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2,316,495

LIQUEFIED GAS DISPENSING SYSTEM

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Fig. 1

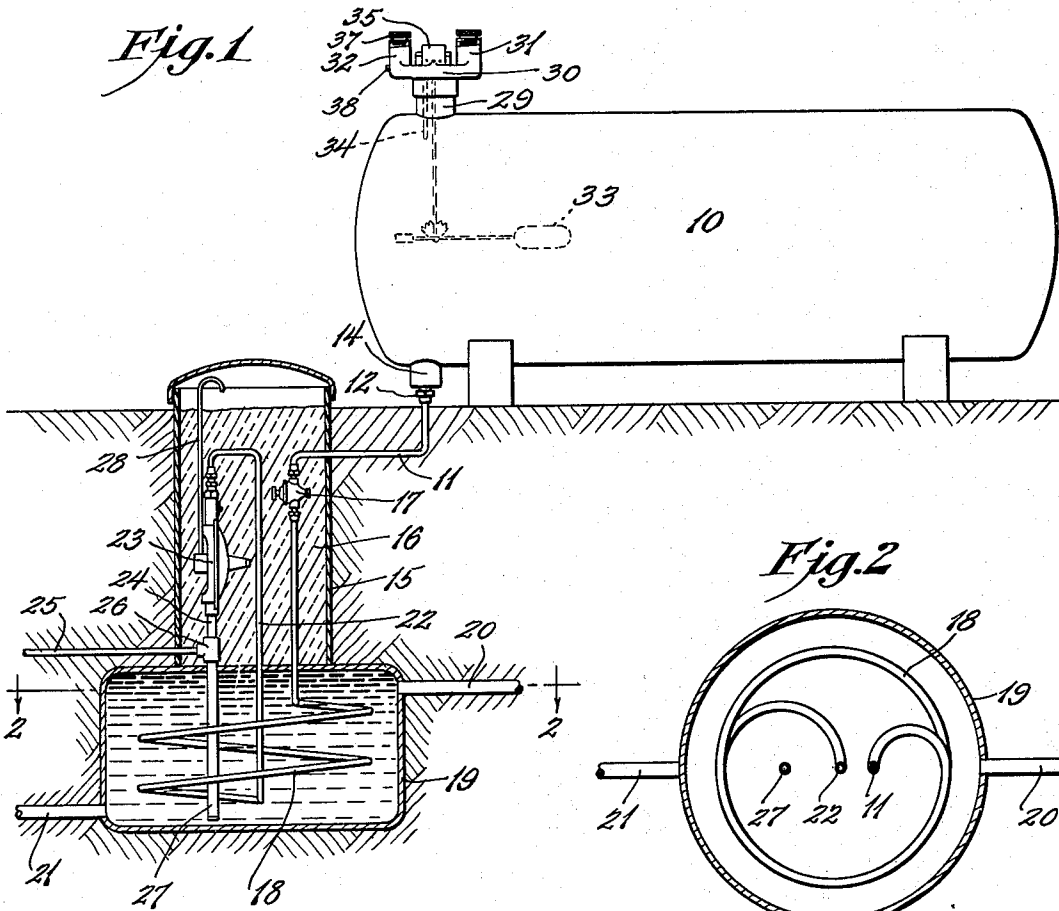


Fig. 2

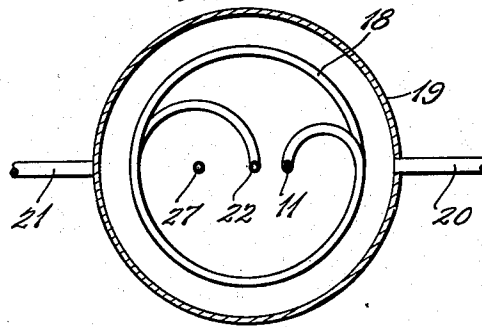


Fig. 4

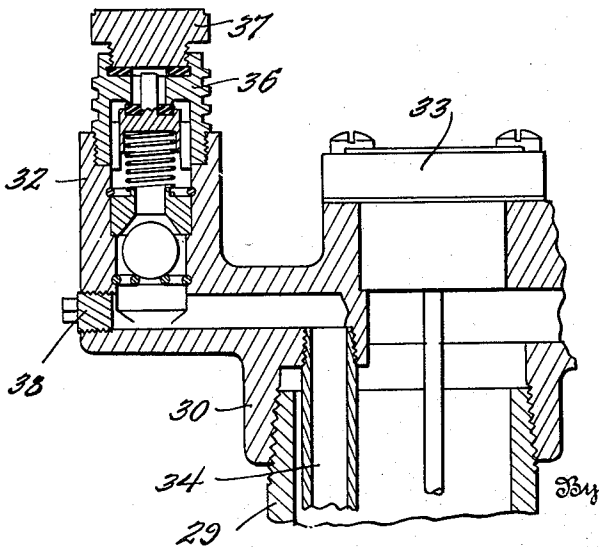
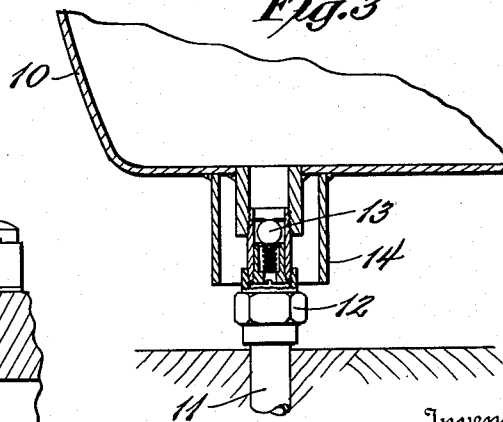


Fig. 3



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LIQUEFIED GAS DISPENSING SYSTEM

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6 Claims. (Cl. 62—1)

This invention relates to liquefied petroleum gas systems of the type employed for generating and dispensing butane gas or mixtures of more or less volatile liquefied petroleum constituents and, among other objects, aims to provide an improved, simplified system having an above-ground container or storage tank from which the liquefied gas is delivered in the liquid phase to an underground vaporizer and, thence, to a service pipe. The idea is to provide such a system to meet the demand for above-ground tanks in some parts of the country.

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, partly in elevation, showing a system embodying the invention;

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

Fig. 3 is an enlarged fragmentary sectional view showing the outlet connection to the storage tank in Fig. 1; and

Fig. 4 is an enlarged fragmentary sectional view showing a combination vapor return and air valve.

In some sections of the country, butane storage containers or generating tanks are usually buried under the ground. In other sections, however, where excavations are difficult or where the soil tends to corrode the tank rapidly, the tanks are placed above the ground and there is also some demand for such above-ground tanks where the climate is not extremely cold. It is one of the objects of this invention to provide a system which employs an above-ground tank 10 from which the liquefied gas is dispensed or delivered by the vapor pressure and gravity to an underground vaporizer, utilizing the earth's heat and/or supplemental heat derived from a heat exchanging fluid, such as water, to generate the vapor to be delivered to the service pipe. To insure delivery of the liquefied gas from the tank, even in cold weather, there is shown a delivery pipe 11 connected by means of a union coupling 12 to the casing of an ordinary excess flow check valve 13, which, in turn, is connected to the bottom of the tank, as shown in Fig. 3 and the connection is protected by a depending cylindrical shield 14 welded to the tank.

The pipe 11 leads underground through the side wall of a vertical casing 15 shown as extending slightly above the ground; thence downwardly through a filler of insulating material 16 to a

pressure reducing valve 17 which may reduce the pressure to five pounds or less and the liquid passes through a coil 18 submerged in a closed vaporizing container or chamber 19 which is supplied with water through an inlet pipe 20 and an outlet pipe 21. This may be and preferably is a part of the ordinary water supply system, it being understood that the critical temperature of the liquefied gas is much lower than that of the water. The vapor generated in the coil passes out through a vertical pipe 22, shown as extending to a point below the ground level within the vertical casing 15, and then downwardly also within the casing through an ordinary second stage pressure regulator 23. The gas is then delivered through an outlet nipple 24 to a service pipe 25 extending substantially horizontally underground below the frost line to a point of use. The low point of the service pipe is below the regulator, so that any condensate formed therein will drain back toward the tank. The nipple and pipe are shown as being connected by a T fitting 26 carrying a depending spur tube 27 having a closed lower end and extending through the upper wall of the chamber 19 into the water to revaporize the condensate.

In this instance, the regulator is shown as having the usual vent tube 28 extending upwardly into the casing 15 above the level of the insulation. Incidentally, the casing is filled with the insulating material to about the ground level. The casing has the usual removable vented cover to permit any gas issuing from the vent tube 28 to escape to the atmosphere.

The storage tank is adapted to be filled by any ordinary filling appurtenances well known in the art. In this instance, however, it is shown as having an upstanding nipple 29 carrying a fitting 30 which has valved filling and vapor return branches 31 and 32. This fitting is similar to that shown in the White Patent No. 2,121,675 and also carries the usual float gauge 33 (Fig. 4) and a dip tube 34 projects from the vapor return branch 32 into the tank to the maximum liquid level to prevent over-filling. The usual pressure relief valve is mounted in a branch 35 on the fitting.

In the operation of the system, vapor pressure usually exists in the tank and the liquid flows by gravity and under the pressure through the first stage pressure reducing regulator 17 and its pressure is reduced to, say, five pounds. The liquid is then vaporized at about the same pressure and delivered through the second stage regulator 23 to the service pipe 25 at a pressure of about six

ounces. Sufficient water is supplied to the container to replace the vaporizing heat absorbed by the coil.

During extremely cold weather, the temperature may fall below that necessary to generate sufficient vapor pressure in the tank 10 to force it through the first stage regulator 17. In this event, air or gas under pressure may be introduced into the tank 10 through the vapor return valve branch 32. It is contemplated that propane gas or some other gas having a very low critical temperature may be used. An air hose may be connected to the usual hose fitting 36 (Fig. 4) after the plug 37 is removed or an ordinary tire valve (not shown) may be provided in lieu of the closure plug 38 to receive the usual hose fitting of a conventional tire pump. In any event, air or gas may be readily pumped or introduced through the branch 32 and dip tube 34 to provide the necessary pressure on the liquefied gas in the tank.

From the foregoing description, it will be apparent that the tank and its associated parts are easily accessible from above the ground. Any leaks that may occur can easily be detected. The underground vaporizer is always dependable and an adequate supply of gas is assured under all ordinary weather conditions, even though the vapor pressure in the tank may be greatly reduced due to cold weather.

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 having a permanently installed pressure storage tank mounted above the ground; a liquid outlet conduit communicating with the bottom of the tank and leading underground; a first stage pressure reducing regulator in said conduit; a heat exchanger including a coil of pipe connected to said regulator and a chamber containing circulating water within which the coil is submerged; a gas outlet conduit connected to said heat exchanger; a second stage pressure reducing regulator in the gas outlet conduit also arranged underground and connected to deliver gas to a service pipe, and a protecting casing for said regulators supported on the heat exchanger and extending above the ground level and filled with heat insulating material to a point above both regulators.
2. In a liquefied gas dispensing system having a permanently installed pressure storage tank mounted above the ground; a single fitting having provision for filling the tank and for introducing air or gas into the tank; a liquid outlet conduit communicating with the bottom of the tank and leading underground; a first stage pressure reducing regulator in said conduit; a heat exchanger employing liquid as a heating medium buried in the ground below the frost line adjacent to the tank and connected to said regulator; an upstanding reversely bent gas conduit connected to said heat exchanger and leading downwardly to a point adjacent to the heat exchanger; a second stage regulator connected to the reversely bent portion of the gas conduit to deliver the gas to a service pipe; and a protecting casing about said upstanding conduit around both regulators and partially filled with heat insulating material to a point above both regulators.
3. A liquefied gas dispensing system comprising, in combination, a permanently installed pressure storage tank mounted above the ground; a liquid outlet conduit communicating with the

bottom of the tank and leading underground; a first stage pressure reducing regulator in said conduit; a heat exchanger employing liquid as a heating medium buried in the ground below the frost line and connected to said regulator; an upstanding reversely bent gas conduit connected to said heat exchanger and having its reversely bent portion extending downwardly to a point near the heat exchanger; a second stage regulator connected to the reversely bent portion to deliver the gas to a service pipe; and a protecting casing for both of said regulators supported on the heat exchanger and extending upwardly above the ground adjacent to the bottom portion of said storage tank and filled with heat insulating material to a point above the conduits and regulators.

4. A liquefied gas dispensing system comprising, in combination, a permanently installed pressure storage tank mounted above the ground and having provision for introducing air or gas under pressure into said tank; a liquid outlet conduit connected to the bottom of the tank and leading underground; an excess flow check valve at the tank end of said outlet conduit; a union coupling connection between the valve casing and said conduit; a first stage pressure reducing regulator in said conduit; a heat exchanger employing liquid as a heating medium buried in the ground below the frost line and connected to said regulator; a gas outlet conduit connected to said heat exchanger; a second stage pressure reducing regulator in the gas outlet conduit also arranged underground and connected to deliver gas to a service pipe; and a protecting casing for both regulators supported on the heat exchanger and extending upwardly above the ground level adjacent to the tank.

5. A liquefied gas dispensing system comprising, in combination, a permanently installed pressure storage tank mounted above the ground; a single valved fitting having provision for filling the tank and for introducing air or gas into the tank to increase the pressure during cold weather; a liquid outlet conduit connected to the tank and leading underground; a first stage pressure reducing regulator in said conduit; a heat exchanger employing liquid as a heating medium buried in the ground below the frost line and connected to said regulator; a gas outlet conduit connected to said heat exchanger; and a second stage pressure reducing regulator in the gas outlet conduit also arranged underground and connected to deliver gas to a service pipe.

6. In a liquefied gas dispensing system having a permanently installed pressure storage tank mounted above the ground, a heat exchanger buried in the ground below the frost line; a casing supported on the heat exchanger and extending above the ground; said heat exchanger including a chamber filled with circulating water and a coil submerged therein having its ends projecting upwardly into the casing; a liquid conduit communicating with the bottom portion of the tank leading underground into the casing and connected to one end of said coil; a first stage pressure reducing regulator in said conduit within the casing; a gas outlet conduit connected to the other end of said coil and extending through the side of the casing underground to a point of use; and a second stage pressure reducing regulator in said gas outlet conduit also arranged in the casing.

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