

June 21, 1938.

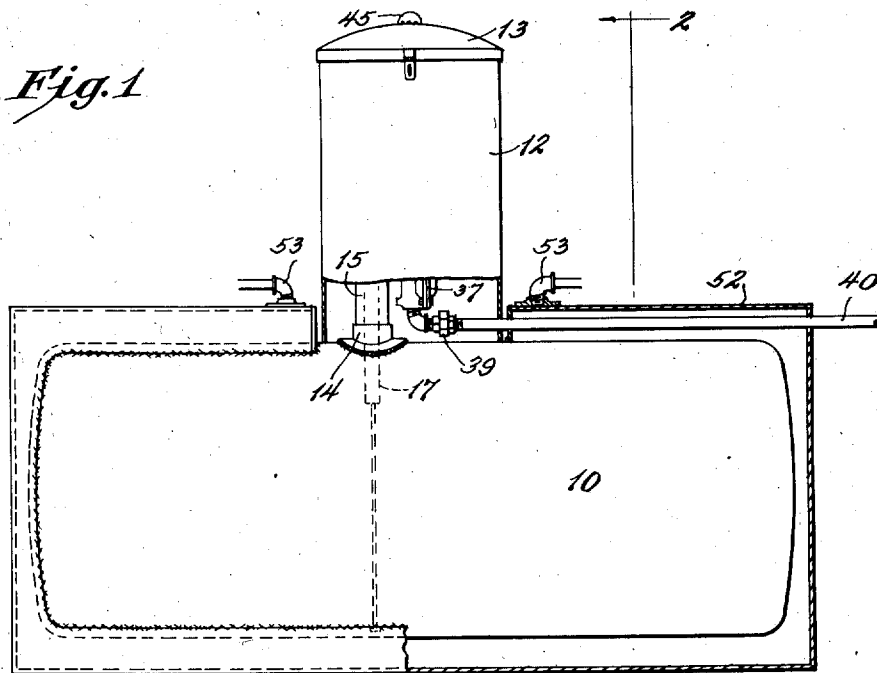
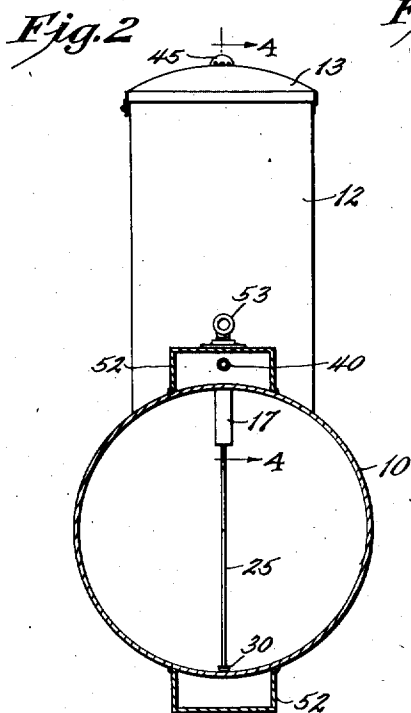
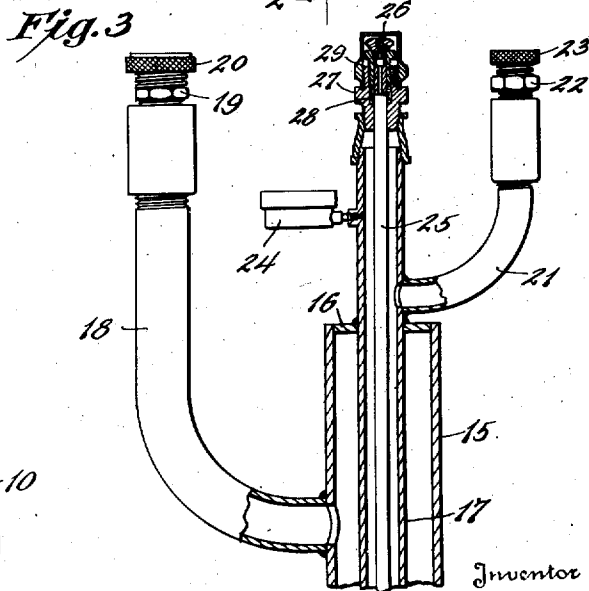
L. J. WHITE

2,121,673

DISPENSING APPARATUS FOR LIQUEFIED GAS

Filed Aug. 26, 1936

3 Sheets-Sheet 1



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June 21, 1938.

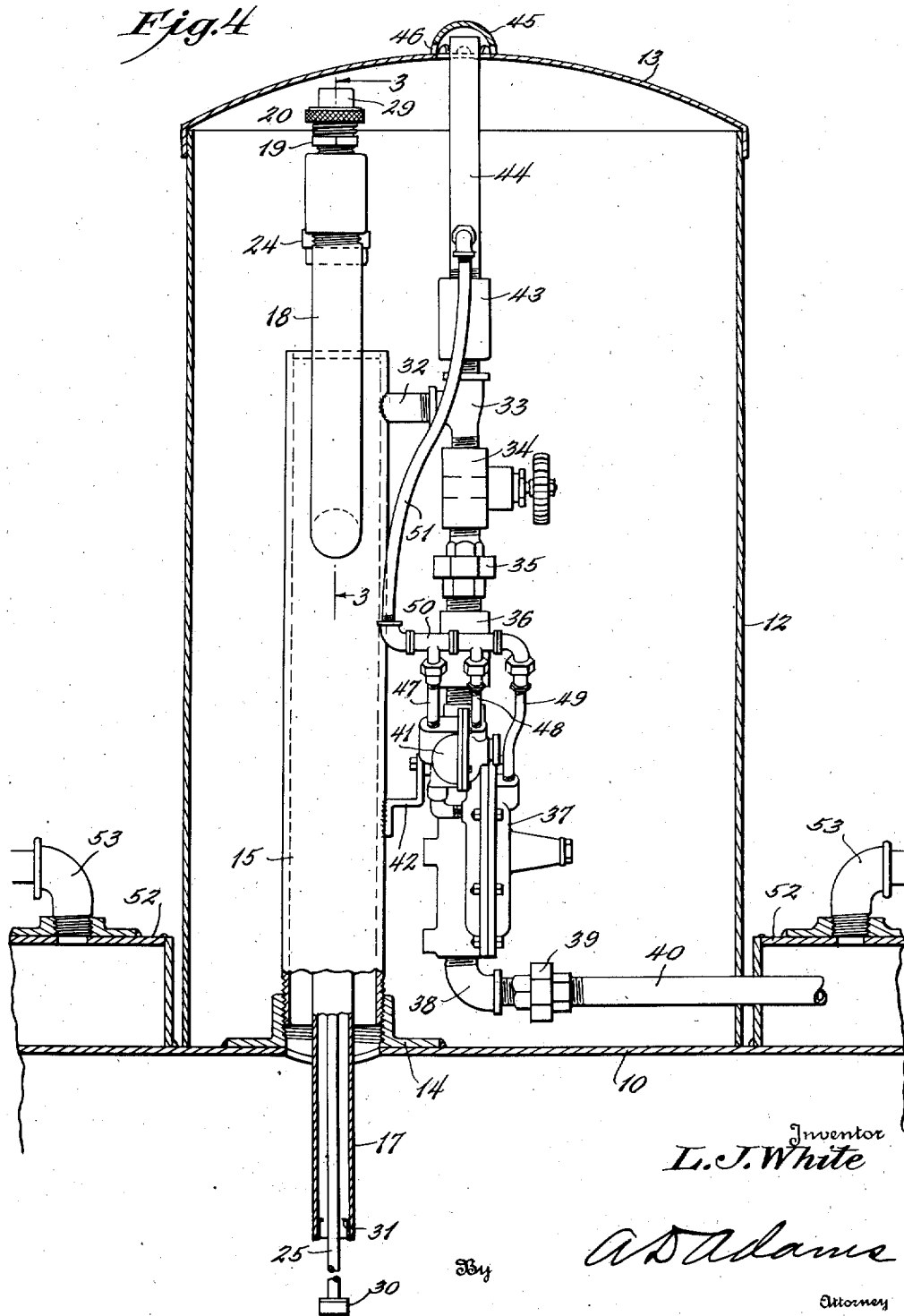
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DISPENSING APPARATUS FOR LIQUEFIED GAS

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3 Sheets-Sheet 2



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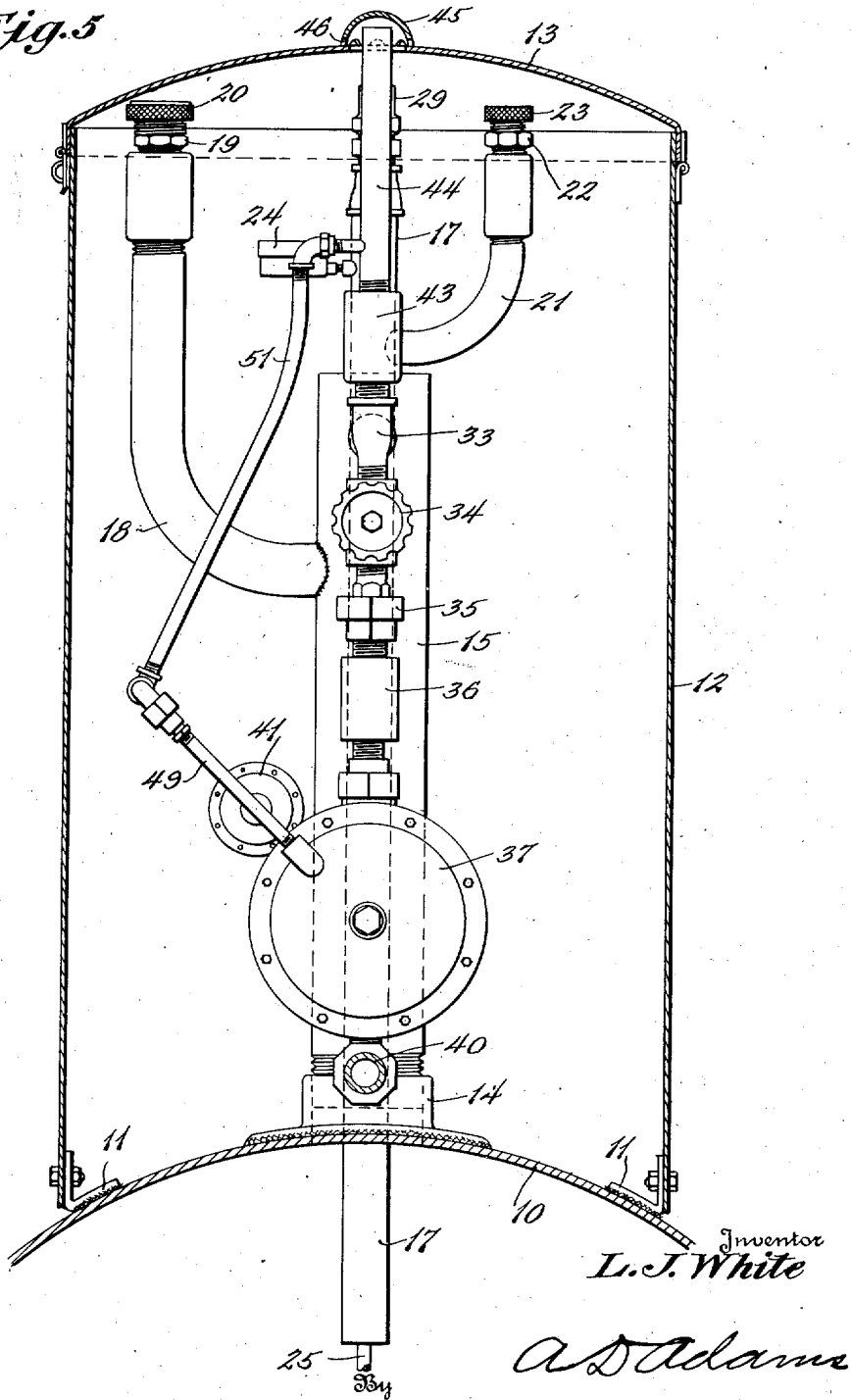
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Fig. 5



UNITED STATES PATENT OFFICE

2,121,673

DISPENSING APPARATUS FOR LIQUEFIED GAS

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Application August 26, 1936, Serial No. 98,048

19 Claims. (Cl. 62-1)

This invention relates to apparatus for dispensing liquefied gas and, among other objects, aims to provide a greatly improved, simplified and reliable dispensing unit to be used in household installations. One of the objects of the invention is to provide dispensing apparatus for connection to a storage tank adapted to be assembled as a unit and then connected to the tank by means of a single pipe fitting and so constructed that a single vertical conduit or standpipe not only serves as a support for all of the appurtenances, but, also, provides a filling and gas service conduit for the system. Another important object is to provide novel means to prevent overfilling of the storage tank and thereby avoid the consequent danger of a ruptured tank. This invention involves improvements on the apparatus disclosed in U. S. Patent No. 2,042,439.

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

Fig. 1 is a side elevation, partly in section, showing a system embodying the invention;

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

Fig. 3 is a sectional view taken on the line 3-3 of Fig. 4;

Fig. 4 is an enlarged sectional view taken on the line 4-4 of Fig. 2, parts being shown in elevation; and

Fig. 5 is a similar enlarged sectional view taken at right angles to Fig. 4.

Referring particularly to the drawings, the apparatus there shown is especially designed for use in dispensing liquefied petroleum gases such as normal butane, isobutane, propane, or a mixture of the same, wherein a storage tank is adapted to be buried in the ground and filled at intervals by a service tank truck. The liquefied gas is stored under pressure and is vaporized in the tank. It is adapted to be delivered under low pressure through the control apparatus to a service main.

In the present example, there is shown a cylindrical storage tank 10 to which there is removably attached by means of suitable angle brackets 11, a protecting casing or housing 12 for the dispensing apparatus. The housing has a hinged or removable dome-shaped cover 13 to afford access to the apparatus. The tank is adapted to be buried in the ground to such depth that only the upper end of the housing is exposed.

The present practice, as exemplified in my Pat-

ent No. 2,042,439, is to have separate pipes entering the tank for liquid and vapor connections and other necessary outlets, with the result that it is necessary to assemble the various pipes, valves and fittings to the tank. The slightest error in alinement of these several pipes, or the slightest distortion in the tank shell, due to the heat of welding, makes it difficult to match threaded connections and to assemble all appurtenances properly. At best, the work is slow and tedious and cannot progress faster than the fabrication of the tanks. Furthermore, these tanks which vary in size, and are usually cylindrical, are awkward to work on and necessitate either that the pipe fitting be done in the tank fabricating shop, or that the tanks be moved to the pipe fitting department, neither of which is efficient or economical shop practice. The present invention is therefore contrived to avoid all of these difficulties by securing the appurtenances to a single standpipe removably secured to the tank by a single tank fitting.

Referring to Figs. 1, 4 and 5, the tank 10 is shown as having an ordinary boiler flange 14 which may be welded to the outside and inside of the tank shell. A single enlarged standpipe 15 carrying all of the dispensing equipment is shown as being screw threaded into this flange and has an upper end wall 16. In accordance with this invention, the standpipe serves not only to carry a slip tube gauge and a dip pipe to prevent overfilling, but as the conduit for filling the tank and for dispensing the liquefied gas. In this instance, it has a central dip tube or pipe 17 projecting axially through the upper end wall and downwardly into the tank to the desired liquid level. This dip pipe serves to trap the gas or vapor in the tank above its lower end and also permits the overflow or escape of excess liquefied gas delivered to the tank through the standpipe 15 around its outside, thereby preventing overfilling the tank and avoiding the possible disastrous consequences of a ruptured tank due to overfilling.

The tank is adapted to be filled through a branch conduit 18 leading into the standpipe below its upper end, as clearly shown in Figs. 3, 4 and 5. This filling conduit has an automatic filling valve 19 at its upper end which opens and closes automatically against pressure and is provided with a screw threaded hose connection, protected when not in use by a cap 20. It extends to the top of the housing or casing so that it is easily accessible from the outside when the cover is removed. The upper end portion of the dip pipe 17 above the standpipe is shown as having a

branch vapor outlet conduit 21 provided with a vapor valve 22 which opens mechanically when the hose coupling is screwed down on it and closes automatically by spring tension when the hose coupling is removed, and is protected, when not in use, by a cap 23. The arrangement is such that when the filling hose from a truck tank is connected to the filling valve 19 and the vapor valve is connected to the upper part of the filling tank by a suitable hose, thus equalizing the vapor pressure in the two tanks, the liquefied gas will flow into the storage tank by gravity, while the displaced gas in the storage tank is removed through the vapor outlet 21 back to the filling tank.

Also, at the upper end portion of the dip tube 17, there is shown an ordinary pressure gauge 24 to indicate the pressure existing in the storage tank. A slip tube gauge in the form of a small tube 25 projects centrally through the dip pipe 17 below its lower end and is shown as having an ordinary valved head 26 and is slidably mounted in a pipe fitting 27 carrying a stuffing box 28. The valved head is adapted to be covered by a screw threaded cap 29. The lower end of the slip tube gauge is shown as having an enlarged head 30 adapted to be retracted into the lower end portion of the slip tube and prevented from being pulled above the level of the lower end by means of a clip or bracket 31 (Fig. 4). The construction and arrangement is such that the level of the liquid in the tank may quickly be determined by removing the cover cap 29, opening the valved head of the slip tube gauge and raising it through the liquid until vapor discharges through the small outlet opening in the head 26. The height to which the gauge tube is raised, of course, determines the quantity of liquefied gas in the storage tank. This may easily be done by referring to a strapping table or suitable chart for that purpose. It will thus be seen that the dip pipe serves three important purposes: first, as a vapor discharge conduit leading to the filling tank; second, as a means for preventing overfilling; and, third, as a guide for the slip tube gauge.

Referring now to the dispensing appurtenances, there is shown a service nipple 32 welded or otherwise secured to the standpipe near its upper end and well above the level of the connection of the filling conduit 18 so that liquefied gas will not spill into it while the storage tank is being filled. An ordinary service T 33 is connected to the nipple 32. The gas is delivered downwardly from the service T through an ordinary service cut off valve 34, a union coupling 35, an ordinary excess flow check valve 36, a pressure regulator 37, L lifting 38, union coupling 39 and service conduit 40. On the low pressure side of the regulator 37 is shown the usual low pressure relief valve 41. However, it is to be understood that the regulator and the low pressure relief valve may be combined in a single unit. In this instance, the regulator casing is shown as being supported on the standpipe by means of a bracket 42 welded to the standpipe at one side and the arrangement is such that the regulator and its allied equipment may easily be removed from the casing by closing the cut off valve 34 and disconnecting the union couplings 35 and 39. This greatly facilitates the installation and repairs.

The service line between the tank 10 and regulator 37 is shown as having a high pressure safety relief valve 43 connected to the upper branch

of the T 33 and communicating with a vent pipe 44 leading to and through the cover 13. The arrangement is such that the excess flow check valve 36 will close automatically if the flow of vapor becomes excessive as would be the case if the service conduit 40 was accidentally broken. The high pressure relief valve 43 will open to prevent the storage tank from being ruptured in the event the internal pressure for any reason dangerously exceeds the designed working pressure of the storage tank. The projection upper end of the vent pipe 44 is preferably covered by a small dome-shaped cap 45 welded or otherwise secured to the cover 13 and having outlet openings 46 around its lower portion below the level of the upper end of the vent pipe, the idea being to create an air pocket therein and effectively prevent water from entering the vent pipe in case of heavy rains or overflow of the pressures. Three vent pipes 47, 48 and 49 for the regulator and low pressure relief valve are connected to a manifold having a single vent tube 51 leading to the vent pipe 44 above the high pressure safety relief valve 43.

In this example, circulating water is used to maintain the temperature of the contents of the storage tank and of the vapor in the service pipe 40 well above the normal vaporization temperature of the gas employed. Instead of employing a coil extending through the contents of the tank, there is shown a water circulating jacket 52 on the outside of the tank in the form of a closed channel conveniently welded to the tank and extending longitudinally around it from one side of the casing 12 to the other. City water is adapted to be circulated through this jacket through L fittings 53 at opposite ends of the channel. The service conduit 40 extends through a portion of this jacket as shown in Fig. 1, so that any condensed vapor therein will immediately be revaporized and maintained in vapor form until it reaches the point of use. The water jacket arranged on the outside of the tank in heat exchanging relation therewith avoids the possibility of water being mixed with the liquefied gas in the storage tank or liquefied gas from escaping through a water conduit in case the jacket is frozen and bursts, or springs a leak due to any cause. If the outside jacket ruptures, it will bulge away from the tank and will not rupture the tank wall. Moreover, the outside jacket presents more heat exchanging surface to the tank than is possible by using ordinary pipe coils in the tank and does not reduce the capacity of the tank.

From the foregoing description, it will be seen that the design of the apparatus has been greatly simplified. The dispensing and control appurtenances can be manufactured as a single unit in the plant and shipped to a tank manufacturing plant at a distant point ready for installation in various parts of the country, thereby saving the excessive freight charges on the tanks, which are relatively cheap and easy to manufacture. There are no special fittings required to assemble the unit on the tank. This may be done by ordinary plumbers. Moreover, this insures that the control and dispensing equipment will not be damaged in transit due to rough handling of the tank.

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 ad-

vantageously in various combinations and sub-combinations.

What is claimed is:

1. In liquefied gas dispensing apparatus of the class described, a storage tank; a single standpipe removably connected to the tank; filling and gas dispensing conduits connected to said standpipe; a dip pipe projecting through said standpipe into the tank to the desired liquid level to prevent overfilling; and a valved vapor outlet conduit connected to said dip pipe having a hose nipple adapted to be connected to the vapor space in a filling tank whereby the storage tank may be filled while the pressure is maintained therein.
2. In liquefied gas dispensing apparatus of the class described, a storage tank; a single standpipe connected to the tank; filling and gas dispensing conduits connected to said standpipe; a dip pipe projecting through said standpipe to the desired liquid level in the tank and having a valved vapor outlet; and a valved tubular depth gauge slidably mounted in said pipe and projecting through the bottom of the standpipe into the tank whereby the quantity of liquid in the tank may be determined.
3. As an article of manufacture, a filling and dispensing unit for liquefied gas comprising a standpipe having one closed end and adapted to be connected to a storage tank; filling and control devices attached to said standpipe; and a dip pipe projecting through the standpipe, all assembled as a unit at the factory to be applied to a tank during the installation of a system.
4. In liquefied gas dispensing apparatus of the class described, a storage tank; a standpipe connected to the tank; a valved filling conduit communicating with the standpipe; and a valved vapor outlet conduit extending through the standpipe into the tank to the maximum liquid level whereby the storage tank may be filled while the pressure is maintained therein.
5. In liquefied gas dispensing apparatus of the class described, a storage tank; a standpipe connected to the tank; filling and gas dispensing conduits connected to said standpipe; a dip pipe projecting through said standpipe to the maximum liquid level in the tank and having a valved vapor outlet; and a hose fitting associated with the valved outlet.
6. In liquefied gas dispensing apparatus of the class described, a storage tank; a standpipe connected to the tank; filling and gas dispensing conduits connected to said standpipe; a dip pipe projecting through said standpipe to the maximum liquid level in the tank and having a valved vapor outlet; and a depth gauge carried by said standpipe and projecting through it into the tank whereby the quantity of liquid in the tank may be determined.
7. In liquefied gas dispensing apparatus of the class described, a storage tank; a standpipe connected to the tank; filling and gas dispensing conduits connected to said standpipe; a dip pipe projecting through said standpipe to the maximum liquid level in the tank and having a valved vapor outlet; and a valved tubular depth gauge slidably carried by said standpipe and projecting through the bottom thereof into the tank whereby the quantity of liquid in the tank may be determined.
8. In liquefied gas dispensing apparatus of the class described, a storage tank; a standpipe removably connected to the tank; valved filling and vapor discharging conduits connected to the standpipe to enable the tank to be filled while

the contents are maintained under pressure; a dip pipe projecting through the standpipe to the maximum liquid level in the tank; a gas dispensing conduit also connected to the standpipe; a service pipe; and control devices removably connected to the service pipe and to the gas dispensing conduit and supported by said standpipe.

9. In liquefied gas dispensing apparatus of the class described, a storage tank; a single standpipe connected to the tank; valved filling and vapor discharging conduits connected to the standpipe to enable the tank to be filled while the contents are maintained under pressure; a gas dispensing conduit also connected to the standpipe; a service pipe; control devices including a pressure reducing regulator removably connected to the service pipe and to the gas dispensing conduit and directly supported by said standpipe; a protecting casing surrounding said standpipe and control devices; a removable cover on said casing; and a vent pipe for the control devices.

10. In liquefied gas dispensing apparatus of the class described, a storage tank; a standpipe removably connected to the tank; valved filling and vapor discharging conduits connected to the standpipe to enable the tank to be filled while the contents are maintained under pressure; said vapor discharging conduit including a dip pipe projecting through the standpipe into the tank to the maximum liquid level; a gas dispensing conduit also connected to the standpipe; a service pipe; and control devices removably connected to the gas dispensing conduit and to the service pipe and supported by said standpipe.

11. In liquefied gas dispensing apparatus of the class described, a storage tank; a standpipe connected to the tank; valved filling and vapor discharging conduits connected to the standpipe to enable the tank to be filled while the contents are maintained under pressure; a gas dispensing conduit also connected to the standpipe; a service pipe; control devices including a pressure reducing regulator removably connected to the gas dispensing conduit and to the service pipe and supported by said standpipe; a protecting casing surrounding said standpipe and control devices; a removable cover on said casing; a vent pipe for the control devices projecting through said cover; and a cap on the cover surrounding the upper end of said vent pipe and having vent openings below the level of said vent pipe to provide an air trap and thereby prevent water from entering and flooding the vent pipe.

12. In a liquefied gas dispensing apparatus of the class described, a storage tank; a boiler flange on said tank; a standpipe having a closed upper end removably connected to said boiler flange and constituting the filling and gas delivering conduit; a gas dispensing conduit communicating with the upper portion of the standpipe; and control devices including a pressure reducing regulator connected to said service pipe and supported by said standpipe.

13. In liquefied gas dispensing apparatus of the class described, a storage tank; a boiler flange on said tank; a standpipe having a closed upper end connected to said boiler flange and constituting the filling and gas delivering conduit; a gas dispensing conduit communicating with the upper portion of the standpipe; a service pipe; a cut off valve in said gas dispensing conduit; and control devices including a pressure reducing regulator removably connected to

said service pipe and to said cut off valve to facilitate removal and replacement.

14. In liquefied gas dispensing apparatus of the class described, a storage tank; a standpipe connected to the tank and constituting a filling and gas dispensing conduit; a service pipe connected to the standpipe; pressure control devices and valves connected to said service pipe; a safety relief valve communicating with the standpipe and having a vent pipe through which it discharges; and vent means for the pressure control devices connected to said vent pipe, said control devices and vent means being supported by said standpipe.

15. In liquefied gas dispensing apparatus of the class described, a storage tank; a standpipe connected to the tank; branch filling and vapor return conduits connected to the upper end portion of the standpipe; a pipe connected to one of the conduits and extending through the standpipe into the tank; and automatic filling and vapor return valves connected to said branch conduits having hose connections thereon.

16. In liquefied gas dispensing apparatus of the class described, an underground pressure storage tank; a standpipe constituting a gas dispensing conduit connected to the tank and extending upwardly therefrom to a point near the ground level; a gas dispensing unit including a pressure reducing regulator communicating with the standpipe; and a valved depth gauge slidably mounted in and projecting through the bottom of the standpipe into the tank, whereby the quantity of liquid in the tank may be determined.

17. In liquefied gas dispensing apparatus of

the class described, an underground pressure storage tank; a standpipe constituting a gas dispensing conduit connected to the tank and extending upwardly therefrom to a point near the ground level; a gas delivering conduit communicating with the standpipe; a pressure reducing regulator connected to the conduit and supported by the standpipe; a service conduit removably connected to the pressure reducing regulator; and separate gauges carried by the standpipe to determine both the pressure of the vapor and the quantity of liquid in the tank.

18. In liquefied gas dispensing apparatus of the class described, an underground pressure storage tank; a standpipe constituting a gas dispensing conduit connected to the tank and extending upwardly therefrom to a point near the ground level; gas vapor dispensing means including a pressure reducing regulator communicating with the standpipe; and separate gauges connected to the standpipe to determine the pressure of the vapor and the quantity of liquid in the tank.

19. In liquefied gas dispensing apparatus of the class described, an underground pressure storage tank; a standpipe constituting a gas dispensing conduit connected to the tank and extending upwardly therefrom to a point near the ground level; gas vapor dispensing means including a pressure reducing regulator communicating with the standpipe; and a liquid level gauge associated with the standpipe whereby the quantity of liquid in the tank may be determined.

LOYD J. WHITE.

CERTIFICATE OF CORRECTION.

Patent No. 2,121,673.

June 21, 1938.

LOYD J. WHITE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 15, claim 9, for "dispending" read dispensing; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 4th day of July, A. D. 1939.

Henry Van Arsdale

(Seal)

Acting Commissioner of Patents.

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