TWO LEVEL CONTROL
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Our invention relates to an improvement in controls for liquids, and has for one purpose the provision of a control adapted for the delivery of a liquid fuel to a burner.

Another purpose is the provision of improved safety means for preventing the accumulation of more than a predetermined relatively small amount of fuel in the bottom of a burner in the event of burner failure.

Another purpose is the provision of improved control means for accurately controlling the flow of fuel to a burner.

Another purpose is the provision of means for cutting off the flow of fuel to a burner in response to a predetermined excess fuel in the bottom of a burner.

Other purposes will appear from time to time in the course of the specification and claims.

We illustrate our invention more or less diagrammatically in the accompanying drawing, which is a vertical section through our control means and a burner adapted to be controlled thereby.

Like parts are indicated by like symbols throughout the specification and drawing.

Referring to the drawing, 1 indicates any suitable burner pot having a bottom portion 2, and a fuel delivery line 3 extending to the pot bottom, and preferably downwardly and outwardly inclined away from the pot bottom. The details of the burner do not of themselves form part of the present invention, but we illustrate for convenience a pot type burner, the side walls of which are provided with a plurality of primary air inlet apertures 4. Any suitable secondary air inlet means may be provided at or near the top of the pot.

It will be understood that in burners of this type a liquid hydrocarbon fuel delivered to the bottom of the pot, as at 5, is vaporized by the heat of combustion above. The vaporized hydrocarbon mixes with the primary air delivered through the apertures 4 to form a preliminary or partially combustible mixture, which upon being mixed with a secondary air supply burns at or above the top of the pot.

10 generally indicates a float chamber, with any suitable preferably removable top 11. 12 is a supply line extending to the pot and delivering fuel to a filter chamber 13, which has an upwardly extending passage 14, terminating in a valve seat 15 and located within or surrounded by a sleeve 16, apertured as at 17.

It will be understood that fuel from any suitable fuel source not herein shown flows upwardly along the passage 14 and outwardly through the passage 17 into the interior of the chamber 10 to form a body of liquid 18. 19 is a fuel delivery sleeve extending upwardly from the bottom of the chamber 10 and communicating with a line 20, which in turn extends by the elbow 21 to a lower chamber 22, having a cover 23. The interior of the chamber 22 is in communication with the outer end of the fuel supply line 2.

We may provide any suitable means for maintaining a generally constant level of fuel in the first chamber 10. We illustrate for example a float 25 adapted to control a valve stem 26, terminating in a valve element 27, opposed to the valve seat 15. It will be understood that the float 25 rises in response to a rise in the level of the fuel body 18, and moves the valve stem 26 downwardly into closing position. We illustrate the float 25 as having an arm 28, pivoted as at 28a on any suitable normally fixed support 29. An outer end 30 of the arm is in engagement with a flange 25a on the upper end 28a of the valve stem 26. A spring 31 tends normally to urge the valve towards open position, the action of the spring being checked by the float 25. When the level of the fuel 18 rises with the float, the stem 26 moves toward closed position. When the lever of the fuel 18 drops, the float 25 is effective to move the valve towards open position.

It will be observed that the sleeve 19 terminates below the normal fuel level in the chamber 10. 40 is an inner sleeve, the lower end of which is positioned in the upper end of the sleeve 19. The member 40 is provided with a metering portion 41, the bore 42 of which receives the lower end of a valve stem 43. The member 43 has a metering lower end 44, which is slotted, as at 45, to provide one or more metering apertures. It has also a conical portion 46 adapted to serve as a positive closure when moved against the valve seat 47. The inner sleeve 40 is apertured as at 48 above the valve seat 47.

49 is an exterior control knob. It will be understood that, in response to rotation of the knob by any suitable mechanism, the stem 43 raises and lowers, and thus varies the effective metering area of the slots 45. Thus, a controlled flow of fuel is permitted downwardly along the passage 20 to the interior of the chamber 22.

Whereas we have illustrated a manual control knob 48, it will be understood that any suitable control means, either manual or automatic, for example thermostatically responsive control
measured, may be employed whereby the amount of fuel delivered to the burner may be controlled or varied.

The chamber 22 is further connected to the chamber 10 by a tube 50, which extends upwardly through the bottom of the chamber 10 and has an open top, as at 51, above the normal level of the fuel body 16.

52 is a float located in the lower chamber 22, which cooperates with the pin 53, extending upwardly through the portion of the member 50, and secured at its upper end to a trip lever 54, which in turn is pivoted, as at 55, to the member 25. It has a tooth or dog 56, which normally engages a weight lever 57. The weight lever carries a weight 58 and is pivoted, as at 59, to the member 28. The weight lever also has an outwardly extending associated reset lever 60 whereby the device may be reset.

We find it advantageous to permit an actual inspection of the feed downwardly through the line 20. We, therefore, illustrate an aperture or apertures 70, which may be closed by glass or any other suitable substance, and which permits the operator to watch the flow or dripping of fuel downwardly through the passage.

It will be realized that, whereas we have illustrated a practical and operative device, nevertheless, many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of our invention. We therefore wish that the description and drawing be taken as in a broad sense illustrative or diagrammatic, rather than as limiting us to our precise showing.

The use and operation of our invention are as follows:

The level of fuel in the chamber 10 is controlled by the valve 26, 27, in response to movement of the float 25. The rate of flow of fuel from the chamber 10 to the chamber 22 is controlled, either manually or automatically, by the valve 43, 44, 45. In the event more fuel is for any reason admitted to the pot 1 than can be burned, and the fuel rises above the normal operating level, this rise of fuel level in the lower chamber 22 raises the float 52. At some predetermined point, for example if the fuel in the bottom of the pot reaches the trip-off level, the parts are so proportioned that the float 52 then lifts the trip lever 54 far to release the dog 56 to permit the weight 58 to drop. In that connection the lever 57 strikes the reduced end 26a of the valve stem 26 and forces the valve 27 into a closed position, thus cutting off any further inflow of fuel to the chamber 10. But only a relatively small volume of fuel is in the bottom of the pot 1, and in the small lower chamber 22. The parts are so proportioned that the trip-off level is only slightly higher than the operating oil level, and the volume of fuel in the bottom of the pot is, therefore, quite small and can be burned off without undue smoking or overheating of the burner.

In view of the fact that the bottom 2 of the pot is higher than the bottom of the chamber 28 of the float 22, very little fuel will be fed into the pot, as the fuel in it is burned off. Thus, in operation, if for any reason the level of fuel in the chamber raises the trip-off float, the supply of fuel is cut off until the user again manually resets the trip lever by using the exterior member 68.

Assume that the burner has gone out, all that the user has to do is to re-light the burner by dropping a match or piece of lighted waste into the bottom, and permit the relatively small volume of oil in the bottom of the burner to burn off. There is not enough oil in the burner to do any damage, and normal combustion can shortly be restored.

In practice, the provision of means of cutting off the oil supply after only a small amount of excess oil has accumulated in the bottom of the pot is of great practical importance. With the use of controls currently employed with pot type burners, upon burner failure the pot becomes flooded with a very large amount of oil. Draining the oil, on the one hand, is a difficult and annoying procedure. On the other hand, the volume of oil in the bottom is so great that burning it off is equally annoying. It may overheat the burner and in any event may cause carbon deposits and heat delivery at times when heat delivery is not desired. The time when such a pot is most likely to go out is when it is run at a relatively low or pilot stage when heat is not desired. If it becomes necessary then to burn off a great depth of oil in the bottom of the pot, the technical annoyance is that the oil is held to a relatively low minimum. This trip-off level is indicated in the drawing and may be located as much as an inch and a half below the lowest primary air inlet apertures. There is insufficient fuel in the bottom of the pot at this time to produce a fire hazard. Note that the volume of fuel in the lower chamber 22 adds little to the volume of fuel which has to be burned off. The capacity of the chamber 22 below the trip-off level may be one-tenth or less than that of the burner bottom. No oil enters the float chamber after the fire goes out, and the oil in the pot reaches the indicated trip-off level.

The oil may be metered drop by drop as it flows from the float chamber to the lower chamber 22, maintaining a rate of flow satisfactory for a low turndown or pilot combustion. The device can, of course, be manually reset when the oil has been burned off.

We claim:

1. In combination in control means for liquid fuel burners, a burner, a primary float chamber, means for delivering a liquid fuel thereto, a valve controlling the admission of such liquid fuel to the primary float chamber, a float in said primary float chamber, an actuating connection between said float and said valve, adapted to close said valve in response to a predetermined excess level of fuel in the primary float chamber, a secondary float chamber at the general level of the bottom of the burner, in communication with said primary float chamber, a fuel delivery pipe extending from said secondary float chamber to the burner, said pipe constituting the sole avenue of delivery of liquid fuel to the burner from the primary float chamber, a valve in the primary float chamber, adapted to control the volume of liquid fuel delivered to the primary float chamber, the volume of fuel delivered to the burner being determined by the height of the liquid fuel in the secondary float chamber and thus to the burner, means for varying the setting of said valve, a float in said secondary chamber, responsive to
the level of fuel in said secondary chamber and in the bottom of the burner, and an actuating connection between said float in the secondary chamber and the valve for controlling the flow of fuel into the primary chamber.

2. In combination, in control means for liquid fuel burners, a burner element having a closed bottom and a circumferential side wall, and means for delivering liquid fuel to the burner element, including a primary fuel chamber, a secondary fuel chamber in communication with said primary fuel chamber, a fuel pipe extending from said secondary fuel chamber to the burner element, said secondary fuel chamber extending above and below the normal range of level of liquid fuel in the burner element, means for controlling the inflow of liquid fuel to the primary fuel chamber, including a movable control valve and means for actuating it, a float in said secondary fuel chamber and an actuating connection between the float and said control valve for the primary chamber, said float in said secondary fuel chamber being directly responsive to fluctuations of the level of a body of liquid fuel which extends continuously from the interior of the secondary fuel chamber, through said fuel pipe, to the interior of the burner element.

3. In combination, in control means for liquid fuel burners, a burner element having a closed bottom and a circumferential side wall, and means for delivering liquid fuel to the burner element, including a primary fuel chamber, a secondary fuel chamber in communication with said primary fuel chamber, a fuel pipe extending from said secondary fuel chamber to the burner element, said secondary fuel chamber extending above and below the normal range of level of liquid fuel in the burner element, means for controlling the inflow of liquid fuel to the primary fuel chamber, including a movable control valve and means for actuating it, a float in said secondary fuel chamber and an actuating connection between said float and the control valve for the primary chamber, said float in said secondary fuel chamber being directly responsive to fluctuations of the level of a body of liquid fuel which extends continuously from the interior of the secondary fuel chamber, through said fuel pipe, to the interior of the burner element, said secondary fuel chamber being located at a level substantially below that of the primary fuel chamber.

4. In combination, in control means for liquid fuel burners, a burner element having a closed bottom and a circumferential side wall, and means for delivering liquid fuel to the burner element, including a primary fuel chamber, a secondary fuel chamber in communication with said primary fuel chamber, a fuel pipe extending from said secondary fuel chamber to the burner element, said secondary fuel chamber extending above and below the normal range of level of liquid fuel in the burner element, means for controlling the inflow of liquid fuel to the primary fuel chamber, including a movable control valve and means for actuating it, a float in said secondary fuel chamber and an actuating connection between said float and the control valve for the primary chamber, said float in said secondary fuel chamber being directly responsive to fluctuations of the level of a body of liquid fuel which extends continuously from the interior of the secondary fuel chamber, through said fuel pipe, to the interior of the burner element, said secondary fuel chamber being located at a level substantially below that of the primary fuel chamber.

5. In combination, in control means for liquid fuel burners, a burner element having a closed bottom and a circumferential side wall, and means for delivering liquid fuel to the burner element, including a primary fuel chamber, a secondary fuel chamber in communication with said primary fuel chamber, a fuel pipe extending from said secondary fuel chamber to the burner element, said secondary fuel chamber extending above and below the normal range of level of liquid fuel in the burner element, means for controlling the inflow of liquid fuel to the primary fuel chamber, including a movable control valve and means for actuating it, a float in said secondary fuel chamber and an actuating connection between said float and the control valve for the primary chamber, said float in said secondary fuel chamber being directly responsive to fluctuations of the level of a body of liquid fuel which extends continuously from the interior of the secondary fuel chamber, through said fuel pipe, to the interior of the burner element, said secondary fuel chamber being located at a level substantially below that of the primary fuel chamber.

6. In combination, in control means for liquid fuel burners, a burner element having a closed bottom and a circumferential side wall, and means for delivering liquid fuel to the burner element, including a primary fuel chamber, a secondary fuel chamber in communication with said primary fuel chamber, a fuel pipe extending from the secondary fuel chamber to the burner element, said secondary fuel chamber extending above and below the normal range of level of liquid fuel in the burner element, means for controlling the inflow of liquid fuel to the primary fuel chamber, including a movable control valve and means for actuating it, a float in said secondary fuel chamber and an actuating connection between said float and the control valve for the primary chamber, said float in said secondary fuel chamber being directly responsive to fluctuations of the level of a body of liquid fuel which extends continuously from the interior of the secondary fuel chamber, through said fuel pipe, to the interior of the burner element.

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