May 17, 1932. W. C. COLEMAN 1,858,264

DEVICE FOR BURNING LIQUID FUELS

Filed Nov. 7, 1929 2 Sheets-Sheet 1

Fig 2

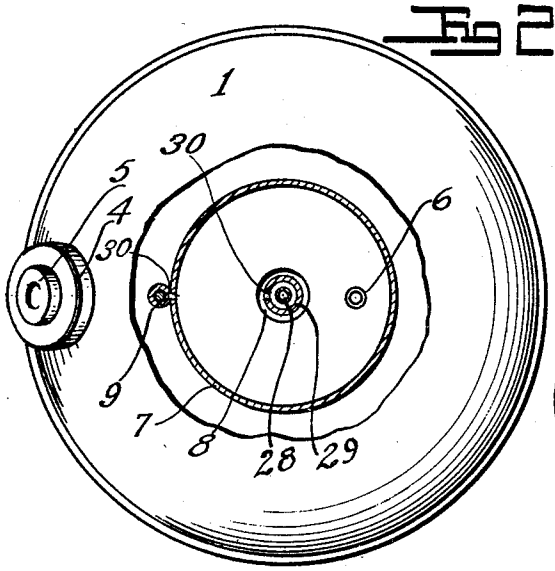


Fig 1

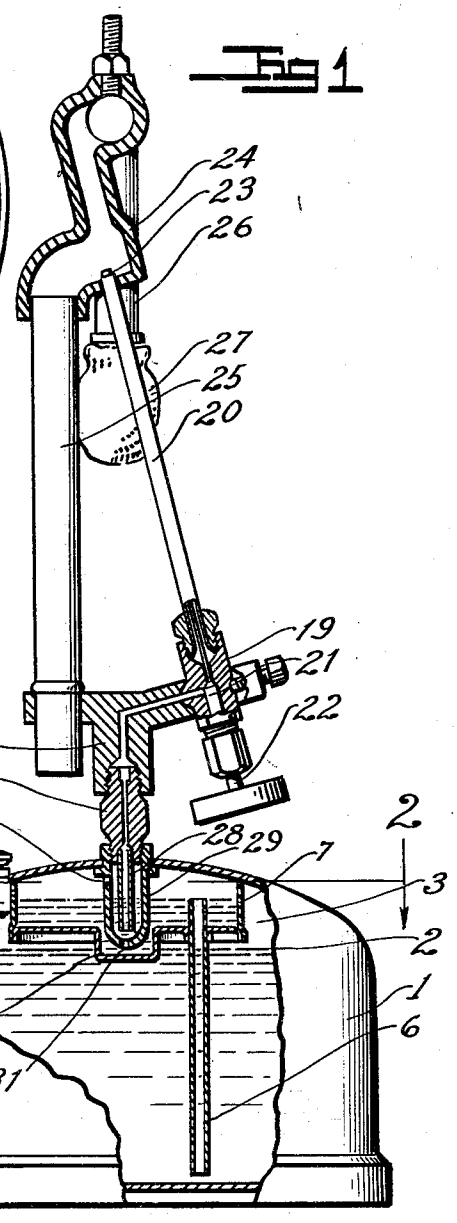
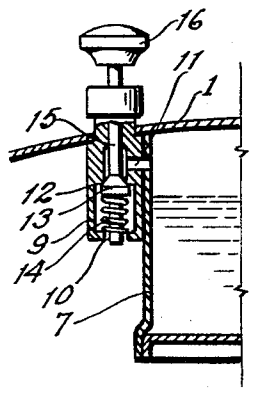


Fig 3



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DEVICE FOR BURNING LIQUID FUELS

Filed Nov. 7, 1929 2 Sheets-Sheet 2

Fig 4

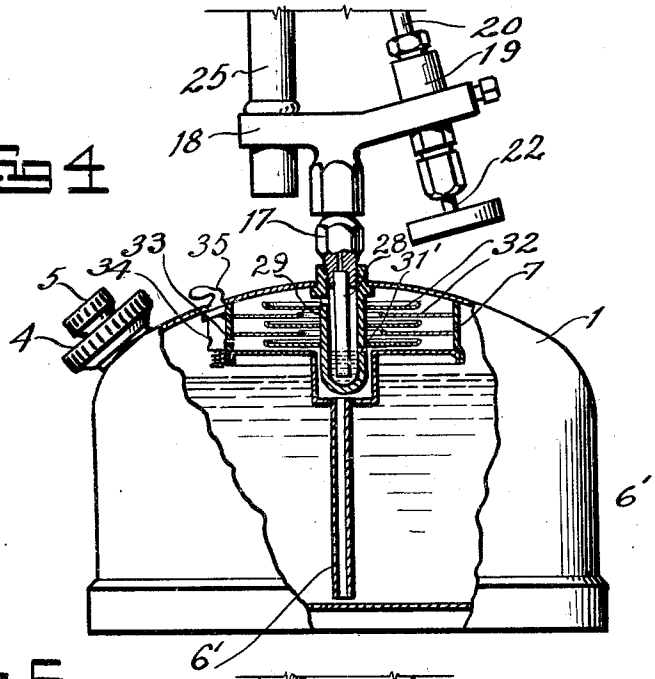

Fig 6

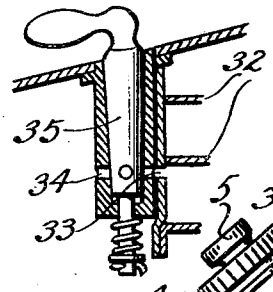

Fig 5

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1,858,264

UNITED STATES PATENT OFFICE

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DEVICE FOR BURNING LIQUID FUELS

Application filed November 7, 1929. Serial No. 405,330.

This invention relates to a liquid hydrocarbon burning device which, for the sake of brevity, will hereinafter be called oil burning device with the understanding that it is capable of handling any appropriate liquid fuel. The invention contemplates a device for initially delivering carbureted air to a vaporizing generator which may discharge into a burner and after the vaporizing generator has been heated to a vaporizing temperature, the supply of carbureted air is cut off so that thereafter the vaporizing generator is supplied with liquid fuel only. Thus, the burner can be lighted before the vaporizing generator is heated to a vaporizing temperature, the flame from the burner furnishing the heat for the vaporizing generator so that it will not be necessary to use a preheater or torch on the vaporizing generator to convert the liquid fuel from the liquid phase to the vapor phase. In a broad sense this same result is accomplished by the structures shown in the patent to John E. McCutchen, No. 1,718,473, patented June 25, 1929, wherein the structure is designed to automatically cut off the flow of air when the generator reaches a vaporizing temperature.

My invention distinguishes from the McCutchen patent in that the air or liquid will flow in response to a manually controlled valve so that for the initial ignition, carbureted air will flow to the burner and then in response to the valve, liquid only will flow to the generator and burner.

I have evolved a novel construction of mechanism for controlling the air and the liquid flow, the details of which will be apparent by reference to the following description in connection with the accompanying drawings in which:

Fig. 1 is a view partly in elevation and partly in section of a liquid fuel burning device to which my invention is applied.

Fig. 2 is a sectional view on the line 2—2 of Figure 1.

Fig. 3 is a sectional view through part of the secondary container and the air admitting valve.

Fig. 4 is a view partly in elevation and partly in section through a liquid fuel burning device showing a modified form of my invention.

Fig. 5 is a like view showing a further modified form of the invention and

Fig. 6 is an enlarged detailed view partly in section and partly in elevation of the air admitting valve shown in Figures 4 and 5.

Referring now to the drawings by numerals of reference, 1 designates a container to hold liquid fuel under pressure in contact therewith. The initial liquid level in the container will preferably be along the line 2 to provide an air space 3 above the liquid. A filler cap 4 will normally close the opening through which the liquid may be introduced into the container. The filler cap may have a check valve through which air may be forced through the head 5 as is common in such devices or a built-in pump may be provided. A liquid supply pipe 6 extends down to a point near the bottom of the container 1 and at its upper end, it communicates with a secondary container 7 which in effect is an enlargement of the pipe 6. Obviously, the container 7 is smaller than the container 1 and it may be located within or without the container 1. The container 7 is shown as provided with a well 8 below the normal bottom of the container 7. The reference numeral 9 designates a valve body having an inlet port 10 communicating with the air space 3 and an outlet port 11 communicating with the secondary container 7. The valve body is provided with a valve seat 12 upon which the valve 13 may be seated by the expansion spring 14 surrounding the stem 15 and having one end bearing against the valve and the other against the bottom of the valve body. The valve can be unseated by pressing on the knob 16 to overcome the spring as will clearly be seen by reference to Figure 3. Connected to the top of the primary container 1 is a nipple 17 carrying a ported bracket 18 communicating with the valve body 19, carrying a vaporizing generator 20 and a valve 21 controlled by a valve stem 22. The end 23 of the vaporizing generator discharges into a mixing chamber 24 with which an air tube 25 communicates, the air chamber having one or

more discharge tubes 26 to which the burner or burners, such as a mantle or mantles, are attached in the usual way.

Depending from the nipple 17 is a tube 28 extending into the secondary container 7 and surrounded by an outer tube 29 having an air inlet orifice 30 above its lower end and a liquid inlet orifice 31 at its lower end. It will be noted that the liquid supply tube 6 extends into the secondary container 7 above the bottom thereof so that there will always be liquid in the secondary container 7. When the parts are assembled in the space 3 on top of it, the liquid will partly fill the container 7. Then, when the operator wishes to burn the fuel, he will press down upon the button 16 to admit air from the space 3 into the container 7. As the valve 21 is unseated, the air will pass through port 30 carrying the trapped liquid in the outer tube along with it through tube 28, through nipple 17, through ported bracket 18, through vaporizing generator 20 to the mixing chamber 24 where the combined air and liquid will combine with the air admitted to the mixing chamber through air tube 25 to make a rich combustible mixture at the burner 27. Since the burner 27 is adjacent to the vaporizing generator 20, the vaporizing generator will quickly be heated thereby to a vaporizing temperature.

It is to be noted that the liquid within the container 7 and the well 8 will flow through port 31 to maintain the level of the liquid in the tube 8 equal to the level in the container 7 when the device is not in operation. When the valve controlling the discharge to the burner is opened, the air will flow through port 30 forcing the fuel in tube 29 up through the tube 28. This creates a slight hydrostatic pressure on the inlet 31 to cause liquid to flow in. This inlet orifice is so ratioed to the discharge orifice 23 of the vaporizer that the inflow of fuel is insufficient for the fuel burner demand but will supply a limited amount of liquid fuel to the tubes 28 and 29 which the air entrains to enrich the mixture at the burner. It is also to be noted that the unseating of the valve 9 will equalize the pressure in the containers 1 and 7 so that the liquid in the container 7 will flow from container 7 back into container 1 until its level reaches the top of the pipe or conduit 6 before the air starts to flow to the burner. It will be observed that the air valve 16 remains closed after the air pressure in the two containers is equalized as above set forth. As the compressed air in container 7 flows to the burner through port 30, the fuel from the main container 1 flows through pipe 6 into container 7 replacing the air being discharged. When liquid reaches the level of port 30, liquid fuel only will henceforth flow therethrough to the vaporizer. In the meantime, the burning mixture or air and liquid vapor has heated the vaporizer to cause the liquid fuel to vaporize to supply the full demand of the burner. It is evident, therefore, that only the air initially admitted to container 7 is consumed in the lighting process. The valve 16 may remain open during the lighting process. I do not advise this as it results in larger loss of air during the lighting process. The container 7 should be sized to contain the amount of air needed so that one initial opening of the valve 16 before lighting will cause container 7 to receive sufficient air to produce an initial combustible mixture before the burner has acquired vaporizing heat for liquid fuel.

When the valve 21 is seated to shut off the supply of liquid fuel to the generator 20, the pressure in container 1 will maintain the container 7 partially filled with liquid for the next operation so when it is desired to relight the burner, it will be necessary only to push upon the button 16 to unseat valve 9 to again admit air to the container 7 to equalize the pressures in containers 1 and 7. Then, by unseating the valve 21, the air impregnated with wet gas will again be supplied to the burner as above described. It will therefore be apparent that the fuel at the burner can be combusted without first preheating the generator and it will also be obvious that the device to which my invention is applied is merely illustrative of one of its uses, for obviously, it would be equally applicable to any device in which liquid hydrocarbon fuel is converted from the liquid phase to the vapor phase and combined with air to make a combustible fuel.

In Figure 4 I have shown a slightly modified form of the invention in which the primary container 1 is provided with a secondary container 7 with a supply pipe 6′ delivering liquid fuel to the secondary container 7 but in the form shown in Figure 4, the secondary container 7 is provided with liquid retaining pans 32 which will trap liquid so that the air in its passage over the pans will be enriched. In this form, the air inlet port 33 for the secondary container 7 is supplied from the space above the liquid in container 1 through a port 34 and a plug valve 35 illustrated in Figure 6. One essential difference between the construction shown in Figure 1 and the construction shown in Figure 4 is that I have shown means for trapping the liquid by suitable retaining means to provide a considerable surface over which the air may pass on its way to the burner. Then, too, in the from shown in Figure 4, the liquid inlet orifice for the outer tube 29 is positioned at a point above the lower extremity of the tube 29 as shown at 31′ so that when the pressures within the primary and secondary containers 1 and 7 are equalized and liquid in the secondary container recedes to the primary container, there will always be enough

trapped liquid fuel in the outer tube 29 when the generator valve is unseated to enrich the air and vapor to make an initial combustible mixture. It will further be noted that the liquid inlet orifice 31′ is above the lower end of the tube 28 so that when the supply port leading to the burner is closed, the lower end of the tube 28 will be submerged in the trapped liquid. This is for the purpose of insuring some of the liquid fuel initially going over with the air when the valve 19 is opened. This I regard as a very effective construction but not essential to successful operation, for the fuel rises from container 1 when air is discharged from container 7 and quickly submerges the inlet orifice 31, thus supplying the needed liquid to be entrained with the air.

In Figure 5 I have shown a further modified form of the invention in which the main container 1 is provided with an elongated secondary container 36 extending down to the bottom of the container 1 and supplied with liquid through a tube 39. In this construction, the tube 28′ corresponds to the tube 28 in Figure 1 and the tube 29′ corresponds to the tube 29 in Figure 1. The air is admitted to the secondary chamber 36 through a pipe 37 communicating with the air space above the liquid in container 1 through a valve such as is shown in Figure 6. The operation of the device as applied to Figure 5 will be substantially the same as has been described in connection with the structure shown in Figure 1. That is, air admitted to the secondary chamber 36 will enter the port 38 and pass down tube 29′ admitted through port 40 to the mixing chamber to combine with the air admitted through tube 25 to make a combustible mixture and until the turning plug 35 shuts off the supply of air, the liquid in secondary chamber 36 will continue to enrich the carbureted air flowing through the system to maintain an enriched combustible mixture. Just as soon as the valve 35 closes communication between the air or vapor space above the liquid in container 1 and the secondary container 36, the differential in pressures between the containers 1 and 36 will be re-established. Liquid will flow from the main container into the secondary container quickly submerging the port 38 and liquid only will then flow to the burner.

I have shown what appears to be at this time, the best embodiment of my invention and have illustrated alternative structures. Since it is apparent that other modifications may suggest themselves from time to time, I do not wish to be limited to the exact structural details shown.

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

1. A container to hold liquid fuel and air under pressure in contact therewith, a vapor burner associated with the container, a smaller secondary container to receive the flow of liquid from the fuel space of the main container, a conduit communicating the secondary container with the vaporizer of the burner, valved means communicating the air space of the main container with the secondary container to equalize the pressures therein, to cause liquid fuel in the secondary container to be replaced by air and vapour, and means associated with the conduit supplying the burner to cause the air released from the secondary container to the burner to entrain portions of liquid fuel from within the secondary container to produce a combustible mixture at the burner.

2. A container to hold liquid fuel and air under pressure in contact therewith, a vapor burner associated with the container, a smaller secondary container to receive the flow of liquid from the fuel space of the main container, a conduit communicating the secondary container with the vaporizer of the burner, valved means communicating the air space of the main container with the secondary container to equalize the pressures therein, to cause liquid fuel in the secondary container to be replaced by air and vapor from the main container, and means associated with the conduit supplying the burner to cause the air released from the secondary container to the burner to entrain portions of liquid fuel supplied from the main container to produce a combustible mixture at the burner.

3. A container to hold liquid fuel and air under pressure in contact therewith, a vapor burner associated with the container, a smaller secondary container to receive the flow of liquid from the fuel space of the main container, a conduit communicating the secondary container with the vaporizer of the burner, valved means communicating the air space of the main container with the secondary container to equalize the pressures therein, to cause liquid fuel in the secondary container to be replaced by air and vapor from the main container, and means associated with the conduit supplying the burner to cause the air released from the secondary container to the burner to entrain portions of liquid fuel supplied from the main container to produce a combustible mixture at the burner, said means having a discharge outlet to the burner-supplying conduit, said outlet being located toward the lower portion of the secondary container, a second conduit communicating the discharge outlet with the secondary container, one of the conduits having a restricted inlet orifice adjacent to the discharge outlet.

4. A container to hold liquid fuel and air under pressure in contact therewith, a vapor burner associated with the container, a smaller secondary container to receive the

flow of liquid from the fuel space of the main container, a conduit communicating the secondary container with the vaporizer of the burner, valved means communicating the air space of the main container with the secondary container to equalize the pressures therein, to cause liquid fuel in the secondary container to be replaced by air and vapor, and means associated with the conduit supplying the burner to cause the air released from the secondary container to the burner to entrain portions of liquid fuel to produce a combustible mixture at the burner.

5. A container to hold liquid fuel and air under pressure in contact therewith, a vapor burner associated with the container, a smaller secondary container to receive the flow of liquid from the fuel space of the main container, a conduit communicating the secondary container with the vaporizer of the burner, a valved conduit communicating the air space of the main container with the secondary container to equalize the pressures therein, to cause liquid fuel in the secondary container to be replaced by air and vapor, and means associated with the conduit supplying the burner to cause the air released from the secondary container to the burner to entrain portions of liquid fuel to produce a combustible mixture at the burner, said means having a discharge outlet to the burner-supplying conduit, said outlet being located toward the lower portion of the container, a second conduit communicating the discharge outlet with the secondary container space above the liquid level thereof and having a retricted inlet orifice adjacent to the discharge outlet.

6. A container to hold liquid fuel and air under pressure in contact therewith, a vapor burner associated with the container, a smaller secondary container to receive the flow of liquid from the fuel space of the main container, a conduit communicating the secondary container with the vaporizer of the burner, valved means communicating the air space of the main container with the secondary container to equalize the pressures therein, to cause liquid fuel in the secondary container to be replaced by air and vapor, and means associated with the conduit supplying the burner to cause the air released from the secondary container to the burner to entrain portions of liquid fuel to produce a combustible mixture at the burner, said means having a discharge outlet leading from the lower part of the secondary container space, a conduit communicating the discharge outlet with the secondary container space above the discharge outlet, the conduit having two inlets, one being located above the other.

7. A container to hold liquid fuel and air under pressure in contact therewith, a vapor burner associated with the container, a smaller secondary container to receive the flow of liquid from the fuel space of the main container, a conduit communicating the secondary container with the vaporizer of the burner, valved means communicating the air space of the main container with the secondary container to equalize the pressures therein, to cause liquid fuel in the secondary container to be replaced by air and vapor, and means associated with the conduit supplying the burner to cause the air released from the secondary container to the burner to entrain portions of liquid fuel from within the secondary container to produce a combustible mixture at the burner, said means having a discharge outlet to the burner-supplying conduit, said outlet being located toward the lower portion of the container, a second conduit communicating the discharge outlet with the secondary container space above the normal liquid level thereof and having a restricted inlet orifice adjacent to the discharge outlet.

8. A container to hold liquid fuel and air under pressure in contact therewith, a vapor burner associated with the container, a smaller secondary container to receive the flow of liquid from the fuel space of the main container, a conduit communicating the secondary container with the vaporizer of the burner, valved means communicating the air space of the main container with the secondary container to equalize the pressures therein, to cause liquid fuel in the secondary container to be replaced by air and vapor, and means associated with the conduit supplying the burner to cause the air released from the secondary container to the burner to entrain portions of liquid fuel from within the secondary container to produce a combustible mixture at the burner, said means having a discharge outlet leading from the lower part of the secondary container space, a conduit communicating the discharge outlet with the secondary container space above the discharge outlet, the conduit having two inlets, one being located above the other, the lower inlet being restricted to limit inflow of liquid fuel to less than the normal capacity of the burner, the upper inlet being larger to secure a free discharge of air and a liquid discharge adequate for the full demand of the burner when the air has been consumed.

9. A container to hold liquid fuel and air under pressure in contact therewith, a vapor burner associated with the container, a smaller secondary container to receive the flow of liquid from the fuel space of the main container, valved means communicating the air space of the main container with the secondary container so that when open, the pressures in the two containers are equalized, to cause liquid fuel in the secondary container to flow back into the main container to permit compressed air and vapor

to enter the secondary container from the main container, a valved discharge outlet in the secondary container communicating the burner therewith, a conduit communicating the discharge outlet within the secondary container with the space in the secondary container above the discharge outlet, one of the conduits having a restricted inlet orifice to limit the inflow of liquid fuel therethrough to less than the normal capacity of the burner.

10. A container to hold liquid fuel and air under pressure in contact therewith, a vapor burner associated with the container, a smaller secondary container to receive the flow of liquid from the fuel space of the main container, valved means communicating the air space of the main container with the secondary container so that when open, the pressures in the two containers are equalized, to cause liquid fuel in the secondary container to flow back into the main container to permit compressed air and vapor to enter the secondary container from the main container, a valved discharge outlet in the secondary container communicating the burner therewith, a conduit communicating the discharge outlet within the secondary container with the space in the secondary container above the discharge outlet, one of the conduits having a restricted inlet orifice to limit the inflow of liquid fuel therethrough to less than the normal capacity of the burner, and means within the secondary container to retain portions of liquid fuel to contact the air to add to its fuel value.

In testimony whereof I affix my signature.

WILLIAM C. COLEMAN.