Feb. 3, 1931. W. R. RAY 1,791,012

OIL FEEDING AND REGULATING DEVICE FOR OIL BURNERS

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Fig. 1.

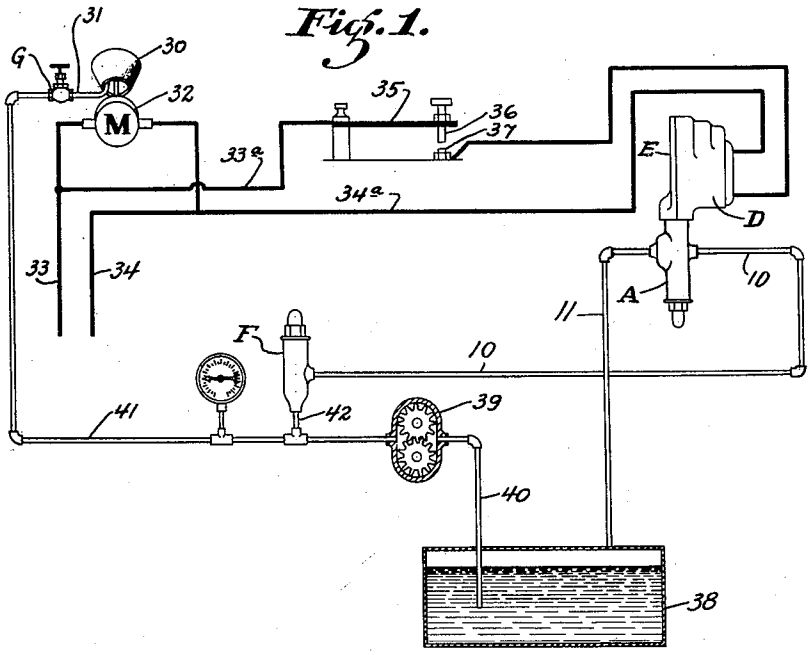
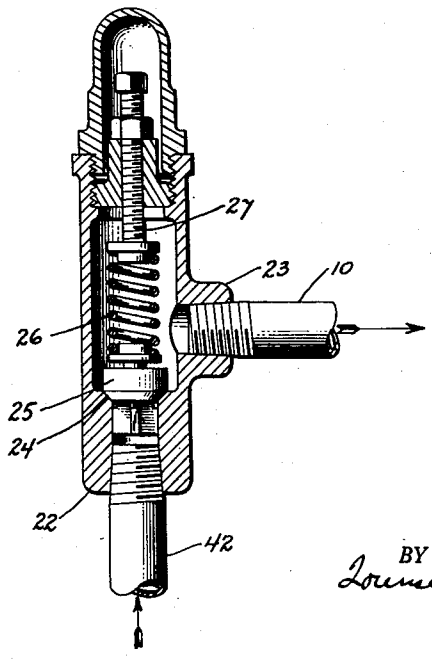


Fig. 2.



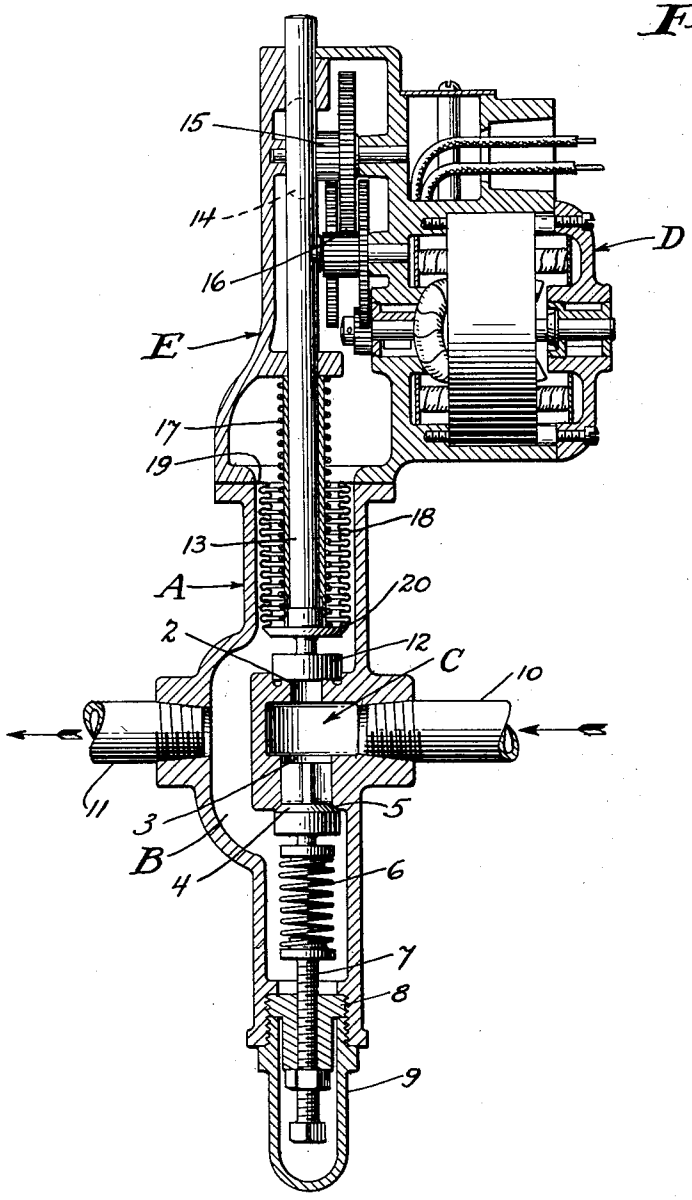
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Fig. 3.



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UNITED STATES PATENT OFFICE

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OIL FEEDING AND REGULATING DEVICE FOR OIL BURNERS

Application filed April 9, 1928. Serial No. 268,468.

This invention relates to an automatic oil feeding and regulating device for oil burners.

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 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 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 pipes will become warmer and 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 regulating mechanism operable in conjunction with a burner of the atomizing type, which will automatically increase the pressure on the oil line so as to insure a rich mixture during the starting operation; to provide a mechanism of this character which will maintain the pressure and accordingly a rich mixture until the fire box and furnace room reach a proper temperature; and further to provide mechanism of this character which will automatically reduce the pressure on the oil to a normal fire condition after the proper temperature has been attained, so as to insure a clear and smokeless fire.

The invention is shown by way of illustration, in the accompanying drawings, in which—

Fig. 1 is a diagrammatic view showing the oil feeding and regulating mechanism as installed in the oil pipe line of an oil burner.

Fig. 2 is an enlarged vertical section of the by-pass valve.

Fig. 3 is an enlarged vertical central section of an electric motor actuated by-pass valve.

Referring to the drawings in detail, and particularly Fig. 3, A indicates a casing on the interior of which are formed two chambers generally indicated at B and C, the chamber C being in communication with the chamber B through discharge ports 2 and 3. The port 3 is normally closed by means of a check valve 4 which is retained on its seat 5 by means of a compression spring 6. This spring is interposed between the valve 4 and an adjusting screw 7, and the tension of the spring may accordingly be adjusted as will hereinafter be described. The screw extends through a plug 8 mounted in one end of the casing A, and it is enclosed by a cap 9 to prevent tampering, once the proper adjustment has been made.

The port 2 normally remains open to permit a free flow of oil from pipe 10 through chamber C, port 2 and into the chamber B, and from there through a discharge pipe generally indicated at 11. Port 2 will, however, be closed by means of a valve 12 under certain operating conditions. The valve 12 is formed on the end of a stem or plunger rod 13, on the upper end of which is formed a gear rack 14 which continuously meshes with a driving pinion 15, this pinion being driven at a reduced speed through a chain of spur gears or the like, such as indicated at 16, which are driven from an electric induction motor generally indicated at D. When a cir-

cuit is closed through the motor and the rotor rotates, power will be transmitted through the gears 16 and the pinion 15 to raise the stem 13 and the valve 12 attached thereto. During such raising movement a spring 17 is placed under compression, this spring serving the function of closing the valve when the circuit through the motor is opened.

The motor D, together with the reduction gears driven thereby, are enclosed in a housing generally indicated at E. This housing is screwed or otherwise secured to the upper end of the housing A and the two housings are sealed or separated with relation to each other by means of a flexible bellows tube 18 to prevent crude oil from entering the upper housing E. Bellows tubes of this character are generally employed, and a detail description thereof is considered unnecessary. Suffice it to say that the upper flange of the bellows tube indicated at 19 is secured between the housing sections, while the lower flange of the bellows tube is secured to a collar 20 formed on a valve stem. A flexible seal is thus formed which permits vertical movement of the valve stem, thereby preventing leakage of oil from one housing to the other.

The valve mechanism just described will hereinafter be referred to as the electrically operated valve. There are only two additional valves required in the system, to-wit, a by-pass valve such as indicated at F, and a regulating valve such as indicated at G. The by-pass valve F is best illustrated in Fig. 2. It consists of a main housing having an inlet connection 22 and a discharge connection 23. A valve seat 24 is formed in the inlet opening, and cooperating therewith is a valve 25 which is retained on the seat by means of a compression spring 26. This spring is engaged at the opposite end by an adjusting screw 27, this screw being similar to the screw 7 previously described, being adjustable and enclosed to prevent tampering.

The valve G may be an ordinary globe or needle valve, its only function being that of regulating the oil supply to the burner.

In actual practice the valves 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", issued August 8, 1916.

The type of burner disclosed in the patent referred to employs a rotary atomizing cup such as indicated at 30, (see Fig. 1) to which the oil is delivered through means of a pipe 31, the valve G controlling the flow of oil through the pipe 31. This cup is rotated at high speed by means of an electrical motor such as indicated at 32, the speed being sufficient to cause the oil delivered to the cup to be centrifugally projected and atomized.

The motor is driven from any suitable source of electric current supply, as by means of the wires 33 and 34. The induction motor D is connected in parallel therewith through wires 33*a* and 34*a*, and a thermostat of suitable construction is mounted as at 35. A bimetallic type of thermostat is here illustrated. When the atmosphere is cold the thermostat member 35 assumes the position shown in Fig. 1, thereby maintaining the contacts 36 and 37 separated, but when the temperature increases beyond a predetermined temperature the contacts close and a circuit through the induction motor will be established.

The valves A, F and G are connected in the oil line as shown in Fig. 1. The oil supply is represented by a tank such as indicated at 38. A pump of suitable construction is mounted at the point 39. The suction side of the pump is connected with the tank 38 through a pipe 40. The discharge side of the pump is connected with a pipe 41 and this delivers the oil to the valve G and the supply pipe 31 which in turn delivers the oil to the atomizing cup.

The pump under actual operation will deliver a greater quantity of oil than that required by the burner, and a return pipe line is accordingly required. This return line consists of a pipe 42 which is connected with the by-pass valve F. The pipe 10 connects with the discharge side of the by-pass valve and enters the intake of the valve A, the discharge side of the valve A being connected with the tank 38 through means of pipe 11.

The operation will be as follows:

On a cold morning the oil is exceedingly thick and viscous and under such temperature conditions the contacts 36 and 37 will remain separated. When the burner is to be started the circuit is closed through the motor 32 and the pump 39 is simultaneously placed in operation. The spring 26 of the by-pass valve F will under normal conditions be adjusted so that it will not open to by-pass oil until a pressure of approximately 30 pounds is reached. Thus, excess oil will by-pass through the valve F the moment 30 pounds pressure is reached and the by-passed oil will as such reach the valve A. The valve 12 is closed under starting conditions and so is the valve 4. The spring 6 is adjusted so that it will not open until a pressure of 45 pounds is reached. The pressure in the pipe line will thus build up to 45 pounds before it can by-pass through the valve 4 and return to the tank 38. In other words, a total pressure of 45 pounds will be exerted on the oil delivery line 41 and this pressure will be sufficient to deliver sufficient oil to the atomizing cup to insure a rich starting mixture.

After the burner has been in operation for a while and the temperature adjacent the burner begins to increase sufficiently to actuate the thermostat 35, this will gradually close and will finally close the circuit through the induction motor D when the contacts 36

and 37 engage. At this time the general surrounding atmosphere has increased materially in temperature and the oil pipe lines have warmed up to such an extent that the oil is flowing more freely. The moment the circuit is closed by means of the thermostat through the induction motor D, this starts rotating, and through the reduction gears 16, the pinion 15 and the rack 14, raises the valve 12. The oil entering through the pipe 10 will thus discharge freely through the chamber C, the port 2 and the chamber B, and as such will return through the pipe line 11 to the tank 38 without any material resistance, and the pressure on the pipe line 41 is accordingly automatically reduced 15 pounds. The normal operating pressure being controlled by the spring 26 of the valve F, and as this is set for 30 pounds pressure the normal operating pressure after certain temperatures have been reached will be 30 pounds. The oil flow to the atomizing cup is thus automatically decreased, the mixture becomes leaner and a clear and smokeless fire is obtained.

From the foregoing it becomes apparent that I have provided means for automatically increasing the pressure on the oil pipe line when starting cold and when the oil is viscous and difficult to handle. I have similarly provided means for automatically reducing the pressure as desired when temperature conditions become such as to permit a free flow of the oil.

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

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

1. The combination with an oil burner and a pipe line for delivering oil thereto, of a pump for supplying oil to the pipe line under pressure, a by-pass return pipe line to return excess oil to the pump, a by-pass valve in the by-pass line, means for regulating the by-pass valve so that it will not open and permit return of oil until a predetermined pressure has been built up in the pipe line which supplies the burner, a second valve in the by-pass line adapted to be regulated so that it will not by-pass oil until a predetermined higher pressure has been built up in the oil supply line to the burner, a third valve in the by-pass line and temperature actuated means for opening said last named valve so as to permit the oil by-passed by the first named valve to return freely to the pump.

2. The combination of an oil burner, of means for delivering oil under pressure thereto, said means subjecting the oil to the temperature of the surrounding atmosphere, and means for maintaining a high predetermined pressure on the oil when the temperature of the surrounding atmosphere is cold, said maintaining means including an oil by-pass return line having a valve normally closed, the valve being opened automatically to reduce the pressure of the oil to a predetermined lower pressure only when the surrounding atmosphere reaches a predetermined normal temperature.

WILLIAM R. RAY.