March 5, 1946. P. S. RUSSEL 2,396,205

CONTROLLING MEANS

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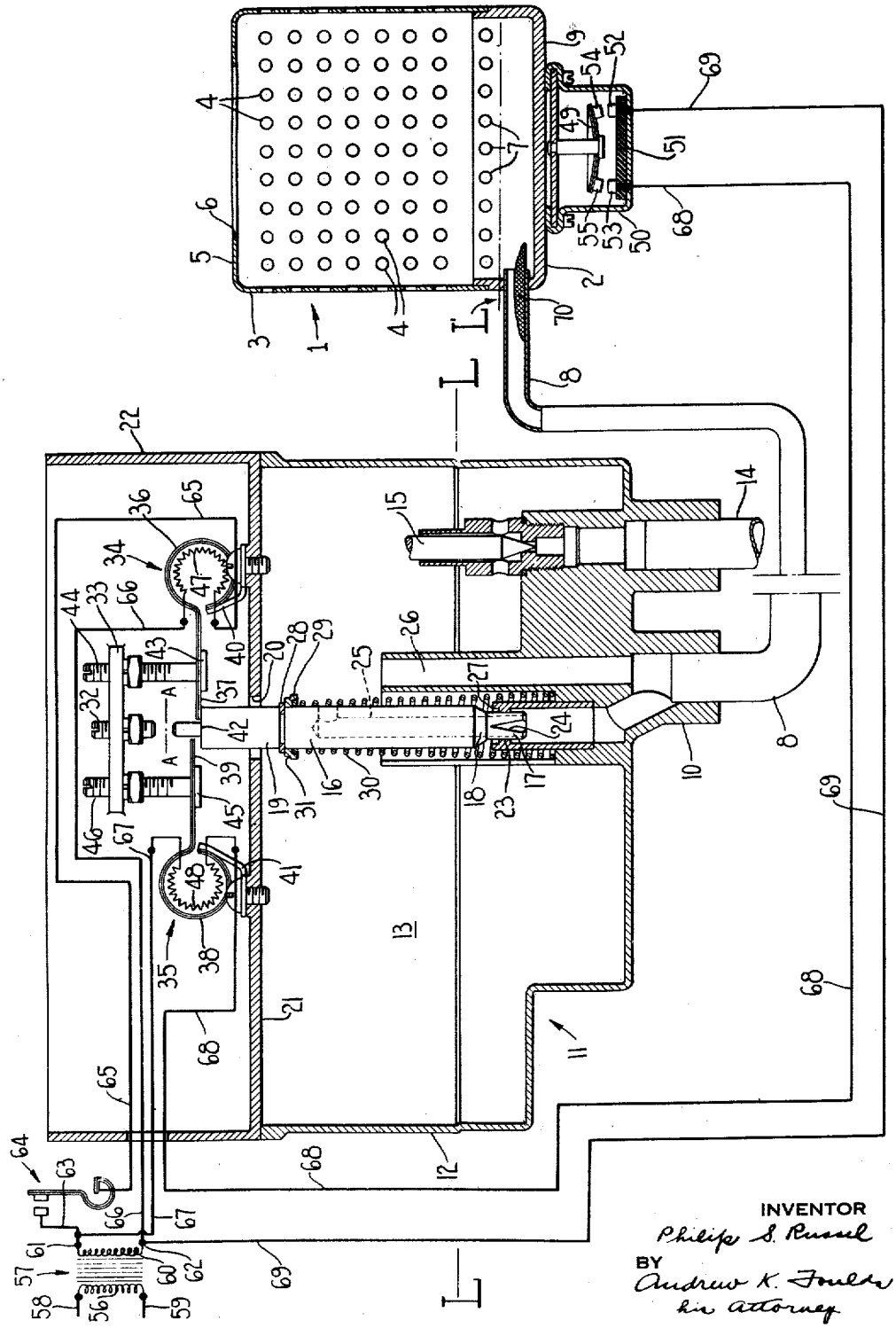

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2,396,205

CONTROLLING MEANS

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Application November 1, 1940, Serial No. 363,885

11 Claims. (Cl. 158—28)

This invention relates generally to controlling means and more particularly to that type of control which is adaptable to control the flow of liquid fuel to a pot or hydroxylation type fuel burner.

An object of this invention is to provide a control system for a fluid fuel burner in which the burner is raised to a desired temperature for burning a desired increased quantity of fuel prior to the supplying of the increased fuel to the burner.

Another object is to provide means for automatically increasing by steps the flow of fuel to the burner.

Another object is to provide in such a stepped increased control, means for decreasing by a single step the flow of fuel to the burner.

Another object is to provide means for increasing the flow of fuel to the burner in response to a given condition and then to subsequently further increase the flow of fuel to the burner upon an increase in temperature of the burner.

The invention consists in the improved construction and combination of parts, to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawing, to be taken as a part of this specification, there is fully and clearly illustrated a preferred embodiment of the invention, in which drawing:

The figure of the drawing is a view in vertical section of a control apparatus and of a fluid fuel burner embodying the invention and showing the electrical control circuit therefor.

Referring to the drawing by characters of reference, 1 designates generally a pot or hydroxylation type burner having a cup-shaped lower member 2 and a cylindrical member 3. The cylindrical member 3 has the peripheral side wall portion apertured, as at 4, for the admittance of air, has its lower open end secured to the upper edge portion of the lower member 2 and has at its upper end portion an inturned peripheral flange 5 forming a circular aperture 6 through which the products of combustion and/or unburned fuel vapors pass. The upper side wall portion of the lower member 2 also has a group of apertures 7 therethrough for admitting air to the lower member 2. A conduit 8 has one end opening into the lower member 2 adjacent a bottom wall 9 thereof and has its other end secured in a suitable manner to and in communication with an outlet 10 of a flow controlling apparatus generally designated 11.

The apparatus 11 comprises a lower casing 12 having a chamber 13 for containing a supply of liquid fuel admitted thereto through an inlet conduit 14 leading from a source of supply (not shown). Flow through the conduit 14 is controlled by a valve member 15 actuated by a suitable means such as a float (not shown), but which is well known to the art, to maintain a substantially constant level of liquid fuel in the chamber 13 substantially at the line L—L. Flow of fuel through the outlet 10 from the chamber 13 is controlled by means of a valve member 16 having at its lower end portion a reduced diameter portion 17, and a conical portion 18 connecting the normal diameter portion with the portion 18, and having at its upper end a stem portion 19 extending upwardly through the chamber 13 and through an aperture 20 in a bottom wall 21 of an upper casing 22 of the apparatus 11. The valve member portion 17 has a piston fit in an outlet port 23 and has a V-shaped slot 24 therein which adjustably registers with the upper edge of the outlet port 23 to control the rate of flow of the fuel to the burner 1. An interior passageway 25 in the valve member 16 has one end opening into the chamber 13 above the line L—L and has the other end opening through the lower end portion of valve member 16 on the outlet side of the outlet port 23. A second passageway 26 leads from the chamber 13 above the fuel level L—L directly to the outlet 10. The passageways 25 and 26 act to maintain the same pressure on the outlet side of the outlet port 23 and in the outlet 10 which is in the chamber 13 above the fuel level L—L so that the only force tending to promote fuel flow through the exposed portion of the slot 24 is the head of the fuel itself. In this manner, it is possible to obtain a predetermined constant rate of flow from the chamber 13 to the burner 1 for any given setting of the valve member 16. Should it be desired to stop the flow of fuel from the chamber 13 completely, the valve member 16 may be moved downward until the conical portion 18 engages an upwardly facing seating surface 27 which projects above and surrounds the outlet port 23. The line L' indicates the maximum level of the fuel which can occur in the burner 1 in the event that the flame thereof becomes extinguished. The liquid level line L' is preferably below the lowermost set of apertures in the burner so that no fuel is allowed to flow from the burner in the case of the occurrence of an extinguished or other emergency condition.

The valve member 16 has a split ring 28 secured within a recess in the portion 19 within the cham-

ber 13. An annular abutment member 29 is slidable on the portion 19 below the ring 28 and serves as an abutment for the upper end of a helical coil spring 30 which surrounds and is concentric with the member 16. The spring 30 has its lower end portion engaging a lower wall surface of the chamber 13 and exerts an expansive force urging the abutment member 29 upward into engagement with and acts through the split ring 28 to move the valve member 16 upwardly in a direction to expose a greater area of the slot 24 thereby to increase the flow of fuel to the burner 1. The aperture 20 is preferably of such a size that the split ring 28 may pass therethrough and a reduced diameter portion of the abutment member 29 can pass into the aperture 20 but the member 29 is prevented from passing through the aperture 20 due to engagement of a shoulder 31 thereof with the under surface of the wall 21. By utilizing a construction of this design the valve member 16 may be removed, as for inspection, replacement, repair or any other reason, upward out of its position in the chamber 13 through the aperture 20. In such an event, the spring 30 will be prevented from unduly expanding due to engagement of shoulder 31 with wall 21 and will be held in correct alignment for reinsertion of the valve member 16 due to the reduced diameter portion of the abutment member 29 fitting within the aperture 20.

Maximum upward movement of the valve member 16 under the influence of the spring 30 is limited by engagement of the upper end of stem portion 19 with the lower end of a high fire stop member or abutment 32 which is screw-threaded through a flange 33 projecting inwardly into the casing 22 from the rear wall thereof. The valve member 16 is operated by means of a pair of bimetallic power elements 34, 35 which are substantially similar to those described and claimed in an application of Walter S. Landon, Serial No. 339,427, filed June 8, 1940 for Heat actuated devices and assigned to the assignee of this invention. The element 34 has a cylindrical portion 36 and an arm portion 37. The element 35 has a cylindrical portion 38 and an arm portion 39. The elements 34 and 35 are rigidly secured to the upper surface of the wall 21 by means of brackets or supporting members 40, 41, respectively. The arm portion 37 engages a shoulder 42 on the upper portion of the valve member stem portion 19 and acts, when the portion 36 is cooling to ambient or room temperature, to urge the valve member 16 against the force of the spring 30 toward valve closed position. Movement of the valve member 16 toward valve closed position by the arm portion 37 is limited by engagement of the arm portion 37 with a flange 43 of a low fire adjustment member 44 threaded through the flange 33. When the portion 38 of element 35 is at ambient or room temperature downward movement of the arm portion 39 is limited by engagement with a lower flange 45 of an intermediate flow stop member 46 which is screw-threadedly secured to the flange 33. When the two portions 36 and 38 are at room or ambient temperature, the arm portion 37 should be against the flange 43 holding the valve member 16 in low or pilot fire position against the force of the spring 30 while the arm portion 39 should be held spaced from the shoulder 42 and in engagement with the flange 45 with sufficient force so that, upon engagement of the shoulder 42 due to upward movement of the valve member 16, the arm portion 39 will prevent further upward movement of the valve member 16. The position of the upper end portion of the stem portion 19 when the shoulder 42 is in engagement with the arm portion 39 is indicated by the line A—A.

Electrical heating units 47, 48 are respectively positioned within the cylindrical portions 36 and 38. The heaters 47, 48 preferably are so arranged that they lie along the inside surface of the respective portions 36 and 38 so that as the cylindrical portions 36 and 38 change in shape, due to heating and cooling thereof, the heaters 47, 48 will maintain a good thermal contact with the respective portions 36 and 38.

Secured in good thermal conducting relation with the bottom wall 9 is a bimetallic snap acting disk 49 of a well-known type and the particular construction of which apart from the system shown forms no part of this invention. The disk 49 is preferably carried by a housing 50 which is secured as by screws to the wall 9 and carries an electrical insulating terminal member 51. The member 51 carries two contact members 52, 53 which are insulated electrically from the housing 50 by the member 51. The disk 49 carries a pair of contact members 54, 55 which are preferably electrically connected together due to the conductivity of the disk 49 but which may be conductively connected together by a jumper wire (not shown) and/or insulated from the disk 49. The contact members 54, 55 respectively engage the contact members 52, 53 when the disk 49 attains a predetermined temperature and snaps from the concave upwardly position, as shown in the drawing, to a concave downwardly position to complete an electrical circuit between the members 52, 53.

The control circuit for the apparatus is as follows: Electrical energy is supplied from a suitable source of supply (not shown) to the primary coil 56 of a transformer 57 by lead wires 58, 59. The transformer 57 has a secondary coil 60 and secondary coil terminals 61, 62. The terminal 61 is connected by lead wire 63 to one terminal of a suitable room thermostatic switch, diagrammatically shown at 64. The other terminal of the switch 64 is connected by a lead wire 65 to one terminal of the heater 47. The other terminal of the heater 47 is connected by a lead wire 66 to the terminal 62 so that upon closure of the switch 64, due to the occurrence of a predetermined low temperature in the space wherein the switch 64 is located, and which space is heated by the burner 1, an electrical circuit will be energized and the heater 47 will act to heat the cylindrical portion 36 thereby causing the arm portion 37 to move upwardly. The terminal 61 is also connected by a lead wire 67 to one terminal of the heater 48. The other terminal of the heater 48 is connected by a lead wire 68 to the contact member 53. A lead wire 69 connects the contact member 52 to the terminal 62. Upon increase in temperature of the disk 49 and engagement of the contact members 54, 55 with their respective cooperating members 52, 53, an electrical circuit is made energizing the heater 48 to heat the cylindrical portion 38 thereby causing the arm portion 39 to rise upwardly from the flange 45.

The operation of the control system is as follows: In the cooperative position of the parts as seen in the drawing, the space to be heated and therefore the thermostatic switch 64 is at or above the predetermined low temperature. Pilot or low fire fuel is now being supplied to the burner 1 through a reduced area exposed portion of the

slot 24 which is located above the top surface of the outlet port 23. The cylindrical portions 36, 38 of the elements 34, 35 are at ambient temperature or cold so that the arm portions 37, 39 are held against the respective flanges 43, 45. The downward or engaging force of the arm portions 37, 39 is such that when the force of the spring 30 moves the valve member 16 upwardly so that the shoulder 42 is engaging the arm portion 37 or 39 either arm portion 37 or 39 will overcome the upward force of the spring and the position of the valve member 16 will be determined by the setting of the members 44 or 46. The pilot fire fuel flows from the apparatus 11 through the outlet 10 and conduit 8 to the burner 1 where it is vaporized and burns from an asbestos wick 70 which is positioned partly in the conduit 8 and partly in the burner 1 adjacent the bottom wall 9.

Should the temperature in the space heated by the burner 1 fall below the predetermined low temperature at which the thermostatic switch 64 is set to actuate, the switch 64 will act to close and establish an electrical circuit from the terminal 61, lead wire 63, switch 64, lead wire 65, heater 47, lead wire 66, terminal 62, and secondary coil 60 back to the terminal 61. This circuit may be termed the room thermostat circuit. Upon closure of the switch 64, the heater 47 heats the element portion 36 and after a predetermined temperature of the portion 36 has been reached, the arm portion 37 will rise allowing the spring 30 to move the valve member 16 upward causing the shoulder 42 to engage with the arm portion 39 at which time further upward movement of the valve member 16 will be arrested with the top end of the valve stem portion 19 approximately at the line A—A. Continued heating of the element portion 36 will cause the arm portion 37 to move away from the shoulder 42 and out of controlling relation therewith leaving the control of the valve member 16 to the power element 35. The upward movement of the valve member 16 into engagement with the arm portion 39 will expose a greater area of the slot 24 above the top surface of the outlet port 23 allowing an increased flow of fuel to the burner 1. The wick 70 is not sufficient to burn this increased fuel supply and the fuel spreads over the bottom wall 9 of the burner 1 and starts burning with the result that the wall 9 begins to heat up. When the wall 9 has heated sufficiently, say to about 500° F., the disk 49 will act to move to a concave downwardly position and move the contact members 54, 55 into engagement with the contact members 52, 53 to close a secondary control circuit. The secondary control circuit is as follows: Current flow from the terminal 61, through lead wire 67, heater 48, lead wire 68, contact members 53, 55, 54, 52, lead wire 69, terminal 62 and coil 60 to the terminal 61. Current flowing through the heater 48 acts to heat the element portion 38. Upon the attainment of a predetermined temperature by the element portion 38, the arm portion 39 will rise allowing the valve member 16 to move upwardly until the top end wall of the valve stem portion 19 engages the maximum or high fire stop member 32 for high fire operation of the burner 1 with a maximum area of the slot 24 exposed above the upper surface of its outlet port 23. Maximum heat is now being supplied to the heated space by the burner 1. Summarizing the opening movement of the valve member due to a call for heat in the heated space as reflected by the closing of the thermostatic switch 64, it may be said that the valve member 16 is moved under the control of the power element 34 until there has been a small increase of fuel flow to the burner 1 and then after the power element 34 has actuated throughout a desired portion of its movement, the second power element 35 takes control and is actuated to regulate the further opening of the valve member 16. The second power element 35 will therefore be actuated subsequent to change in a condition initiated by power element 34.

Upon the increase of the space temperature to the predetermined temperature at which the switch 64 opens, the room thermostat circuit will be deenergized and the heater 47 will no longer act to heat the element portion 36 so that the portion 36 will cool causing the arm portion 37 to move into engagement with the shoulder 42 and further cooling of the portion 36 will move the valve member 16 downwardly toward closed position until the arm 37 engages the flange 43. Further cooling of the portion 36 will merely cause the arm portion 37 to engage the flange 43 with a greater force but will not move the valve member 16 further toward closed position. After the fuel which was in the lower member 2 is burned, the temperature of the wall 9 will become lowered and the disk 49 will move to its concave upwardly position to part contact members 52, 54, and 53, 55, respectively, thereby deenergizing the secondary control circuit. Deenergization of this secondary circuit acts to stop the heating of the element portion 38 allowing it to cool to ambient temperature and thereby causing the arm portion 39 to move into engagement with the flange 45 without change in the operation of the burner 1. The burner 1 will then be operating in the manner shown and be ready to duplicate the above described operation.

It may therefore be seen that the invention provides a new and novel control means which is simple in design, construction, and operation for controlling the flow of fuel to a burner in accordance with a predetermined burner condition which is responsive to the heat demand in the space heated by the burner.

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

1. In an apparatus of the character described, a pot type liquid fuel burner, a valve member for controlling flow of fuel to said burner, means for urging said valve member toward open position to allow flow of fuel to said burner, means engageable by said valve member for determining maximum opening movement of said valve member, a first bimetallic heat actuated power element engageable with said valve member and operable to move said valve member toward closed position in opposition to said urging means, means limiting movement of said valve member toward closed position by said element, a second bimetallic heat actuated power element engageable with said valve member and operable to move said valve member toward closed position and to hold said valve member against movement by said urging means, means limiting movement of said valve member toward closed position by said second element, said second-named limiting means so that said first power element can move said valve member further toward closed position than said second power element, means to actuate said first element, said valve member being moved upon actuation of

said first element by said urging means toward open position and into engagement with said second element to increase the flow of fuel to said burner, and means responsive to the temperature of said burner and operable upon a predetermined temperature of said burner to heat said second element thereby to cause said second element to move and allow said urging means to move said valve member into engagement with said maximum opening limiting means.

2. In an apparatus of the character described, a pot type liquid fuel burner having a bottom wall, a valve member for controlling flow of fuel to said burner, means for urging said valve member toward open position to allow flow of fuel to said burner, means engageable by said valve member for determining maximum opening movement of said valve member, a first bimetallic heat actuated power element engageable with said valve member and operable to move said valve member toward closed position in opposition to said urging means, means limiting movement of said valve member toward closed position by said element, a second bimetallic heat actuated power element engageable with said valve member and operable to move said valve member toward and to hold said valve member against movement by said urging means, means limiting movement of said valve member toward closed position by said second element, said second-named limiting means being spaced further away from valve member closed position than said first-named limiting means so that said first power element can move said valve member further toward closed position than said second power element, means to actuate said first element, said valve member being moved upon actuation of said first element by said urging means toward open position and into engagement with said second element to increase the flow of fuel to said burner, electrical heating means for heating said second element, and bimetallic switch means secured to said bottom wall and operable upon a predetermined temperature thereof to energize said electrical means thereby to cause said second element to move and allow said urging means to move said valve member into engagement with said maximum opening limiting means.

3. Liquid fuel burning means comprising a heating apparatus having a liquid fuel burner, a metering valve controlling the flow of liquid fuel to said burner, an electrically energized heat motor controlling the opening movement of said valve, a second electrically energized heat motor having means limiting the opening movement of said valve by said first-named heat motor, said second heat motor being operable to control the further opening movement of said valve beyond the limit of said means thereby to supply fuel at an increased rate to said burner, and a thermostatic switch carried by said apparatus and positioned to respond to burner temperature, said switch being electrically connected to and operable to control said second heat motor for said further opening movement at a temperature of said apparatus at which substantially complete combustion of the fuel at the increased rate of supply will occur.

4. Liquid fuel burning means comprising a heating apparatus having a liquid fuel burner, a metering valve controlling the flow of liquid fuel to said burner, an electrically energized heat motor controlling the opening movement of said valve, a second electrically energized heat motor having means limiting the opening movement of said valve by said first-named heat motor, said second heat motor being operable to control the further opening movement of said valve beyond the limit of said means thereby to supply fuel at an increased rate to said burner, and a thermostatic switch responsive directly to the temperature of said burner to control said second heat motor for said further opening movement at a temperature of said apparatus at which substantially complete combustion of the fuel at the increased rate of supply will occur.

5. Liquid fuel burning means comprising a heating apparatus having a liquid fuel burner, a metering valve controlling the flow of liquid fuel to said burner, an electrically energized heat motor operable upon energization to control the opening movement of said valve, a second electrically energized heat motor having means limiting the opening movement of said valve by said first-named heat motor, a circuit for energizing said second heat motor, said second heat motor being operable upon energization to control the further opening movement of said valve beyond the limit of said means thereby to supply fuel at an increased rate to said burner, a thermostatic switch controlling and operable to close said circuit when the burner temperature is sufficient for substantially complete combustion of the fuel at the increased rate of supply, and means supporting said switch on said apparatus in position for response to burner temperature.

6. Liquid fuel burning means comprising a heating apparatus having a liquid fuel pot-type burner, a metering valve controlling the flow of liquid fuel to said burner, an electrically energized heat motor having direct engagement with and controlling the opening movement of said valve, a second electrically energized heat motor having means limiting the opening movement of said valve by said first-named heat motor, said second heat motor having direct engagement with and being operable to control the further opening movement of said valve beyond the limit of said means thereby to supply fuel at an increased rate to said burner, and a thermostatic switch mounted on the burner pot and operable to control said second heat motor for said further opening movement at a temperature of said pot at which substantially complete combustion of the fuel at the increased rate of supply will occur.

7. Liquid fuel burning means comprising a heating apparatus having a liquid fuel burner, a metering valve controlling the flow of liquid fuel to said burner, a bimetallic heat motor having an electric heater and controlling the opening movement of said valve, a second bimetallic heat motor having an electric heater and having a portion limiting the opening movement of said valve by said first-named heat motor, said second heat motor being operable to control the further opening movement of said valve thereby to supply fuel at an increased rate to said burner, and a thermostatic switch responsive to the temperature of said apparatus, means shielding said switch from the temperature of the medium to be heated by said apparatus, said switch acting to control said second heat motor for said further opening movement at a temperature of said apparatus at which substantially complete combustion of the fuel at the increased rate of supply will occur.

8. Liquid fuel burning means comprising a heating apparatus having a liquid fuel burner, a metering valve controlling the flow of liquid fuel to said burner, means urging said valve toward open position, a bimetallic heat motor having

an electric heater and directly engaging and urging said valve toward closed position with a force greater than the force of said urging means, a circuit for said heater, a switch responsive to the temperature of the medium to be heated by said burner and controlling said circuit, a second bimetallic heat motor having an electric heater and having an end portion interposed in the path of opening movement of said valve, a circuit for said second-named heater, said second heat motor exerting a resistance to opening movement of said valve greater than the force of said urging means, a stop member supporting said end portion out of engagement with said valve so that said valve can move toward open position upon heating of said first-named heat motor, and a thermostatic switch responsive to the temperature of said apparatus independently of the temperature of said medium, said thermostatic switch controlling said second-named circuit for further opening movement of said valve at a temperature of said apparatus at which substantially complete combustion of fuel at an increased rate of supply will occur.

9. In combination, in a pot type burner and control means therefor, a burner pot, means for delivering liquid fuel to the pot, valve means in the line of flow of the liquid fuel, for controlling the rate of flow to the pot, said valve means including a valve seat and a valve element, holding means for normally holding said valve element at minimum flow position, a room thermostat, and means responsive to the actuation of said room thermostat for releasing said holding means and for permitting a movement of said valve toward fully open position, additional holding means for limiting the movement of the valve to an intermediate flow position, when released by said first holding means, thermally responsive means directly associated with the pot, and means responsive to said thermally responsive means for releasing said second holding means and for thereby permitting said valve element to move to fully open position, and means for normally urging said valve as far toward open position as said holding means will permit.

10. In combination, in a pot type burner and control means therefor, a burner pot, means for delivering liquid fuel to the pot and valve means in the line of flow of the liquid fuel for controlling the rate of flow to the pot, said valve means including a valve seat and a valve element, means effective normally to urge said valve element toward maximum flow position, a warping bar directly opposed to said valve element and adapted normally to prevent its movement from minimum flow position, a heating element associated with said warping bar, and a room thermostat in circuit with said heating element and adapted, when closed, to close an actuating circuit through said heating element, said warping bar being adapted when heated to release the valve for movement toward full flow position, an additional warping bar directly opposed and in the line of movement of said valve element and adapted to prevent the valve element from moving beyond a predetermined intermediate flow position, heating means for said additional warping bar, an actuating circuit therefor, a heat responsive element directly associated with said pot, and means for closing said actuating circuit for said second heating means in response to actuation of said heat responsive element, when the temperature of the pot exceeds a predetermined minimum.

11. In a liquid fuel burning apparatus, a burner pot, a conduit for supplying fuel to said pot, a valve controlling flow through said conduit, means urging said valve to an open position in which the rate of fuel flow will exceed the rate for complete combustion in a cold pot, means operable to limit opening movement of said valve beyond an intermediate rate of flow position in which substantially complete combustion will occur in a cold pot, said limiting means being movable out of limiting position when the vaporizing temperature of said pot will cause substantially complete combustion of the supplied fuel in said valve open position, and thermostatic means responsive to the temperature of said pot and operable at said vaporizing temperature to move said limiting means out of limiting position.

PHILIP S. RUSSEL.

Certificate of Correction

Patent No. 2,396,205. March 5, 1946.

PHILIP S. RUSSEL

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 71, claim 1, after the word "means" insert *being spaced further away from valve member closed position than said first-named limiting means*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2d day of July, A. D. 1946.

[SEAL]

LESLIE FRAZER,
First Assistant Commissioner of Patents.

an electric heater and directly engaging and urging said valve toward closed position with a force greater than the force of said urging means, a circuit for said heater, a switch responsive to the temperature of the medium to be heated by said burner and controlling said circuit, a second bimetallic heat motor having an electric heater and having an end portion interposed in the path of opening movement of said valve, a circuit for said second-named heater, said second heat motor exerting a resistance to opening movement of said valve greater than the force of said urging means, a stop member supporting said end portion out of engagement with said valve so that said valve can move toward open position upon heating of said first-named heat motor, and a thermostatic switch responsive to the temperature of said apparatus independently of the temperature of said medium, said thermostatic switch controlling said second-named circuit for further opening movement of said valve at a temperature of said apparatus at which substantially complete combustion of fuel at an increased rate of supply will occur.

9. In combination, in a pot type burner and control means therefor, a burner pot, means for delivering liquid fuel to the pot, valve means in the line of flow of the liquid fuel, for controlling the rate of flow to the pot, said valve means including a valve seat and a valve element, holding means for normally holding said valve element at minimum flow position, a room thermostat, and means responsive to the actuation of said room thermostat for releasing said holding means and for permitting a movement of said valve toward fully open position, additional holding means for limiting the movement of the valve to an intermediate flow position, when released by said first holding means, thermally responsive means directly associated with the pot, and means responsive to said thermally responsive means for releasing said second holding means and for thereby permitting said valve element to move to fully open position, and means for normally urging said valve as far toward open position as said holding means will permit.

10. In combination, in a pot type burner and control means therefor, a burner pot, means for delivering liquid fuel to the pot and valve means in the line of flow of the liquid fuel for controlling the rate of flow to the pot, said valve means including a valve seat and a valve element, means effective normally to urge said valve element toward maximum flow position, a warping bar directly opposed to said valve element and adapted normally to prevent its movement from minimum flow position, a heating element associated with said warping bar, and a room thermostat in circuit with said heating element and adapted, when closed, to close an actuating circuit through said heating element, said warping bar being adapted when heated to release the valve for movement toward full flow position, an additional warping bar directly opposed and in the line of movement of said valve element and adapted to prevent the valve element from moving beyond a predetermined intermediate flow position, heating means for said additional warping bar, an actuating circuit therefor, a heat responsive element directly associated with said pot, and means for closing said actuating circuit for said second heating means in response to actuation of said heat responsive element, when the temperature of the pot exceeds a predetermined minimum.

11. In a liquid fuel burning apparatus, a burner pot, a conduit for supplying fuel to said pot, a valve controlling flow through said conduit, means urging said valve to an open position in which the rate of fuel flow will exceed the rate for complete combustion in a cold pot, means operable to limit opening movement of said valve beyond an intermediate rate of flow position in which substantially complete combustion will occur in a cold pot, said limiting means being movable out of limiting position when the vaporizing temperature of said pot will cause substantially complete combustion of the supplied fuel in said valve open position, and thermostatic means responsive to the temperature of said pot and operable at said vaporizing temperature to move said limiting means out of limiting position.

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LESLIE FRAZER,
First Assistant Commissioner of Patents.