

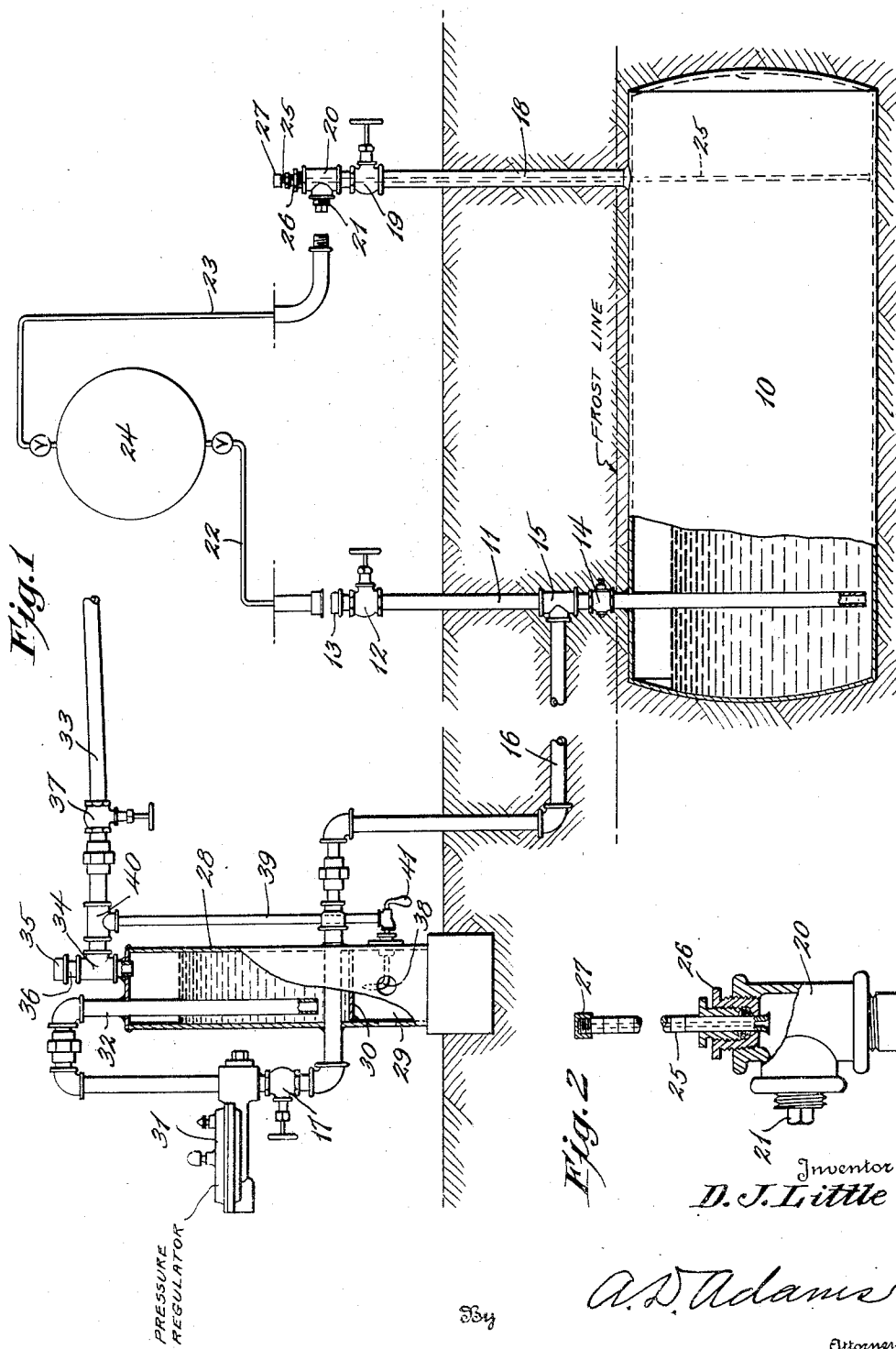
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LIQUEFIED HYDROCARBON GAS STORAGE AND DISPENSING SYSTEM

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LIQUEFIED HYDROCARBON GAS STORAGE
AND DISPENSING SYSTEMDavid J. Little, San Antonio, Tex., assignor to
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11 Claims. (Cl. 62—1)

This invention relates to apparatus for storing, generating and dispensing hydrocarbon gas, and among other objects, aims to provide a greatly improved system for gasifying volatile, liquid hydrocarbons, such as normal butane, isobutane, propane and mixtures of the same which volatilize at temperatures varying from, say 30° to 50° F. The main idea is to provide a simplified plant for domestic and commercial use wherein a storage tank is buried in the ground below the frost line and a gasifying unit is connected to it to produce a clean, substantially odorless gas of high heat content for use in cooking, heating and lighting appliances.

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 side elevation, partly in section, of a system embodying the invention; and

Fig. 2 is a fragmentary enlarged sectional view of a combined slip-tube gage and gas vent shown in Fig. 1.

Referring particularly to the drawing, the simplified system shown for illustrative purposes is adapted to generate gas for domestic or commercial use from the highly volatile constituents of petroleum. In this instance, a metal pressure tank 10 is shown as being buried in the ground below the frost line and in heat exchanging relation to the surrounding earth fill. A filling pipe 11 projects into the tank to a point near the bottom and extends above the ground having a cut-off valve 12 and a removable filling cap 13. This pipe also serves as a dispensing conduit for the liquefied gas and has a stop cock 14 near the tank below a T 15 to which a discharge pipe 16 is connected. The discharge pipe has a valve 17, which may be closed while the tank is being filled.

A vent pipe 18 is also connected to the tank and extends above the ground level to vent the gas while the tank is being filled. For this purpose, it has a valve 19 and T 20 at its upper end carrying a screw plug 21. When the tank is to be filled, the filling cap 13 and the vent plug 21 are removed and valved filling and venting hoses 22 and 23, respectively, of a service truck tank 24 are connected to the filling and venting pipes. The valve 17 is closed and the valves 12 and 19 are opened. The arrangement is such that the liquefied gas under pressure in the service tank flows by gravity into the tank 10 and the displaced gas in the storage tank is conducted through the

vent pipe 18 and hose into the top portion of the service truck tank.

To enable the attendant to determine the level of the liquefied gas in the tank 10 while it is being filled, a slip-tube gage 25 is mounted in a stuffing gland 26 in the upper end of the T 20 on the vent pipe 18. The slip-tube is adapted to be lowered through the vent pipe past the open valve 19 into the tank and has a cap 27 at its upper end which may be removed or partially opened. When the lower end of the small tube reaches the liquid level, liquid will be discharged through the upper end. Then suitable graduations on the slip-tube will indicate the liquid level. When the desired liquid level is reached, the slip-tube has to be raised so that its lower end clears the valve 19 to permit this valve to be closed. Incidentally, the end is shown as being flared to prevent the tube from being pulled out of the stuffing box. The service tank hoses are then disconnected, the filling cap and vent plug replaced, and the valves 12 and 19 are again closed so that the system may dispense the gas. The heat of the surrounding earth will vaporize some of the liquefied gas in the tank and always maintain a gas pressure above the liquid level therein to force liquid upwardly through the dispensing conduit 16. The pressure will be equal to that at which the liquid will vaporize due to the temperature of the surrounding earth.

In this instance, the conduit 16 passes through the water compartment of a gasifier unit shown as being above the ground level. The gasifier is shown as comprising a closed cylindrical heater 28 having an open burner compartment or chamber 29 below a welded-in bottom wall 30. It is adapted to be partially filled with water, as shown. The liquefied gas, after being slightly preheated and partially vaporized in that portion of the pipe 16 passing through the water heater, passes through an ordinary pressure regulator 31, and a pipe 32 discharging into the heater near the bottom of the water compartment. The arrangement is such that the partially vaporized liquefied gas is completely vaporized by absorbing heat from the water and the gas is cleansed of tar and other foreign matter as it bubbles up through the water to the gas chamber at the top. An upwardly inclined service pipe 33 is connected to the gas chamber of the heater conveniently by means of a nipple carrying a T 34 through which the heater is adapted to be supplied with water. It is shown as having a filling cap 35 on a short nipple 36. The inclined service pipe will drain any condensed gas back toward

the heater where it will be revaporized by heat exchange with gas and the pipe adjacent to the heater. A service cut-off valve 37 is shown as being connected to the pipe near the heater.

The gasifier is shown as being heated by a small burner 38 connected by a pipe 39 to a T 40 in the service pipe 33 and having a burner valve 41. A small pilot-like flame will supply the necessary heat during cold weather. During warm weather, the burner may be cut off.

It will be noted that the entire gasifier unit, including the pressure regulator, pipe connections and burner, is adapted to be assembled at the factory and may be connected by ordinary pipe couplings. While it is shown as being located above the ground, it may be installed at any convenient place. It will also be understood that it should be protected by a suitable insulating housing or protecting casing (not shown), especially when it is installed outside of a house.

From the foregoing description, it will be seen that the system is very simple in its design and reliable in operation. It is well adapted for ordinary household and commercial use. It may be manufactured and installed at low cost. It has no delicate and expensive parts requiring frequent replacement. It will generate clean gas in any climate and requires very little attention.

Obviously, the present invention is not restricted to the particular embodiment thereof herein shown and described. Moreover, it is not indispensable that all the features of the invention be used conjointly, since they may be employed advantageously in various combinations and sub-combinations.

What is claimed is:

1. In a gas generating and dispensing system of the class described, a storage tank adapted to be buried in the ground and partially filled with liquefied hydrocarbon gas; a dispensing conduit extending to a point near the bottom of the tank; a pressure regulator connected to the dispensing conduit; a gasifier unit comprising a closed heater partially filled with water below the level of which the dispensed gas is discharged; a gas service pipe connected to the heater above the water level; and a burner for the heater connected to be supplied with the generated gas.

2. In a gas generating and dispensing system of the class described, a storage tank adapted to be buried in the ground and partially filled with liquefied hydrocarbon gas; a dispensing conduit extending to a point near the bottom of the tank; a pressure regulator connected to the dispensing conduit; a gasifier unit comprising a closed heater partially filled with water below the level of which the dispensed gas is discharged; a gas service pipe connected to the heater above the water level; and a gas burner for the gasifier connected to the service pipe.

3. In a gas generating and dispensing system of the class described, a storage tank adapted to be buried in the ground and partially filled with liquefied hydrocarbon gas; a dispensing conduit extending to a point near the bottom of the tank; a pressure regulator connected to the dispensing conduit; a gasifier unit comprising a closed heater partially filled with water below the level of which the dispensed gas is discharged; a gas service pipe connected to the heater above the water level; and a gas burner for the gasifier connected to the service pipe, said dispensing conduit extending through the heater partially to vaporize the liquefied gas before it passes through the pressure regulator.

4. In a gas generating and dispensing system of the class described, a storage tank adapted to be buried in the ground and partially filled with liquefied hydrocarbon gas; a dispensing conduit extending to a point near the bottom of the tank; a pressure regulator connected to the dispensing conduit; a gasifier unit comprising a closed heater partially filled with water below the level of which the dispensed gas is discharged; and a gas service pipe connected to the heater chamber above the water level and inclined upwardly therefrom to drain any condensate back toward the heater.

5. In a gas generating and dispensing system of the class described, a storage tank adapted to be buried in the ground and partially filled with liquefied hydrocarbon gas; a dispensing conduit extending to a point near the bottom of the tank; a pressure regulator connected to the dispensing conduit; a closed chamber above the ground partially filled with water below the level of which the dispensing conduit is connected to discharge; a gas service conduit connected to the chamber above the water level therein; heating means employing some of the generated gas to heat the chamber; and means to supply water to the chamber.

6. In a gas generating and dispensing system of the class described, a storage tank adapted to be buried in the ground and partially filled with liquefied hydrocarbon gas; a dispensing conduit extending to a point near the bottom of the tank; a pressure regulator and manually operable cut-off valve connected to the dispensing conduit; a valved filling pipe connected to the dispensing conduit above the tank; a valved vent pipe connected to the vapor space in said tank; and a service tank having hoses adapted to be connected to said filling conduit and vent pipe.

7. In a gas generating and dispensing system of the class described, a storage tank adapted to be buried in the ground and partially filled with liquefied hydrocarbon gas; a dispensing conduit extending to a point near the bottom of the tank; a pressure regulator connected to the dispensing conduit; a valved filling pipe connected to the dispensing conduit above the tank; a valved vent pipe connected to the vapor space in said tank; a service tank having hoses adapted to be connected to said filling conduit and vent pipe; and a slip-tube gage in the vent pipe connected to determine the level of the liquid in the storage tank while the storage tank is being filled.

8. In a liquefied gas dispensing system of the class described, an underground pressure storage tank partially filled with a volatile liquid fuel; a discharge pipe through which the liquid fuel is delivered therefrom by the pressure of vaporized gas on the surface of said liquid fuel; a gasifier having an open chamber in its lower portion; a burner mounted in said chamber; a closed upper portion partially filled with water; a portion of the discharge pipe passing through said water chamber to transmit heat from said water to said liquid fuel; a pressure regulator in the discharge pipe leading from the regulator to the bottom of said water chamber; a service conduit connected to the top of said water chamber; and a supply pipe for said burner connected to said service conduit.

9. In a storage and dispensing system for liquefied gas, an underground pressure storage tank; a dispensing conduit connected to deliver liquefied gas from the tank; a combined gasifier and gas cleansing unit above the ground remov-

ably connected to said dispensing conduit; and a gas burner to heat said unit supplied with gas therefrom.

10. In a storage and dispensing system for liquefied gas, an underground pressure storage tank; a dispensing conduit connected to deliver liquefied gas from the tank; a combined gasifier and gas cleansing unit above the ground removably connected to said dispensing conduit; a pressure regulator in the dispensing conduit; and a burner for the gasifier connected to be supplied with gas delivered from the gasifier.

11. A storage and dispensing system for lique-

fied petroleum gas comprising, in combination, a pressure storage tank; a liquid eduction pipe communicating with the bottom portion of said storage tank; a pressure reducing regulator in said liquid eduction pipe; a vaporizing tank partially filled with liquid; and a valved service pipe connected to said vaporizing tank above the liquid level; means to deliver the liquid gas to the bottom portion of the generating tank below the liquid level therein; one of said tanks being buried in the ground to absorb heat from the surrounding earth.

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