 76 against the under side of the terminal board 40. The rivets 73, spacing sleeves 74, washers 75, and stop bracket 76 are constituted of metal of good electrical conductivity, and together with the sheet metal stamping M serve to electrically connect the movable contact button 68 with the terminal or binding post 1, the shank of which post 1 passes through an opening in the terminal board 40 and has its lower end mechanically secured to and in good electrical contact with the stop bracket 76. The toggle switch S is completed by a toggle spring 77 compressed between spring cups 78 and 79, the bottoms of which are indented or socketed to adapt them to be interfitted with the tapered projection 71' of toggle arm or member T and the tapered ends of finger 72' of toggle arm T', respectively. It will be understood from the foregoing description that the toggle arm or member T is constituted of the end member 71, its finger 72', and the portions of the side members 70 and 70' located on the left hand side of the spacing sleeves 74 and washer 75 as viewed in Figures 4 and 5.

A switch operator 80, in the form of a strip of insulating material, has a portion securely fixed by rivets 81 to the finger 72' and end member 72 of the toggle arm T' of the stamping M. The switch operator 80 projects beyond the end member 72 and its outer or free end is interposed between switch actuating elements, designated generally at 82 and 83, respectively. These elements 82 and 83 are adjustably supported on an angle bracket 84 connected to and movable with the valve operating arm 50, and in fact the bracket 84 may be conviently made an integral part of the valve-operating arm 50 although it projects laterally therefrom and is offset upwardly with respect thereto. The switch-actuating elements 82 and 83 are of identical construction and each has a knurled knob 85 at its upper end, is formed with a threaded shank portion 86, which is interthreaded with an opening provided therefor in the bracket 84, and has an annular flange or collar 87 engageable with the switch operator. The arrangement is such, however, that the collar 87 of the switch-actuating element 82 is below the switch operator whereby the flange or collar 87 of the operator 83 is above the same.

When the valve is moved to closed position, the valve-operating arm 50 descends. This moves the bracket 84 downwardly, bringing the actuating element 83 into engagement with the switch operator 80, thereby shifting the toggle arms T and T' to the position shown in Figure 5. This moves the contact 68 away from the fixed contact 66 to open the switch.

An abutment or stop 90 limits the extent to which the contact 68 may move away from the contact 66, this abutment or stop being of insulating material and being carried by a bracket 91 which is supported on the panel 40 by the terminal 2. When the valve arm 50 moves upwardly to allow the metering valve to open, the switch-actuating element 82 swings the switch operator 80 to cause the toggle arms to shift to the position shown in Figure 8, whereupon the contact 68 snaps over into engagement with the contact 66 to close the switch.

The switch-actuating elements 82 and 83, by virtue of their threaded interconnection with the bracket 84, are vertically adjustable, and they are releasably maintained in any adjustment by means of split resilient lock washers 92. By providing two switch-actuating elements 82 and 83, making them vertically adjustable and combining them in the manner described with the operating element 80 of the snap-actuating switch S, it is practical and convenient to so adjust these switch-actuating elements that they will control the operation of the burner in a specially advantageous manner, as will be hereinafter more clearly described.

As illustrated in Figure 11, a room thermostat 95 controls the energization of the electric heating element 46 of the heat motor H. One terminal of the electric heating element 46 is connected by a flexible wire 96 to the binding post or terminal 4. A wire 97 connects the binding post or terminal 4 with the movable conductive thermostat leaf 98 of room thermostat 95. A fixed contact 99 of the room thermostat is connected by a wire 100 to the binding post 5. A wire 101 connects the binding post 5 with one terminal of the secondary winding 102 of a step-down transformer, designated generally at 103. The other terminal of the secondary winding 102 of the transformer 103 is connected to a connector clip 104 carried by the under side of the terminal board. A flexible wire 105 connects the clip 104 with the other terminal of the electric heating element 46. The primary winding 106 of the transformer 103 has one terminal connected by a wire 107 to the binding post 1. A wire 108 connects the binding post 1 to one side of the power line. The other terminal of the primary coil 106 of the transformer 103 is connected by a wire 109 to binding post or terminal 3. The binding post or terminal 3 is connected by a wire 110 to the other side of the power line. A wire 111 connects the binding post 103 to one terminal of the fan motor E. The other terminal of the motor E is connected by a wire 112 to the binding post 2. As described, the binding

post 2 is electrically connected to the fixed contact 65 of the snap-acting switch S, whereas the movable contact 68 of the switch S is electrically connected with the binding post or terminal 1.

With this construction, when the room thermostat 95 is satisfied, the circuit of the electric heating element 46 of the heat motor H is broken, and the bimetallic strip 45 acts through the arm 50 and the stud 55 to press down on the push pin 26 and swing the lever 22 to the position shown in Figure 2. This downward swinging movement of the lever 22 is limited by the action of the low fire stop 29 so that the metering valve is maintained in low pilot fire position. At this time the switch-actuating element 83 has shifted the switch operator 80 to the position shown in Figure 5 so that the contact 68 is disengaged from contact 66 and the fan motor circuit is open. Now then, if the room thermostat calls for heat its leaf 98 engages the fixed contact 99, thereby energizing the electric heating element 46 of the heat motor H, causing the bimetallic element 45 to warp upwardly. This so swings the valve-operating lever 50 and parts carried thereby that pressure on the pin 26 is relieved and the valve spring 18 opens the metering valve 17 so that a higher flame is had in the burner. The setting of the switch-actuating element 82 is such that it does not come into engagement with the switch operator 80 until after the metering valve has opened a predetermined amount, this operation being desirable to avoid possible extinguishment of a low flame by the forced draft. However, at the selected time, the switch-actuating element 82 engages under the outer end of the switch operator 80 and thereby shifts the toggle switch from the position shown in Figure 5 to the position shown in Figure 8. In the closed position of switch S shown in Figure 8, the contacts 68 and 66 are engaged. Consequently, the circuit through the fan motor E is closed and the motor starts up and operates the fan to supply air to the fire pot of the burner. When the room thermostat is satisfied, the circuit through the electric heating element 46 of the heat motor H is broken and the bimetallic strip 45 warps downwardly, thereby moving the valve-operating arm and its stud 55 downwardly to cause the heads 56 of the stud to press down on the push pin 26 and swing the lever 22 to low pilot fire position. The arm 50 may continue to move downwardly after the lever 22 is in low fire position, due to the provision of the spring 60, which affords a yieldable or lost motion connection between the valve-operating arm 50 and its stud 55. The provision of this yieldable connection in the motion transmission train between the heat motor H and the valve makes it practical and convenient to set the switch-actuating element 83 so that it will not engage the switch operator 80 for a predetermined time after the metering valve has been shifted to low pilot fire position. Consequently, the fan motor continues to supply forced draft to the burner after the metering valve has been shifted to low pilot fire position, thereby scavenging the burner and insuring complete and odorless combustion.

The present invention also proposes to provide control mechanism of this character with means for throwing the heat motor H out of action so that, if desired, the control exercised over the supply of oil to the burner will be entirely manual. As illustrated in Figures 12 and 13, a bell crank lever, designated generally at 115, may be fulcrumed, as at 116, on the control housing. One arm of the lever, designated at 117, terminates in a rounded end 118 which underlies the outer end portion of the bimetallic leaf 45. The other arm 119 of the bell crank lever extends up through the housing and has an offset upper end 120 projecting through a keeper slot 121 provided in the cover of the control casing. The keeper slot has one margin formed with an integral lug 122 providing latching shoulders 123 and 124 cooperable with the offset end 120 of the bell crank 115 to releasably secure the latching lever in idle or operative position. Figure 12 shows the keeper 115 in full lines in idle position, in which event thermostatic control is had. By shifting the lever over to the dotted line position shown in Figures 12 and 13, and engaging it with the keeper shoulder 124, the bimetallic leaf 45 is flexed upwardly and retained in upwardly flexed position out of the range of movement of the pin 26, thereby converting the mechanism into a manually controlled device. When this is done the switch-actuating elements 82 and 83 may be removed or else adjusted so as not to exercise any control of the snap switch, and it, of course, may be positioned as desired. The bell crank lever 115 is constituted of resilient metal and its arm 119 is so formed and assembled that under the influence of its own inherent resiliency it is biased to have latching engagement with the margin of the keeper slot on which the shoulders 123 and 124 are formed.

While we have shown and described several constructions in which the invention may be advantageously embodied, it is to be understood that the constructions shown have been selected merely for the purpose of illustration or example, and that various changes in the size, shape, and arrangement of the parts may be made without departing from the spirit of the invention or the scope of the subjoined claims.

We claim:

1. A control mechanism of the character described for use in regulating the supply of oil and air to an oil burner and comprising a burner, a metering valve for regulating flow to the burner, a heat motor controlled in its action by means responsive to the temperature to be regulated and having a movable motor element operatively interconnected to said valve to control the position thereof, means for supplying air to the burner including an electric motor-driven fan, a switch controlling the starting and stopping of said fan motor, and two, independently adjustable, switch actuators carried by and movable with said movable motor element, one of said actuators functioning to close the switch on movement of said motor element a predetermined distance in one direction, the other of said actuators functioning to open said switch upon predetermined movement of said motor element in an opposite direction.

2. A control mechanism of the character described for use in regulating the supply of oil and air to an oil burner and comprising a burner, a casing having a liquid supply chamber provided with an outlet, a metering valve for regulating flow through the outlet, a bimetallic leaf operatively interrelated with the valve to control the position thereof, an electric heating element combined with said bimetallic leaf, a thermostat regulating the supply of current to said electric heating element, means for supplying air to the burner including an electric motor-driven fan, a switch controlling the starting and stopping of said fan motor, and two adjustable actuating elements for

the switch carried by and movable with the bimetallic leaf, one of said elements functioning to close the switch on movement of the leaf a predetermined distance in one direction, the other of said elements functioning to open said switch upon predetermined movement of the leaf in an opposite direction.

3. A control mechanism of the character described for use in regulating the supply of oil and air to an oil burner and comprising a burner, a metering valve for regulating flow to the burner, a heat motor controlled in its action by means responsive to the temperature to be regulated, a valve operator actuated by the heat motor, motion transmission means between said operator and said valve and including a yieldable connection providing for continued movement of said heat motor after the valve is arrested in its low fire position, means for supplying air to the burner including an electric motor-driven fan, a switch controlling the starting and stopping of the fan motor, and means utilizing said continued movement of the heat motor for opening said switch and stopping the motor a predetermined time after the valve is moved to low fire position.

4. A control mechanism of the character described for use in regulating the supply of oil and air to an oil burner and comprising a burner, a casing having a liquid supply chamber provided with an outlet, a metering valve for regulating flow through said outlet, lever mechanism mounted in the casing and cooperable with the valve for shifting the same from high fire to low fire pilot position, high and low fire stops for the valve, a cover for the casing having an opening therein overlying said lever mechanism, a motor transmission pin slidable through said opening and operatively engaged with the lever mechanism in the casing, said pin projecting beyond the casing, a control housing mounted on and secured to the cover of the casing at one side of said pin, a terminal board of insulating material supported within the housing in spaced relation with the walls thereof, a bimetallic leaf supported on said terminal board, a valve-operating arm secured to the free end of said leaf and projecting upwardly therefrom into an overlying relation with the pin, a spring projected motion transmission element carried by the portion of the arm overlying the pin and engageable with the pin, an electric heating element combined with the leaf, a thermostat for regulating the supply of current to said electric heating element, means supplying air to the burner including a motor-driven fan, a snap action switch controlling starting and stopping of said fan motor, means actuated by said leaf for opening said switch and stopping the motor a predetermined time after the valve is moved to low fire position.

5. A control mechanism of the character described for use in regulating the supply of oil and air to an oil burner comprising a burner, a casing having a liquid supply chamber provided with an outlet, a metering valve for regulating flow through said outlet, high and low fire stops for the valve, a bimetallic leaf, motion transmission means between said leaf and said valve including a yieldable connection providing for continued movement of the leaf after the valve is arrested in low fire position, an electric heating element combined with said leaf, a thermostat for regulating the supply of current to said element, means for supplying air to the burner including a motor-driven fan, a snap action switch controlling starting and stopping of the fan motor, and means for utilizing the continued movement of the leaf for opening said switch and stopping the motor a predetermined time after the valve is moved to low fire position.

6. A control mechanism of the character described for use in regulating the supply of oil and air to an oil burner and comprising a burner, a casing having a liquid supply chamber provided with an outlet, a metering valve for regulating flow through said outlet, high and low fire stops for the valve, a bimetallic leaf cooperable with the valve to control the position thereof from a high fire position to a low fire position, an electric heating element combined with said leaf, a thermostat for regulating the supply of current to said electric heating element, means for supplying air to the burner including a motor-driven fan, a snap-acting switch controlling the starting and stopping of said fan motor, a switch operator combined with the switch and projecting therefrom, a bracket carried by said leaf, and an actuating element for the switch operator adjustably supported on the bracket and cooperable with the operator to open the switch and stop the motor a predetermined time after the valve is moved to low fire position.

7. A control mechanism of the character described for use in regulating the supply of oil and air to an oil burner and comprising a burner, a casing having a liquid supply chamber provided with an outlet, a metering valve for regulating flow through said outlet, high and low fire stops for the valve, a bimetallic leaf cooperable with the valve to control the position thereof from a high fire position to a low fire position, an electric heating element combined with said leaf, a thermostat for regulating the supply of current to said electric heating element, means for supplying air to the burner including a motor-driven fan, a snap-acting switch controlling the starting and stopping of said fan motor, a switch operator combined with the switch and projecting therefrom, a bracket carried by said leaf, and two independently adjustable actuators for the switch carried by said bracket, one of said actuators functioning to close the switch on movement of said bracket a predetermined distance in one direction, the other of said actuators opening the switch upon predetermined movement of the bracket in an opposite direction.

8. A control mechanism for use in regulating the supply of oil and air to an oil burner and comprising a burner, a metering valve for regulating flow of oil to the burner, a heat motor having a bimetallic leaf interconnected with the valve for controlling the position thereof, means for supplying air to the burner including an electric motor-driven fan, a switch controlling the starting and stopping of said electric fan motor, an operator for said switch adjacent said leaf, a bracket carried by the leaf and overlying said operator, and two switch actuators adjustably supported on said bracket, one of said actuators engaging the operator from above and the other engaging the same from below whereby one of said actuators functions to close the switch upon predetermined movement of the leaf in one direction and the other functions to open the switch upon predetermined movement of the leaf in the opposite direction.

9. A control mechanism for use in regulating the supply of oil and air to an oil burner and comprising a burner, a metering valve for regu-

lating flow of oil to the burner, a heat motor having a bimetallic leaf interconnected with the valve for controlling the position thereof, means for supplying air to the burner including an electric motor-driven fan, a switch controlling the starting and stopping of said electric fan motor, an operator for said switch adjacent said leaf, a bracket carried by the leaf and overlying said operator, and a switch actuator adjustably supported on the bracket and cooperable with said operator upon predetermined movement of said leaf.

10. A control mechanism for use in regulating the supply of oil and air to an oil burner and comprising a burner, a metering valve for regulating flow of oil to the burner, a heat motor having a bimetallic leaf interconnected with the valve for controlling the position thereof, means for supplying air to the burner including an electric motor-driven fan, a switch controlling the starting and stopping of said electric fan motor, an operator for said switch adjacent said leaf, a bracket carried by the leaf and overlying said operator, and two switch actuating screws threadedly interconnected with said bracket, one of said screws having a collar engageable with said operator from above, the other having a collar engageable with said operator from below.

11. A control mechanism for use in regulating the supply of oil and air to an oil burner and comprising a burner, a metering valve for regulating flow of oil to the burner, high and low fire stops for the valve, a heat motor having a bimetallic leaf, motion transmission means between said leaf and said valve including a yieldable connection providing for continued movement of said leaf after the valve is arrested in low fire position, means for supplying air to the burner including an electric motor-driven fan, a switch controlling the starting and stopping of said electric fan motor, and a switch actuator adjustably supported on the leaf actuator and utilizing the continued movement of the leaf after the valve is arrested in low fire position to automatically open the switch and stop the motor after the lapse of a predetermined interval of time.

12. A control mechanism for use in regulating the supply of oil and air to an oil burner and comprising a burner, a metering valve for regulating flow of oil to the burner, high and low fire stops for the valve, a heat motor having a bimetallic leaf, motion transmission means between said leaf and said valve including a yieldable connection providing for continued movement of said leaf after the valve is arrested in low fire position, means for supplying air to the burner including an electric motor-driven fan, a switch controlling the starting and stopping of said electric fan motor, an operator for the switch adjacent said leaf, and two switch actuators adjustably supported on said bracket, one of said actuators engaging the operator from above and utilizing the continued movement of the leaf after the pilot valve is arrested in its low fire position to automatically open the switch and stop the motor after the lapse of the predetermined interval of time, the other of said actuators engaging the operator from below and functioning to automatically close the switch and start the motor after the valve opens to a predetermined extent beyond its low fire position.

13. A control mechanism for use in regulating the supply of oil and air to an oil burner and comprising a burner, a metering valve for regulating flow of oil to the burner, high and low fire stops for the valve, a heat motor having a bimetallic leaf interconnected with the valve to control the position thereof, means for supplying air to the burner including an electric motor-driven fan, a double throw snap action switch controlling the starting and stopping of said electric fan motor, an operator for said switch adjacent said leaf, and means carried by the leaf and cooperable with said operator to effect closing of the switch upon predetermined movement of the leaf in one direction and opening of the switch upon predetermined movement of the leaf in an opposite direction.

14. A control mechanism for use in regulating the supply of oil and air to an oil burner and comprising a burner, a casing having a liquid supply chamber provided with an outlet, a metering valve for regulating flow through said outlet, lever mechanism mounted in the casing and cooperable with the valve for shifting the same from high fire to low fire position, high and low fire stops for the valve, a cover for the casing having an opening therein overlying said lever mechanism, a motion transmission pin slidable beyond said opening and operatively engaged with the lever mechanism in the casing, said pin projecting beyond the casing, a control housing mounted on and secured to the cover of the casing at one side of said pin, a terminal board of insulating material supported within the housing in spaced relation with the walls thereof, a heat motor including a bi-metallic leaf supported on the terminal board, a valve-operating arm secured to the free end of said leaf and projecting outwardly of the housing and into the overlying relation with the pin, a spring projected motion transmission element carried by the portion of the arm overlying the pin and engageable with the pin, means supplying air to the burner including an electric motor-driven fan, a double throw snap acting switch controlling starting and stopping of said fan motor, an operator for the switch adjacent the leaf, a bracket carried by the leaf and overlying the operator, and two switch actuating screws threadedly interconnected with said bracket, one of said screws having a collar engageable with said operator from above, the other having a collar engageable with said operator from below.

15. A control mechanism for use in regulating the supply of oil and air to an oil burner, and comprising a burner, a main casing having a liquid supply chamber provided with an outlet, a metering valve for regulating flow through said outlet, high and low fire stops for the valve, a control housing mounted on the main casing, a terminal board of insulating material supported within said housing in spaced relation to the walls thereof, a heat motor including a bimetallic leaf supported on said terminal board, motion transmission means between the free end of the leaf and said valve, means for supplying air to the burner including an electric motor-driven fan, a double throw snap action switch mounted on the terminal board adjacent said bimetallic leaf and connected in circuit to said fan motor to control the starting and stopping thereof, an operator for said switch adjacent the leaf, and means carried by and movable with the leaf and cooperable with the operator to effect opening and closing of the switch at predetermined times.

16. A control mechanism for use in regulating the supply of oil and air to an oil burner, and comprising a burner, a main casing having a liquid supply chamber provided with an outlet, a metering valve for regulating flow through said outlet, high and low fire stops for the valve, a control housing mounted on the main casing, a terminal board of insulating material supported within said housing in spaced relation to the walls thereof, a heat motor including a bimetallic leaf supported on said terminal board, motion transmission means between the free end of the leaf and said valve, means for supplying air to the burner including an electric motor-driven fan, a double throw snap action switch mounted on the terminal board adjacent said bimetallic leaf and connected in circuit to said fan motor to control the starting and stopping thereof, an operator for said switch adjacent the leaf, and two switch actuating screws threadedly interconnected with said bracket, one of said screws having a collar engageable with said operator from above, the other having a collar engageable with said operator from below.

17. A control mechanism for use in regulating the supply of oil to an oil burner and comprising a burner, a main casing having a liquid supply chamber provided with an outlet, a metering valve for regulating flow through said outlet, manually adjustable cam means for controlling the position of the valve from fully closed position through intermediate fire position to high fire position, lever mechanism also interconnected with the valve for controlling the position thereof within the range permitted by the manually adjustable cam means, high and low fire stops cooperable with said lever mechanism, a control housing mounted on the main casing, a heat motor controlled in its action by means responsive to the temperature to be regulated and including a bimetallic leaf supported in the control housing, motion transmission means freely coupled to the leaf but actuated thereby to control the position of the valve, a latching lever fulcrumed within the control housing and having an arm engageable with the bimetallic leaf, and an arm projecting exteriorly of the control housing, the control housing having a slot through which the projecting end of said last named arm extends, said slot having latching shoulders cooperable with the adjacent portion of the projecting arm of the lever to releasably secure the lever in idle position with its first named arm out of engagement with the bimetallic leaf or in latching position with its first named arm engaged with and warping the leaf out of operative interengagement with said motion transmission means whereby the control mechanism is subject solely to the control of said manually adjustable cam means.

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