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CONTROL DEVICE FOR LIQUID FUEL BURNERS

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Fig. 1

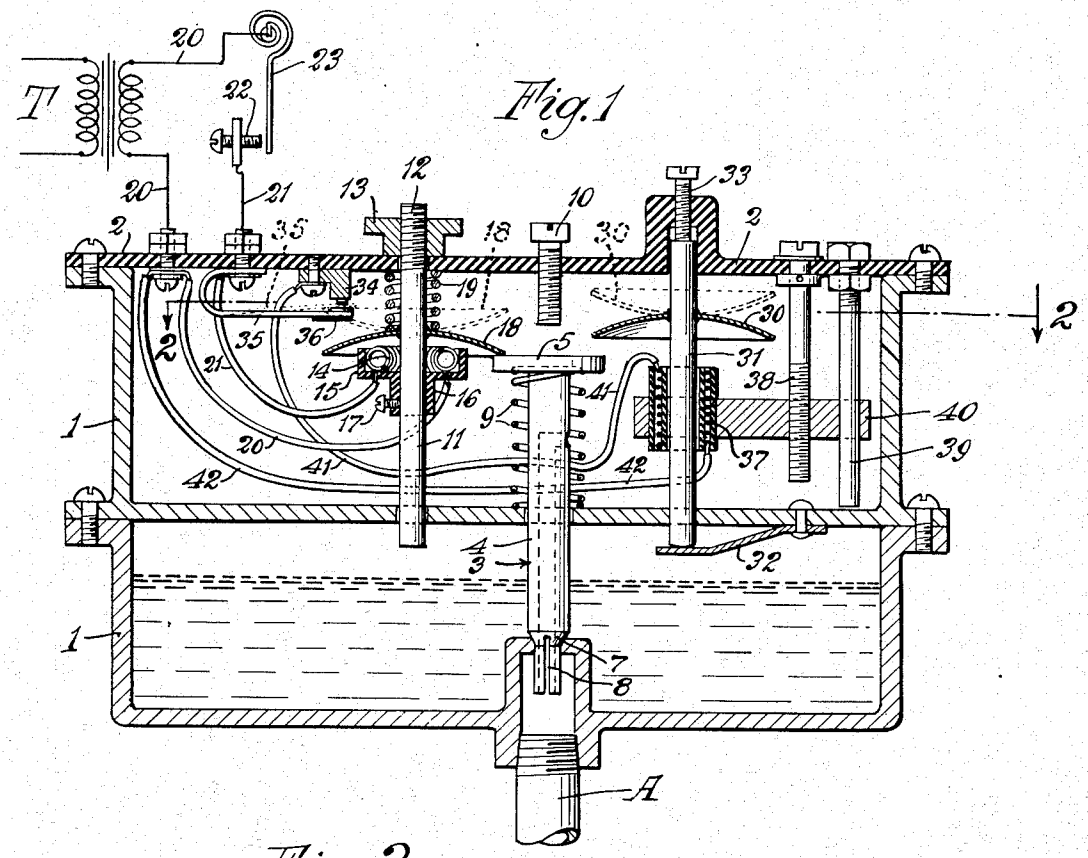
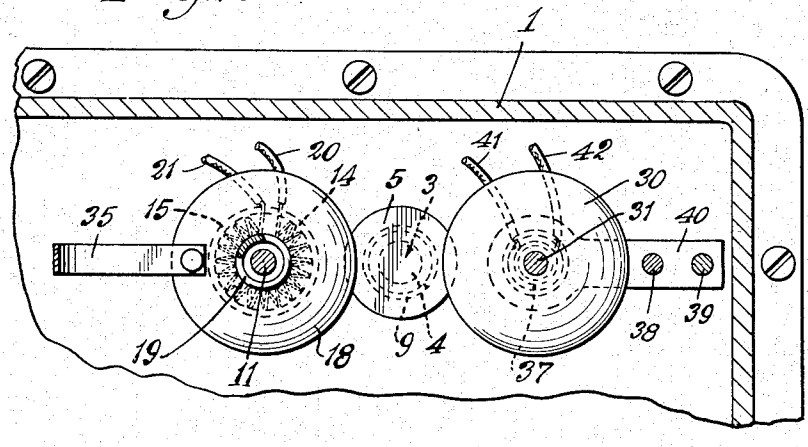


Fig. 2



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CONTROL DEVICE FOR LIQUID FUEL BURNERS

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8 Claims. (Cl. 236—68)

The invention relates to an improvement in control means for liquid fuel burners and has for one purpose the provision of improved means for causing or permitting a liquid fuel control valve to move sharply from a closed or minimum flow position to an intermediate flow position, for example upon the actuation of a room thermostat, for thereafter to maintain a generally constant intermediate flow, and at the end of a predetermined period to advance rather sharply to full flow position.

Another purpose is the provision of an improved valve actuating means effective, for example, for use with pot type burners, in which an intermediate and substantially constant flow is maintained at the starting stage, whereby smoking of the pot and excess feed is prevented.

Another purpose is the provision of improved means for sharply increasing the fuel supply from pilot stage to the intermediate stage for causing a rapid heating of the pot.

Another purpose is the provision of sharp shutoff means for sharply terminating the fuel flow on cessation of operation, in order to eliminate the after fire, smoke and lazy combustion usually associated with pot type burners when the oil supply is gradually reduced.

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

The invention is illustrated more or less diagrammatically in the accompanying drawing wherein:

Fig. 1 is a vertical section through an embodiment of the invention, illustrating the valve in minimum or closed position; and

Fig. 2 is a section on the line 2—2 of Fig. 1.

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

Referring to the drawing, 1 generally indicates the valve chamber or housing, having a cover plate 2, a valve element 3, a valve stem 4, and an upper valve control portion 5. 7 indicates the valve portion proper, provided with any suitable metering slot 8.

A indicates a fuel supply line extending from the valve housing 1, and it will be understood that any suitable means, not herein shown, may be provided for delivering to and maintaining in the chamber 1 a suitable supply of fuel.

Assuming that the parts are in the cold or starting position, a spring 9 tends to raise the valve to a top or full flow position, which may be adjustably controlled by a stop 10. In order to limit the initial upward movement of the valve 3 at the pilot stage, and to provide for a subsequent sharp upward movement, we provide the following structure:

We provide a stem 11 mounted on the cover plate 2 and adjustable as to height, for example, by means of its upper screw threaded end 12 and a cooperating manually adjustable nut 13. 14 is a heating or resistance element, herein shown as a coil resting in a cup of insulating material 15, which may be adjusted on the stem 11, as by the collar 16 and screw 17. Positioned above the coil 14 is the bimetal disc 18, which when cold takes the full line position of Fig. 1. The spring 19, compressed between the disc 18 and the bottom of the cover 2, is of sufficient strength to resist the upward thrust of the light spring 9, which normally tends to open the valve 3 and is, therefore, effective to cause the disc 18, when in the full line position, to serve as a stop limiting the upward movement of the valve and thus providing a setting for minimum flow or pilot position of the valve.

A circuit for the coil 14 is provided by the conductive lines 20 and 21. The line 21 extends to the normally fixed contact 22 of a thermostat, the movable or bimetallic member of which is shown as at 23. The line 20 extends to the transformer T and thence to the thermostatic member 23. It will be understood that electrical current may be supplied to the circuit in any other suitable way, but this is a convenient circuit, which is closed in response to a drop in room temperature, which causes the member 23 to flex into circuit closing position. When this takes place and the resistance 14 is heated after a predetermined lag, the disc 18 snaps sharply from the full line to the dotted line position of Fig. 1, and allows the light spring 9 to lift the valve 3. Its upward movement, however, is limited by the bimetallic disc 30, which is mounted on the stem 31, normally upwardly thrust by the spring 32 and adjustable, as by the adjustable stop 33, in the cover plate 2.

When the abutment 5 of the valve stem 4 strikes the disc 30, it will be understood that it is cold and in the full line position of Fig. 1, and stops the upward movement of the valve short at an intermediate position below the maximum fire position which would otherwise be permitted by the adjustable stop 10. Another result of the upward warping or snapping of the disc 18 is to close the switch which includes the fixed contact 35 and a moving contact 36, which is struck by the edge of the disc 18, which impinges against the insulating block 36 thereon. This closes a circuit through a heater or resistance 37, which

is mounted on or surrounds the stem 31 and which may be adjusted toward and away from the disc 30, for example by the adjusting screw 38. 39 is a guide for the block or arm 40, upon which the coil 37 is actually mounted. The circuit for the coil 37 includes the lines 41 and 42, and it will be understood that, when the switch 34, 35 is closed, the two resistances are in parallel. Thereafter, when the disc 18 snaps to the dotted line position, it closes the circuit for the heater 37, and after a predetermined lag the disc 30 snaps sharply from the full line to the dotted line position and permits the spring 9 to lift the valve as high as the stop 10 will permit.

It will be noted that the speed of heating of the disc 30 may be controlled by adjusting the coil 37 toward and away from it. If the coil 37 is close to the bottom of the disc 30, it is effective to heat the disc directly, in addition to the heat conducted along the preferably metallic stem 31. If, on the other hand, the coil is moved a substantial distance down away from the disc 30, then the time lag is increased, and the heat of the coil 37 reaches the disc 30 primarily by conduction along the stem 31.

It will thus be understood that, when heat is first called for by the room thermostat, the disc 18, which normally holds the valve 3 at pilot flow if a pilot flame is used, or at full closure if no oil pilot is used, remains in the full line position. It will be understood that, if an oil pilot is used, the valve 3 is so related to the valve seat and is so formed or adjusted that there will always be a minimum or pilot flow of fuel, and for purpose of illustration it will be assumed that the structure herein shown is provided for a burner with an oil pilot. When the room thermostat is closed by a demand for more heat, the circuit for the coil 14 is closed, and after a short lapse of time the disc 18 snaps into the dotted line position, and since the snapping of the disc is almost instantaneous, the light spring 9 can sharply raise the valve 3 from the pilot or minimum setting to the intermediate setting, as determined by the position of the disc 30. It is desirable to have an intermediate setting for a reasonably controlled length of time, and this time can be accurately controlled by adjusting the position of the heater 37. In any event the effect of the snapping of the disc 18 to the dotted line position is to close the circuit through the heater 37, and thereafter, after a predetermined lag, the disc 30 snaps from the full line to the dotted line position, and the valve is again sharply moved upwardly by the spring 9 as high as the stop 10 will permit.

After heat is no longer called for by the room thermostat, and the circuit for both heaters is simultaneously broken, both the discs 18 and 30 warp back into the full line position. Preferably the disc 18 is made to operate more rapidly than the disc 30, so that it will sharply move the valve 3 clear down to the minimum setting.

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

We claim:

1. In valve control means for use with liquid fuel burners, a valve housing, a valve member movably mounted in said housing, means for normally holding the valve member in closed or minimum flow position, including a bimetallic warping disc, means for causing said valve member to move sharply toward open position, including means for heating said warping disc, means for maintaining said valve member at a subsequent intermediate flow position for a predetermined period, including a second bimetallic warping disc, and means for thereafter causing movement of the valve member to full flow position, including means for heating said second warping disc.

2. In valve control means for use with liquid fuel burners, a valve housing, a valve member movably mounted in said housing, means for normally holding the valve member in closed or minimum flow position, including a bimetallic warping disc, means for adjusting the minimum flow position of the valve, including means for bodily moving said warping disc, means for causing said valve member to move sharply toward open position, including means for heating said warping disc, means for maintaining said valve member at a subsequent intermediate flow position for a predetermined period, including a second bimetallic warping disc, and means for thereafter causing movement of the valve member to full flow position, including means for heating said second warping disc.

3. In valve control means for use with liquid fuel burners, a valve housing, a valve member movably mounted in said housing, means for normally holding the valve member in closed or minimum flow position, including a bimetallic warping disc, means for causing said valve member to move sharply toward open position, including means for heating said warping disc, means for maintaining said valve member at a subsequent intermediate flow position for a predetermined period, including a second bimetallic warping disc, means for adjusting the intermediate setting of said valve, including means for bodily moving said second warping disc, and means for thereafter causing movement of the valve member to full flow position, including means for heating said second warping disc.

4. In valve control means for use with liquid fuel burners, a valve housing, a valve member movably mounted in said housing, means for normally holding the valve member in closed or minimum flow position, including a bimetallic warping disc, means for causing said valve member to move sharply toward open position, including resistance means for heating said warping disc, means for maintaining said valve member at a subsequent intermediate flow position for a predetermined period, including a second bimetallic warping disc, and means for thereafter causing movement of the valve member to full flow position, including resistance means for heating said second warping disc, and circuits for said resistance means, and a source of electric power therefor, and a room thermostat in circuit with said electrical power source.

5. In valve control means for use with liquid fuel burners, a valve housing, a valve member movably mounted in said housing, means for normally holding the valve member in closed or minimum flow position, including a bimetallic warping disc, means for causing said valve member to move sharply toward open position, in-

cluding resistance means for heating said warping disc, means for maintaining said valve member at a subsequent intermediate flow position for a predetermined period, including a second bimetallic warping disc, and means for thereafter causing movement of the valve member to full flow position, including resistance means for heating said second warping disc, circuits for said resistance means, a source of electric power therefor, a room thermostat in circuit with said electrical power source, and means for controlling the time lag between intermediate flow position and full flow position, including means for moving the resistance means for the second disc toward and away from said disc.

6. In valve control means for use with liquid fuel burners, a valve housing, a valve member movably mounted in said housing, means for normally holding said valve member in closed or minimum flow position, including a bimetallic warping disc opposed thereto, means for causing said valve member to move sharply toward open position, including resistance means for heating said warping disc, means for maintaining said valve member at a subsequent intermediate flow position for a predetermined period, including a second bimetallic warping disc in the line of movement of said valve member when the valve member is released by the warping of the first mentioned warping disc, and means for thereafter causing movement of the valve from full flow position, including resistance means for heating said second warping disc.

7. In valve control means for use with liquid fuel burners, a valve housing, a valve member movably mounted in said housing, means for normally holding said valve member in closed or minimum flow position, including a bimetallic warping disc opposed thereto, means for causing said valve member to move sharply toward open position, including resistance means for heating said warping disc, means for maintaining said valve member at a subsequent intermediate flow position for a predetermined period, including a second bimetallic warping disc in the line of movement of said valve member when the valve member is released by the warping of the first mentioned warping disc, means for thereafter causing movement of the valve from full flow position, including resistance means for heating said second warping disc, and means for closing the circuit for said last mentioned resistance means in response to the upwarping of the first mentioned warping disc.

8. In valve control means for use with liquid fuel burners, a valve housing, a valve member movably mounted in said housing, means for normally holding said valve member in closed or minimum flow position, including a bimetallic warping disc opposed thereto, means for causing said valve member to move sharply toward open position, including resistance means for heating said warping disc, means for maintaining said valve member at a subsequent intermediate flow position for a predetermined period, including a second bimetallic warping disc in the line of movement of said valve member when the valve member is released by the warping of the first mentioned warping disc, means for thereafter causing movement of the valve from full flow position, including resistance means for heating said second warping disc, means for closing the circuit for said last mentioned resistance means in response to the upwarping of the first mentioned warping disc, and means for varying the time lag between the closure of such circuit and the upwarping of the second warping disc.

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