Feb. 14, 1939. E. C. BALLMAN 2,146,706

LIQUID FUEL BURNING SYSTEM

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Fig. 1.

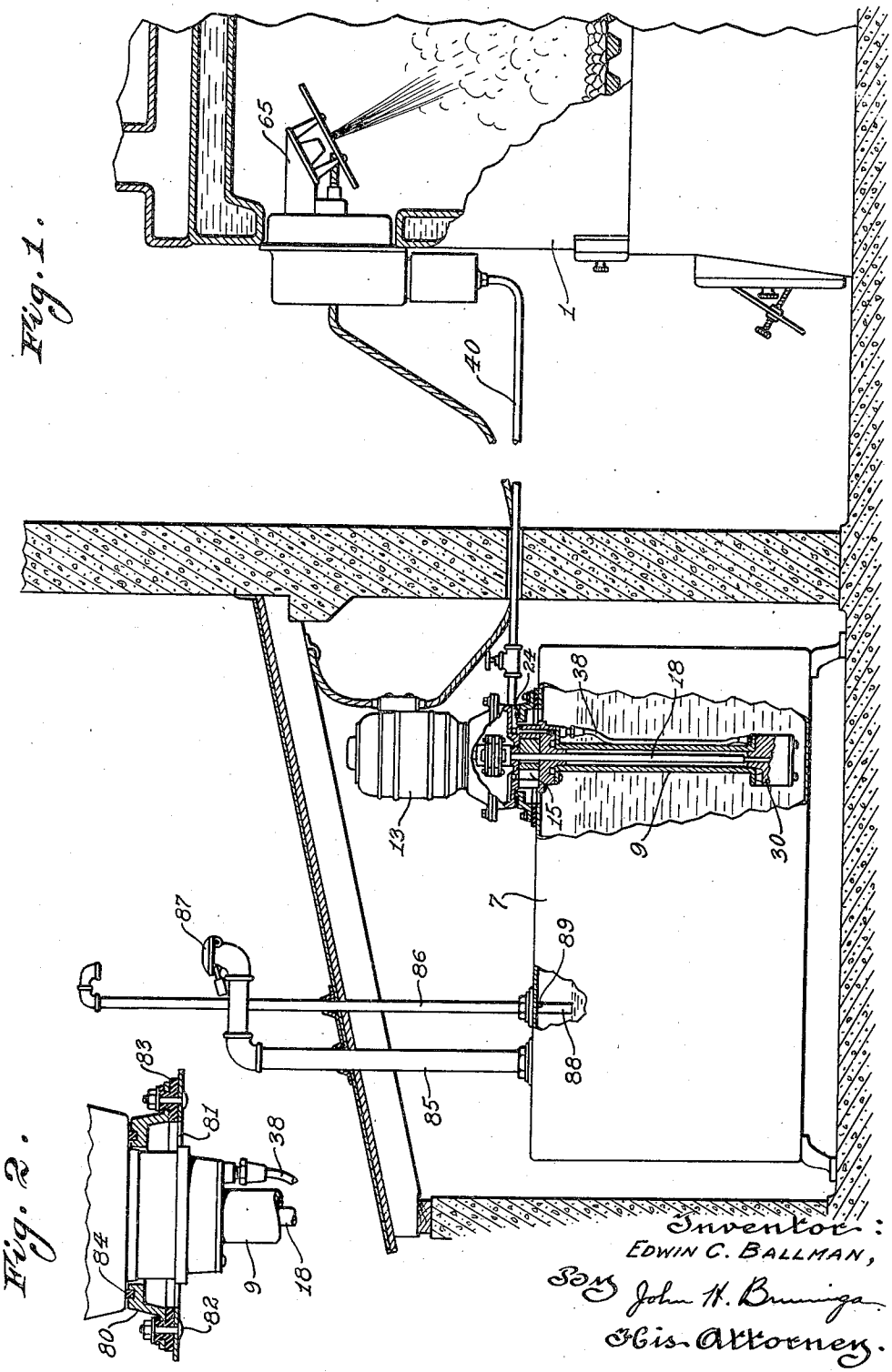

Fig. 2.

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LIQUID FUEL BURNING SYSTEM

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Application May 5, 1934, Serial No. 724,072

1 Claim. (Cl. 158—36.3)

This invention pertains to a system for burning liquid fuel, such as oil.

One of the objects of this invention is to provide such a system in which the fire hazard, due to leakage of oil, is reduced to a minimum.

Another object is to provide a system wherein the fuel handling apparatus is of simple and compact construction and protected against leakage.

Further objects will appear from the following description taken in connection with the accompanying drawing, in which:—

Figure 1 is a sectional view of a portion of a building showing the installation of a fuel burner system embodying this invention;

Figure 2 is a detail of Figure 1 illustrating the manner of mounting the fuel pump.

One of the most serious problems in the installation of oil burner systems has been to properly protect the installation against fire hazard, due to leakage of oil, particularly from handling devices, such as pumps. Every moving element which comes in contact with the fuel oil must be carefully packed to prevent leakage, and it is practically impossible to provide a packing which will operate for an extended period without developing leakage. It has, therefore, always been a hazard in the past, due to the fact that pumps and the like develop leaks, that the leakage oil finds its way to the floor of the furnace room where, of course, it is always subject to accidental ignition and consequent result of fire.

The system of burning fuel involved in the present invention is also described in my copending application, Serial No. 724,071, filed of even date herewith, to which reference may be had for further details, particularly of the burner nozzle.

In accordance with the present invention a furnace 1, of ordinary construction may be provided having an oil burning device provided with a nozzle 65 by which the oil flame is developed within the furnace. A fuel supply tank 7 is provided. This is preferably of sufficient capacity to operate the burner for an extended length of time, such as several weeks, so that the necessity for replenishing the tank 7 does not occur at too frequent intervals. The tank 7 is preferably housed in a room, or compartment, separate from the furnace room, although this is not absolutely essential and the tank may be in the furnace room. It should, however, be spaced from the furnace ten feet, or more, for reasons of safety. Mounted in the fuel tank 7 and supported thereon is a structure 9 including at its lower end a fuel pump 30 submerged in the liquid in the tank, and at its upper end an air pump 15. Both of these pumps are connected to a drive shaft 18 driven by a pump motor 13. The upper end of the structure 9 is carried by a flange or bracket 80 which in turn is mounted on the tank 7, the structure 9 extending downwardly through a suitable opening 81 in the tank. The bracket 80 is secured in place by fasteners 82, resilient sound insulating means, such as a soft rubber flange 83 being interposed so as to prevent the transmission of vibrations from the motor to the tank. The tank being hollow and at times partly empty may form a sounding drum so that any noise vibrations transmitted thereto might be amplified sufficiently to become objectionable. A rubber gasket 84 may also be interposed where the structure 9 rests upon the bracket 80. It will be noted from Figure 2 that the entire structure 9, including the pump 15, is suspended within the interior of the flange 80 which communicates with the opening 81. Accordingly, any leakage of fuel from any part of said structure may drain directly into the tank 7.

The air pump 15 has its intake by a suitable duct, not shown, opening to the atmosphere above the bracket 80, and its discharge by a duct 24.

The discharge of the oil pump 30 is by way of a pipe 38 which enters the discharge duct 24 of the air pump 15. Accordingly, a mixture of fuel and air is discharged from the latter duct. Connected to the duct 24 is the pipe or conduit 40 which leads the mixture to the burner 65 in the furnace. The duct 40 is preferably arranged so that its approach to the burner is a rising one so that the mixture flows upwardly to the burner. This has the advantage that when operation is interrupted any fuel remaining in the duct will drain backwardly down this rising portion of the conduit 40 instead of dripping out of the end of the burner nozzle. As the quantity of liquid contained in the duct 40 at any particular time is relatively small, there is ample capacity to collect such residual fuel at a low spot of the pipe. The pipe may even be given a dip at some point near the burner for this purpose. This avoids drippage into the furnace after operation ceases. The accumulation of oil in the conduit 40 is blown out again as soon as operation is resumed, at which time the oil is ignited and any raw oil blown into the furnace will be burned and thus disposed of.

It will be noted that by placing both pumps providing fuel and air at the fuel tank 7 and mounting the same in such a manner that any

leakage therefrom must flow back into the tank, via the opening 81, all hazard from leakage at these parts is eliminated. The only oil bearing conduit which traverses the furnace room is the conduit 40 and this carries relatively little oil, and air to drive it along the conduit. This conduit may be made in a continuous run for practically any convenient distance and its joints may be permanently set up as there is no occasion for altering them. Accordingly, a thoroughly leak-proof construction may be provided, and thus the fire hazard, due to leakage, is practically entirely eliminated.

Another difficulty often encountered with a system of this kind is due to carelessness on the part of the operator when replenishing the tank 7. The tank is ordinarily provided with a filling conduit 85 and a vent tube 86. It is expected that as the fuel is filled in at the tube 85 air will be exhausted through the tube 86. It happens occasionally, however, that the operator runs the fuel into the pipe 85 at an excessive rate. At the same time he is careless in watching to see when the tank is filled. Accordingly, the tank becomes completely filled and the liquid rises in the pipe 85 clear up to the filling inlet 87. At this point, of course, it becomes evident to the operator and the flow is cut off, not however until some oil has been spilled. Furthermore, the pipe 85 is filled to a level above the tank outlet and a head of liquid is provided which will, if there are leaks, force the oil out of the tank and possibly into the basement or furnace room.

In order to remedy this condition, this invention provides that the vent pipe 86 be extended as indicated at 88 a predetermined distance below the top of the tank 7, such as to provide above this level a tank capacity equal to, or greater than, the capacity of the pipes 85 and 86 up to the level of their upper ends. A very small vent opening 89 is made in the pipe 86 within the tank 7 and near the top thereof. This device operates as follows: When a careless operator fills liquid into the pipe 85 at an excessive rate, the tank 7 becomes filled to the level of the lower end of the extension 88. At this point the vent pipe becomes sealed at its lower end by the liquid so that no more air may exhaust at this point. The vent 89 is still open, but is too small to exhaust air at the rate required. Accordingly, air is entrapped in the top of the tank 7 which forces liquid to rise in both pipes 85 and 86. This liquid seals off the opening 89 against the rapid escape of air and the liquid continues to rise in the vent pipe 86 and also in 85, whose upper end should be within view of the operator. When the liquid finally reaches the top of the fill pipe and begins to discharge therefrom, it will be noticed and the filling will be discontinued. The air entrapped in the upper portion of the tank 7 now begins to exhaust through the opening 89 and the pipe 86. As the air escapes, the liquid level in the pipes 85 and 86 falls. This liquid is received in the tank which is provided with sufficient capacity to hold it. Eventually all the liquid is drawn out of the pipes 85 and 86 and the vent opening 89 is eventually opened to the atmosphere so that fuel may be drawn out of the tank and air passed into it at this opening.

It will be seen that the arrangement automatically protects the tank against the consequence of careless operation on the part of the one replenishing it, and against danger of leakage on account of the excessive head of oil is eliminated.

While this invention has been described as embodied in a complete unitary system, it will be understood that individual features or subcombinations thereof may be useful by themselves without reference to the other features, or the complete combination, and it is understood that the employment of such individual features and subcombinations is contemplated by this invention and within the scope of the appended claim. It is obvious that various changes may be made, within the scope of the appended claim, in the details of construction without departing from the spirit of this invention; it is to be understood, therefore, that this invention is not limited to the specific details shown and/or described.

Having thus described the invention what is claimed is:

In a liquid-fuel burning system of the character described having a furnace provided with a fuel burner, a main fuel-supply tank, a fuel pump submerged in said tank, an air blower positioned over the liquid in said tank, and having an outlet duct, means connecting the discharge port of said fuel pump to said outlet duct of said air blower, and means for mounting said air blower providing drainage means leading into said tank.

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