Jan. 17, 1950 R. B. PLASS 2,494,778

SHUTDOWN SYSTEM FOR OIL BURNERS

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Fig. 1.

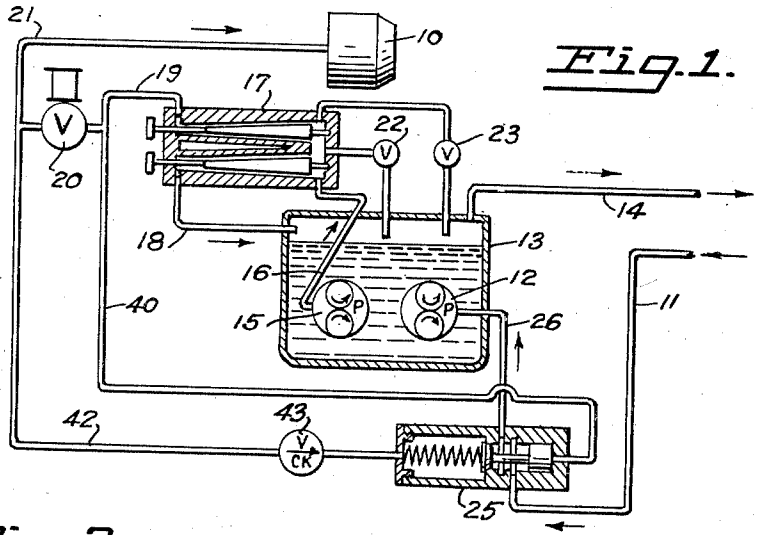


Fig. 2.

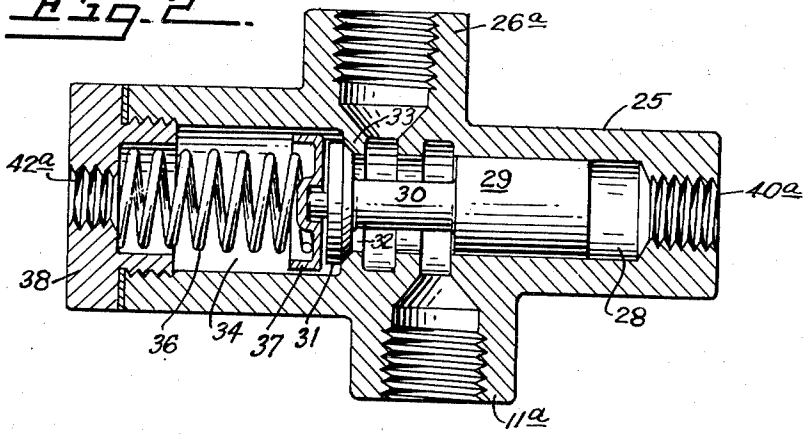
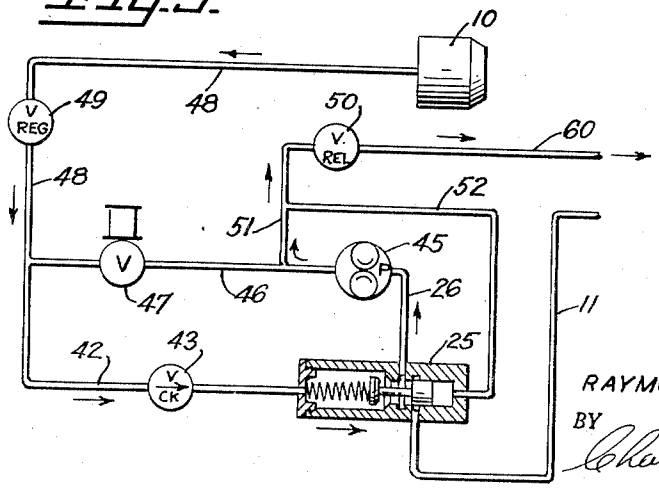


Fig. 3.



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SHUTDOWN SYSTEM FOR OIL BURNERS

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1 Claim. (Cl. 158—36.3)

1

This invention relates to oil burners of the type used in furnaces or the like wherein oil is pumped to a burner tip, mixed with air, and ignited. In oil burners of this kind, an oil shut-off valve is customarily positioned at some distance from the burner tip. When the burner is shut down, this valve is closed to discontinue the flow of oil to the burner tip. Oil, however, remains in the pipe which leads from the shut-off valve to the burner and also in the burner fuel tube which forms a continuation of said pipe and communicates with the burner tip.

This oil remaining in the pipe and fuel tube gives rise to certain undesirable results. For example, the oil may bleed or drip through the burner tip into the fire box of the furnace. In the fire box, it may burn or partially burn producing a gummy residue which fouls the nozzle and atomizing tube of the burner and prevents the burner from functioning properly. This is quite a common occurrence because after the furnace is shut down, the radiant heat from the fire box causes sufficient heating of oil standing in the adjacent pipe to cause it to expand and to be exuded through the burner tip. In some cases heavy or viscous oils have to be preheated before they will operate satisfactorily in a burner. If such oil is permitted to remain in the burner tube during a shut down it becomes cold and interferes with proper starting of the burner.

Another disadvantage of oil remaining in the pipe between the shut-off valve and the burner tip arises from the fact that air is supplied at or adjacent the burner tip by a blower driven by a motor which also drives the pump which delivers oil to the burner tip. Consequently, when the motor is energized, oil is instantly delivered through the burner tip but the blower requires a few seconds to obtain its normal operating speed. As a result, oil is fed into the fire box before an adequate supply of air is obtained, ignition is delayed, and when the fuel finally ignites, the excess of oil causes a flare-back or burst of flame which is undesirable.

It is therefore an object of the present invention to overcome the difficulties related above as well as other difficulties, and to provide an oil burner with means for automatically removing oil from the burner tube and oil pipe adjacent such tube whenever the burner is shut down. It

2

is also an object of the invention to provide means for forcibly withdrawing oil from a burner tube when a burner is shut down, and to provide means whereby the burner oil delivery pump will effect such forcible withdrawal of oil.

Still further objects and advantages of the invention are made apparent in the following specification in which reference is made to the accompanying drawings which illustrate one form which the invention may assume.

In the drawings:

Fig. 1 is a diagrammatic view illustrating an oil burner and supply means therefore embodying the present invention;

Fig. 2 is an enlarged sectional view illustrating the details of construction of a valve which forms a part of the burner system illustrated in Fig. 1; and

Fig. 3 is a view similar to Fig. 1 but illustrating the application of the present invention to a slightly different form of burner system.

Referring first to Fig. 1 of the drawings, an oil burner system is schematically disclosed as comprising a burner tip 10 adapted to be disposed within the fire box of a furnace or the like. Oil for the burner is supplied through a pipe 11 which communicates with a storage tank or a source of supply not shown, and from which oil is drawn by a pump 12 for delivery into a reservoir 13.

An overflow or return line 14 is customarily provided for the purpose of returning any excess of oil to the source of supply. A pump 15 which, like the pump 12, may be disposed within the reservoir, withdraws oil from the reservoir and delivers it through pipe 16 to a viscosity valve 17. This viscosity valve 17, the use of which is well known in the art and which may be of the kind disclosed in the patent to Neubauer No. 2,037,994, functions to direct a certain proportion of the oil delivered to it to the burner tip and to direct the remainder of the oil through a return line 18 to the reservoir 13.

The oil which passes through the burner tip flows through a pipe 19, shut-off valve 20 which may be of the magnetically actuated type and pipe 21 which communicates with the fuel tube of the burner. It is customary also to provide a regulating valve 22 by means of which

some of the oil in the viscosity valve may be relieved back to the reservoir 13 to regulate the size of the flame at the burner tip.

A relief valve 23 may also be provided in the event that excessive pressure is built up in the viscosity valve. The valves 22 and 23 are, however, conventional and do not form a part of the present invention.

In the operation of the system disclosed in Fig. 1, the pumps 12 and 15 are driven by a single motor, not shown, energized by a circuit which also includes the magnetic valve 20. Either the same motor or a separate one energized by the same circuit may be employed to operate a blower, not shown, which delivers air to the nozzle tip 10. The valve 20 is normally closed but when the circuit is closed to actuate the pumps this valve is opened by its electromagnet energized by the circuit in a conventional manner. Therefore, with the pumps 12 and 15 in operation, oil is drawn through the pipe 11, through a valve 25, the construction of which will presently be described, and through a pipe 26 communicating between the valve 25 and the pump 12. The oil thus delivered to the reservoir 13 is picked up by the pump 15 and delivered through pipe 16 through the viscosity valve 17, pipe 19, valve 20 and pipe 21 to the nozzle tip.

When the burner is shut down by opening the circuit to the motor which drives the pumps, the valve 20 returns to its normal closed position and, except for the present invention, the pipe 21 and fuel tube in burner tip 10 remain filled with oil which causes the difficulties hereinabove described. After the motor is de-energized, however, it coasts or continues to drive the pumps 12 and 15 for several revolutions and this coasting action of the pumps is employed to withdraw the oil from the pipe 21 and the burner tube. This is accomplished through the valve 25 which, as shown in Fig. 2, comprises a housing with a cylindrical chamber 28 in one end within which is reciprocably mounted a piston valve 29 having a stem 30 and a poppet valve 31 carried thereby. The poppet valve 31 normally closes a valve port 32 in a wall 33 which separates the cylinder 28 from a spring chamber 34 formed in the end of the valve housing 25 opposite to the cylindrical chamber 28. A spring 36 in the chamber 34 seats at one end against a seat member 37 which bears against the valve, and at its other end against a cap 38 which forms a closure for the spring chamber 34.

Under normal operating conditions, the spring 36 holds the poppet valve 31 closed so that oil flowing through pipe 11 which is connected with a threaded boss 11*a* on the valve 25 flows into and through the cylindrical chamber 28 passing out through pipe 26 which is connected with a threaded boss 26*a*. When the motor which energizes the pumps is de-energized the valve 20 closes and the pressure resulting from the continued or coasting action of the pumps is transmitted through a line 40 which communicates between the line 19 and the valve 25 and enters the valve through an inlet 40*a* communicating with the interior of the cylinder 28 at a point which causes the piston 29 to slide in opposition to the pressure of the spring 36. This movement of the piston 28, of course, effects opening of the poppet valve 31 and at the same time effects closing of the port in the cylinder with which the pipe 11 is connected. Consequently, the suction line 26 of the pump 12 is in communication through the open poppet valve 31 with the spring chamber 34 and a line 42 forms a communication between the spring chamber 34 and the pipe 21 which communicates with the nozzle tip 10. This line connects with the cap 38 of the spring chamber through the medium of a threaded port 42*a* therein. Consequently, the coasting action of the pump 12 serves to withdraw oil from the pipe 21, and the fuel tube of the burner tip 10 and to deliver such oil through the spring chamber 34, the open poppet valve 31 and back through the line 26 into the reservoir 13 so that whenever the burner is shut down by the energization of the motor which operates it, all oil is automatically evacuated from the line between the valve 20 and the burner tip. A conventional check valve 43 is preferably provided in the line 42 in order to prevent reversal of flow therein.

Fig. 3 shows the application of the present invention to a somewhat simpler type of burner system wherein the reservoir 13 is omitted and a single pump 45 delivers oil through a line 46, magnetic shut-off valve 47 and pipe 48 to the burner tip 10. In this system the viscosity valve 17 is also omitted and a conventional burner regulating valve 49 is employed in the pipe 48. A relief valve 50 is provided in the line 51 which communicates with the line 46 and a by-pass line 52 communicates between the line 51 and the piston end of the valve 25. The pump 45 normally withdraws oil from a source not shown through the pipe 11, valve 25 and pipe 26 which are identical with the correspondingly numbered parts in Fig. 1 as are the line 42 and check valve 43. Therefore, in this simplified system de-energization of the motor which is driving the pump 45 also permits the magnetic shut-off valve 47 to close. The coasting action of the pump then builds up pressure in the line 46 which is communicated through lines 51 and 52 to the valve 25 to urge the piston therein to the position illustrated in Fig. 3 where it closes the line 11 and effects opening of the poppet valve 31 which controls the line 42. Oil in the line 48 is then withdrawn and returned by the pump into the line 46 and any excessive pressure in the line 46 resulting from this action will be relieved through the relief valve 50 and returned through a line 60 to the source of supply.

In either of the systems shown in Fig. 1 or Fig. 3 when the pump comes to a stop the pressure in the line 40 (Fig. 1) or 52 (Fig. 3) drops and the spring 36 of the valve 25 returns the piston to its normal operating position.

I claim:

In an oil burner which includes a burner tip, motor driven pump means for directing oil from a source of supply to the tip, a conduit from the pump means to the tip, and a valve in said conduit arranged to be closed upon deenergization of the motor, a first fuel passage between the source of supply and the intake of the pump means, a second fuel passage between the burner tip and the intake of the pump means, a pressure actuated valve normally opening the first fuel passage and closing the second fuel passage and operable by pressure to close the first fuel passage and open the second one, a pressure line for communicating valve actuating pressure from said conduit at a point between the pump means and the first named valve to said pressure actuated valve, whereby upon deenergization of the motor the latter valve will be operated to open communication between the intake of the pump means and the burner tip and the coasting action of the pump will withdraw oil from the burner tip,

and means for discharging oil pumped during said coasting action toward the source of supply.

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