Oct. 8, 1940. L. J. WHITE 2,217,582

LIQUEFIED GAS DISPENSING SYSTEM

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Fig. 1

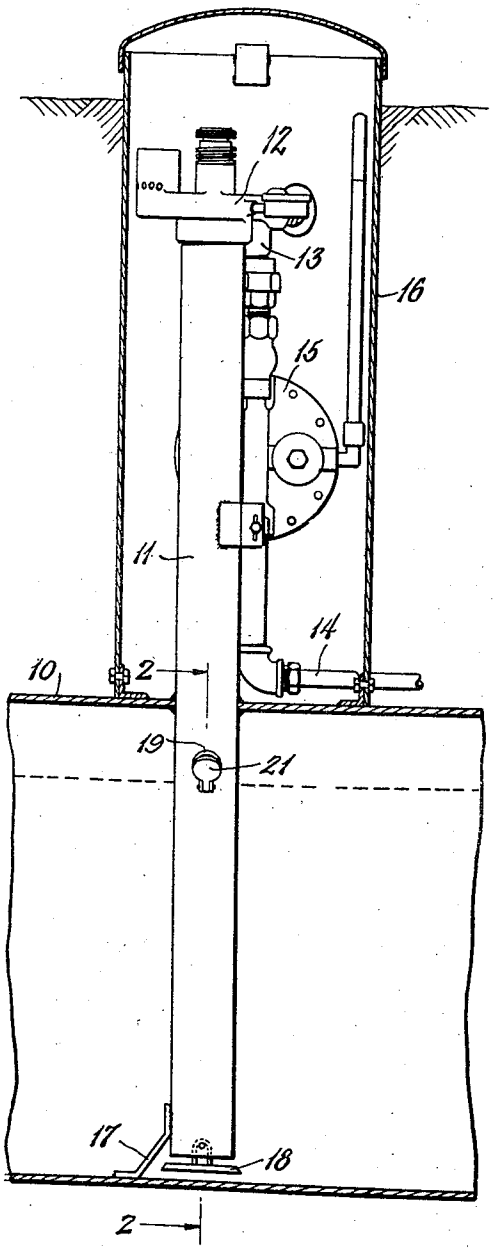
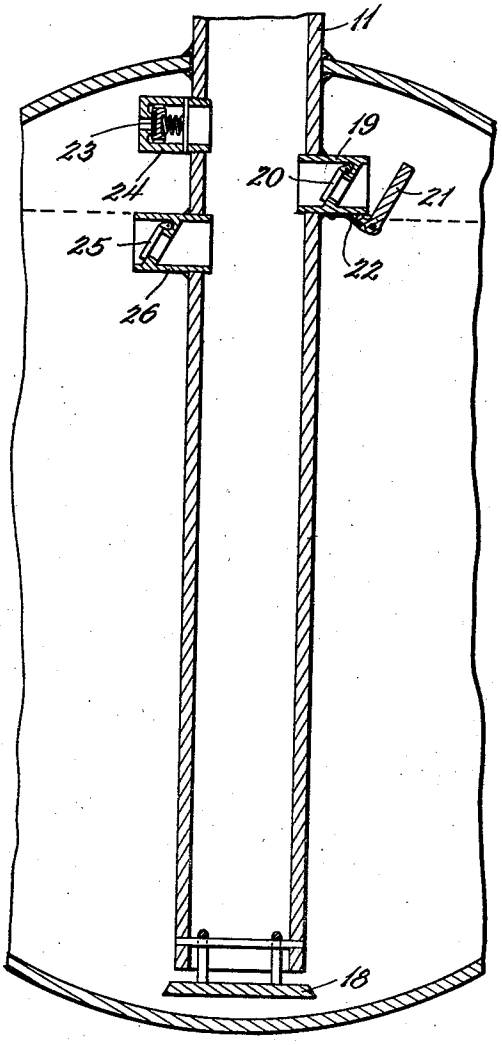


Fig. 2



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LIQUEFIED GAS DISPENSING SYSTEM

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6 Claims. (Cl. 62—1)

This invention relates to underground liquefied gas dispensing systems of the type embodying a storage tank buried in heat exchanging relation with the surrounding earth and dispensing appurtenances connected thereto for generating and dispensing liquefied petroleum gas including mixtures of butane and propane, which are most commonly used and, among other objects, aims to provide important improvements in the types of systems shown in U. S. Patents Nos. 2,121,673 and 2,121,675, the main idea being to confine the vaporization of the liquefied gas to a standpipe, taking it from the bottom portion of the tank and thereby insuring substantially uniform richness of the dispensed vapor. In the latter respect, this application involves simplified improvements on the vaporizing means disclosed in my copending applications Ser. No. 237,113, filed October 26, 1938.

Other aims and advantages of the invention will appear in the specification, when considered in connection with the accompanying drawing, wherein:

Fig. 1 is a vertical sectional view of a underground system embodying the invention; and

Fig. 2 is an enlarged view taken on the line 2—2 of Fig. 1.

As explained in the aforesaid copending application, some difficulty has been experienced with burner appliances because of the lack of uniformity in richness or B. t. u. content of gas delivered from a dispensing system of the type described. This is due largely to the fact that, when the tanks are serviced or filled, the propane mixed with the butane vaporizes more rapidly than the butane and it contains less B. t. u.'s than the butane. It has been found that if the liquefied gas is delivered from the bottom portion of the tank into a vaporizer the generated vapor will remain of substantially uniform heating value from the time the tank is filled until it is empty or nearly empty. This invention therefore, provides a simplified form of vaporizer combined with what is known as a standpipe system and using an extension of the standpipe into the tank for that purpose, as distinguished from the separate valved vaporizing chamber shown in the aforesaid copending application.

Referring particularly to the drawing, the system there shown for illustrative purposes is similar to the one disclosed in Patent No. 2,121,675. It embodies an underground tank 10 having a standpipe 11 to the top of which is removably connected a combination unitary valved fitting 12 like the one shown in said patent. The fitting is provided with the usual filling and safety appurtenances and gauges which require no explanation here. It is to be understood, however, that the level gauge employed may be of the ordinary slip tube type, or of the float operated type, as shown in copending application Ser. No. 176,842 filed November 27, 1937. To one branch of the fitting is connected the usual outlet nipple 13 through which the gas is delivered to a service pipe 14, the pressure being controlled by the usual pressure reducing regulator 15. The standpipe and the parts just described are housed within the usual protecting casing 16.

In this instance, the standpipe is shown as extending through the top wall of the tank to a point near the bottom. It is preferably, though not necessarily, anchored at the lower end by means of a welded-on bracket 17 to prevent relative vibration. The tank is adapted to be filled through the standpipe as usual and the liquefied gas passes into the lower end of the standpipe from the tank to be vaporized as it is required.

In the bottom of the standpipe there is shown a check valve 18 which acts as an excess flow valve and is adapted to close automatically when the combination fitting 12 is removed from the standpipe to prevent the contents of the tank from escaping. However, this valve may be omitted if repairs are made only when the tank is empty. Above the normal liquid level within the tank there is shown a tubular nipple 19 carrying a small check valve 20 opening into the standpipe to permit a small quantity of vapor generated within the tank to flow into the standpipe and maintain the pressure balance in the standpipe and the tank as gas is being consumed. This nipple is shown as also carrying a check valve 21 normally held open by a spring 22 but adapted to close automatically when the fitting 12 is removed from the standpoint, cooperating with the valve 18 to prevents the contents of the tank from escaping. When the valves 18 and 21 are employed, it is desirable to place a safety valve in the tank communicating with the standpipe to avoid any possibility of a dangerous pressure developing in the tank while repairs are being made. For this purpose, there is shown a spring loaded pressure relief valve 23 well above the normal liquid level in the tank and arranged within a nipple 24.

To prevent the level of the liquid within the stand-pipe from rising too high or to the level of the fitting 12, there is shown a small check valve 25 also conveniently arranged within a nipple 26 and communicating with the stand-

pipe near the maximum liquid level. This valve opens from the standpipe into the tank and is adapted to open after the liquid level in the standpipe rises well above the liquid level in the tank, due to abnormal gas consumption which may temporarily reduce the pressure in the standpipe. As the liquid flows back into the tank to equalize the liquid levels, it will be understood that some vapor may flow through the check valve 20 into the standpipe to replace it. Moreover, the valves 18, 20, 21 and 25 are designed to permit a slight leakage of gas to re-establish a substantially balanced pressure and equalized liquid level within the standpipe and the tank after the fitting 12 has been removed and is replaced. It will be seen that vaporization of the liquefied gas as the gas vapor is used, takes place within the relatively small standpipe and this insures more or less violent ebullition or agitation. This agitation thoroughly mixes the different constituents of the gas and its richness remains substantially uniform.

From the foregoing description, it will be seen that the system is very simple in its construction and easy to manufacture and install. It is very rugged, dependable and safe in operation. It insures uniformity in heating value of the gas delivered and avoids any complications due to changes in the air supply to burners. Moreover, the improvement is adapted to be employed in any ordinary type of so-called standpipe systems.

Obviously, the present invention is not restricted to the particular embodiment thereof herein shown and described.

What is claimed is:

1. In a liquefied gas dispensing system of the class described, a storage tank; a standpipe extending into the tank to a point near the bottom, permitting liquefied gas to enter its lower end and be vaporized therein to supply the gas demand; a normally closed check valve in the standpipe within the tank opening from the tank into the standpipe above the maximum liquid level in the tank and permitting the gas to flow freely from the tank into the standpipe to equalize the pressure and maintain the liquid level in the standpipe substantially the same as that in the tank; and gas dispensing and control appurtenances connected to the standpipe.

2. In a liquefied gas dispensing system of the class described, a storage tank; a standpipe extending into the tank to a point near the bottom, permitting liquefied gas to enter its lower end and be vaporized therein to supply the gas demand; a normally closed check valve opening from the tank into the standpipe above the maximum liquid level in the tank and permitting the gas to flow from the tank into the standpipe to equalize the pressures; a check valve opening into the tank from the standpipe near the level of said first named check valve to permit liquid to flow from the standpipe into the tank when the liquid level rises in the standpipe above the level in the tank; and dispensing and control appurtenances connected to the upper end of the standpipe.

3. In a liquefied gas dispensing system of the class described, a storage tank; a standpipe extending into the tank to a point near the bottom, permitting liquefied gas to enter its lower end and be vaporized therein to supply the gas demand; a pair of check valves connected to the standpipe in the tank, one opening into the standpipe and the other opening into the tank, to equalize the pressure and maintain the same liquid level in the standpipe and tank; a valved filling and dispensing fitting connected to the standpipe; and other check valves connected to the standpipe within the tank adapted to be closed by the pressure in the tank to cut off communication between the tank and standpipe when the fitting is removed or the standpipe springs a leak outside the tank, thereby preventing the contents of the tank from escaping.

4. In a liquefied gas dispensing system of the class described, a storage tank; a standpipe extending into the tank to a point near the bottom, permitting liquefied gas to enter its lower end and be vaporized therein to supply the gas demand; a pair of check valves connected to the standpipe in the tank, one opening into the standpipe and the other opening into the tank, to equalize the pressure and maintain the same liquid level in the standpipe and tank; a valved filling and dispensing fitting connected to the standpipe; other check valves connected to the standpipe within the tank adapted to be closed by the pressure in the tank to cut off communication between the tank and standpipe when the fitting is removed or the standpipe springs a leak outside the tank, thereby preventing the contents of the tank from escaping; and a pressure relief valve connected to the standpipe also above the maximum liquid level to relieve abnormal pressures in the tank when all of said check valves are closed.

5. In a liquefied gas dispensing system of the class described, a storage tank; a standpipe extending into the tank to a point near the bottom, permitting liquefied gas to enter its lower end and be vaporized therein to supply the gas demand; a check valve opening from the tank into the standpipe above the maximum liquid level in the tank; a check valve opening into the tank from the standpipe below the level of said first named check valve to permit liquid to flow from the standpipe into the tank when the liquid level rises in the standpipe above the level in the tank; dispensing and control appurtenances connected to the upper end of the standpipe; and other check valves connected to cut off communication between the tank and standpipe when said appurtenances are removed or the standpipe springs a lead outside the tank.

6. In a liquefied gas dispensing system of the class described, a storage tank; a standpipe extending into the tank to a point near the bottom, permitting liquefied gas to enter its lower end and be vaporized therein to supply the gas demand; a valved fitting connected to the upper end of the standpipe; a pipe nipple in the standpipe within the tank above the maximum liquid level; a normally closed check valve in the nipple opening toward the standpipe to permit a small quantity of vapor to flow from the tank and equalize the pressure in the standpipe; a normally open check valve on said nipple opening into the tank and adapted to close due to the pressure in the tank when said valved fitting is removed or the standpipe springs a leak outside the tank; and a normally open check valve in the lower end of the standpipe also adapted to close and cut off communication between the standpipe and tank when said fitting is removed.

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