March 23, 1926. 1,577,622

R. M. GASTON

LIQUID FUEL BURNER

Filed Jan. 2, 1924 2 Sheets-Sheet 1

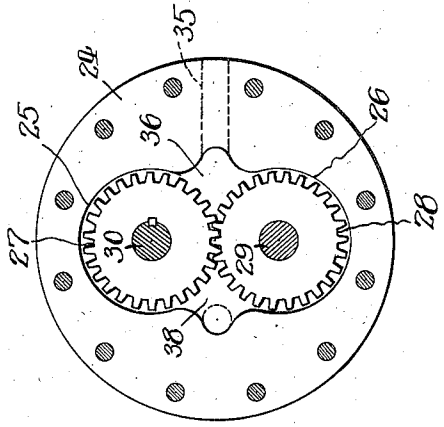


Fig. 3.

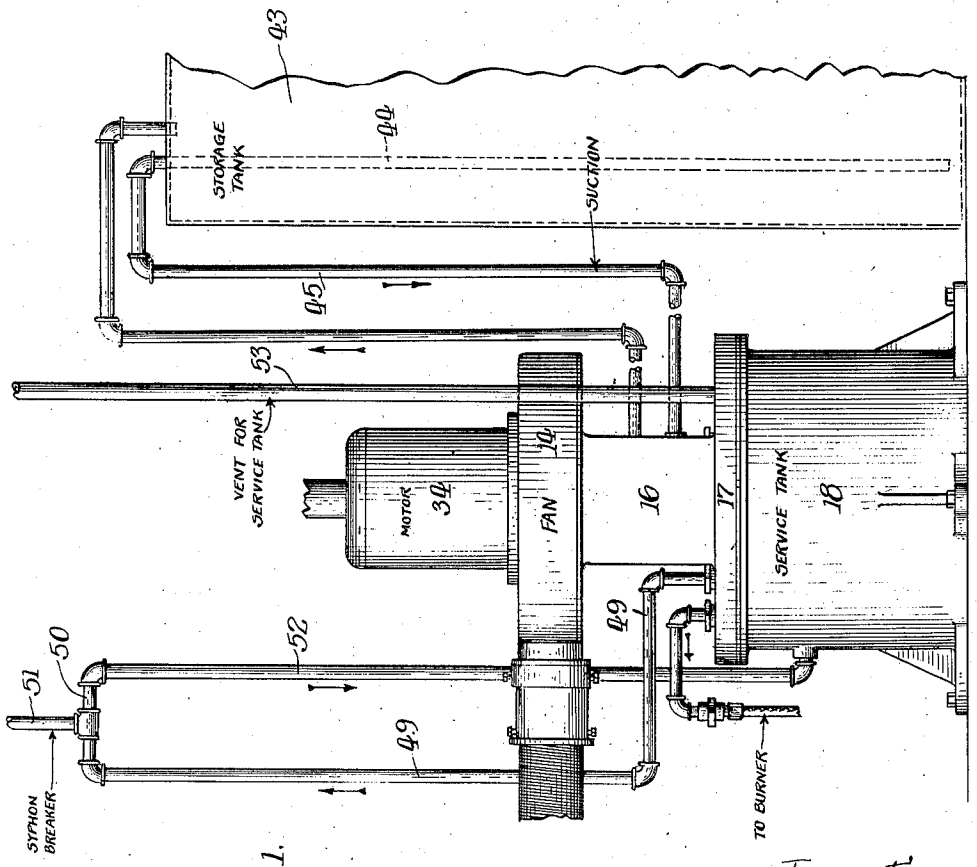


Fig. 1.

Witness:
A. J. Sauser.

Inventor
Ralph M. Gaston,
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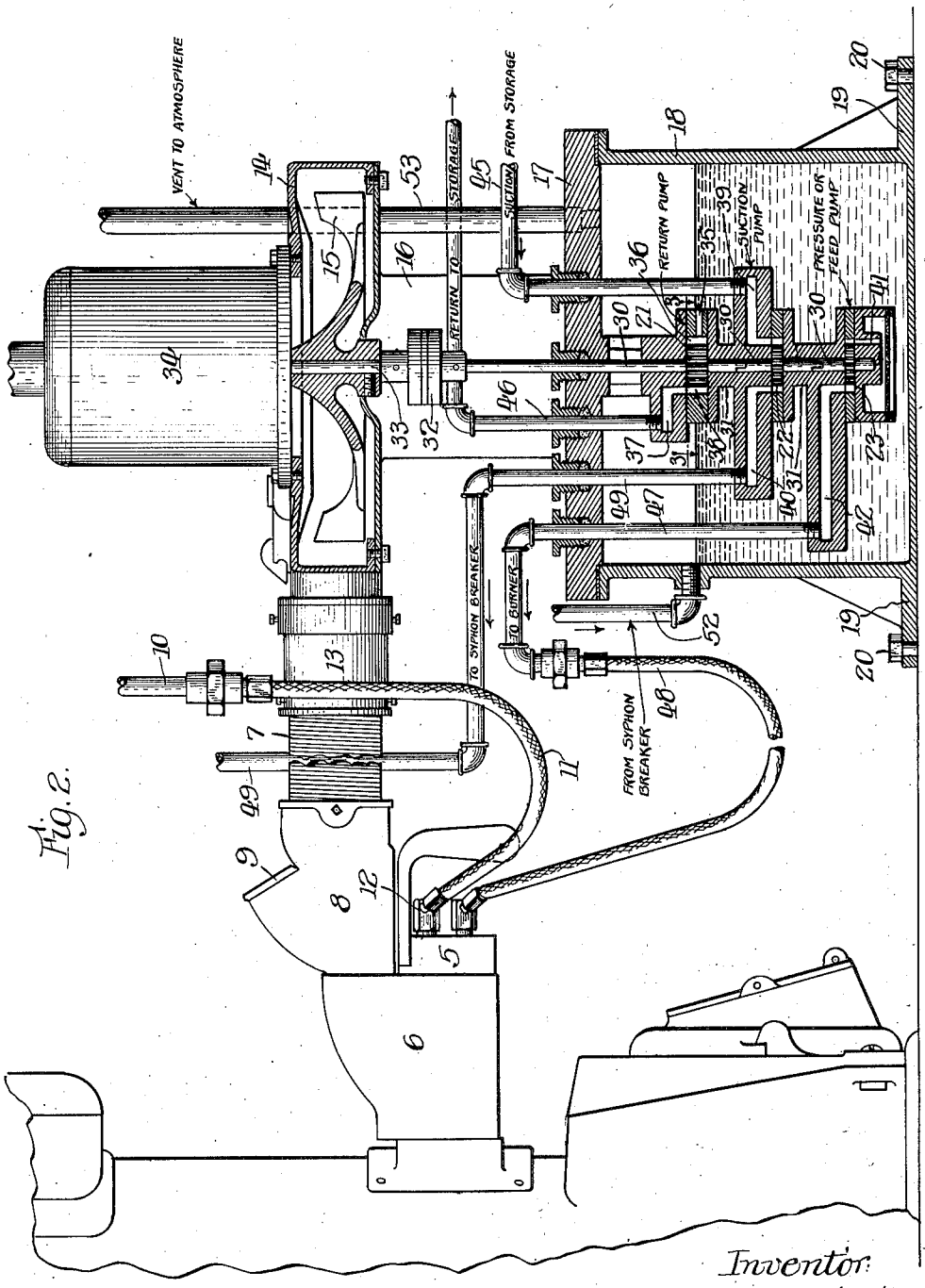


Fig. 2.

Witness:
C. J. Sauser.

Inventor:
Ralph M. Gaston,
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Patented Mar. 23, 1926. 1,577,622

UNITED STATES PATENT OFFICE.

RALPH M. GASTON, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO WAYNE TANK & PUMP COMPANY, OF FORT WAYNE, INDIANA, A CORPORATION OF INDIANA.

LIQUID-FUEL BURNER.

Application filed January 2, 1924. Serial No. 683,856.

To all whom it may concern:

Be it known that I, RALPH M. GASTON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Liquid-Fuel Burners, of which the following is a specification.

This invention relates to liquid fuel burners of the spray type employed in connection with boilers and furnaces for heating purposes, in lieu of solid fuel, and has reference more particularly to that type of burner wherein the fuel is forced to and through the burner nozzle by mechanical means, such as a pump.

The main purpose or object of the present invention is to provide a safe and reliable system of fuel supply for liquid fuel burners regardless of the location of the storage tank, and one which will permit the liquid fuel to drain away from the burner when the fuel and air forcing mechanism is idle.

In an earlier application filed by me on the 20th day of April, 1923, Serial No. 633,395, I have disclosed and claimed a mechanism for supplying oil and air under pressure to a burner nozzle, including a rotary pump of the gear type submerged in the fuel oil contained in a service tank, a fan or blower directly mounted on said tank for supplying air to the burner nozzle, and an electric motor superposed on the fan casing and directly driving both the fan and the pump, with a gravity flow from the fuel storage tank to the fuel service tank.

My present invention is in the nature of an improvement upon the apparatus of the aforesaid application, and embodies, in addition to the pressure pump shown therein for forcing oil from the service tank to the burner, a suction pump for drawing oil from the storage tank to the service tank, and preferably also a third or return pump for returning to the storage tank any surplus of oil in the service tank, and thereby maintain a substantially constant level of the oil in the latter. My present invention also includes in the line from the suction pump to the service tank a siphon-breaker including a vent which is located at a point higher than the top of the storage tank to prevent siphon flow from the latter to the service tank when the suction pump is idle.

My present improvements, the objects attained and purposes served thereby, and the advantages inherent therein will be readily understood by persons familiar with this art from the following detailed description, taken in connection with the accompanying drawings in which I have illustrated one practical embodiment of the principle of the invention, and wherein—

Fig. 1 is an elevation of the storage and service tanks with the fan and motor mounted on the latter and a diagrammatic showing of the various pipe connections between said tanks and from the service tank to the burner, including the siphon-breaker;

Fig. 2 is a similar side elevation, partly in vertical section through the service tank, its contained pumps, and fan, with the storage tank omitted, and the burner and front portion of the furnace served thereby in side elevation; and

Fig. 3 is a horizontal section through one of the rotary pumps (which are all alike) on the line 3—3 of Fig. 2.

Referring to the drawings, 5 designates as an entirety the burner nozzle, the specific details of which are not herein shown as they constitute no part of the present invention; and 6 designates a mixing chamber in advance of the burner nozzle that is supplied with air through an air tube 7 and coupling 8, on the upper side of which latter is a window 9 through which the performance of the burner can be observed. 10 designates a gas pipe and 11 a hose connected thereto for supplying gas to a pilot gas burner 12. The rear end of the air tube 7 connects, through a coupling 13 with the tangential discharge nozzle of the casing 14 of a horizontal high speed rotary fan 15. The fan casing 14 is mounted through suitable supports 16 on a plate 17 that constitutes the head or closure of an upright service tank 18; this latter having a base flange 19 adapted to be secured to the floor or other suitable support by screw bolts 20.

Rigidly suspended within the tank 18 from the cap or cover 17 thereof is a series of three relatively superposed pumps, the uppermost of which is designated as an entirety by 21, the intermediate by 22, and

the lowermost by 23. Each of these pumps (which are all alike) is of the well-known gear type comprising, generally stated, a casing 24 (Fig. 3) containing a pair of communicating circular chambers 25 and 26 in which are mounted the intermeshing pump gears 27 and 28. The gear 28 is journaled on a vertical bearing 29, while the gear 27 is keyed to a vertical shaft section 30 constituting part of the common drive shaft of the several pumps, the shaft sections 30 of the intermediate and lower pumps being coupled to the corresponding sections of the upper and intermediate pumps by tongue and slot joints 31, indicated in Fig. 2, and the shaft section 30 of the upper pump 21 extending upwardly through a stuffing box in the cover 17 and at its upper end being united through a flexible coupling 32 to the lower end of the fan shaft 33, this latter being connected to the armature shaft of an electric motor conventionally shown at 34, which motor is mounted directly on the fan casing 14.

In the casing of the upper pump 21 is an inflow duct 35 that leads to an inflow chamber 36 (Fig. 3) on one side of the pump gears, and on the opposite side of the casing is a cored duct 37 that communicates at its lower end with a discharge chamber 38 on the opposite side of the pump gears. In the intermediate pump 22 are inflow and outflow ducts 39 and 40 respectively that communicate with similar inflow and outflow chambers on opposite sides of the gears of said pump; and in the lower pump 23 are inflow and outflow ducts 41 and 42 respectively that communicate with similar inflow and outflow chambers on opposite sides of the gears of said pump.

In Fig. 1 is conventionally shown a storage tank 43 which is preferably of considerable size and capacity and is connected to the suction and return pumps 22 and 21 by pipe lines as follows. 44 designates a pipe extending through the top of the storage tank 43 downwardly nearly to the bottom thereof and communicating at its upper end with a line pipe 45 which, as shown in Fig. 2, leads into the intake duct 39 of the intermediate or suction pump. 46 designates a pipe line leading from the discharge duct 37 of the uppermost or return pump into the top of the storage tank 43.

47 designates an oil delivery pipe that leads from the discharge duct 42 of the lowermost or pressure pump up through the cover 17 and communicates with a hose 48 leading to the burner nozzle 5. 49 is a pipe which leads from the delivery duct 40 of the intermediate or suction pump through the cover 17 and thence upwardly to a point higher than the top of the storage tank 43, where it communicates with a horizontal pipe 50 in which is a vent pipe 51 to the atmosphere. From the other end of the pipe 50 a pipe 52 leads back into the side of the service tank 18.

The service tank 18 is vented to the outside atmosphere through a pipe 53 mounted in the cover plate 17 so that the service tank is never under pressure and vapors therefrom cannot enter the furnace room.

In the operation of the system, when the motor is started, the fan 15 and the three pumps 21, 22 and 23 are simultaneously started in operation. The pump 22 continuously draws fuel from the storage tank through the pipes 44 and 45 and delivers it to the service tank through the pipes 49, 50 and 52. At the same time the pump 23 draws oil from the service tank and forces it to the burner through the pipe 47 and hose 48. If the oil is supplied to the service tank by the pump 22 at a faster rate than it is delivered to the burner by the pump 23, as soon as the oil rises in the service tank to the level of the intake 35 of the return pump 21, the latter returns such surplus oil to the storage tank through the pipe 46, thus maintaining a substantially constant level of the oil in the service tank at the height indicated in Fig. 2. The burner nozzle being higher than the return pump 21, when the machine stops, the oil in the burner supply pipe and hose automatically drains back into the service tank. Also, the oil in the pipes 49, 50 and 52 on the delivery side of the suction pump 22 drains back into the service tank without siphoning over any oil from the storage tank by reason of the presence of the siphon-breaker 51. The vent pipe 53 of the service tank 18 is extended to a point outside the furnace room and preferably to the external atmosphere to prevent the escape of fumes into the latter. The described arrangement permits the use of a comparatively large suction or circulating pump 22 with reliable action even if the burner demands are small, since any excess is returned to the storage tank by the return pump 21. It will also be noted that all of the pumps are submerged in the oil, thus insuring ample lubrication, the sealing of any leaks, and reliable operation at all times. Moreover all the pumps are self-priming, since incidental leaks through the bearings will seal the joints perfectly. Again, the suction pump will operate at maximum efficiency, permitting high lifts when the storage tank may be located at a lower level than the pump. Of course, the siphon-breaker shown and described is required only when the oil in the storage tank is at a higher level than the pump unit. The invention provides a safe and convenient supply and oil distribution system, and is not dependent on the uncertain action of any valve or valves for its safe operation. It is compact and may be made of any size de-

sired without altering the general arrangement. To insure proper operation at all times, the suction pump 22 should have a greater capacity than the feed pump 23, thus preventing the possibility of using the fuel in the service tank faster than it is supplied from the storage tank; and to prevent the possibility of overflow from the service tank, the return pump 21 should have a greater capacity than the suction pump 22. The relative capacities of the three pumps are indicated in Fig. 2 by corresponding sizes and working capacities of pump gears. It will be observed that the intake of the excess return pump 21 is at a higher level than both the suction pump 22 and the burner supply pump 23, so that the pumps 22 and 23 can never be uncovered by the pump 21. The service tank gives added safety on account of its enclosing the entire pump system, which prevents spreading of the oil on account of leakage of the latter through accidents to, or defects in, the pumps.

While I have herein shown and described one practical organization and arrangement of co-operating parts, it is manifest that other types of pumps may be used, and the details of structure and organization otherwise considerably varied without departing from the principle of the invention or sacrificing any of the advantages thereof. Hence I reserve all such variations and modifications as fall within the spirit and purview of the appended claims.

I claim—

1. In a liquid fuel burner system, the combination of a storage tank, a service tank, a burner, a pressure pump for forcing oil from said service tank to said burner, a suction pump for supplying oil to said service tank from said storage tank, and a return pump for returning excess oil from said service tank to said storage tank, all of said pumps being connected for simultaneous operation.

2. In a liquid fuel burner system, the combination of a storage tank, a service tank, a burner, a pump submerged in oil in said service tank supplying oil from the latter to said burner, and another pump submerged in oil in said service tank supplying oil to the latter from said storage tank, said pumps being connected for simultaneous operation.

3. In a liquid fuel burner system, the combination of a storage tank, a service tank, a burner, a pump submerged in oil in said service tank supplying oil from the latter to said burner, means for supplying oil from said storage tank to said service tank, and a return pump submerged in oil in said service tank returning excess oil from the latter to said storage tank.

4. In a liquid fuel burner system, the combination of a storage tank, a service tank, a burner, a pressure pump submerged in oil in said service tank at a lower level than said burner and supplying oil to the latter, a suction pump submerged in oil in said service tank supplying oil to the latter from said storage tank, and a return pump submerged in oil in said service tank returning excess oil from the latter to said storage tank.

5. In a liquid fuel burner system, the combination of a storage tank, a service tank, a burner, a pressure pump submerged in oil in said service tank at a lower level than said burner and supplying oil to the latter, a suction pump submerged in oil in said service tank supplying oil to the latter from said storage tank, and a siphon breaker in the flow line of said suction pump.

6. In a liquid fuel burner system, the combination of a storage tank, a service tank, a burner, a pressure pump submerged in oil in said service tank at a lower level than said burner and supplying oil to the latter, a suction pump submerged in oil in said service tank, supplying oil to the latter from said storage tank, a siphon breaker in the flow line of said suction pump, and a return pump submerged in oil in said service tank returning excess oil from the latter to said storage tank.

7. In a liquid fuel burner system, the combination with a burner and a fuel receptacle, of a burner feed pump and a receptacle supply pump both submerged in oil in said receptacle, a motor, and a common drive shaft from said motor to both of said pumps.

8. In a liquid fuel burner system, the combination with a burner, a fuel receptacle and a fuel storage tank, of a burner feed pump, means to supply fuel from said storage tank to said receptacle, and an excess oil return pump discharging into said storage tank, both of said pumps being submerged in oil in said receptacle, a motor, and a common drive shaft from said motor to both of said pumps.

9. In a liquid fuel burner system, the combination with a burner, a fuel receptacle, and a fuel storage tank, of a burner feed pump, a receptacle supply pump connected on its suction side to said storage tank, and an excess oil return pump discharging into said storage tank, all three of said pumps being submerged in oil in said receptacle, a motor, and a common drive shaft from said motor to all three of said pumps.

10. In a liquid fuel burner system, the combination with a burner, a fuel receptacle, and a fuel storage tank, of a burner feed pump, a receptacle supply pump, and an excess oil return pump discharging into said storage tank, all three of said pumps being of the rotary type mounted in vertical tan-

dem relation in said receptacle and submerged in the oil in the latter, an electric motor mounted above said receptacle, and a common drive shaft for said pumps direct-connected to the armature shaft of said motor.

11. In a liquid fuel burner system, the combination with a burner, a fuel receptacle, and a fuel storage tank, of a burner feed pump, a receptacle supply pump, and an excess oil return pump discharging into said storage tank, all three of said pumps being of the rotary type mounted in vertical tandem relation in said receptacle and submerged in the oil in the latter, a fan mounted on the top of said receptacle, an electric motor mounted on top of the casing of said fan, and a common drive shaft for said fan and pumps direct-connected to the armature shaft of said motor.

12. In a liquid fuel burner system, the combination of a closed service tank, constituting an oil-tight pump enclosure, a storage tank, a burner feed pump in said service tank, a pump in said service tank for supplying the latter with oil from said storage tank, means for operating said pumps simultaneously, and a vent pipe leading from the interior of said service tank to the external atmosphere.

13. In a liquid fuel burner system, the combination of a storage tank, a service tank, a suction pump submerged in oil in said service tank for supplying oil to the latter from said storage tank, and a return pump in said service tank for returning excess oil from the latter to said storage tank, said return pump having its intake above said suction pump, whereby the latter can never be uncovered by said return pump.

14. In a liquid fuel burner system, the combination of a storage tank, a service tank, a suction pump submerged in oil in said service tank for supplying oil to the latter from said storage tank, a burner supply pump also submerged in oil in said service tank, and a return pump in said service tank for returning excess oil from the latter to said storage tank, said return pump having its intake above both said suction pump and said burner supply pump, whereby said suction and burner supply pumps can never be uncovered by said return pump.

15. In a liquid fuel burner system, the combination with a burner, and a fuel receptacle, of a burner feed pump and a receptacle supply pump both submerged in oil in said receptacle, a motor, a fan, and a common drive shaft from said motor to said fan and both of said pumps.

16. In a liquid fuel burner system, the combination with a burner, of a fuel receptacle, a fuel storage tank, a motor, a burner feed pump, a receptacle supply pump, and an excess oil return pump discharging into said storage tank, all three of said pumps being of the rotary type mounted in vertical tandem relation in said receptacle and submerged in the oil in the latter, with said excess oil return pump disposed nearest to said motor, and a common drive shaft for said pumps direct-connected to the armature shaft of said motor.

17. In a liquid fuel burner system, the combination with a burner, of a fuel receptacle, a fuel storage tank, a fan mounted on the top of said receptacle, an electric motor mounted on the top of the casing of said fan, a burner feed pump, a receptacle supply pump, and an excess oil return pump discharging into said storage tank, all three of said pumps being of the rotary type mounted in vertical tandem relation in said receptacle and submerged in the oil in the latter, with said excess oil return pump disposed nearest to said motor, and a common drive shaft for said fan and pumps direct-connected to the armature shaft of said motor.

RALPH M. GASTON.