Nov. 20, 1945. W. S. LANDON 2,389,519

BURNER CONTROL MEANS

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FIG.-1

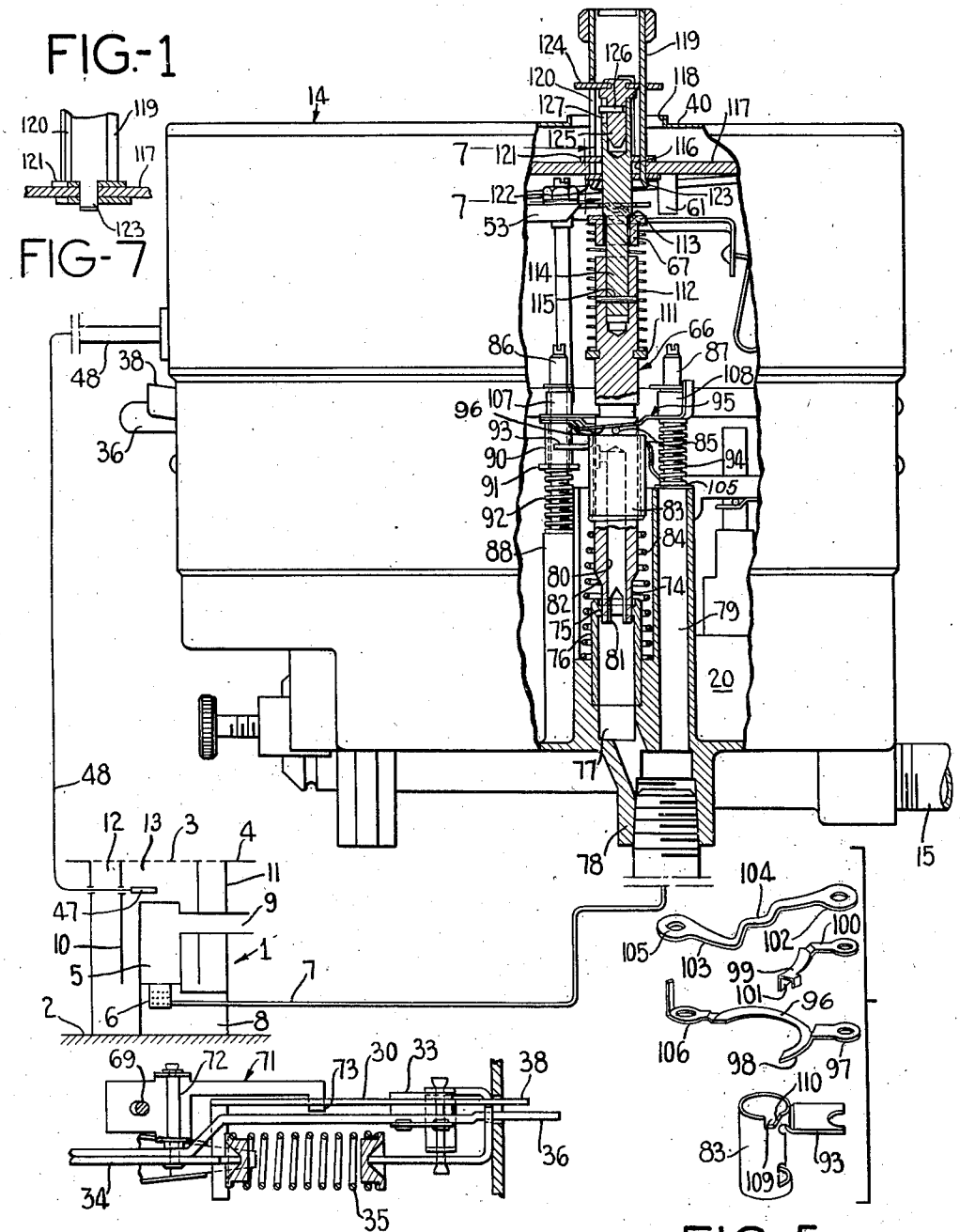


FIG.-7

FIG.-4

FIG.-5

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FIG.-2

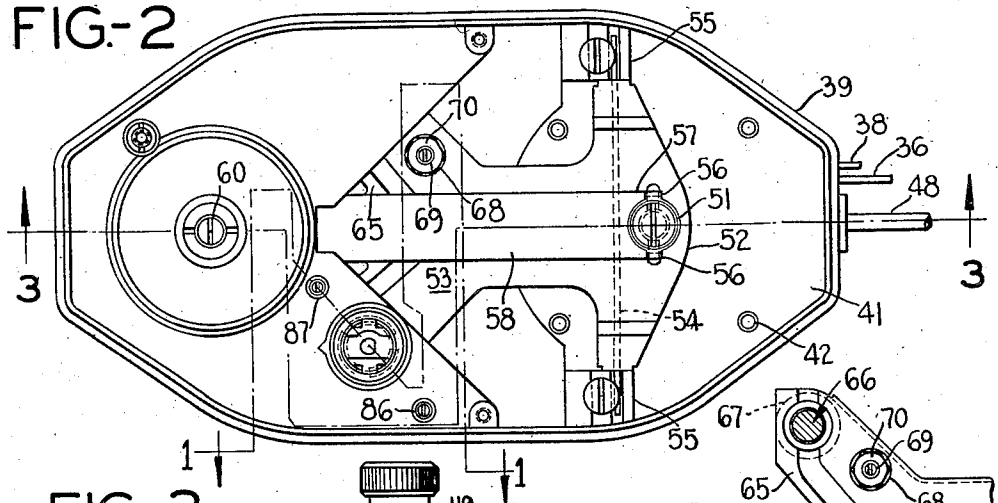


FIG.-6

FIG.-3

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BURNER CONTROL MEANS

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Application September 4, 1942, Serial No. 457,310

11 Claims. (Cl. 236—10)

This invention relates to new and useful improvements in heating apparatus and more particularly to means for controlling the operation of a burner for the same.

An object of the invention is to provide control means for a heating apparatus which is particularly adapted for use with so-called floor furnaces, in that safety means is provided for stopping operation of the apparatus in the event of excess temperature of the apparatus.

Another object is to provide means for automatically regulating the heat output of the heating apparatus.

Another object is to provide novel means for determining the range of automatic operation and the maximum and minimum flow limits of the fuel supplying valve for the heating apparatus.

Another object is to utilize the excess oil lever safety trip mechanism of a constant liquid level control means to stop operation of the heating apparatus upon occurrence of an undesired high temperature of the heating apparatus.

Another object is to utilize the automatic heat output regulating means for actuating the safety trip mechanism.

The invention consists in the improved construction and combination of parts and their aggroupment in operative relation to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed. In the accompanying drawings to be taken as a part of this specification, there is fully and clearly illustrated a prefered embodiment of the invention, in which drawings:

Figure 1 is a schematic view of the heating apparatus having the novel control means and showing the control means in side elevation but with parts broken away and in vertical section substantially on the line 1—1 of Figure 2;

Fig. 2 is a top plan view of the control means with the top cover member removed;

Fig. 3 is a view of the control means in vertical central section on the line 3—3 of Fig. 2;

Fig. 4 is a detail view showing certain of the safety mechanism and taken on the line 4—4 of Fig. 3;

Fig. 5 is a detail exploded view of parts of the valve positioning mechanism;

Fig. 6 is a detail view in section on the line 6—6 of Fig. 3 showing the cooperation of the metering valve and its operating lever, and

Fig. 7 is a detail view of certain knob supporting means.

Referring to the drawings by characters of reference, 1 designates generally a heating apparatus such as a floor furnace supported by a basement floor or the like 2 and discharging the heated air upward through a grill 3 set in the floor 4. The heating apparatus has a combustion chamber 5 with a pot-type oil burner 6 which may be a gravity fed hydroxalation burner supplied with fuel oil through a supply pipe 7 and with combustion air through an air inlet 8, either natural draft or pressure fed by a fan or the like. The combustion chamber 5 has an outlet duct 9 to the usual stack or chimney. Surrounding the combustion chamber 5, there is a continuous vertical partition or baffle 10 dividing the space within the casing 11 of the heating apparatus into a return air inflow passageway 12 for receiving air from the heated space and an upflow discharge passageway 13 for the heated air which discharges through the grill 3 into the space to be heated. The baffle 10 terminates above the base of the heating apparatus so that the passageway 12 is in communication at its lower end with the lower end of the upflow passageway 13.

The liquid fuel is fed through the pipe or conduit 7 from a constant liquid level control device 14 which is supplied with fuel from a supply tank not shown through an inlet supply pipe 15 which is connected into an inlet strainer chamber 16 in the base of the device 14. The outlet from the strainer 17 and chamber 18 opens into a passageway 19 which opens upward through a valve seat member 19 into the constant level chamber or reservoir 20 of the device 14. Cooperable with the seat member 19 there is a float operated inlet-controlling and shut-off needle valve 21 for regulating the inflow of oil to the reservoir 20. The valve 21 is secured to a float operated lever arm 22 fulcrumed for normal operation on a pin 23 and carrying a float member 24 adjustable relative to the arm 22 by means of a screw 25 engageable with the bimetal float supporting member 26. The arm 22 is provided with bearing slots 27 cooperable with the pin 23 so that in the event of failure of the valve 21 to maintain a constant liquid level such that the liquid level increases, the arm 22 can fulcrum on the connecting pin 28 between the arm 22 and valve member 21, thereby to permit the float member 24 to move upward due to the lost motion permitted at the slots 27. Upward movement of the float 24 in response to excess or undesired increase in liquid level will cause the lever arm extension 29 to engage the trip arm 30 of the safety trip mechanism 31 and move the dog or pawl 32 out of underlying relation to the latch plate 33 on the safety trip lever 34 so that the force of the spring 35 is released to move the lever 34 sharply downward into engagement with the upper end of the valve member 21, thereby to force it to closed position against its seat. The safety trip lever 34 has an end portion 36 which extends out of the casing 37 of the device 14 so that the trip mechanism can be reset by lifting upward on the lever end 36. The trip arm 30 also has an end portion 38 which extends out of the casing 37 so that the lever 34 can be manually tripped or released. A more complete description of this

mechanism will be found in the patent to Russel 2,317,556, granted April 27, 1943, for Liquid level controlling means.

Fitting on the top of the side walls of and conforming to the casing 37, there is a housing member 39 having a top cover member 40 and a horizontal supporting member such as a plate cast integral with the housing 39 and extending across one end portion of the housing 39 in overlying relation to the trip mechanism 31. Secured to the underside of the supporting member 41 by screws or the like 42, there is a temperature responsive power element 43 having a casing 44 closed and sealed by an expansible, collapsible wall 45, such as a metal bellows to provide an expansion chamber 46 communicating with a bulb or feeler element 47 through a capillary tube 48. The power element is charged under a vacuum with a suitable volatile liquid such as aniline oil. The bulb element 47 is inserted through the heating apparatus casing 11 into the upflow passageway 13 so that the pressure in the expansion chamber 46 varies in accordance with the temperature of the heated air discharging to the space to be heated. The bellows head or end wall 49 has an upward extending thrust member 50 from which a spring abutment post 51 extends concentrically upward. Straddling the post 51 is the bifurcated end portion 52 of an operating lever 53 which is journaled on a bearing pin 54 supported in oppositely disposed brackets 55 on the top face of the supporting plate 41. The post 51 has oppositely positioned downward directed knife edge members 56 which seat in end recess in the bifurcated end portion 57 of a leaf spring member 58 which straddles the post 51. The spring member 58 extends longitudinally and in overlying relation to the lever 53 and terminates adjacent the opposite end of the housing 39 in an adjustment screw engaging portion 59 cooperable with an adjustment screw 60 bearing downward against the spring 58 and tensioning it over a bridge member 61 which supports the spring 58 intermediate its ends. The lever 53 has a downturned spring-abutment arm 62. Positioned between the arm 62 and an abutment member 63 secured to the housing 39, there is a rebent leaf type toggle spring 64 so positioned relative to the lever 53 that its component of force opposing rotation of lever 53 will decrease at such a rate that the force which will initiate movement of the lever 53 will cause movement of the lever 53 through its complete range of travel. Extending from the lever 53 adjacent and on the power element side of the bridge member 61 which limits upward movement of the lever 53 by the spring 64, there is a valve operating arm 65 apertured for passage of a metering valve stem 66 therethrough and having opposite downturned bearing portions for engaging the top face of a collar 67 slidable on the stem 66. This metering valve operating mechanism is more fully described in my Patent 2,342,633, granted February 29, 1944, for Control means.

Secured in an aperture in arm 65, there is an internally threaded sleeve or nut 68 through which there is adjustably screwthreaded an operating rod 69 for actuating the safety trip mechanism, a lock nut 70 being provided to hold the rod 69 in adjusted position. The rod or thrust member 69 extends downward into the casing 37 and terminates in overlying relation, see Fig. 4, to one end portion of a release lever 71 carried by and journaled on the valve closing lever 34 by a bearing pin 72. The other end of the lever 71 has a laterally projecting arm 73 which underlies the trip arm 30 so that upon counterclockwise rotation of the lever 71 by downward thrust of the rod 69, the arm 73 will lift the trip arm 30 and release the lever 34 to close the float operated valve member 21.

The lower end portion of the metering valve stem 66 is of reduced diameter, as at 74, for a sliding fit in an annular flange 75 within a valve seat member 76 which is press-fitted in the outlet conduit 77 leading from the reservoir 20. The conduit 77 has an internally screw-threaded fitting 78 projecting from the bottom wall of the casing 37 and into which the end of the fuel conduit 7 is secured as by screw-threaded engagement. Communicating with the conduit 77 and extending upward from the fitting 78 there is a vent passage 79 for relieving the conduit 7 of any fuel, entrained air or gas. The lower end portion of the stem 66 has an internal longitudinal bore 80 which extends upward to a point above maximum liquid level in the reservoir 20 so as to vent the passageway or conduit 7 of any fuel, entrained air or gas. The reduced stem end portion 74 is provided with a metering slot 81 which is tapered at its upper end for pilot flow, the slot cooperating with the flange 75 to meter flow from the reservoir 20 to the burner 6. Above the reduced portion 74, the stem has a conical portion 82 which is engageable with the upper end of the valve seat member 76 to close off or stop the flow of fuel from the reservoir 20 to the conduit 77. Loosely fitting on the stem 66 above the conical portion 82 there is a sleeve or tubular member 83 which is urged upward by a helical coil spring 84 seating at its lower end on the bottom wall of the casing 37 and surrounding the seat member 76. The upper end or face of the sleeve 83 is engageable with a pin or arm 85 extending radially outward from the stem 66 so that the spring 84 acting upward through the sleeve 83 against the pin 85 acts to move the valve 74 toward open position, see Fig. 1. Positioned laterally of the stem 66 and at diametrically opposite points there are a low fire adjustment screw 86 and a high fire adjustment screw 87 which are adjustably screw-threaded into supporting bosses 88, 89 respectively extending upward from the bottom wall of the casing 37. Slidable on the screw 86 there is an adjustable low fire stop member 90 in the form of a sleeve having a lateral flange 91 at its lower end, the member 90 being supported on a stiff helical coil spring 92 which surrounds the screw 86 and seats on the boss 88. Cooperable with the member 90 there is an arm 93 which extends radially and horizontally from the sleeve 83 and is notched or apertured at its end to slidably fit the member 90 to hold the sleeve 83 against rotation and to engage the top face of the flange 91 to limit downward movement of the sleeve 83 and of the stem 66 when pin 85 is in engagement with the sleeve top face, as in Fig. 1. Supported on the sleeve member 90 and a stiff helical spring 94 surrounding the high fire adjustment screw 87 there is a cam track means 95, see Fig. 3. The cam track member 96 has an apertured ear 97 received by the screw 86 and seating on the sleeve 90. Overlying the ear 97 and the low fire end portion 98 of the member 96 there is a resilient track member 99 having an apertured arm 100 which fits over the screw 86. The member 99 has an inverted U-shaped end section to hold it laterally in registry with the end portion 98

and has a downward inclined side edge 101 leading from the portion 98 as a flexible track extension. Also received by the screw 86 is the apertured end portion 102 of a cam seating member 103 having a horizontal step 104 cooperable with the valve stem pin 85 to seat and hold the conical valve portion 82 in engagement with the seat member 76. The other end of the cam seating member 103 is apertured, as at 105, to receive the screw 87 and to be held in engagement with the top face of the boss 89 by the overlying spring 94. The high fire end of the cam track 96 has an apertured ear 106 which receives the screw 87 and seats on the top face of the stiff spring 94. Secured on the screws 86 and 87, there are sleeve abutment members 107, 108 respectively which hold the cam track means 95 down against the springs 92 and 94. The cam track means 95 closely surrounds the stem 66 so that the pin 85 bears upwardly against the under face of the track member 96 or the step 104 of the member 103 or the resilient track edge 101. The top edge of the sleeve 83 has a recess or notch 109 positioned beneath the step 104 and has a downward inclined cam edge 110 leading from beneath the flexible track edge 101 so that upon rotation of the stem 66, the pin 85 will move down along the track member 96 and from the track edge 101 and into the recess 109 under the resilient downward force of the member 103, the arm 93 and flange 91 preventing further downward movement of the sleeve 83.

Above the cam means 95, the stem 66 has an annular upward facing shoulder 111 on which is seated the lower end of a helical coil compression spring 112 which surrounds and acts at its upper end against the collar 67 to hold the collar against a downward facing annular shoulder 113 on the stem 66. Preferably the collar 67 is reciprocal on a stem extension 114 fitted into a stem end bore and pinned therein, as at 115, so that the parts can be assembled. The stem 66 extends upward through an aperture 116 in a horizontal shelf or supporting plate member 117 preferably cast integral with the housing member 39 and thence through a registering aperture 118 in the cover member 40. Journaled in the aperture 116 there is a tubular hand adjustment member or knob 119 which extends upward through the cover aperture 118 and is longitudinally slotted upwardly, as at 120, at a plurality of points from its lower end. Each of the downward extending knob fingers is of reduced width at its lower end portion to pass through aligned arcuate slots in clamping washers 121, 122 which engage the top and bottom faces respectively of the shelf 117. The finger shoulders engage the top face of the washer 121 so that the lower ends of the knob fingers turned or bent outward, as at 123, lock and hold the knob 119 longitudinally fixed for rotation in the shelf aperture 116, see Fig. 7. The stem extension 114 extends upward through the washers 121, 122 and has, at its upper end, a disc 124 with arcuate slots through which the knob fingers slidably fit so that rotation of the knob 119 acts through the disc 124 to rotate the stem 66, thereby to reciprocate the stem as the pin 85 is moved along the cam means. The disc 124 is carried by a pin 125 which fits in a longitudinal bore or socket in the upper end of the stem extension 114 and is held against rotation relative to the extension 114 by a cross pin 126 which fits in a stem end slot 127.

The operation of the apparatus is as follows: The low fire adjustment screw 86 is set to position the flange 91 such that, with the arm 93 in engagement therewith, the desired minimum fuel flow for pilot operation of the burner 6 will be maintained. This simultaneously adjusts the position of the main cam track low end 98 and its auxiliary track member 101 so that when the cam follower member 85 is rotated to minimum flow position, it will be riding on the top face of the sleeve member 83. It may be noted that the auxiliary track member 101 provides a flexible resilient end portion for the main track member 96, thereby to accommodate manufacturing tolerances in the spacing between the low cam end 98 and the top face of sleeve member 83. The high fire adjustment screw 87 is set to position the high end of the main track member 96 at the maximum permissible fuel flow to the burner 6. The thrust member 69 is adjusted relative to the force of spring 112 so that the lower end of the thrust member 69 will actuate the release lever 71 upon predetermined temperature increase above the temperature at which the arm 93 will have been moved into engagement with the flange 91 and which is the limit temperature at which the burner must be shut down. Assuming that the burner is operating at pilot fire and the hand grip member 119 has been rotated to position the follower member 85 radially, as shown in Fig. 1, then, upon a call for heat, the thermostatic power element 43 will move the lever 53 upward with a quick action, thereby permitting the spring 84 to move the valve stem 66 upward until the follower member 85 engages the main track member 96, as shown in Fig. 1. Any desired fuel flow to the burner can be obtained within the minimum and maximum limits set by the low fire screw 86 and the high fire screw 87 respectively by merely rotating the stem 66 to regulate the lift of the follower member 85 before its engagement with the cam track means. When the temperature is reached at which the power element 43 is set to operate by the prior adjustment of screw 60, the lever 53 will be moved downward with a quick action, compressing the spring 84 and moving the arm 93 into engagement with limit flange 91. This downward movement of the lever 53 will not compress the spring 112 since it exerts a greater resistance than the spring 84. If the temperature increase which resulted in downward movement of the lever 53 was caused by an obstruction to outflow of the heated air through the grill 3 from passageway 13, as for instance by the positioning of a rug over the grill 3, then the temperature surrounding the bulb element 47 will increase and when the temperature has risen to the predetermined safe limit as determined by the adjustment of the thrust member 69, then the further expansion of power element 43 will have compressed the spring 112 sufficiently so that release lever 71 will have moved the trip arm 30 upwardly, thereby releasing the lever 34 for closing of the inlet valve 21 under the force of spring 35. Fuel flow to the burner 6 will now continue at a decreasing rate until the fuel in the chamber 20 is consumed. This small quantity of fuel which is burning at a decreasing rate will not cause an increase in temperature within the furnace 1 and will result in a safe operation, which would not be the case if the power element 43 had acted to fully close the metering valve 74, for the reason that opening of the metering valve after such a safety operation by the power element 43 would result in fuel flow to the burner 6 which

might still be so hot that an explosion would occur. After the power element 43 has tripped the safety mechanism 31 and has cooled to a position calling for heat, such as shown in Fig. 3, then the trip mechanism can be manually reset to the position of Fig. 3 by lifting upward on the lever extension 36 sufficiently to position the latch plate 33 above the pawl 32. If it is desired to shut down the burner 6, the hand grip member 119 is rotated to move the follower member 85 off the end of the main track member 96 and into underlying relation to the step 104, which is possible by reason of the sleeve member recess 109 which permits the stem 66 to move downward beyond the limit set by flange 91, the resilience of the track member 103 acting to hold the conical valve portion 82 tightly against its seat on the member 76.

It may be noted that if it is desired to provide a control device in which the metering valve is modulated in accordance with the temperature of the power element 43, that this may be accomplished by changing the angle at which the spring 64 acts on the lever 53, so that the sum of the power element resisting component of force of the spring 64 and the force of the spring 58 does not decrease upon movement of the lever 53 by the power element 43, as is well known to those skilled in the art.

What is claimed and is desired to be secured by Letters Patent of the United States is:

1. A heating apparatus comprising a furnace having a combustion chamber and an air flow passageway, a fluid fuel burner for said chamber, a metering valve operable to regulate the supply of fuel to said burner, thermostatic means mechanically acting on and for regulating said valve in accordance with air temperature in said passageway, means to stop closing movement of and determining the minimum low fire open position of said valve, a control valve operable to shut off the supply of fuel to said burner, a spring transmitting motion from said thermostatic means to said metering valve and providing for continued movement of said thermostatic means upon stopping of said metering valve by said determining means, releasable means under tension operable to strike and move said control valve to closed position, and means mechanically transmitting the continued movement of said thermostatic means to said releasable means to release said releasable means.

2. A heating apparatus comprising a furnace having a combustion chamber and an air flow passageway, a liquid fuel burner for said chamber, a liquid fuel reservoir, a valve operable to regulate the supply of fuel from said reservoir to said burner, thermostatic means for regulating said valve in accordance with air temperature in said passageway, means determining the minimum open position of said valve, a control valve responsive to liquid level in said reservoir and operable to shut off the supply of fuel to said burner, lost-motion means providing for continued movement of said thermostatic means upon limitation of said first-named valve by said determining means, releasable means operable to move said control valve to closed position, said thermostatic means acting upon said continued movement to release said releasable means, and means operable to release said releasable means upon occurrence of excess liquid level in said reservoir.

3. A heating apparatus comprising a furnace having a combustion chamber and an air flow passageway, a fluid fuel burner for said chamber, a rotatable and longitudinally reciprocal metering valve operable upon reciprocation to regulate the supply of fuel to said burner, thermostatic means to reciprocate said valve in accordance with air temperature in said passageway, a lever mechanically interconnecting said thermostatic means and said valve, means to stop the closing movement of and determining the minimum low fire open position of said valve, a stop member on said valve and engageable with said stop means, a control valve operable to shut off the supply of fuel to said burner, a spring transmitting movement of said lever to said metering valve and providing for continued movement of said thermostatic means upon limitation of said metering valve by said determining means, manual means to rotate said metering valve to move said stop member out of engaging relation to said stop means thereby to permit movement of said metering valve toward closed position beyond the limit of said determining means, and means operable by said thermostatic means and acting upon said continued movement to close said control valve.

4. A heating apparatus comprising a furnace having a combustion chamber and an air flow passageway, a fluid fuel burner for said chamber, a metering valve operable to regulate the supply of fuel to said burner, thermostatic means mechanically acting on and for regulating said valve in accordance with air temperature in said passageway, means determining the minimum open position of said valve, a control valve operable to shut off the supply of fuel to said burner, a spring transmitting movement from said thermostatic means to said metering valve and providing for continued movement of said thermostatic means upon limitation of said metering valve by said determining means, releasable means operable to move said control valve to closed position, and a thrust member operable to transmit movement to said releasable means from said thermostatic means upon said continued movement to release said releasable means, said spring and said thrust member determining the temperature of said thermostatic means at which said thermostatic means will release said releasable means.

5. A control device for liquid fuel burners comprising a constant level liquid reservoir having an inlet and an outlet, a float operated valve controlling said inlet, a metering valve controlling said outlet, a lever operable to actuate said metering valve, temperature responsive means directly acting on and through said lever and urging said metering valve to a closed position at a predetermined high temperature, safety trip mechanism operable to close said float valve upon occurrence of an undesired increase of liquid level, normally inactive safety means including a thrust member operable by said lever to release said trip mechanism, and means determining the increased temperature of said responsive means above said high temperature at which said thrust member will release said trip mechanism.

6. A control device for liquid fuel burners comprising a constant level liquid reservoir having an inlet and an outlet, a float operated valve controlling said inlet, a metering valve controlling said outlet, a lever operable to actuate and having a lost-motion connection with said metering valve, safety trip mechanism operable to close said float valve upon occurrence of an undesired

increase of liquid level, said mechanism including a spring urged safety lever and a trip arm holding said lever against movement, a release lever carried by said safety lever and operable to actuate said trip arm, a thrust member carried by said metering valve operating lever and engageable with said release lever, means to limit closing movement of said metering valve for a predetermined minimum fuel flow, and thermostatic means to operate said metering valve operating lever, said thermostatic means acting through said lost-motion connection to actuate said release lever upon temperature increase above the temperature at which said metering valve is limited by said limiting means.

7. A control device for liquid fuel burners comprising a casing having a constant level liquid fuel chamber with an inlet and an outlet, a float valve controlling said inlet, a float operated lever pivotally connected to and for actuating said float valve to maintain a constant liquid level and having a lost-motion connection at its fulcrum, a safety trip lever engageable with and urged toward said valve, a trip arm releasably holding said trip lever against movement and operable by said float operated lever upon increase of liquid level above the constant level, a release lever carried by said trip lever and operable to move said trip arm, a longitudinally slidable and rotatable metering valve having a stem and controlling said outlet, a low-fire fuel flow adjusting screw and a high-fire fuel flow adjusting screw positioned diametrically and longitudinally of said metering stem, a sleeve on said low fire screw and having a minimum limit flange, a coil spring on said low-fire screw and supporting said sleeve, a coil spring on said high-fire screw, a main cam track member apertured to receive said screws and seating on said sleeve and said high-fire spring, a resilient valve shut off cam track member apertured to receive said screws and having a shut off step at the low end of said main track member, an auxiliary track member carried by said low-fire screw and extending along and beneath the low end of said main track member and leading to said step, a cam follower member projecting from said stem and engageable with underfaces of said main track, said auxiliary track and said shut off track members, a sleeve member on said stem and having an arm in guided sliding engagement with said sleeve and engageable with said limit flange, a coil spring surrounding said stem and urging said sleeve member against said follower member thereby to urge said valve toward open position, said sleeve member having a top edge recess positioned beneath said step to receive said follower member for movement of said valve to closed position, a collar slidable on said stem, means resisting downward sliding movement of said collar, an automatically operable lever engageable with said collar to move said metering valve toward closed position and said sleeve member arm against said limit flange, a thrust member longitudinally adjustably supported by said automatic lever and operable to move said release lever, said automatic lever being operable to overcome said collar resisting means upon engagement of said arm and said limit flange and to move said thrust member into moving engagement with said release lever, and manually operable means extending out of said casing for rotating and for longitudinally reciprocating said stem.

8. A heating apparatus comprising a furnace having a combustion chamber and an air flow passageway, a fluid fuel burner for said chamber, a rotatable and longitudinally reciprocable valve operable to regulate the supply of fuel to said burner, thermostatic means for longitudinally reciprocating said valve to regulate flow to said burner in accordance with air temperature in said passageway, a stop member engageable by said valve upon longitudinal reciprocation of said valve by said thermostatic means to determine the minimum open position of said valve, a control valve operable to shut off the supply of fuel to said burner, lost-motion means providing for continued movement of said thermostatic means upon limitation of said first-named valve by said determining means, and means to rotate said valve out of cooperable relation to said stop member so that said first-named valve can have movement toward closed position beyond the limit of said stop member, said thermostatic means upon said continued movement cooperating with said control valve.

9. A control device for liquid fuel burners comprising a constant level liquid reservoir having an inlet and an outlet, a float operated valve controlling said inlet, a metering valve controlling said outlet, a lever operable to actuate said metering valve, safety trip mechanism operable to close said float valve upon occurrence of an undesired increase of liquid level in said reservoir, a thrust member operable by said lever to release said trip mechanism, thermostatic means cooperable with said lever and operable at a predetermined temperature to move said metering valve to a low fire position, and means determining release of said trip mechanism by operation of said thrust member at a temperature of said thermostatic means above said predetermined temperature.

10. A control device for liquid fuel burners comprising a constant level liquid reservoir having an inlet and an outlet, a float operated valve controlling said inlet, a metering valve controlling said outlet, a lever operable to actuate and having a lost-motion connection with said metering valve, safety trip mechanism operable to close said float valve upon occurrence of an undesired increase of liquid level, said mechanism including a spring urged safety lever and a trip arm holding said safety lever against movement, a release lever carried by said safety lever and operable to actuate said trip arm, and a thrust member carried by said metering valve operating lever and engageable with said release lever to actuate said safety mechanism.

11. A control device for liquid fuel burners comprising a liquid reservoir having an inlet and an outlet, a valve controlling said inlet, safety means operable to move said valve to close said inlet, a lever controlling operation of said safety means, a metering valve for said outlet, means to limit closing movement of said metering valve to a minimum open position, temperature responsive means having a driving connection with said valve and acting through said connection upon temperature increase to move said metering valve to said minimum open position, means in said driving connection and providing for overtravel of said thermostatic means upon temperature increase subsequent to movement of said metering valve to said position, and means operable by said thermostatic means to move said lever to effect operation of said safety means upon said overtravel.

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