

May 12, 1925.

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OIL VALVE ACTUATING MECHANISM FOR OIL BURNERS

Filed Jan. 28, 1924

3 Sheets-Sheet 1

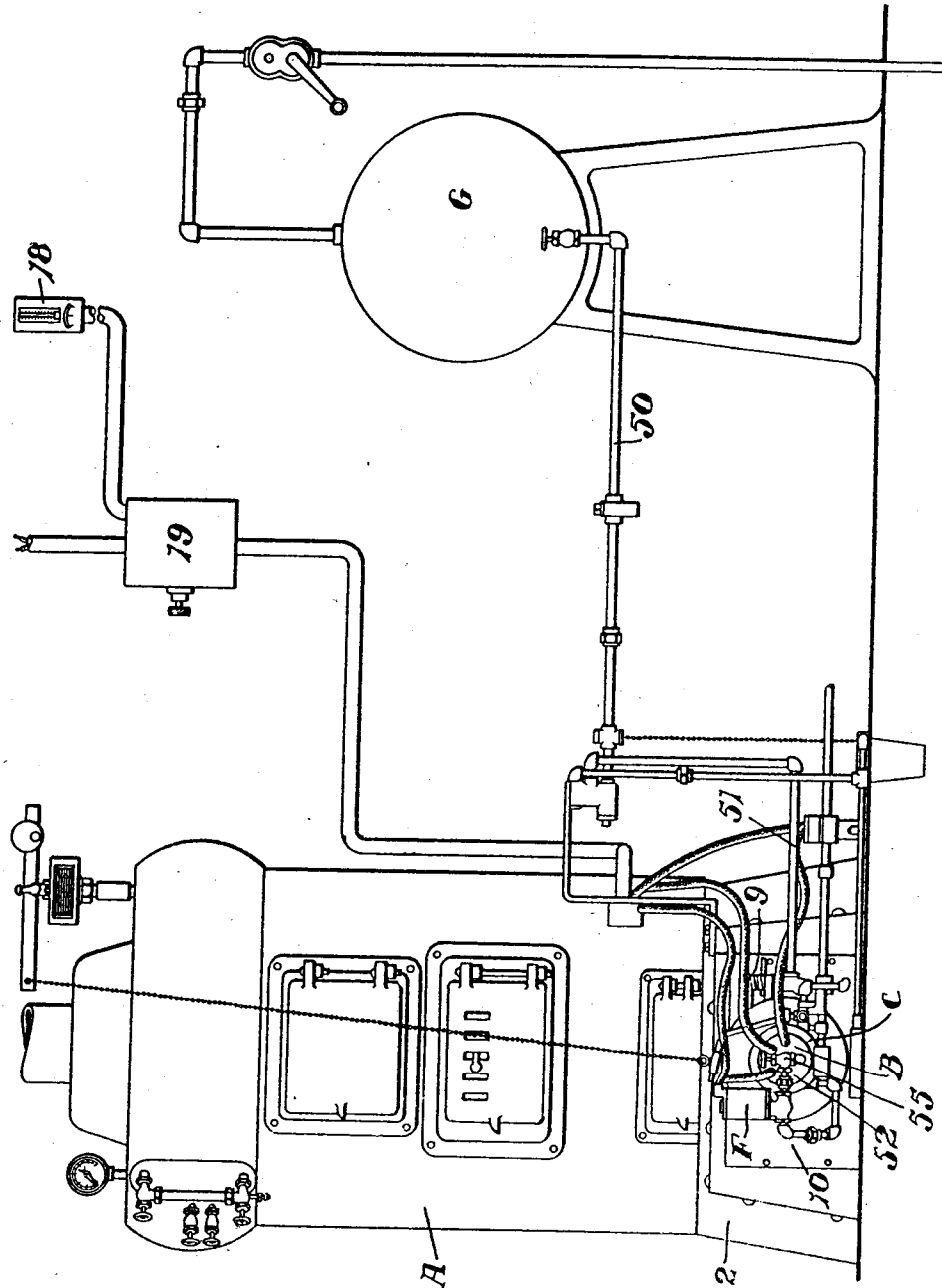


Fig. 1.

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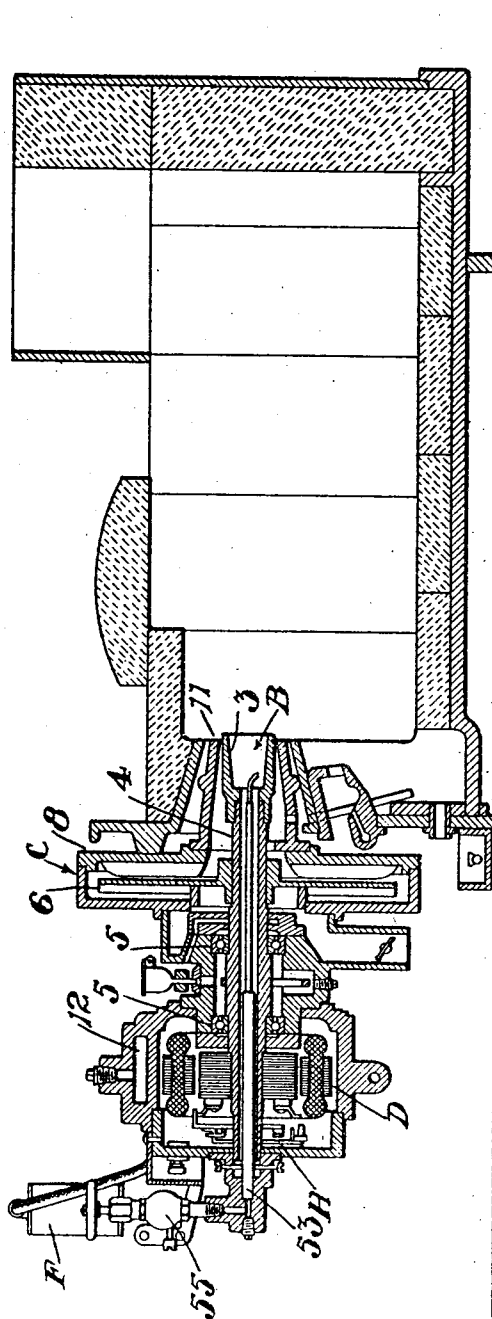
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Fig. 2



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Fig. 3

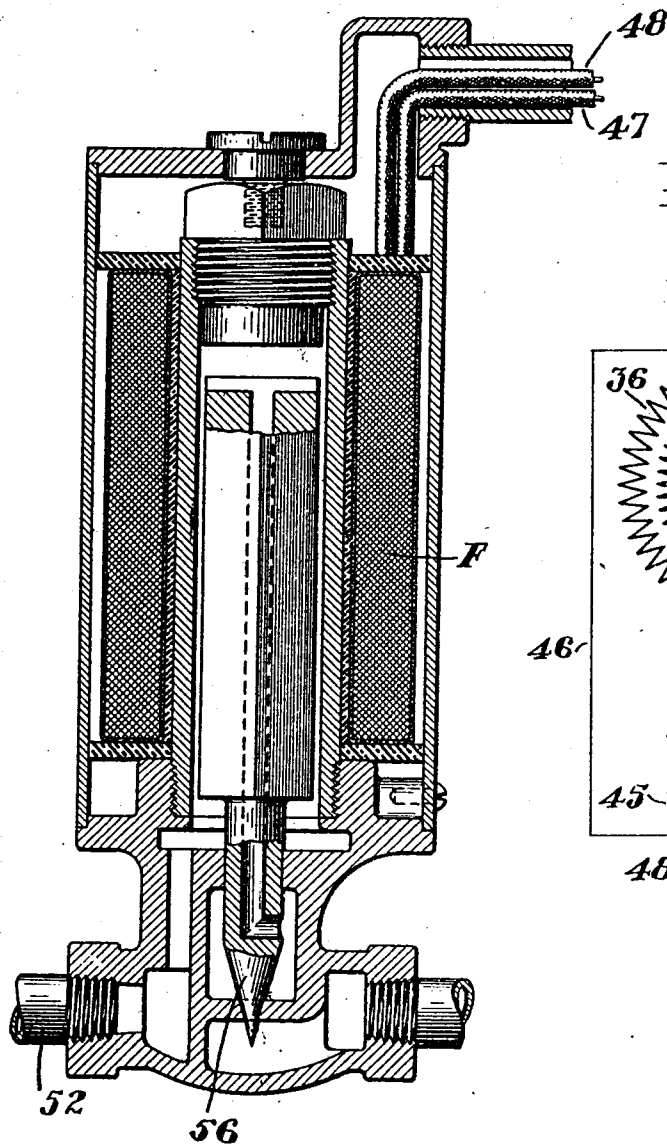
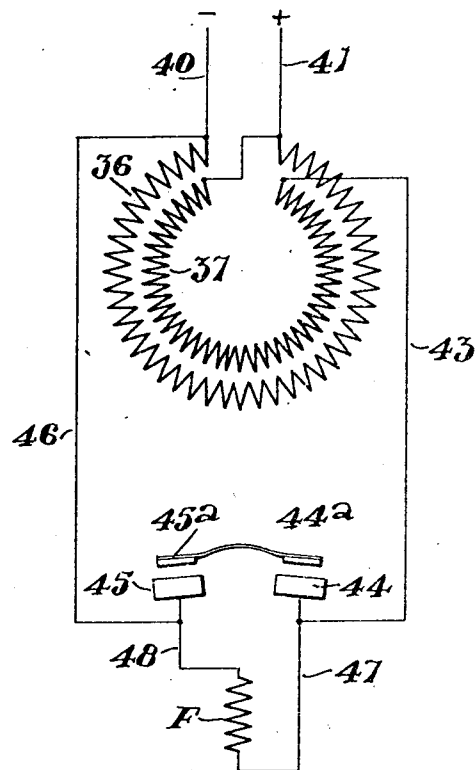


Fig. 4.



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UNITED STATES PATENT OFFICE.

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OIL-VALVE-ACTUATING MECHANISM FOR OIL BURNERS.

Application filed January 28, 1924. Serial No. 688,955.

To all whom it may concern:

Be it known that I, WILLIAM R. RAY, a citizen of the United States, residing at the city and county of San Francisco, and State of California, have invented new and useful Improvements in Oil-Valve-Actuating Mechanism for Oil Burners, of which the following is a specification.

This invention relates to oil burners of the electric-motor-driven type, and especially to an automatically actuated oil valve therefor, whereby the oil to the burner is turned on when the burner is started, and conversely shut off when the burner is stopped.

Where crude oil burners of the motor-driven type are employed and it is desired to manually or automatically start or stop the same from a distant point, for instance, by the closing of an electric switch, thermostatically or manually controlled, it is necessary to employ an oil valve which is automatically opened when the burner is started and conversely automatically closed when the burner is stopped.

Oil valves for the purpose just referred to are usually actuated by means of a solenoid or like magnet and are by no means new, but they are nevertheless far from satisfactory in actual use as they require a special and rather complicated switch mechanism when it is required that they be automatically operated.

Numerous switches are employed but are not satisfactory. Either the contact breaking points are liable to stick, arc and burn, or their operation cannot be depended upon, and with others mechanical defects encountered, the result is that the windings of the solenoid magnet are liable to overheat and the insulation to be burned, or the circuit will not be closed when required, thus making the operation of the valve anything but dependable.

In the burner disclosed in the present application a single phase alternating current motor is used for the purpose of operating the oil burner. The stator of this motor is provided with two sets of windings, one known as the main or running winding, and the other as the starting winding. The windings are connected in parallel and the current flows through both when the motor is first started. The circuit through the starting winding is, however, automatically broken when the motor reaches a predeter-

mined speed and this is accomplished by the use of a centrifugally-actuated switch mounted in the housing of the motor and driven by the rotor.

In actual practice it is found that the circuit through the starting winding remains closed for approximately two to five seconds and as it is not desirable to turn on the oil until the motor reaches approximately full speed, I have found that it is possible to connect the solenoid magnet of the oil valve with the starting winding and the centrifugal switch of the motor as a circuit thus obtained permits a certain lag, or in other words prevents energization of the solenoid and opening of the oil valve before the motor substantially reaches operating speed. This manner of connecting the solenoid magnet of the oil valve with the starting winding and the centrifugal switch of the motor entirely eliminates the use of separate switches such as previously referred to. It simplifies the entire installation and materially reduces the cost of the same.

The manner of connecting the winding of the solenoid magnet with the starting winding of the motor and the centrifugal switch actuating the same forms the subject matter of the present application and will be explained in more detail by referring to the accompanying specification and drawings, in which—

Fig. 1 is a front view of a hot water or steam boiler, showing the position of the burner with relation to the furnace, and also showing the position of the oil valve whereby the flow of oil to the burner is controlled.

Fig. 2 is a central vertical longitudinal section through the burner and the furnace box, said view also showing the electric motor whereby the burner is operated, and furthermore the centrifugal switch whereby the starting winding of the motor and the solenoid magnet of the oil valve are actuated.

Fig. 3 is an enlarged central vertical section of the oil valve.

Fig. 4 is a wiring diagram showing the circuits formed in the motor and also the circuits controlled by the centrifugally actuated switch.

Referring to the drawings in detail, and particularly to Figs. 1 and 2, A indicates a standard form of steam or hot water boiler, and 2 the base thereof in which the furnace

proper is located. B indicates the burner in general; C a fan or blower, and D an electric motor whereby the fan and the burner are operated.

The burner is of the rotary atomizing type and consists of a cup 3 secured on the outer end of a hollow or tubular shaft 4. This shaft is supported in anti-friction bearings as indicated at 5, and it does not only form a support for the atomizing cup 3, but also forms a support for a blower 6 and the rotor 7 of the motor D. The blower 6 is enclosed by a housing 8 and this housing is supported by hinges 9 formed on a front plate 10; this plate being attached to the furnace front or forming a part thereof. The fan housing also forms a support for an air nozzle 11 which surrounds the atomizing cup, and it furthermore forms a support for the anti-friction bearing 5 and the motor housing D. This motor housing is provided with a jacket in which is formed an annular passage 12 and oil is circulated through this passage, first, to cool the motor, and secondly, to heat the oil before it passes through the oil-controlling valve and is finally delivered to the atomizing cup 3.

The entire burning unit, to-wit, the fan housing, the bearing members 5 and the motor D, together with the air nozzle as previously stated, is supported by the hinges 9 on the front plate 10 of the furnace box, and as such may be readily swung to or away from the furnace for inspection, repair or otherwise.

The furnace box may be constructed in any manner desired as this feature does not form any part of the present invention; in fact, the entire burner structure shown in this application is disclosed in several patents previously issued to me (see for instance, Patent No. 1,253,422, dated January 15, 1918 and Patent No. 1,285,376, dated November 19, 1918) and the only reason for illustrating the same is to permit a clear description of the use and function of the oil valve and the mechanism actuating the same.

The burner installation shown in this instance is entirely automatic in operation. It is provided with means for maintaining a predetermined temperature in the room or rooms to be heated, the means employed being an adjustable thermostat such as indicated at 18. This thermostat is centrally located in the room to be heated and is connected with a thermostatic relay 19 which automatically controls the circuit through the motor. For instance, if it is desired to maintain a temperature of 72° F., it is only necessary to set the thermostat 18 to this temperature. The moment this temperature is reached, relay 19 is automatically actuated and the circuit through the motor is broken. Again, if the temperature drops

below 72° F., the relay 19 is again automatically actuated and the circuit through the motor is closed. The burner is for this reason more or less intermittent in operation and means must therefore be employed for automatically opening and closing the oil flow to the atomizing cup when the burner is started or stopped.

The oil valve employed is generally indicated at F. This oil valve, per se, forms the subject matter of a copending application entitled "Electro-magnetic valve," filed January 28, 1924, Serial No. 688,954, and the specific details and construction of the valve will therefore not be entered into. Suffice it to say, the valve consists of a casing which is provided with an inlet passage and an outlet passage, the inlet being connected with a source of fuel supply such as a tank G from which the oil is fed by gravity through the pipe 50. This pipe connects with the hinge structure which supports the blower, casing, electric motor, etc., and it passes through this hollow hinge structure. It then enters the jacket of the motor at the point indicated at 51 and circulates around and through said jacket, and then discharges through the pipe 52, which connects with the intake side of the oil valve housing shown in Fig. 3. The oil is permitted to freely pass through this valve if it is open, and it then enters a regulating valve 55 from where it finally enters a hollow pipe 53 which extends through the hollow shaft and terminates in a gooseneck 54 in the centrifugal atomizing cup 3. The oil thus delivered is discharged and atomized by centrifugal action and it is furthermore atomized by a blast of air delivered by the fan 6 and discharging through the nozzle 11.

The oil valve is provided with a valve stem, generally indicated at 56; this valve stem forming a part of the core or armature of the solenoid magnet generally indicated at F. When the magnet is energized the core, together with the valve stem 56, is elevated and oil flow through the valve casing is permitted, but if the circuit through the coil of the solenoid magnet is broken, the core becomes de-energized and it will drop, together with the valve stem, by gravity against the valve seat and thus prevent further flow of oil to the burner.

The operation of the burner is completely controlled by the thermostat 18 and the relay 19, and as the relay 19 really performs no other function besides that of making or breaking the circuit through the motor D, it can be seen that the form of relay employed may be fairly simple. Most burners of this type require a rather complicated relay or special switch as it is not only necessary to make or break the circuit through the motor, but it is also necessary to make and break the circuit through the oil valve and

in some instance also to make and break a circuit through a magnetically controlled gas pilot valve. Complication, as far as the relay 19 is concerned, is avoided in this instance as its only duty is that of making and breaking the circuit through the motor. I have previously stated that this motor is provided with a centrifugal switch and this is generally indicated at H in Fig. 2. The present invention consists in utilizing this switch for the purpose of automatically making and breaking the circuit through the solenoid magnet F and it is accomplished as follows:

Referring to Fig. 4, the wires 40 and 41 indicate the incoming wires from the relay 19, the wire 41 being the feed wire and the wire 40 the return. 36 indicates the main running winding of the motor and 37 the starting winding. One terminal of the starting winding is connected with the wire 41, while the other terminal of the starting winding is connected through a wire 43 with one of the stationary contacts 44 of the centrifugally actuated switch H. The other stationary contact indicated at 45 is connected through a wire 46 with the return wire 40 and a circuit through the starting winding is first closed when the movable contacts 44* and 45* are brought into engagement with the stationary contacts 44 and 45. The terminals of the running winding 36 are connected to the wires 40 and 41, respectively, and the circuit therethrough therefore remains closed as long as the motor is in operation. The circuit through the starting winding 37 will also remain closed in this instance, but the circuit through the winding F of the solenoid magnet which actuates the oil valve will not be closed before the motor reaches approximate working speed. This can be explained as follows:

If the circuit through the motor is closed by the relay 19, current will flow not only through the running winding 36, but it will also pass through the starting winding 37 and the contacts 44, 44*, 45 and 45* as the centrifugally actuated switch A is normally closed and it is not opened until the motor reaches a predetermined speed. No current will flow through the winding of the solenoid magnet F when the motor is first started as the switch H acts as a short between the contacts 44 and 45. The moment, however, that the motor reaches a predetermined speed, or approximately running speed, the centrifugal governor H operates and the switch actuated thereby is opened. The short connection between the contacts 44 and 45 is thus broken and the circuit will thus pass through the wires 47 and 48 which are connected with the opposite terminals of the magnet F; thus when the motor reaches running speed, the circuit will

not only pass through the main running winding 36 and the starting winding 37, but it will also be closed through the winding of the solenoid magnet F; these several circuits remaining closed until the circuit is again broken by the thermostat and the relay.

The important features gained by utilizing the switch H are: first, no oil is delivered to the atomizing cup of the burner until the motor approximately reaches running speed. This is due to the fact that the circuit through the magnet F is not established until the switch H opens; thus a time lag is produced which prevents opening of the oil valve and delivery of oil to the cup 3 before it has attained a speed sufficient to properly atomize the oil; second, it will be noted that as no circuit is established through the magnet F when the motor is first started, the motor is relieved of the extra load and all the current energy may be utilized to start the motor; third, by connecting the magnet F with the contacts 41 and 45 in the manner here shown, the tendency to arc when the switch is opened is materially reduced; fourth, by employing the switch H for the purpose of automatically opening and closing the circuit through the coil F of the solenoid magnet, which actuates the oil valve, it not only simplifies the entire installation and reduces the cost thereof, but it also entirely eliminates the use of special complicated switch mechanisms, reduces the cost of the relay, prevents sticking and arcing of the contacts, and furthermore prevents all mechanical complications and the liability of overheating the solenoid coils.

While certain features of the present invention are more or less specifically illustrated, I wish it understood that various changes in form and proportion may be resorted to within the scope of the appended claims. I similarly wish it understood that the materials and finish of the several parts employed may be such as the experience and judgment of the manufacturer may dictate or various uses may demand.

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

1. The combination with an electric motor driven liquid fuel burner, of a fuel delivering pipe connected therewith, a valve on the pipe, electrically operated means for opening and closing said valve, a common electric circuit for the motor and said electrically operated means, and means for automatically energizing said electrically operated means a predetermined time period after a circuit has been closed through the motor.

2. The combination with an electric motor driven liquid fuel burner, of a fuel delivering pipe connected therewith, a valve on the pipe, electrically operated means for

opening and closing said valve, a common electric circuit for the motor and said electrically operated means, and means for automatically energizing said electrically operated means when the motor has attained approximate running speed.

3. The combination with a burner of the character described and a single phase alternating current electric motor whereby it is operated, the stator of said motor including a starting winding and a centrifugally actuated switch, of a solenoid magnet connected in parallel with the switch, and an oil valve adapted to be opened and closed by the solenoid magnet.

4. The combination with a burner of the character described and a single phase alternating current electric motor whereby it is driven, the stator of said motor including a starting winding and a centrifugally actuated switch, said switch including a pair of stationary contacts and a pair of movable contacts, a magnet connected between the stationary contacts and adapted to be shorted when the movable contacts engage the stationary contacts, and an oil valve actuated by the magnet, said oil valve being

closed when the switch is closed and being opened when the switch is opened.

5. The combination with a burner of the character described and a single phase alternating current electric motor, whereby it is operated, the stator of said motor including a starting winding and a centrifugally actuated switch, whereby the circuit through the starting winding is automatically opened or closed, of a magnet connected in the circuit controlled by the switch, and an oil valve adapted to be opened and closed by the magnet.

6. The combination with a burner of the character described and a single phase alternating electric motor whereby it is operated, the stator of said motor including a starting winding and a centrifugally actuated switch whereby the circuit through the starting winding is automatically opened and closed, a magnet, an oil valve adapted to be opened and closed thereby, and an electric circuit for said magnet, also adapted to be opened and closed by the centrifugally actuated switch.

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