June 25, 1929. J. E. McCUTCHEN 1,718,473

OIL BURNING DEVICE

Filed Feb. 28, 1929 2 Sheets-Sheet 1

Fig 1

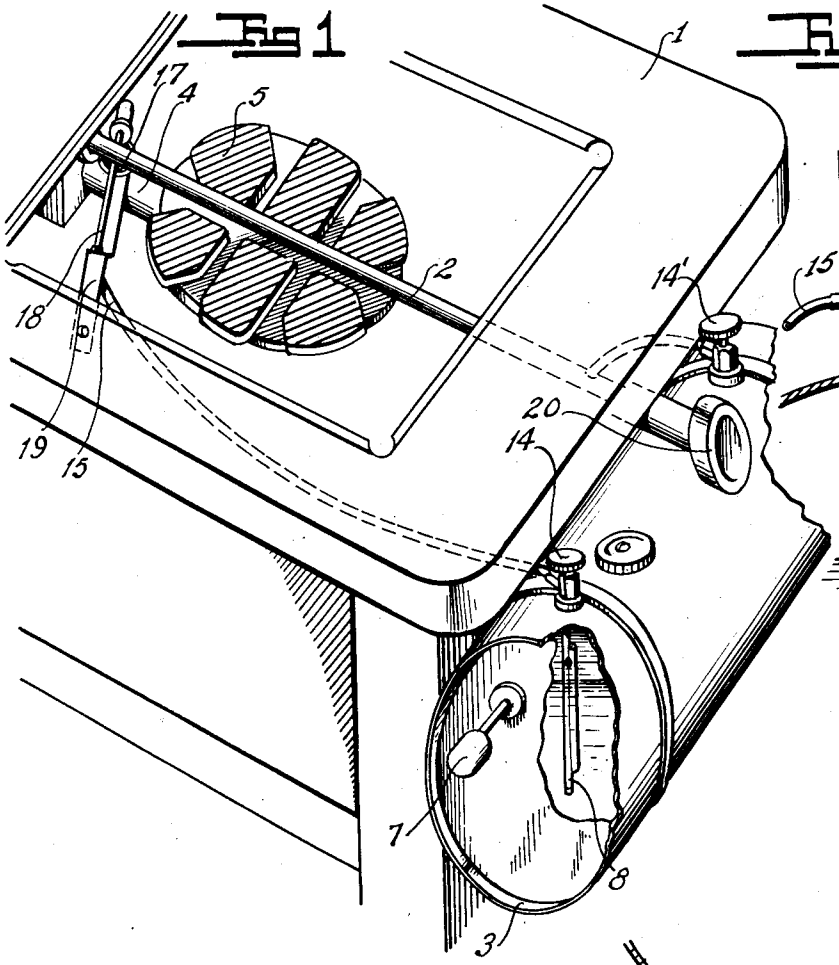


Fig 2

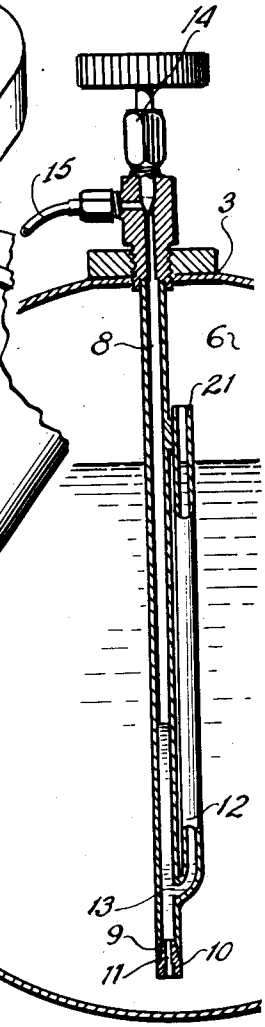
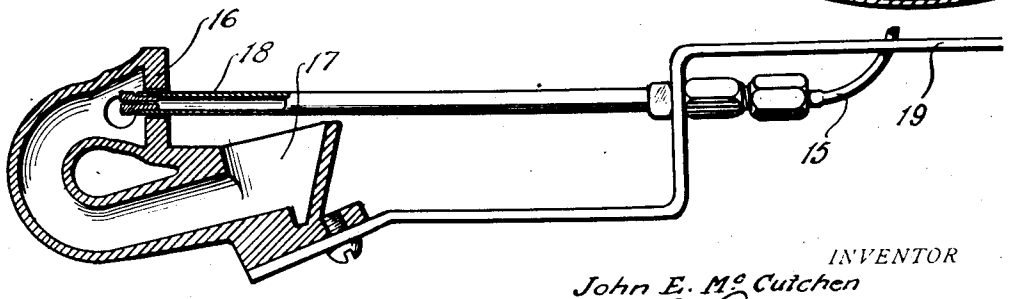


Fig 3



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OIL BURNING DEVICE

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Fig 4

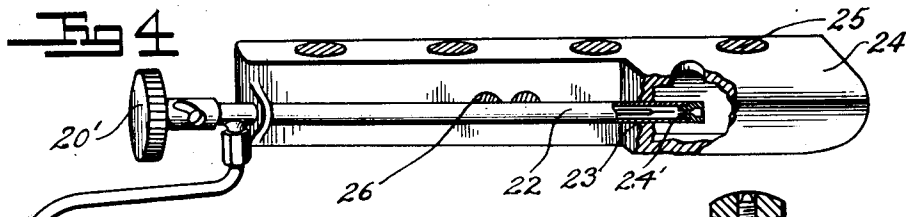

Fig 5

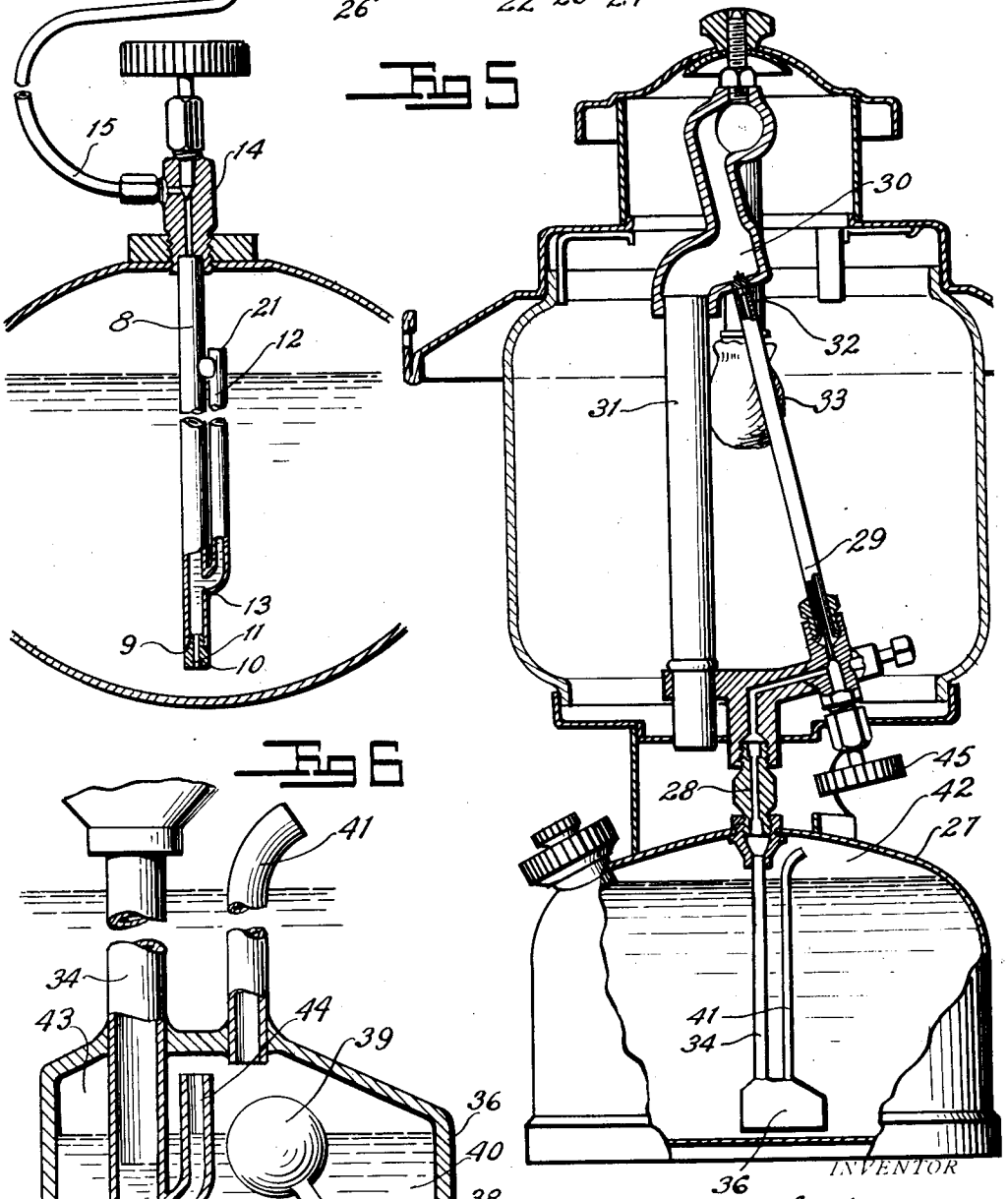

Fig 6

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Patented June 25, 1929. 1,718,473

UNITED STATES PATENT OFFICE.

JOHN E. McCUTCHEN, OF WICHITA, KANSAS, ASSIGNOR TO THE COLEMAN LAMP AND STOVE COMPANY, OF WICHITA, KANSAS.

OIL-BURNING DEVICE.

Application filed February 28, 1929. Serial No. 343,430.

This invention relates to an oil burning device and it is a continuation in part of an application filed by me on October 6, 1927, Serial No. 224,364, for "Method and apparatus for flowing fuel".

Specifically, the invention is illustrated in connection with liquid hydrocarbon fuel burning devices in order that the invention may be thoroughly comprehended. Liquid hydrocarbon fuel, such as gasoline, is extensively used for heating and lighting. A vaporizing generator communicating with the tank is usually employed to change the fuel from the liquid phase to the vapor phase before it passes into the burner to be combusted. Originally, the vaporizing generator was heated by a blow torch, an alcohol lamp, or by allowing raw gasoline to first flow into a priming pan beneath the generator. The raw gasoline was then ignited so that its flame would heat the generator. All of these methods proved exceedingly inconvenient as well as consuming time in preheating the vaporizing generator which, of course, would later be maintained at the proper temperature by the heat of combustion. The fuel tanks usually contain liquid under pressure, so there is an air space above the liquid. The air in the space becomes highly impregnated with the more volatile constituents of the fuel and makes a very good fuel in the gaseous state. Realizing this, inventors have attempted to successfully utilize this air gas as a means of initially heating the vaporizing generator. In all of the methods and apparatuses, of which I have any knowledge, no means had been provided for automatically cutting off the supply of air gas when the generator became hot enough to vaporize the liquid. Consequently, while the gas burned satisfactorily, the loss in pressure, due to its wasteful consumption as a preheating agent, made its use unpopular and undesirable. This was due largely to the fact that the hand valves were required to cut off the supply of gaseous fuel and by the time the operator closed off the gas consumption, the pressure was so low that it was not effective to force the liquid into the generator. Consequently, the operator would have to pump more air into the tank.

My invention contemplates a method and an apparatus for carrying out the method of initially utilizing the gaseous fluid, preferably from the top of the tank, as a preheating agent and automatically cutting off the gaseous fuel or carbureted air from the top of the tank just as soon as the vaporizing generator becomes hot enough to vaporize the liquid supplied to the generator, this being due to heating the generator to expand the liquid to several hundred times its original volume so that thereafter the liquid fuel will flow to the burner in sufficient quantities to supply the burner demand.

In order to comprehend the generic principle of my invention and some of the adaptations thereof, reference should be had to the accompanying drawings, in which:

Fig. 1 is a perspective view of one end of a stove to which my invention is applied, part of the tank being broken away.

Fig. 2 is a cross-sectional view through the tank and feed pipe on an enlarged scale.

Fig. 3 is a view partly in section and partly in elevation of one form of burner.

Fig. 4 is a diagrammatic view showing the hook-up for delivering fuel directly into the burner without preheating it.

Fig. 5 is a view partly in elevation and partly in section of a lantern to which my invention is applied; and

Fig. 6 is an enlarged view, partly in section and partly in elevation, showing a constant liquid level maintaining means used in the lamp front.

There are a number of mechanisms which may be utilized to carry out the method comprehended by my invention, the drawings merely being illustrative of some of the forms. In Fig. 1, the stove frame 1, the vaporizing generator 2 communicating with the tank 3, the burner manifold 4 and the burner 5, are all old and well known. The tank receives liquid fuel under pressure, there being an air space 6 above the normal liquid level in the tank, the air being introduced by any suitable means, for example, by a built-in pump 7. In Figures 1, 2 and 3, I have shown my invention as applied to a preheater in which the following arrangement is used. A supply pipe 8 passes into the tank 3 with its inlet end 9 below the normal liquid level in the tank. In the lower end of the tube is a removable nipple 10 having a restricted orifice 11 of less cross-sectional area than that of the pipe or tube 8. A gaseous fluid supply pipe 12 has one end above the normal liquid

level in the tank and the other communicating with the pipe 8 below the normal liquid level, as for example at 13. The pipe or fuel conductor 8 projects through the tank, being provided with a hand operated valve 14 which, when the valve is unseated, allows the pipe 8 to communicate with the line or pipe 15, discharging into the preheater burner 16, having a retort 17 which will direct the flame against the generator 18 of the preheater and the generator 2 for the burner manifold 4. The preheater 16 may rest upon the manifold 4 and it may be fastened to the frame by a bracket 19.

In this construction, before the valve 20 for the generator 2 is unseated, the operator opens the valve 14. This allows the gaseous fuel or carbureted air to pass through the inlet 21 of tube 12 into the tube or pipe 8, mixing with the relatively small amount of liquid fuel which passes into the tube or pipe 8 through the restricted orifice 11 so that a rich gas is delivered to the preheater burner 16. A match flame applied to the burner will cause an immediate combustion in the form of a relatively blue flame, the fuel passing into the burner under pressure so that a hot blast flame is impinged upon the generator 2 and upon the preheater generator 18, the outlet orifice of which is smaller than the orifice 10. As soon as the generator 18 becomes hot enough to vaporize the liquid content of the fuel passing through it, the liquid fuel will be vaporized into a vapor volume several hundred times its original liquid volume so that it partially fills the pipe 18 and I believe creates sufficient pressure in pipe 8 to slow up the flow of the liquid and air, permitting the liquid to flow up through the orifice 11 into the tube or pipe 8 and into the pipe 15 in sufficient quantity to supply the burner demand, thus effectively closing outlet of pipe 12, thereby preventing further flow of gaseous fluid from space 6 above the liquid. So long as the generator 18 of the pipe 15 is hot enough to transform the liquid into vapor, the increased vapor volume will prevent loss of pressure from the air or vapor space 6, and during this time only liquid will pass up through pipe 8 and into the generator 18 where it is transformed into vapor. This is due, I believe, to the fact that as the rate of flow of fuel to the burner is reduced, the liquid can flow into pipe 8 through inlet 11 fast enough to supply the burner demand so that liquid will flow into pipe 8, up past the orifice 13 to seal off the air. The effectiveness of the seal is unmistakable because after the stove is lighted, it may be burned until practically all of the gasoline is consumed without any appreciable loss of pressure other than that occasioned by diminishing fuel supply and my assumption is that the pressure, due to the expansion of the liquid content by vaporization of the fuel, permits the liquid to flow up into the pipe 8, past the port or orifice 13 so as to provide a liquid seal to seal off the air to pipe 12. This may not be wholly correct, but I do know that the vaporization of the liquid content, due to heat and the expansion of the vapor is effective in substantially cutting off the air supply immediately after the fuel from the burner is ignited. I, therefore, do not want to be limited to any details of construction, since in so far as I am able to discover, I am the first to supply air or gaseous fuel for the initial combustion and automatically cut it off by heat supplied from the burner.

In Fig. 4, I have shown the same construction of tank illustrated in Figures 1 and 2, except here the pipe 15 feeds direct into a vaporizing generator 22 having an outlet orifice 23 discharging into the vapor inlet 24′ of the burner 24 where the fuel will mix with the air, so instead of using a preheater, the gaseous vapor may be ignited at the burner tips 25 and when the flame from the burner tips 26 heat the generator 22, at a temperature sufficient to vaporize the liquid content of the fuel, then the escape of air through the tube 12 will cease. In this form, no preheater is employed.

In Figures 5 and 6, I have shown the invention applied to a lamp or lantern without materially changing the construction of the lamp or lantern. The font 27, the passageway 28, the generator 29, the mixing chamber 30, the air tube 31, the burner or mantle supports 32 and the mantles 33 are now used in present day gasoline lamps or lanterns. The only difference between the present day lamps or lanterns and my invention is that the fuel tube 34, communicating with passageway 28, has a restricted orifice 35 in its lower end. A housing is provided about the lower end, the housing being in the form of a reservoir 36 having a liquid inlet port 37 in its bottom adapted to be closed by a float actuated valve 38 when the liquid level in the reservoir reaches a determined level, and of course, the valve is adapted to be unseated when the float 39 drops, due to a fall in the level of the liquid 40. There is an air tube 41 communicating the air space 42 in the front with the air space 43 in the reservoir 36 and there is an air tube 44 communicating the air space in the reservoir 36 with the tube 34 so that when the valve 45 in the generator is opened, rich gaseous fuel from the spaces 42 and 43 will pass through tubes 41 and 44 up through pipe 34 into the mixing space or chamber 30 into the burner or mantle 33 where it may be instantly ignited into an incandescent flame. The heat from the mantle will in an imperceptibly short space of time heat the generator 29 hot enough to vaporize the liquid content of the fuel, expanding it to such an extent that the supply of air or gaseous fuel

from spaces 42 and 43 will be cut off and thereafter only liquid fuel will pass up into the generator.

The advantage in providing the reservoir is that the liquid will not rise too high in the discharge pipe and thereby have an excess of liquid fuel to comingle with the air when the burner is first lighted.

Another important feature of my invention is that, should the flame be blown out for any cause, the generator will cool, causing the condensation of the vaporized fuel in the line between the tank and the burner, thus relieving back pressure and permitting the vaporized air from the space 42 to escape from the top of the tank. Consequently, the liquid fuel will not leak into the burners and over the floor, a condition which is constantly liable to happen with present day burners using liquid fuel under pressure.

As heretofore stated, the outlet opening of the generator which leads into the burner should be smaller than the liquid inlet 11. In actual practice I recommend that the outlet 23 of the generator 22, in Figure 4, be 10¼ one-thousandths of an inch in diameter and the inlet 11 in pipe 8 for the liquid be 12½ one-thousandths of an inch in diameter or that the outlet 23 be 11¼ one-thousandths of an inch in diameter and the liquid inlet 11 be 13½ one-thousandths of an inch in diameter because these dimensions have proved to be highly satisfactory, although other proportionate dimensions may later prove to be useful.

Attention is also called to the fact that liquid will accumulate in the tube 8 when the valves are closed and that when the valves are first opened (for example, valve 14, Figure 4, and the generator valve) a small amount of gasoline will be carried over into the burner and be trapped there. The incoming air, however, will gradually absorb this gasoline during the functioning of the burner.

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

1. In an oil burning device, a container to hold liquid fuel and air under pressure in contact therewith, a vaporizing generator and a burner, a conduit extending from the air space into the liquid space and having that part within the liquid space communicating with the generator supplying fuel to the burner in heating relation therewith, the conduit having a restricted opening communicating with the liquid space, the generator having a restricted opening to discharge fuel to the burner, the ratio of the openings being such that air, vapor and liquid fuel in combustible mixture flow through the conduit and generator to the burner, until the heat from the burner vaporizes and expands the liquid fuel content within the generator, to retard the flow within the conduit, to cause the liquid fuel to substantially seal off the flow of air into said conduit.

2. In an oil burning device, a container to hold liquid fuel and air under pressure in contact therewith, a vaporizing generator and a burner, a conduit extending from the air space into the liquid space and having that part within the liquid space communicating with the generator supplying fuel to the burner in heating relation therewith, the conduit having a restricted opening communicating with the liquid space, the generator having a smaller restricted opening to discharge fuel to the burner so that air, vapor and liquid fuel in combustible mixture flow through the conduit and generator to the burner, until the heat from the burner vaporizes and expands the liquid fuel content within the generator, to retard the flow within the conduit, to cause the liquid fuel to substantially seal off the flow of air into said conduit.

3. In an oil burning device, a container to hold liquid fuel and air under pressure in contact therewith, a vaporizing generator and a burner, a conduit extending from the air space into the liquid space and having that part within the liquid space communicating with the generator supplying fuel to the burner in heating relation therewith, the conduit having a restricted opening communicating with the liquid space, the generator having a restricted opening to discharge fuel to the burner, the ratio of the openings being such that air, vapor and liquid fuel in combustible mixture flow through the conduit and generator to the burner, until the heat from the burner vaporizes and expands the liquid fuel content within the generator, to retard the flow within the conduit, to cause the liquid fuel to substantially seal off the flow of air into said conduit, and a control valve in the conduit.

4. In an oil burning device, a container to hold liquid fuel and air under pressure in contact therewith, a vaporizing generator and a burner, a conduit extending from the air space into the liquid space and having that part within the liquid space communicating with the generator supplying fuel to the burner in heating relation therewith, the conduit having a restricted opening communicating with the liquid space, the generator having a restricted opening to discharge fuel to the burner, the ratio of the openings being such that air, vapor and liquid fuel in combustible mixture flow through the conduit and generator to the burner, until the heat from the burner vaporizes and expands the liquid fuel content within the generator, to retard the flow within the conduit, to cause the liquid fuel to substantially seal off the flow of air into said conduit, and a control valve in the generator.

5. In an oil burning device, a container

to hold liquid fuel and air under pressure in contact therewith, a vaporizing generator and a burner, a conduit extending from the air space into the liquid space and having that part within the liquid space communicating with the generator supplying fuel to the burner in heating relation therewith, the conduit having a restricted opening communicating with the liquid space, the generator having a restricted opening to discharge fuel to the burner, the ratio of the openings being such that air, vapor and liquid fuel in combustible mixture flow through the conduit and generator to the burner, until the heat from the burner vaporizes and expands the liquid fuel content within the generator, to retard the flow within the conduit, to cause the liquid fuel to substantially seal off the flow of air into said conduit, a control valve in the conduit, and a control valve in the generator.

6. In an oil burning device, a container for combustible liquid fuel and air under pressure in contact therewith, a conduit leading into the container having a restricted orifice opening into the liquid space, a ported part leading from the conduit within the liquid space to the air space to communicate the conduit with the air space, said conduit being restricted at the end outside the container to provide a discharge orifice for supplying fuel to a burner in heating relation to a portion of the conduit, the ratio of the orifices being such that the vaporization and expansion of the fuel by heat from the burner retards the flow within the conduit to cause the liquid to seal off communication between the conduit and the air space.

7. In a device of the class described, a container to hold liquid fuel under pressure, the container having an air space above the liquid level, a burner, a liquid fuel supply pipe discharging into the burner and having a restricted inlet within the liquid fuel space, a branch pipe having its inlet in the air space above the liquid level and its outlet communicating with the supply pipe below the liquid level, a part of the supply pipe outside the container being adjacent to the burner, a restricted discharge for the supply pipe, said discharge orifice being ratioed to the liquid fuel inlet, so that vaporization and expansion of fuel by heat from the burner will cause substantial cessation of flow from the air space to the supply pipe.

8. A container holding liquid fuel under pressure having a space above the liquid level, a liquid fuel supply pipe having a liquid inlet portion within the liquid space of the container, a vaporizing generator communicating with the supply pipe having a discharge opening smaller than the liquid inlet, means communicating the space in the container above the liquid level to the supply pipe below the liquid level, and a burner associated with the vaporizing generator and in heating relation therewith.

9. A container to hold liquid fuel under air pressure, a liquid fuel supply pipe within the container having an inlet orifice below the level of the liquid, an air supply pipe communicating the air space with the first named pipe below the liquid level, a vaporizing generator communicating with the first named pipe having a discharge orifice smaller than the inlet orifice within the liquid space, and a valve between the discharge orifice and the inlet orifice of the first named pipe.

10. A container to hold liquid fuel under air pressure, a liquid fuel supply pipe associated with the tank having its inlet below the normal liquid level in the tank, a gaseous fuel supply pipe having its inlet above the normal liquid level of the container and communicating with the first named pipe below the normal liquid level of the container, a valved vaporizing generator communicating with the first named pipe outside the tank, the generator having an outlet smaller than the liquid fuel inlet and a valve between the vaporizing generator and the inlet to the first named pipe.

11. A container to hold liquid fuel under pressure, a liquid fuel supply pipe in the container having a restricted inlet below the normal liquid level in the container, a gaseous fuel supply pipe communicating with the first named pipe below the normal liquid level of the container to supply gaseous fuel under pressure into the first named pipe, a vaporizing generator outside the tank communicating with the first named pipe, the generator having an outlet smaller than the restricted inlet in the liquid fuel supply pipe, a valve between the outlet of the generator and the inlet to the first named pipe, and a burner adjacent to the generator into which the generator discharges.

12. In combination, a container for holding liquid fuel under air pressure, a pipe leading from the container, a conduit communicating the pipe with the air space above the liquid level, the pipe having an inlet below the liquid level, a vaporizing generator into which the pipe discharges, the generator having a discharge outlet so ratioed to the liquid inlet of the supply pipe that the multiplied volume of fuel due to vaporization by heat retards the flow of fuel to the generator causing fuel flowing through the inlet orifice of the supply pipe to be in excess of the discharge capacity of the generator orifice, which excess provides a liquid seal of the conduit communicating the air space with the supply pipe.

In testimony whereof I affix my signature.

JOHN E. McCUTCHEN.