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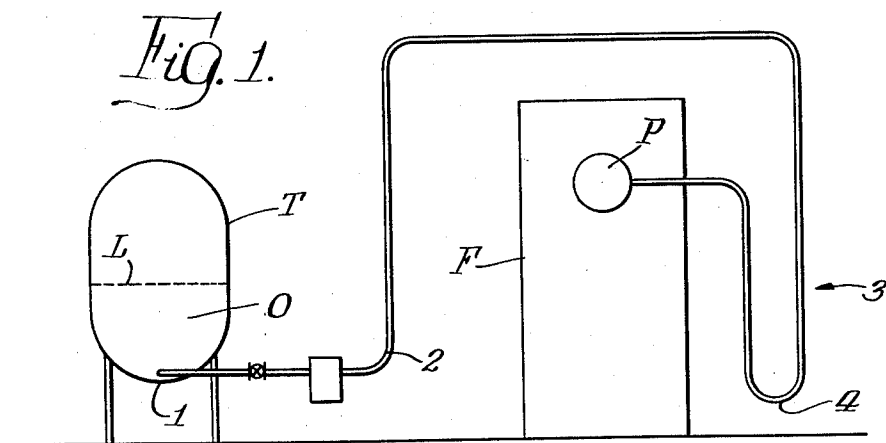
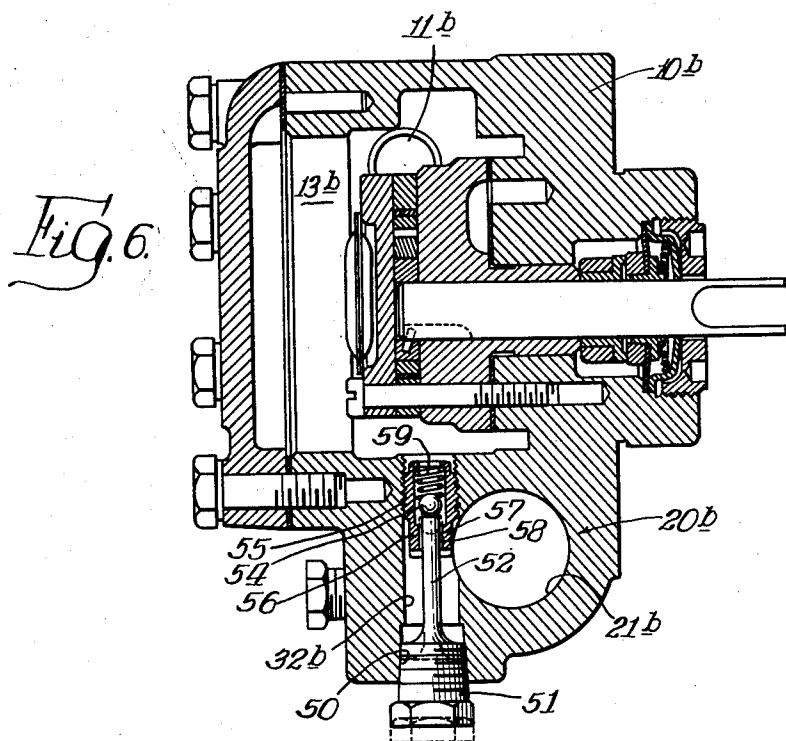
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2,915,015

AIR PURGING APPARATUS FOR PUMPS

Filed May 16, 1955

3 Sheets-Sheet 1



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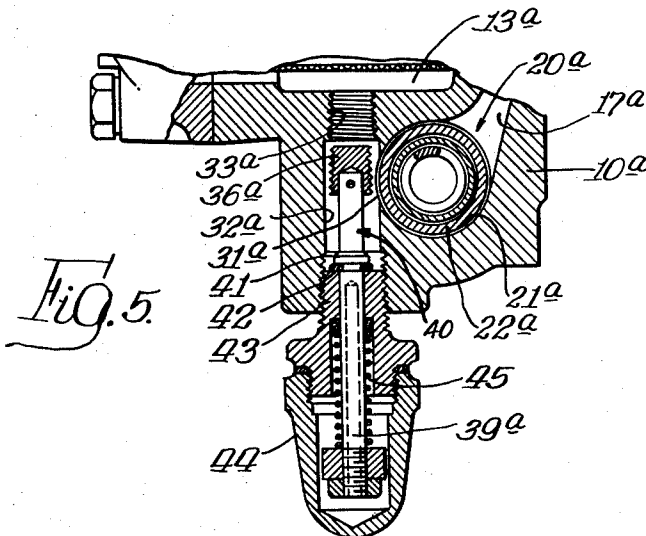
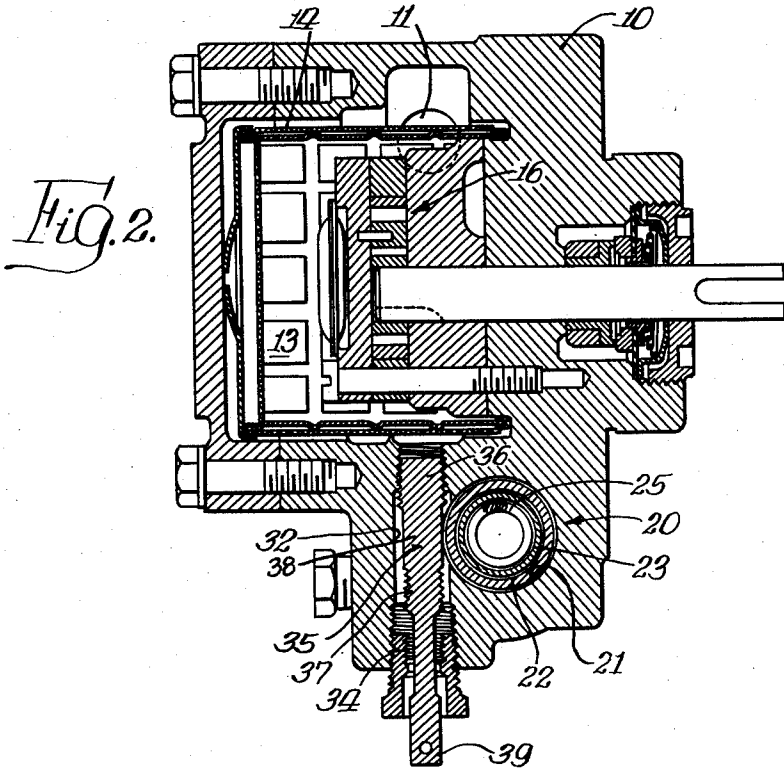
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AIR PURGING APPARATUS FOR PUMPS

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3 Sheets-Sheet 2



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2,915,015

AIR PURGING APPARATUS FOR PUMPS

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5 Claims. (Cl. 103—42)

This invention relates to an air purging apparatus for pumps and more particularly to apparatus for purging air from a single line pumping system.

It is the general object of the invention to produce a new and improved air purging apparatus for pumps.

It is a more specific object of the present invention to provide an oil burner pumping system with readily operable means for purging air from the system upon initial start-up of the pump.

Yet another object of the invention is to provide a system for purging air from a single line oil burner pumping system which includes a chamber into which a portion of the discharge of the pump is introduced and to provide means for opening said chamber to the atmosphere to purge air from the system and for closing said chamber and simultaneously connecting it to the intake port of the pump after the air has been purged.

Still another object of the invention is to provide an air purging means including a valving plunger constructed and arranged to be inserted in the return line port in a two line oil burner pumping system to convert such system to a single line and simultaneously provide a means for purging air.

Other and further objects of the invention will be readily apparent from the following description and drawings in which:

Figure 1 is a diagrammatic view of an oil burner system;

Figure 2 is a cross sectional view of an oil burner pump embodying the invention;

Fig. 3 is a diagrammatic view of the general pumping circuit showing the purging apparatus in purging position;

Fig. 4 is a view like Fig. 2 showing the purging apparatus in normal non purging position;

Fig. 5 is a cross sectional view of a modified form of the purging apparatus; and

Fig. 6 is a view like Fig. 2 of a further modification of the invention.

While this invention is susceptible of embodiments in many different forms, there is shown in the drawings and will herein be described in detail several embodiments, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated. The scope of the invention will be pointed out in the appended claims.

An oil burner fuel supply system is either of a one or two line installation. A "two line" type of installation comprises a supply line connecting the oil storage tank with the oil burner pump with the second line returning the excess oil to the tank. This type of installation contrasts with a "one line" installation where a single supply line connects the pump with the tank and where excess oil from the pump is returned to pump intake. While the one line system obviously requires less installation expense and has lower flow velocities (with resulting decrease in noise of operation), difficulty has been

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experienced on initial start-up of a single line system. This is particularly true where the oil line is not buried in the concrete of the basement floor, but rather is an overhead system where the line is merely secured to the joists of the basement ceiling.

According to the present invention, however, there is provided a simple apparatus for effectively purging the air from a single line oil burner installation even where an overhead supply line is used. The purging apparatus used may be incorporated and housed within the pump casing and may be manually moved from a first position opening the pump by-pass to the atmosphere for air purging to a second position closing the vent to atmosphere and directing by-passed oil to the pump intake.

Referring now to Fig. 1 of the drawings, there is shown an oil burner system, including an oil storage tank T adapted to contain a supply of fuel oil O, and provided adjacent its bottom 1 with a supply line 2 having a loop portion 3 adjacent to pump P, which is to be fed thereby. The pump is associated with an oil burner furnace F to supply oil thereto under pressure. Where the pump is above the liquid level in the tank, such as the case illustrated, the oil in the supply line 2 has a tendency to drain back into the tank T where a small leak in the pump exists. The existence of the loop portion 3, however, prevents such complete drainage or emptying of the supply line, inasmuch as the bottom 4 of the loop is horizontally below the bottom 1 of the tank, and thus siphon drainage can occur only in that portion of the supply line 2 which is between the pump P and the bottom portion 4 of the loop.

Referring now to Figs. 2, 3, and 4 of the drawings, it will be noted that the pump is provided with a pump housing 10, having an intake port 11 to which the supply line 2 is connected with the housing being provided with a burner port 12 adapted to be connected to the burner nozzle. Oil from the supply line 11 on entering the pump casing first passes into a reservoir 13 provided with a screen 14 for screening out foreign particles. From the reservoir the oil is directed into an intake passage 15 communicating with the intake of a crescent type gear pump 16. The pump discharges oil under pressure into a discharge passage 17 connecting with a pressure responsive valve 20 controlling the burner port.

The valve 20 is provided with a bore 21 having therein a fixed sleeve 22 in which a valve piston 23 is reciprocally mounted. The discharge passage 17 opens into a valve chamber 24 which communicates with the burner port 12 and such communication is controlled by the valve piston 23. A passage 24a leads from the chamber 24 to a gauge port adapted to receive a closure plug 24b or a gauge connection. A spring 25 constantly urges the piston 23 to a position closing the burner port and when the fluid pressure in the valve chamber 24 becomes sufficient to overcome the bias of the spring, the piston 23 is moved to a position opening the burner port whereupon oil may flow to the burner nozzle.

Increasing pressure generated by the pump 16 causes the piston 23 to move further in the sleeve to open a bypass system by-passing excess oil. Thus the sleeve 22 is provided with a plurality of passages 26 formed therein adjacent the valve chamber 24 and extending longitudinally of the sleeve with each of the passages 26 being open at one end to the valve chamber 24 and at the other end to the interior surface of the sleeve at a point spaced inwardly from the end thereof. An annular groove 27 is formed on the exterior surface of the side walls of the piston valve 23 and is adapted to establish communication between the passages 26 and three openings 28 extending through the sleeve. The openings 28 communicate with an annular groove 29 formed on the exterior surface of the sleeve 22 which opens to a return

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passage 30 terminating in a return port 31 opening to a chamber 32 in the casing 10. While movement of the piston valve in response to the build-up of a predetermined pressure within the chamber 24 serves to establish communication between the slots 26, groove 27 and openings 28 to return excess oil, it is clear that upon shutdown of the pump a short time would elapse while the pressure in the chamber 24 drops before the piston valve is moved by the spring 25 to a position closing off the burner port. Any delay in the closing off of the burner port after the pump has been shut off is not to be desired, and for this purpose means are provided for establishing a leakage path for high pressure oil, which is open at all times. Thus the piston valve is provided with a bleed slot 26a which constantly establishes communication between the passages 26, groove 27, and via the openings 28a into groove 29. Thus the piston valve may seat rapidly upon the shut-off of the pump, thereby effecting a rapid closure of the burner port.

At one end of the chamber 32 is an internally threaded by-pass port 33 which opens into the reservoir 13 and at the opposite end of the chamber 32 is an internally threaded purge port 34 opening to the atmosphere.

Many pumps are adapted to be used either in a single line system or a two line system and thus are provided with a chamber similar to the chamber 32 and ports similar to the ports 33 and 34. In a two line system a plug blocks the by-pass port 33 and a fuel line returning to tank is connected to the port 34. In a single line system the port 33 is left open and the port 34 blocked by a plug. The present invention may utilize such pre-existing structure (although it is obviously not limited to use therewith) for providing an effective air purging means without requiring complete pump redesign.

For this purpose there is provided a valving plunger 35 having at one end a threaded portion 36 adapted to mate with the threads of the by-pass port 33 and thus close that port. Spaced from the threaded portion 36 is a second threaded portion 37 adapted to mate with the threads on the purge port 34. An intermediate portion 38 separates the threaded portions 36 and 37 so that the distance between said threaded portions is less than the distance between the return port and the purge port. Forming an integral part of the valving plunger is an extension 39 arranged to extend exteriorly of the casing 10 so that the valving plunger 35 may be manipulated.

For purging air from the system thus far described, the valving plunger is manipulated to thread the portion 36 into the by-pass port 33. When the pump is started, air may flow freely through bleed slot 26a to groove 29, thence into the chamber 32 and thence into the atmosphere via the purge port 34. The threaded portion 37 being raised above the purge port permits free escape of entrapped air. When the air has been purged and oil is flowing through the pump, which fact will be evidenced by the flow of oil out of the purge port, the pump may be stopped, or while still operating, and the valving plunger rotated to unthread it from the return port and to engage the threads 37 with the threads of the purge port. The effect of such operation will be to close the purge port while opening the return port to the chamber 32 and henceforth the pump may operate in the single line system thus provided. The foregoing purging operation may be repeated as often as necessary.

A somewhat modified form of purging apparatus is shown in Fig. 5. This is similar in many respects to the apparatus just described and for the purpose of simplifying the explanation, parts which are similar to the first embodiment will be given similar reference numerals with the letter "a" added. In referring now to Fig. 5, there is shown the return port 31a opening into the chamber 32a provided with a by-pass port 33a to open into the pump reservoir. A valving plunger 40 is provided with a threaded portion 36a at one end adapted to mate with the internal threads of the by-pass port 33a. Spaced from the

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threaded portion 36a is a valve 41 adapted sealingly to engage a valve seat 42 provided on a sleeve member 43 fixed in the chamber 32a. The valving plunger is provided with an integral extension 39a extending exteriorly of the casing and adapted to be covered by a cap 44 when the valving plunger is not to be operated.

In the position shown in the drawing, the threaded portion 36a is free of the by-pass port and thus oil may flow through the chamber 32a and into the reservoir and thereafter to pump intake. When it is desired to effect purging, the cap 44 is removed and the valving plunger moved upwardly so that the threaded portion 36a may engage and be threaded into the by-pass port. In such position the seal 41 is unseated from its seat 42 and air may escape into the atmosphere via passages through the stem of the valving plunger. When purging has been completed, the seal is reseated on the seat and to ensure proper closure, it is urged thereagainst by a spring 45. The cap 44 may then be replaced over the extension of the plunger and the pump operated as a single line system.

A further modified form of the invention is shown in Fig. 6, where parts similar to those previously described have been given similar reference numerals with the suffix "b" added. Thus the pump includes a casing 10b and an inlet port 11b, with the outlet of the pump discharging into a valve bore 21b adapted to contain a pressure regulating valve 20b of the type previously described. Excess oil returned by the pressure regulating valve is directed into a chamber 32b formed in the casing and provided with means for purging air from the system.

For this purpose the casing is provided with a threaded port 50 opening from chamber 32b to atmosphere. The port 50 and the chamber 32b are adapted to receive a valving plunger which includes a portion of the form of a closure member or plug 51 externally threaded and shaped to close the port 50. The valving plunger also includes a relatively long stem portion 52 extending from the plug 51 longitudinally of the casing 32b and adapted, when the plug 51 is threaded fully into the port 50, to unseat a ball check valve 54. The upper end of the chamber 32b opens into the reservoir 13b and is provided with a hollow plug 55 having a neck portion 56 at its lower end, through which an opening 57 extends. The walls of the passage 57 are provided with a number of slots 58 to permit oil to flow through the neck portion 56 in spite of the presence of the stem 52 in the opening 57. The ball check valve 54 is biased by a spring 59 to a position closing the opening 57, and is lifted from its seat as previously described when the plug 51 is fully inserted in the port 50.

When it is desired to purge air from an oil burner system, including the pump of Fig. 6, the plug 51 is unthreaded and removed from the port 50. Such removal allows the spring 59 to seat the ball 54 on the upper end of the opening 57, thereby closing off communication between the chamber 32b and the reservoir 13b. When the pump is started with the air purging means in this condition, air is driven out of the port 50 until it has been completely eliminated as indicated by a flow of oil. When oil begins to flow, the plug 51 is reinserted in the port 50 and when this has been accomplished the stem 52 will have moved from the position indicated by dotted lines to the position indicated in solid lines, thereby unseating the ball valve 54 and permitting flow of return oil through the opening 57 and slots 58 from the chamber 32b to the reservoir 13b.

We claim:

1. In an oil burner fuel supply system including a pumping apparatus having a casing provided with a burner port, a pump in the casing, and a pressure operated valve responsive to pump discharge pressure to establish communication between the pump discharge and the burner port and a by-pass passage, said valve having bleed means constantly providing restricted communication between the pump discharge and said by-pass passage means for purging air from the system comprising a chamber in

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the casing, a by-pass port at one end of the chamber and communicating with the intake of the pump, an internally threaded purge port at the opposite end of the chamber and communicating with the atmosphere, a return port opening into the chamber intermediate said ends thereof and communicating with the by-pass passage, a ball check valve controlling said by-pass passage, a spring biasing said check valve to closed position, and a valving plunger movable in the chamber and having a first portion adapted to contact and open the check valve and a second portion threaded to mate with the threads of the purge port, said portions being spaced apart a distance greater than the distance between the purge port and the check valve, whereby when the plunger is moved to a first position and the first portion is moved out of opening contact with the check valve, the threads on the second portion are disengaged from the purge port to open the chamber to the atmosphere and when the plunger is moved to a second position and the second portion is threaded into the purge port, the first portion is moved into opening contact with the check valve to establish communication between the chamber and the pump intake.

2. In an oil burner fuel supply system including a pumping apparatus having a casing provided with an outlet port, a pump in the casing, and a pressure operated valve responsive to pump discharge pressure to establish communication between the pump discharge and the outlet port and a by-pass passage, said valve having bleed means constantly providing restricted communication between the pump discharge and said by-pass passage, means for purging air from the system comprising a chamber in the casing, a by-pass port at one end of the chamber and communicating with the intake of the pump, a purge port at the opposite end of the chamber and communicating with the atmosphere, a return port opening into the chamber intermediate said ends thereof and communicating with the by-pass passage, a check valve biased toward a position to close said by-pass port, and a valving plunger movable in the chamber and having a first portion adapted to contact and open the check valve and a second portion formed to close the purge port, said portions being spaced apart on said plunger so that when the plunger is moved to a first position and the second portion is disengaged from the purge port to open the chamber to the atmosphere, the first portion is moved out of opening contact with the check valve, and when the plunger is moved to a second position and the second portion is positioned to close the purge port, the first portion is moved into opening contact with the check valve to establish communication between the chamber and the pump intake.

3. In an oil burner fuel supply system including a pumping apparatus having a casing provided with a burner port, a pump in the casing, and a pressure operated valve responsive to the pump discharge pressure to establish communication between the pump discharge and the burner port and a by-pass passage, said valve having bleed means constantly providing restricted communication between the pump discharge and said by-pass passage, means for purging air from the system comprising a chamber in the casing, a by-pass port at one end of the chamber and communicating with the intake of the pump, an internally threaded purge port at the opposite end of the chamber and communicating with the atmosphere, a return port opening into the

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chamber intermediate said ends thereof and communicating with the by-pass passage, a check valve controlling said by-pass port, a spring biasing said check valve toward closed position, and a purge port closure member having a portion threaded to mate with the threads of the purge port, whereby the closure member may be threaded out of the purge port to open the purge port and permit closure of the by-pass port by said spring urged check valve and whereby the closure member may be threaded into the purge port to close the purge port.

4. In an oil burner fuel supply system, valve apparatus for purging air from the system, comprising, a casing having a chamber therein, a by-pass port at one end of the chamber, an internally threaded purge port at the opposite end of the chamber communicating with atmosphere, an inlet port opening into the chamber intermediate said ends thereof, a ball check valve controlling said by-pass port, a spring biasing said check valve to closed position, and a valving plunger movable in the chamber and having a first portion adapted to contact and open the check valve and a second portion threaded to mate with the threads of the purge port, said portions being spaced apart a distance greater than the distance between the purge port and the check valve, whereby when the plunger is moved to a first position and the first portion is moved out of opening contact with the check valve, the threads on the second portion are disengaged from the purge port to open the chamber to atmosphere, and when the plunger is moved to a second position and the second portion is threaded into the purge port the first portion is moved into opening contact with the check valve.

5. In a fuel supply system, means for purging air from the system, comprising, a casing having a chamber therein, a by-pass port leading from the chamber, a purge port leading from the chamber to atmosphere, an inlet opening into the chamber, a check valve biased toward a position to close said by-pass port, and a valving plunger movable in the chamber and having a first portion adapted to contact and open the check valve and a second portion formed to close the purge port, said portions being spaced apart on said plunger so that when the plunger is moved to a first position and the second portion is disengaged from the purge port to open the chamber to the atmosphere, the first portion is moved out of opening contact with the check valve, and when the plunger is moved to a second position and the second portion is positioned to close the purge port, the first portion is moved into opening contact with the check valve.

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