Nov. 25, 1947. B. W. TULLIS 2,431,665

BURNER STARTING MECHANISM

Filed May 20, 1944

Fig. 1.

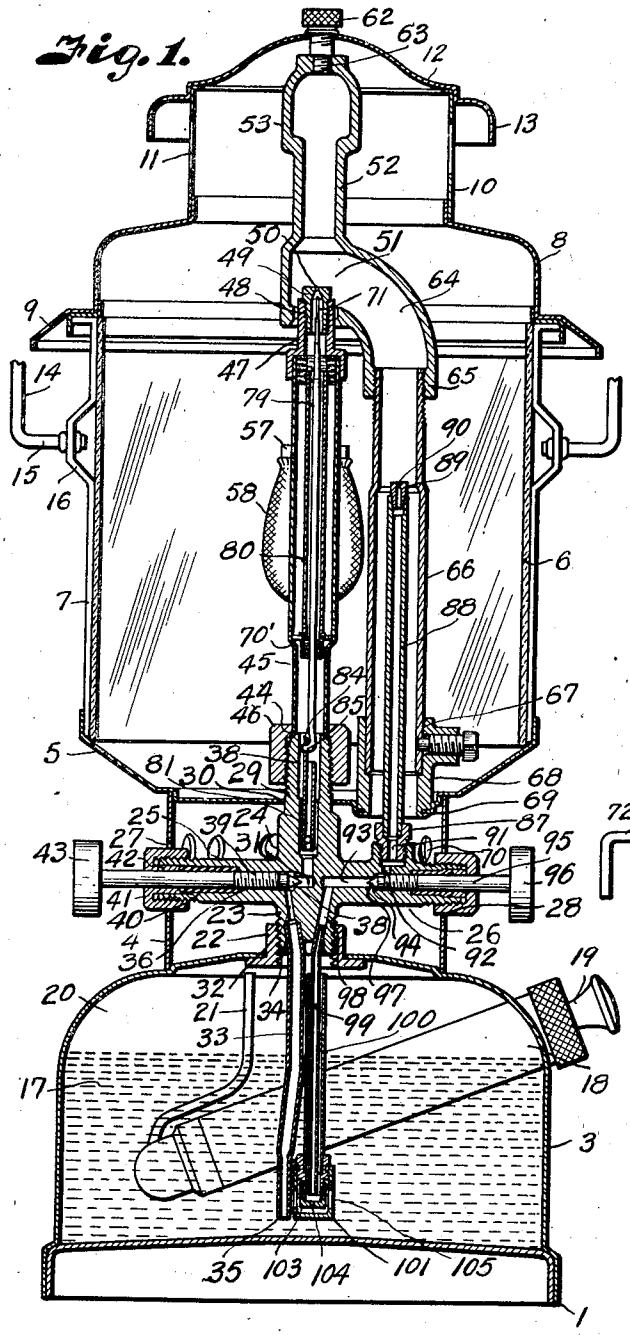
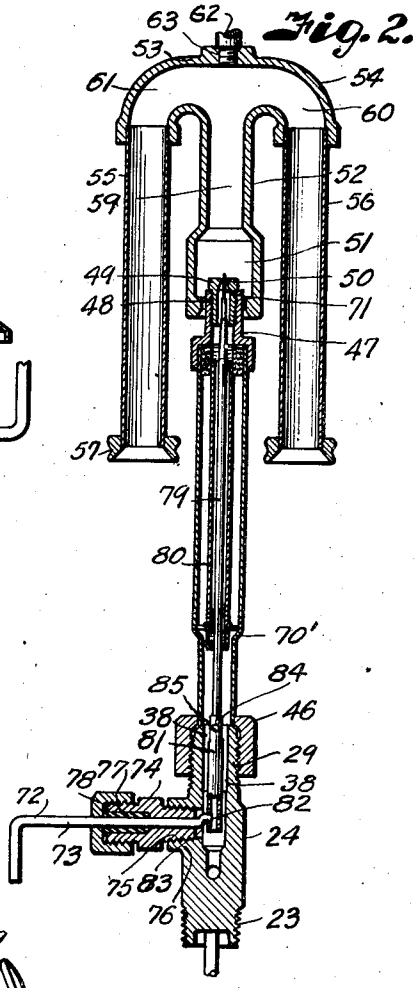


Fig. 2.



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BURNER STARTING MECHANISM

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3 Claims. (Cl. 67—41)

1

This invention relates to liquid fuel burners of the type including a vaporizer which is heated by the burner for converting liquid fuel to a gas usable in the burner, and a supply tank for containing the liquid fuel under pressure sufficient to elevate the liquid fuel to the vaporizer.

It has been the practice to provide burners with instant lighting mechanisms which utilize the air in the supply tank for initially effecting atomization of the fuel delivered through the vaporizer to the burner for producing a combustible mixture usable in the burner until the vaporizer is heated sufficiently to begin vaporization of the fuel.

Burners of this character have operated satisfactorily on straight-run gasolines but when ordinary motor fuels and those containing anti-knock compounds are used, the vaporizers soon clog and the burners cannot be operated after a few hours' running time. This is because the gums and anti-knock compounds in such fuels decompose at vaporizing temperatures and the products of combustion collect within the vaporizer, thereby blocking the flow of fuel.

In carrying out the present invention, I have discovered that the difficulty may be reduced by increasing the capacity of the vaporizer to accommodate the products of decomposition over longer periods, but when the capacity of the vaporizers was increased it was found that the instant lighting mechanisms were rendered inoperative because of inability to maintain atomization necessary to initially operate the burner.

It is, therefore, a principal object of the present invention to provide a vaporizer of substantial capacity and a separate vaporizer operating in conjunction therewith to respectively supply vaporized and atomized fuel to the burner.

Other objects of the invention are to provide a structure for initially atomizing the fuel for starting purposes and in which the operating temperature is kept below the decomposing temperatures of the objectionable components of the fuel by the flow of primary air being supplied to the burner; to provide an atomizing mechanism which is of simple and effective construction; and to provide a relatively large vaporizer capacity in association with an atomizing mechanism that is conservative of the air in the supply tank and which quickly and effectively atomizes the fuel to supply the burner with sufficient heat to bring the vaporizer rapidly to vaporizing temperatures.

In accomplishing these and other objects of

2

the invention, I have provided improved structure, the preferred form of which is illustrated in the accompanying drawing wherein:

Fig. 1 is a vertical section through a lantern equipped with a vaporizer and atomizing mechanism embodying the features of the present invention.

Fig. 2 is a detailed section on the line 2—2 of Fig. 1.

Referring more in detail to the drawings:

1 designates a liquid fuel burning appliance, for example, a lantern constructed for operation on any ordinary motor fuel which may contain gums, anti-knock compounds, and the like.

The lantern includes a fuel tank or fount 3 carrying a circular band 4 on the top thereof mounting a base 5 for seating a lantern globe 6. The base 5 carries the lower ends of vertically arranged straps or posts 7 which mount a lantern top 8 to close the top of the globe 6. The lantern top has an annular eave-like periphery 9 and a central flanged portion to seat a collar 10 having ventilation openings 11 in the sides thereof. The collar 10 mounts a cap 12 having an annular eave 13 over the vent openings 11. The posts 7 attach a carrying bail 14 having trunnions 15 mounted in lateral offsets 16 of the posts.

The fuel, indicated at 17, is contained in the fount 3 and when the lantern is in operation, is kept under air pressure supplied by a pump 18. The pump is manipulated by an actuator 19 and the air is discharged from the pump into the fount through a tube 21 having discharge into the expansion space 20 at a point near the top of the fount. Carried within the axial center of the fount is an internally threaded collar 22 mounting a threaded neck 23 of a valve 24 having lateral branches 25 and 26 projecting through openings 27 and 28 in the band 4 at opposite diametrical sides thereof. The valve also includes an upwardly extending branch 29 that projects through an opening 30 in the globe base 5. The branch 25 has a channel 31 connected with a channel 32 in the neck of the valve. The channel 32 connects with a tube or duct 33 having its upper end mounted within a counterbore 34 of the channel to support the opposite or inlet end 35 thereof slightly spaced above the bottom of the fount. The branch 25 of the valve also has a threaded bore 36 to mount the threaded stem 37 of a needle valve 38 adapted to engage a seat encircling the channel 31, which channel connects with an axial channel 39 in the vertical branch 29 of the valve. The valve stem projects from the outer end of the branch 25 and

is sealed therearound by means of a packing 40 mounted within a counterbore of the bore 36, the packing being pressed about a smooth portion of the valve stem by a nut 41 threadingly connected with exterior threads on the branch of the valve and having a gland 42 engaging the packing as shown in Fig. 1.

The projecting end of the valve is provided with a hand wheel 43 by which the valve may be rotated to move it to and from its seat, thereby opening and closing flow from the channel 32 to the channel 38 in the vertical branch of the valve. The vertical branch of the valve is beveled at the upper end thereof and seats a beveled base flange 44 of a vaporizer tube 45, the vaporizer tube being retained in position by a union nut 46 rotatably mounted on the vaporizer tube and engaging the threaded exterior of the vertical branch of the valve to provide a leak-tight joint and support the vaporizer tube in fixed axial relation with the lantern globe. The upper end of the vaporizer tube carries a nozzle 47 having an internally threaded bore 48 for mounting a gas tip 49 having an outlet orifice 50 for discharging gas into a mixing chamber 51.

The mixing chamber 51 is provided in a depending hollow arm 52 of a substantially T-shaped manifold 53 having lateral branches 54 carrying depending burner or mantle tubes 55 and 56 having collars 57 at the lower ends thereof for mounting mantles 58. The mixing chamber is connected with the upper ends of the tubes by a channel 59 and lateral channels 60 and 61 that are provided in the branches of the manifold as best shown in Fig. 2. The ventilator cap 12 is anchored to the manifold 53 by means of a screw 62 projecting through an opening 63 of the mixing chamber. With this arrangement and with the valve open, pressure within the air space of the fount displaces the fuel upwardly through the tube 33, channel 32, and through the channels 31 and 38 into the vaporizer tube.

When the lantern is in operation, the vaporizer tube is heated to the vaporizing temperature of the fuel so that the fuel is converted into a gas, which gas is discharged through the orifice 50 into the mixing chamber for mixture with combustion supporting air that is admitted to the vaporizing chamber through a lateral L-shaped duct 64 which has its lower end threadedly connected as at 65 with the upper end of an air tube or duct 66. The air tube extends downwardly within the globe and the lower end thereof is removably mounted within a socket 67 of a collar 68 that is supported within an opening 69 formed in the globe base 5 as shown in Fig. 1 so that air admitted through suitable openings 70 in the band 4 is drawn upwardly through the air tube and discharged into the mixing chamber through the L-shaped duct 64 to combine with the vaporized fuel and produce a combustible mixture. The mixture is discharged through the channel 59 into the lateral channels 60 and 61 and through the tubes 55 and 56 to the mantles 58 which depend alongside the vaporizer tube and when incandescent provide heat to maintain the vaporizer tube at vaporizing temperatures.

With the exception of certain features of construction in the vaporizing tube covered in a separate application filed even date herewith, the structure thus far described is conventional and operates satisfactorily when straight-run gasolines are used as a fuel; but as previously pointed out, the vaporizer tube operates at temperatures above the decomposing point of the gums and anti-knock compounds contained in the more readily available motor fuels, with the result that solids collect upon the wall of the vaporizer and block the passageway therethrough. This is overcome in the present invention by enlarging the portion of the vaporizer tube that is located within the hot zone of the mantles. This is effected by providing the vaporizing tube with an outwardly flaring offset 70' so that the vaporizing chamber therein is of substantially greater capacity than a conventional vaporizer tube thereby providing space for the solids resulting from decomposition of the objectionable compounds so that the lantern may be operated over substantially longer periods before it is necessary to replace the vaporizer. The nozzle of the tube is also provided with a clean-out needle 71 that is projectable through the orifice 50 upon operation of a lever 72 having a shaft portion 73 rotatably mounted in a fitting 74 threaded into an opening 75 that is provided in a lateral boss 76 formed on the side of the vertical branch of the valve fitting as best shown in Fig. 2. The fitting 74 has packing 77 which is pressed about the shaft of the operating lever by a packing nut 78. The clean-out needle is carried on the upper end of a shaft 79 that is reciprocable through a guide tube 80. The lower end of the shaft is a tubular section 81 that is reciprocably mounted within the bore 36 and is connected with a crank 82 formed as a part of the shaft 79 and which has a terminal that projects into an opening 83 in the tubular section (see Fig. 2). With this arrangement, the fuel may flow through the tubular portion of the shaft as well as around the periphery thereof so as to avoid as much as possible obstruction to the flow of the fuel.

To facilitate assembly and provide for free operation of the needle shaft, the tubular section thereof is preferably pivotally connected with the upper or rod portion of the shaft by providing an ear 84 on the upper end of the tubular section to connect with a lateral terminal 85 on the lower end of the rod portion as shown in Fig. 1.

As stated above, liquid fuel burning appliances are provided with instant starters whereby air in the fount is used to effect atomization of the fuel that is delivered to the burners, or the mantles in the case of the lantern, by way of the vaporizer tube. However, when the vaporizer tube is constructed for the purpose of the present invention, the large capacity and metal surfaces of the vaporizer tube prevent proper atomization of the fuel and I, therefore, provide a starting or instant lighting mechanism that is connected with the fuel supply and mixing chamber independently of the generator and which includes an atomizing tube located within the air tube 66 so that it is cooled by the air flow therethrough to prevent the fuel vaporizer therein from being heated to the decomposing temperatures of the objectionable compounds such as gums, tetraethyl lead, or the like.

The branch 26 of the valve is, therefore, located so that it extends below the inlet of the air supply tube 66. Fixed within a boss 86 on the branch of the valve is a nipple 87 to which is fixed the lower end of an atomizer tube 88 that extends upwardly within the air tube 66 and terminates short of the upper end thereof to mount a discharge nozzle 89 having an orifice 90.

In order to accommodate the atomizer tube without materially reducing the capacity of the air tube, the portion of the air tube containing the atomizer tube is of larger diameter as shown

in Fig. 1 than the upper portion of the air tube. The nipple 87 has a channel 91 that connects with a port 92 in the branch 26, which, in turn, connects with a channel 93 having a valve seat 94 therein. Threadedly mounted in the branch 26 is a valve stem 95 similar to the valve stem 39 and has a hand wheel 96 on the outer end thereof so that the stem may be rotated to move a coned end 97 thereof into and out of engagement with the seat 94 so as to pass an air and fuel mixture from the fount when the valve is open and to block the flow when the valve is closed.

The channel 93 connects with a channel 98 in the threaded neck 23 of the valve and mounted in the channel is the upper end of a fuel conveying tube 99, which tube projects downwardly within the fount through an air tube 100. The air tube 100 has an open upper end located within the space 20 of the tank 3 and the lower end thereof carries a cage 101 that encloses a cap 103 having an orifice 104 in connection with the tube 100. The cap is spaced from the tube to provide a passageway for the fuel which flows through openings 105 in the cage into the space and through the orifice 104 whenever the valve 94 is unseated. Simultaneously, air is discharged from the space 20 through the upper end of the tube 99 which flows downwardly between the tubes and upwardly with the fuel through the tube 100 to effect atomization of the fuel and discharge of the atomized fuel through the nozzle 89 of the atomizer tube 88. thereby providing a readily burnable fuel which is discharged into the mixing chamber and flows through the manifold 53 for supplying the mantles 58 which when lighted heat the vaporizer tube 45.

Attention is directed to the fact that while the mantles are heating the vaporizer tube to fuel vaporizing temperature, the heat is not effective on the fuel flowing through the vaporizer tube since the air required for combustion carries away any heat that is transmitted to the air tube from the mantles, therefore, the fuel in the atomizer tube is kept at temperatures below the decomposing point of the objectionable compounds and the compounds do not decompose or collect within the relatively small capacity atomizing tube.

In operating a lantern constructed and assembled as described, the fount 3 is supplied with a fuel which may be any of the readily available fuels such as used for operation of motor vehicles and which usually contain gums and anti-knock compounds. Air pressure is then built up within the expansion space of the fount upon operation of the pump 18, after which the valve 94 is opened so that a mixture of air and fuel is discharged through the tube 99 and through the vaporizing tube 88 to the mixing chamber from where the atomized mixture passes to the mantles. This mixture is readily lighted by holding a match adjacent the mantles. Air is also being drawn through the air tube from the exterior of the lantern through the opening 70 so as to maintain the temperature within the atomizing tube below the decomposing temperature of the objectionable compounds contained in the fuel passing therethrough; therefore, the objectionable compounds are discharged as a liquid and burned within the mantles. Heat from the incandescent mantles is readily transmitted to the vaporizer tube to heat the walls thereof so that when the valve 38 is opened and fuel flows from the fount through the tube 33 the fuel vaporizes therein and the vapor is discharged through the orifice 50 into the mixing chamber to maintain burning operation at the mantles.

The vaporizing temperature may be higher than the temperatures at which the objectionable compounds decompose; consequently, the compounds will decompose within the vaporizer tube and collect on the walls thereof, however, since the capacity of the vaporizer tube is relatively large, the particles of decomposition may accumulate over a considerable period of time before the vaporizer must be cleaned or replaced with a new one. Should the nozzle orifice of the vaporizer tend to clog it is readily cleaned by operation of the clean-out needle.

From the foregoing, it is obvious that I have provided a liquid fuel burning appliance which may be provided with an instant starting mechanism and which is successfully operated on motor fuels containing gums, anti-knock compounds, and the like, since the atomized fuel used for starting is bypassed around the vaporizer to burner and the combustion supporting air prevents the atomized air from reaching temperatures above the temperatures at which objectionable compounds are decomposed, thus, the atomizer tube remains clean and free of deposits so that it is of the required size to effect proper atomization of the fuel, while the vaporizer is of large enough capacity to avoid clogging over relatively long periods of operation.

What I claim and desire to secure by Letters Patent is:

1. A liquid fuel burning apparatus including a burner, a mixing chamber above the burner and having a flow connection therewith, a source of fuel supply below the burner, a vaporizer extending through the heat zone of the burner and having discharge into the mixing chamber, an air supply duct also extending through the heat zone of the burner and having discharge into the mixing chamber, an atomizer contained within the portion of the air supply duct which extends through the heat zone of the burner whereby the air moving through the air duct protects the atomizer from the heat of the burner, and separate duct means connecting the vaporizer and atomizer with the fuel supply.

2. A liquid fuel burning apparatus including a burner, a mixing chamber above the burner and having a flow connection therewith, a vaporizer extending through the heat zone of the burner and having discharge coaxially of the mixing chamber, an air duct also extending through the heat zone of the burner and having lateral discharge into the mixing chamber, an atomizer contained within the portion of the air supply duct which extends through the heat zone of the burner and having discharge into the air duct for supplying vaporized fuel to the mixing chamber by way of said duct, a fuel supply means below the burner, and duct means connecting the vaporizer and atomizer with the fuel supply.

3. A liquid fuel burning apparatus including a vertically disposed mixing chamber, a mantle, means suspending the mantle below the mixing chamber and providing flow connection between the mantle and upper portion of the mixing chamber, a fuel vaporizing tube extending through the heat zone of the mantle and having coaxial discharge into the mixing chamber, means supplying fuel to the vaporizer, an air flow duct also extending through the heat zone of the mantle and discharging laterally into the mixing

chamber for supplying combustion supporting air for mixture with the fuel vapor discharged from the vaporizer, a fuel atomizer extending through the portion of the air supply duct which extends through the heat zone of the mantle whereby the atomizer is cooled by air flow through the air supply duct, and means for supplying fuel to said atomizer.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
971,019	Cappon	Sept. 27, 1910
1,228,379	Crook	May 29, 1917
1,515,031	Grady	Nov. 11, 1926
2,070,209	Kerr	Feb. 9, 1937

FOREIGN PATENTS

Number	Name	Date
692,402	France	Aug. 4, 1930