Feb. 5, 1929. 1,701,191

W. R. RAY

AUTOMATIC OIL FEEDING AND STARTING VALVE

Filed May 25, 1927

Fig. 1.

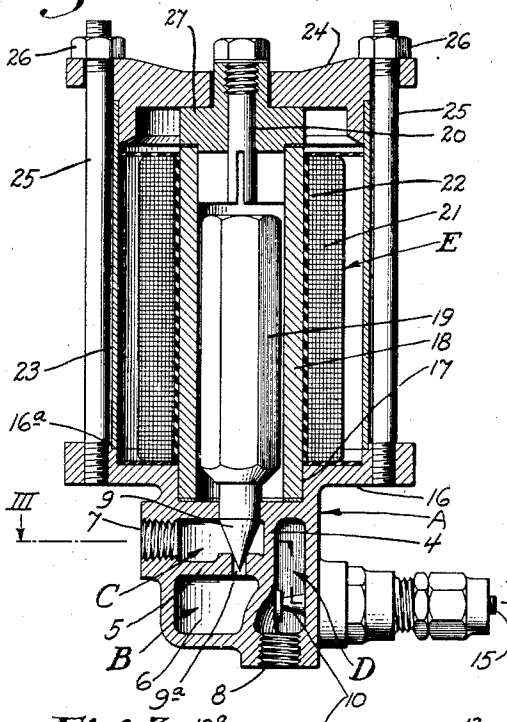


Fig. 2.

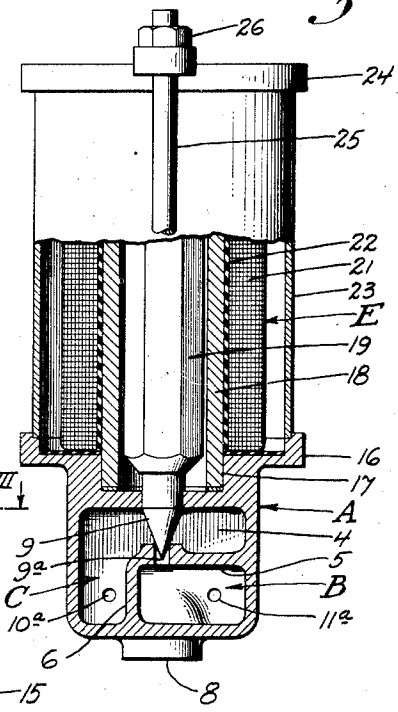


Fig. 3.

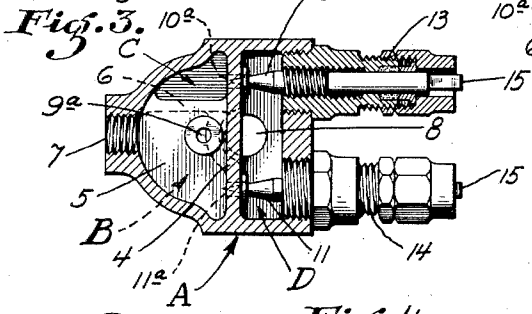
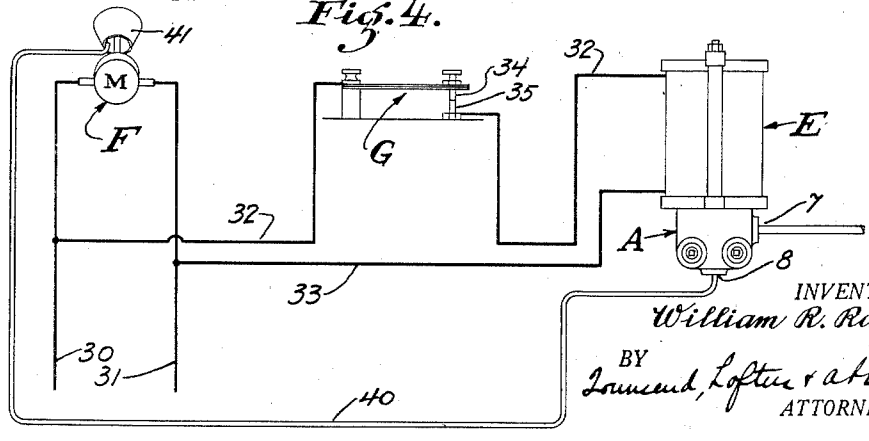


Fig. 4.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC OIL FEEDING AND STARTING VALVE.

Application filed May 25, 1927. Serial No. 194,020.

This invention relates to an oil feeding and starting valve for oil burners of the atomizing type.

In the operation of automatic oil burners of the atomizing type whether rotary, pressure actuated or otherwise, it is common practice to automatically ignite the oil when the burner is started by means of a gas flame, an electric spark or the like.

To insure ignition of the oil during the starting operation, it is necessary to adjust the burner valve so that a rich mixture is obtained and it is later necessary to readjust the burner valve so as to reduce the oil feed or mixture, as incomplete combustion would otherwise result. It is accordingly desirable, especially when fuel oils of heavy gravity are used to increase the oil supply during the starting operation in order to produce a rich mixture, thus making ignition prompt and positive. It is furthermore desirable to maintain this rich mixture until the temperature of the furnace or fire box is high enough to sustain combustion when the mixture may be reduced to normal to insure a clear and smokeless flame. It might also be stated that the rate of flow of heavy gravity fuel oils through pipe lines, valves, etc. before reaching the burner or a zone of combustion, depends to a large extent upon surrounding temperatures, for instance, if the boiler or furnace room is fairly cool before the burner is started, the oil will be thick and viscous and the flow or quantity of oil delivered to the burner will be comparatively small, conversely, as the temperature in the boiler room rises, the oil flow will increase and the burner valve will accordingly require adjustment both before and after starting.

The object of the present invention is to provide an oil feeding and starting valve operable in conjunction with a burner of the atomizing type which will automatically deliver a rich mixture during the starting operation; to provide a valve of this character which will maintain the rich mixture until the fire box and furnace room attain the proper temperature; and further to provide a valve of this character which will automatically reduce the mixture to normal after proper temperature has been attained so as to insure a clear and smokeless fire. The engine is shown by way of illustration in the accompanying drawings in which:—

Fig. 1 is a central vertical longitudinal section through the valve,

Fig. 2 is a partial central section taken at right angles to Fig. 1,

Fig. 3 is a horizontal cross section taken on line III—III, Fig. 1,

Fig. 4 shows the valve, the motor and a thermostat controlled switch.

Referring to the drawings in detail and particularly Figs. 1, 2 and 3, A indicates a valve casing or housing which in this instance is divided into three main chambers such as indicated at B, C and D. Chamber D is formed by a vertical partition wall 4 and chamber B by means of a horizontal wall 5 and a vertical wall 6. The valve housing A is provided with threaded inlet and outlet openings indicated at 7 and 8, the inlet opening being in communication with the chamber C and the outlet opening in communication with the chamber D. The housing otherwise forms a support for a solenoid magnet generally indicated at E and for three valves generally indicated at 9, 10 and 11. The valve 9 is vertically disposed and is guided and actuated by the solenoid magnet. It might furthermore be stated that it aligns with an opening 9^a which forms a communication between the chambers B and C. The valves 10 and 11 are in this instance shown as being horizontally disposed. They extend through the chamber D and they align with openings 10^a and 11^a formed in the vertical partition wall 4. The opening 10^a forms a communication between the chamber C and D while the opening 11^a forms a communication between the chambers B and D. All of the valves are of the needle valve type, the valve 9 being automatically opened and closed as will hereinafter be described, while the valves 10 and 11 are manually regulated and normally assume an open position with relation to the openings 10^a and 11^a. The valves 10 and 11 are otherwise provided with threaded stems as shown which extend through stuffing glands 13 and 14 and each stem is provided with a square end or shank 15 which may be engaged by a key or the like when either of the valves requires regulation. The valve 10 will hereinafter be referred to as the feed valve of the oil burner as it is always open and regulates the flow of oil to the burner during normal operating conditions. The valves 9 and 11

cooperate and will hereinafter be referred to as the starting valves as they are only employed during the starting operation. Valve 11 like valve 10 is also always open but as the oil flow to the valve 11 is controlled by the valve 9, its operation depends thereon. The valve 9 is only open during the starting operation when a rich mixture is required and it is later on automatically closed when the fire box and the furnace room acquire proper temperature. It is accordingly apparent that the operation of the valves 9 and 11 which cooperate is intermittent and neither valve remains continuously open as is the case with the valve 10.

The valve housing A is provided with an annular flange 16 at its upper end which serves as a support for the solenoid magnet. The center portion of the flange is recessed as indicated at 17 to form a guide and support for a central tubular member 18 which is preferably constructed of a non-magnetic metal such as brass or the like. This tubular member serves three functions, first that of a guide for an armature 19 which carries the valve 9, secondly that of a support for an adjusting screw such as indicated at 20 which limits the upward movement of the armature 19, and third that of a support for the windings or coil 21 of the solenoid, these windings being insulated from the tubular member 18 as indicated at 22. The windings are in turn surrounded by a sleeve or tube 23 supported by an annular shoulder 16^a. A head member 24 is placed on top of the sleeve and this is in turn secured to the annular flange 16 by means of bolts and nuts such as indicated at 25 and 26. The entire mechanism comprising the valve 9, the armature 19, the magnet windings, etc. is thus completely enclosed and secured with relation to the valve housing A and a compact, well protected unit is obtained. The adjusting screw 20 is carried by a block or head member 27, this being interposed between the head member 24 and the upper end of the tube 18 and being there secured by the clamping action of the head 24.

In actual practice, the valve here illustrated will in most instances be connected so as to cooperate with the type of burner shown in my Patent No. 1,193,819, entitled "Oil burner," and issued August 8, 1916. The type of burner disclosed in the patent referred to employs a rotary atomizing cup to which the oil is delivered. This cup is rotated at high speed by means of an electric motor, the speed being sufficient to cause the oil delivered to the cup to be centrifugally projected and atomized. The manner of electrically connecting the valve forming the subject matter of the present application with the motor of the burner is diagrammatically illustrated in Fig. 4 in which F indicates the motor which rotates the centrifugal atomizing cup, A the valve proper, E the solenoid magnet which operates the valve and G a thermostat switch. In actual operation it will be understood that oil is delivered to the inlet connection 7 of the valve through a pipe line either from a pump or a tank from which the oil may flow by gravity. The flow of oil through the valve housing A is regulated by the valves 9, 10 and 11 and the oil passing therethrough and discharging through the connection 8 is delivered through means of a pipe 40 to the atomizing cup 41 of the burner. To start the burner it is only necessary to close a circuit through the wires 30 and 31 (see Fig. 4) which are connected with the motor. The solenoid magnet E is connected and parallel with the motor circuit through means of wires 32 and 33 and the solenoid is accordingly energized the moment the circuit through the motor is closed. Energization of the solenoid causes the armature 19 to be elevated upwardly against the adjusting screw 20 and as valve 9 is attached thereto, it will be raised with relation to the opening 9^a and oil entering the chamber C will accordingly also enter the chamber B through the opening 9^a. The valves 10 and 11 as previously stated are always more or less open with relation to the openings 10^a and 11^a and oil will accordingly enter the chamber D and escape through the discharge connection 8 through both of the openings 10^a and 11^a. A comparatively large flow of oil is thus delivered to the atomizing cup of the burner and a sufficiently rich mixture is maintained to insure ignition when a gas flame, an electric spark or like device is employed, and the mixture is furthermore maintained in this condition until the temperature of the fire box is sufficiently high to maintain combustion and until the temperature in the furnace room is sufficiently high to insure a free flow of oil through the pipe and valve connections. When this temperature is reached, means are employed for automatically breaking the circuit through the solenoid thereby permitting valve 9 to close and accordingly reducing the quantity of oil delivered to the burner. This is accomplished as follows:

Suitably positioned in the furnace room is a thermostatic type of switch such as indicated at G. This switch is interposed in the wire connection 32 and the switch is so adjusted that when the furnace room is cold a circuit will be closed through the contacts indicated at 34 and 35. The moment, however, a predetermined temperature is exceeded, for instance, a while after the burner has been started, the thermostatic switch opens and breaks the circuit through the contacts 34 and 35 and consequently through

the windings of the solenoid magnet. The magnet is thus de-energized and the armature settles by gravity to close the valve 9. Valve 10 may then be adjusted for the size of fire desired, as the oil delivered to the burner will in that instance only pass through the chamber C, the opening 10^a and chamber D and once the valve 10 has been adjusted it will require no further regulation. The valve 11 is similarly adjusted during the first operation of the burner to increase or decrease richness of the mixture during the starting operation and once regulated will require no further adjustment.

From the foregoing it should be apparent that a valve is provided which insures a rich mixture during the starting operation of a burner of the character described, and furthermore, that means are provided for automatically actuating said valve and closing said valve when the fire box and furnace room reaches a predetermined temperature.

While certain features of the present invention are more or less specifically described and indicated, I wish it understood that various changes may be resorted to within the scope of the appended claim; similarly, that the materials and finish of the several parts employed may be such as the manufacturer may dictate or varying conditions or uses may demand.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

The combination with an oil burner, having fuel line leading thereto, a valve housing having a plurality of chambers therein, there being an inlet chamber, an intermediate chamber, and an outlet chamber in said housing, there being openings between said inlet chamber and said intermediate chamber and between said inlet chamber and said outlet chamber, and between said intermediate chamber and said outlet chamber, valves disposed in said openings, two of said valves being normally open to permit a continuous flow of oil from said inlet chamber to said outlet chamber, and from said intermediate chamber to said outlet chamber, and means for automatically closing said other valve when a predetermined atmospheric temperature is obtained at a predetermined point adjacent the burner.

WILLIAM R. RAY.