Nov. 16, 1948. W. C. BUTTNER ET AL 2,453,968

GAS DISPENSING SYSTEM

Filed Jan. 9, 1942 3 Sheets-Sheet 1

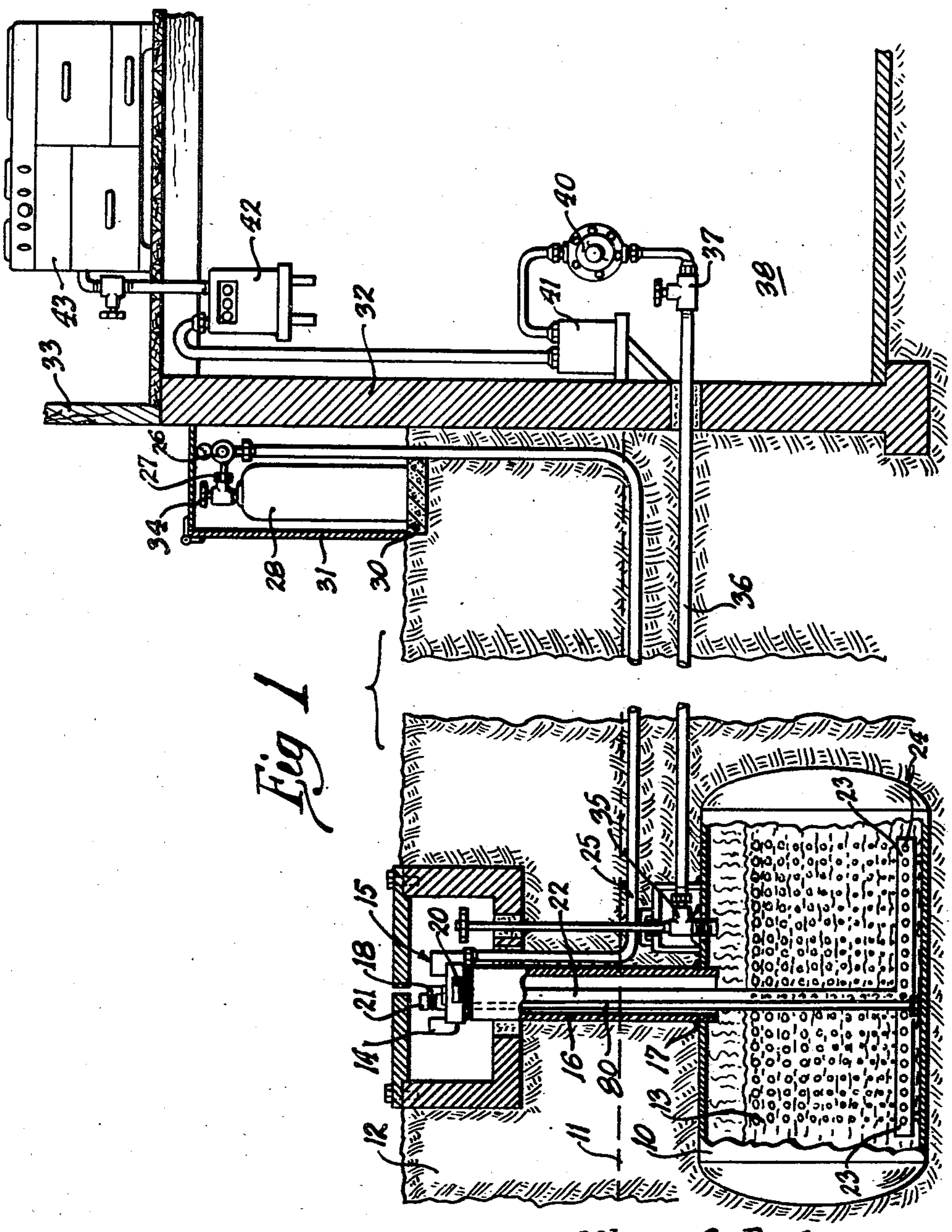

Fig 1

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GAS DISPENSING SYSTEM

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Fig 3

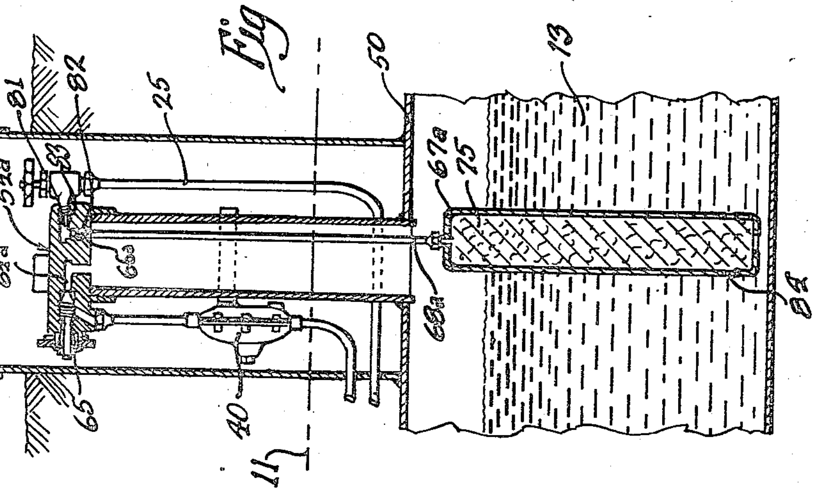
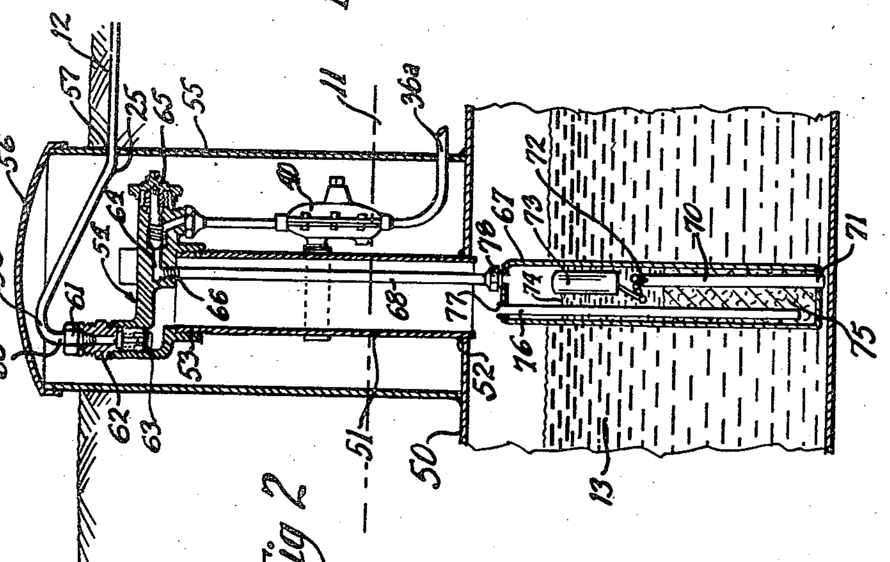


Fig 2



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GAS DISPENSING SYSTEM

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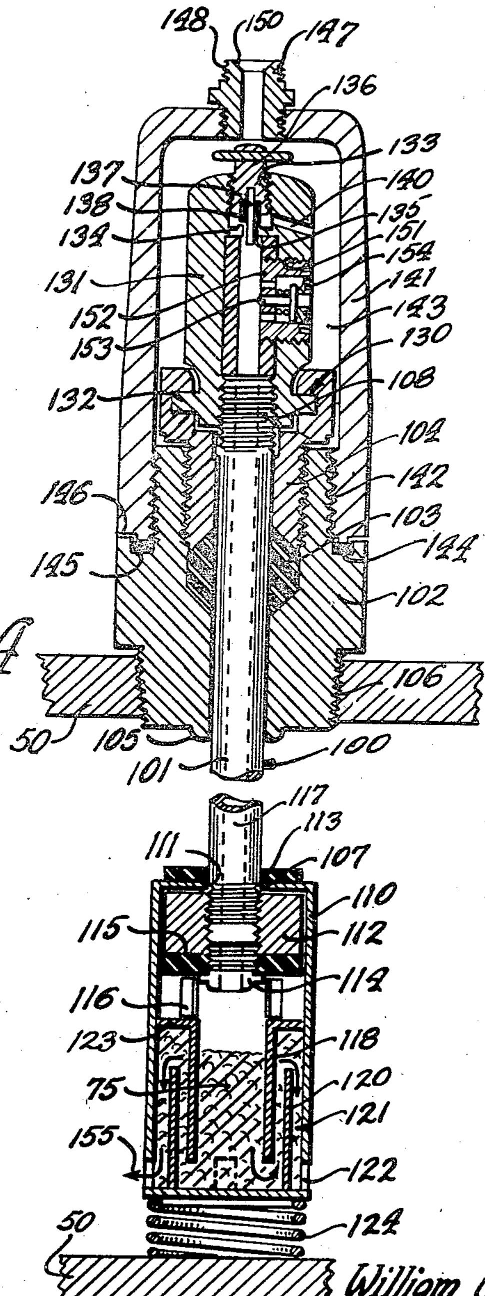

Fig 4

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UNITED STATES PATENT OFFICE

2,453,968

GAS DISPENSING SYSTEM

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Application January 9, 1942, Serial No. 426,206

16 Claims. (Cl. 62—1)

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The present invention relates to a device for dispensing liquefied petroleum products partially or completely saturated with other organic substances in the form of gas or vapor mixture for use in household appliances and has for one of its objects the provision of a construction which can be used as original equipment or as conversion equipment to so convert existing liquefied petroleum gas dispensing systems in order that the heavier hydrocarbons, such as pentane, hexane and octane ranging from light gasoline to kerosene and heavier or other organic hydrocarbon products which have little, if any, vapor pressure at normal temperatures can be used and dispensed safely as a substitute for natural gas or commercial butane gas.

Dispensing devices have heretofore been provided which utilize air under pressure and means for entraining the vapor of liquefied gas for purposes of combustion. Due to the presence of oxygen in the air used these dispensing devices, particularly if they are faulty or kept in poor repair, may cause hazardous conditions to exist by generating an explosive mixture and precipitation under cold conditions. Also, the use of electric power is required to compress air for most of these devices.

One of the objects of the invention is to provide a gas dispensing device in which no oxygen is present or employed in utilizing the hydrocarbons or organic substances as a concentrated source of heat conveyed in its vapor form by a vapor carrier.

Furthermore, it has been the experience with conventional air gasoline or air pentane systems that not only is the explosion hazard present, but the air itself dilutes the calorific content of the gas dispensed and thereby requires specially designed burners and large service lines to make the system acceptable for household installations.

A further object of the invention is to provide a new and improved construction in which a vapor mixture comparable to commercial butane vapor can be used without expansion tanks and larger service pipes in an otherwise conventional butane system, whether that system has two stage pressure reduction or single stage pressure reduction.

Another object of the invention is to eliminate complicated compressors and parts or elements that are subject to wear and breakage while in use, and to provide a system that is not dependent upon electricity for operation.

A further object of the invention rests in the provision of a device of the class described

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wherein the gas generated is of uniform calorific value, whether the storage container is full or almost empty, yet will still have a burnable gas if through carelessness the storage tank has been allowed to become empty.

A further object of the invention is to provide new and improved parts for converting the present commercial butane systems for use with vapor mixtures, including the vapor of octane or hexane as original equipment or as conversion equipment.

A further object of the invention is to provide a device of the class described which is easy to manufacture and service, inexpensive to build and maintain and requiring no electric motor equipment and which complies with the safety standards prescribed for liquefied petroleum gas dispensing systems.

These being among the objects of the present invention, other and further objects will become apparent from the drawings and the description relating thereto and the appended claims.

Referring now to the drawings—

Fig. 1 is a vertical section taken through a storage tank as buried, preferably, below the frost line, and illustrates one of the embodiments of the invention as it appears when placed in service.

Figs. 2 and 3 are fragmentary views similar to Fig. 1 showing the construction of certain modifications of the device illustrated in Fig. 1, which modifications may be employed to convert conventional gas dispensing tanks to use other fuels.

Fig. 4 is a vertical section through a vertical slip tube gauge which can be employed to convert conventional constructions of the objects expressed herein without need for other than a limited opening from the tank to the outside atmosphere.

Storage tanks used with bulk systems that are buried underground are rated with regard to the fuel that can safely be stored in them. In view of the size of the storage tank required for bulk systems it has been the practice to design the tank for use with commercial butane, which fuel makes it possible to make the tank a great deal lighter than one required for propane, thus effecting a substantial saving in metal

The vapor pressure of commercial butane at expected underground temperatures seldom, if ever, reaches 60 pounds per square inch gauge, whereas with propane under like temperatures the vapor pressure could run as much as one hundred and fifty pounds per square inch gauge or more possibly during filling operations. Consequently, in the bulk systems for commercial butane the rated safe pressure of buried storage tanks is approximately one hundred pounds per square inch gauge. At this rating, tanks being manufactured for underground systems at the present time and those already in the ground for dispensing commercial butane would not pass inspection if propane were to be stored in them.

A further comparison of propane and commercial butane as a fuel reveals that propane has less calorific value, per cubic foot of vapor than commercial butane, and, if used in commercial butane appliances would tend to cause the flame to float away from the burner when the burners are full on. The calorific content of commercial butane vapor is approximately 3000 B. t. u.'s per cubic foot at 62° F. and 14.7 pounds per square inch pressure absolute as compared with propane having approximately 2500 B. t. u.'s per cubic foot.

Consequently, difficulty would be experienced in many ways in using propane as a substitute for commercial butane in systems designed for butane dispensing.

In the present invention, by way of illustrating the use of hydrocarbons or organic substances, hexane or octane which have substantially no vapor pressure gauge at the temperatures experienced in the ground below the frost line, is stored in the tank rated for commercial butane and propane in its vapor phase is brought at a reduced pressure into intimate contact with a preferably constant body of stored liquid to absorb sufficient of the vapor of the liquid to provide a resulting gas of approximately the same B. t. u. content as that experienced with commercial butane.

In order to safeguard and prevent overpressuring the system with high propane pressures, the propane vapor is regulated to a reduced pressure, preferably before entering the confines of the tank as at low a pressure as approximately 5 pounds per square inch guage, this pressure being found to be a desirable pressure that provides a maximum pickup of approximately 20% of hexane by weight which has a calorific value of approximately 4800 B. t. u. per cubic foot or 15% of octane by weight which has a calorific content of approximately 6200 B. t. u. per cubic foot.

The resulting mixture of propane vapor and the vapor of ether hexane or octane is stored below the frost line and used as desired, being conducted into the dwelling at the pressure determined by the propane regulator and reduced as gas inside of the dwelling to service pressure of approximately 11 inches water column by a second regulator, after which the gas may be heated, if desired, and metered for use in an appliance. A two stage pressure reduction can be provided or used for the gas mixture.

Referring now to Fig. 1, a storage tank 10 is buried below the frost line 11 in the ground 12 where it will be subjected to a substantially constant temperature above 32° F. Hexane or octane 13 is introduced into the tank through a filler connection 14 in a fitting 15 that is mounted upon the upper end of a riser pipe 16 welded to the tank 10 as at 17.

Other valves and controls such as a vapor return connection 18, pressure and liquid level gauges 20 and 21 are present in the fitting with excess flow and back pressure check valves (not shown) used within as more particularly shown in the co-pending application of William C. Buttner, and Saven L. Sundstrom, Serial No. 397,096, now Patent No. 2,405,998, granted August 20, 1946, reference to which is hereby made. A conduit 22 is mounted on the fitting 15 and extends down into the tank to the bottom where flexible hose pieces 23, preferably made of paraprene extend laterally along the bottom of the tank. The hose pieces 23 are perforated throughout their lengths to provide bubble ports 24, and these ports are supplied preferably with propane in its vapor phase through the conduit 22 from a pipe 25 which extends preferably underground to the delivery side of a pressure reducer 26 mounted upon the outlet connection 27 of a portable propane cylinder 28 having a supply of propane therein in its liquid and vapor phases. The propane cylinder 28 is disposed upon a concrete block 30 in a cabinet 31 at the side of the foundation 32 of a house 33. A hand valve 34, having an automatic filler valve therein, if desired, is detachably mounted upon the propane cylinder in the propane supply line to control the supply of propane furnished thereto for use in the system.

After the tank 10 has been charged with a supply of hexane or octane the hand valve 34 is turned on and propane in its vapor phase supplied to the hose pieces 23 at the pressure predetermined by the regulator, which pressure is preferably 5 pounds per square inch gauge, but being capable of being varied in relationship to the desired calorific value of the gas supplied for use. The propane vapor will bubble up from the ports 24 through the hexane or octane and entrain a certain amount of hexane or octane until the pressure in the tank reaches the pressure determined by the regulator 26.

The vapor mixture thus generated and stored in the tank 10 is then educted from the tank through a hand valve 35 into a service line 36 buried below the frost line, through the foundation 32 into the cellar 38 of the dwelling 33 as controlled by a hand valve 37 located in the cellar. From the hand valve 37 the vapor mixture is conducted to a pressure reducer 40 which reduces the pressure to 11 inches of water column and thereafter the vapor mixture is conveyed through a heat exchanger 41, if desired, and meter 42 to an appliance in the house, such as a stove 43.

The burial of the service pipe 36 below the frost line subjects the vapor mixture therein to the same temperature that it was subjected to while stored in the tank 10, thereby preventing any cold point that might exist which would lower the temperature below the dew point of the vapor. This is possible because with this system little heat, if any, is absorbed from the surrounding parts and the heat of the earth is as constant a factor as possible under the circumstances.

It has already been mentioned that the propane vapor will entrain the hexane or octane and since the calorific value of hexane and octane is much higher than commercial butane, a 15 to 20% entrainment by weight of the octane or hexane by propane respectively, develops a vapor mixture having a B. t. u. content that compares very favorably with the B. t. u. content of the commercial butane with which the system and the appliances were originally designed, namely, approximately 3000 B. t. u. per cubic foot, as measured at 62° F. and 14.7 pounds per square inch absolute.

Referring now to Fig. 2, a device is shown which can be used as original or conversion equipment to utilize a storage tank intended for dispensing butane for the purposes mentioned. The tank 50 is provided with a riser pipe 51 welded thereto as at 52 and threaded as at 53 to receive a fitting 54 illustrated diagrammatically. The propane line 25 is disposed within a protecting housing 55 having a cover 56. The propane supply line 25 in conversion installations can be run along the ground below the ground level for protection and into the housing 55 through an opening 57 to terminate as at 58 in a downwardly extending nipple 60 which carries a nut 61 making up to a female thread upon the filler connection 62 of the fitting 54, said filler connection having a back pressure check valve 63 which functions as an excess flow check valve when the propane tank 28 is connected thereto through the propane service line 25. The fitting 54 has an eduction passageway 64 therethrough controlled by a shutoff valve 65 which opens into the top of the riser pipe 51 at a threaded opening 66.

In combination with the fitting 54 is provided a container 67 adapted to slip downwardly through the riser pipe 51 as carried by a supporting pipe 68 threaded at its upper end in the eduction opening 66.

The container 67 is adapted to receive liquid therein from the bottom of the tank 50 and propane in its vapor phase from the top of the tank for intimate mingling within the container 67. In accomplishing this, the container is provided with a liquid eduction conduit 70 which leads from the bottom of the tank, as at 71, to a valve 72 controlled by a float 73, the float 73 moving the valve to closed position when a predetermined level 74 of liquid is reached in the container 67. Below the valve 72 the container is packed with felt or rock wool 75 which becomes saturated with the liquid in the container 67. Propane is introduced into the container at the bottom thereof in its vapor phase through a conduit 76 mounted at 77 at the top of the container 67. The use of felt or rock wool breaks up the bubbles into small bodies of gas which are forced under pressure differentials to increase the surface of contact of the gas as much as possible.

Above the level 74 of the liquid 13 in the container 67 is provided a space in which mixed vapors similar to those present in the container 10 are stored, and in this particular embodiment the service pressure regulator 40 is mounted preferably upon the riser pipe 51 within the housing 55 in communication with the service passageway 64.

With the device shown in Fig. 2 the commingling of propane and liquid hexane or octane, or both, is a constant factor since the level 74 is constant in the container and the felt 75 comprises a diffuser of constant characteristics, with liquid continually supplied that has not been depleted of its light ends before reaching the interior of the container 67.

Then when the vapor mixture used in the appliance 43 is drawn to the service conduit 36a the pressure in the container is reduced sufficiently to draw propane vapor through the passageway 76 up through the felt 75 and liquid 13 inside of the container 67 to entrain the liquid content for purposes of combustion. Whenever the liquid 74 falls below a predetermined level the float 73 opens the valve 72 and any pressure differences existing between the inside of the container 67 and the tank 50 will force liquid from the tank 50 through the conduit 70 to replenish the liquid carried off by entrainment with the propane vapor.

The construction shown in Fig. 2 is particularly adapted for conversion equipment since no part of the fitting need be changed except the removal of the butane liquid eduction conduit, if it is present, and the replacement thereof by threading the attachment shown into the threaded eduction opening 66. The container 67 is rigidly supported by a lock nut 78 disposed to one side of the center of the container so that the container after it is lowered in place can be moved laterally of the riser pipe 51 to permit a slip tube liquid level gauge, such as that shown at 80 in Fig. 1, to be lowered from the fitting without hindrance from the container 67.

Comparing Fig. 2 with the embodiment illustrated in Fig. 3, Fig. 2 is designed to store the mixed vapors inside of the container 67, whereas in Fig. 3 the device is so constructed and arranged having certain features regarding simplicity whereby the vapor mixture is stored in the storage tank 50.

In the embodiment shown in Fig. 3, the container 67a is filled with felt 75 and propane vapor is supplied to the top of the container 67a through a conduit 68a threaded into an opening 66a in the fitting 54a which communicates with the propane cylinder 28 through a passage 81 having a back pressure check valve 82 therein within the threaded opening 83 which receives the propane supply conduit 25. The usual eduction passageway of a batch system is indicated at 64a with the hand shut-off valve 65 and regulator 40 in the service line, the same as those described in connection with Fig. 2.

Propane vapor entering through the conduit 68a passes through the felt 75 which is soaked with the liquid 13 that enters the container 67a through the openings 84 provided in the bottom of the container, but in view of the fact that the vapor mixture is withdrawn from the main tank 50 rather than from the container 67a, the pressure differential of the embodiment shown in Fig. 3 is the opposite to that existing in Fig. 2. Withdrawal of vapor from the tank 50 reduces the pressure therein sufficiently for the vapor pressure entering the container 67a to force its way down through the felt 75 in intimate contact with the liquid supported thereby and bubbles out through the holes 84 laden with the liquid with which it has been in contact.

Referring to Fig. 4, the construction and operation thereof is somewhat similar to that shown in Fig. 3, otherwise with certain modifications the construction shown in Fig. 4 being similar to the slip tube gauge disclosed and described in the copending application of William C. Buttner and Harold L. Norway, Serial No. 403,512, reference to which is hereby made.

The slip tube gauge 100 is an improved one and is designed to serve several functions that would otherwise require numerous fittings. Not only does the slip tube gauge shown serve to detect the level of liquid in the tank at any level, but it also functions as a vent tube to warn when a maximum fill level has been reached and as a means by which hexane or octane, or both, stored in the tank may be entrained by propane vapors supplied from an outside source. The slip tube gauge 100 comprises a tubular member 101 slidably mounted to slip up and down through a body 102 as sealed by packing 103 compressed by a flanged nut 104. The lower end of the body 102 is machined as at 105 to provide a valve seat and is externally threaded as at 106 with a tapered thread whereby the slip tube gauge can be received and removed from the top of a fitting similar to the fitting 15 described in Fig. 1.

The lower end of the tubular member 101 is threaded as at 107 at the bottom and 108 at the top. A container 110 is provided with an opening 111 in the top thereof and is received over the tubular member 101 and held slidably in place by an internally threaded head 112 received upon the threads 107. On top of the container 110 a washer 113 is mounted which cooperates with the seat 105 when the slip tube gauge is raised to full height so as to provide a seal by which the packing 103 can be serviced if at any time servicing is required. Threaded into the bottom of the head 112 is a retainer nut 114 holding a resilient disk 115 in place. The container 110 has openings 116 in the side thereof just below the disk 115 when the head 112 is in its uppermost position in the container 110, thereby providing communication between the passage 117 in the tubular member 101 and the interior of the tank.

Below the openings 116 the container 110 has mounted therein cylindrical members 118 and 120 which provide a circuitous passageway 121 between the passageway 117 and the interior of the tank through openings 122 in the bottom of the container 110 when the resilient disk 115 is pressed downwardly in sealed relationship with the top flanged wall 123 of the cylindrical member 118. A spring 124 is mounted upon the bottom of the container 110 to take care of manufacturing variations that are incurred with any particular run of tanks, the spring 124 serving to urge the container 110 upwardly and slidably upon the head 112 to establish a seal between the resilient disk 115 and the flanged wall 123 when the slip tube is lowered all the way into the tank. The upper end of the flanged nut 104 is provided with one of the cooperating elements of the bayonet joint 130 and the head 131 that is shown threaded to the upper end of the slip tube member 101 is provided as at 132 with the other element of the bayonet element. In this way, the upward creeping of the slip tube 101 under tank pressure is prevented when the bayonet joint is established.

The head 131 has a threaded chamber 133 therein separated from the tube 101 by a partition 134. A hole 135 is drilled through the partition concentrically with respect to the threads in the wall of the chamber and a valve or vent plug assembly 136 carrying a pin 137 surrounded by a washer 138 is received into the threaded chamber 133. The pin 137 is so constructed and arranged that it extends through and beyond the hole 135 at all operative positions so that it serves to provide an annular flow area for fluid through the hole 135 which is very difficult to obstruct by loose particles as compared with a conventional open drill hole.

A laterally extending passageway 140 leads from the chamber 133 near the bottom thereof so that gas or liquid may be discharged therefrom when the slip tube gauge is operated to determine the level of the liquid in the tank.

In testing for the liquid level in the tank with the slip tube gauge, the tube is raised to its upper limit, the vent plug 136 is loosened until the leakage of escaped gas informs the operator that the gauge is in operation, the container 110 having dropped to provide open communication between the passage 117 and the openings 116. The tube is then pushed down slowly until liquid discharges from the vent hole 140, at which time a reading is taken from calibrated marks (not shown) on the outer surface of the tube 101, and by these markings the liquid level and the contents of the tank can be determined. The vent plug is then tightened, and, if there is no further use for the tube, the tube is lowered again and locked in place by the bayonet joint.

A protecting cap 141 is threaded to the body 102 as at 142, to provide a sealed compartment 143 therein by engaging in sealed relationship a gasket 144 mounted in a recess 145 machined in the shoulder 146 at the bottom of the threading 142. At its top, the cap 141 is provided with a fitting 147 threaded as at 148 and chamfered as at 150 to receive the male member of a connector comprising preferably a pigtail (not shown) having an excess flow check valve therein that is connected to the propane tank 28. In this way, propane vapor at a regulated pressure is supplied to the compartment 143.

The head 131 is elongated and provided with sufficient stock to have machined therein a threaded opening 151 which receives a cage member 152, carrying a back pressure check valve 153 therein that cooperates with the seat 154.

In this way, whenever pressure present in the compartment 143 of the cap 141 exceeds the pressure inside of the storage tank vapor will flow from the compartment 143 through the valve 153 and the passage 117 into the tank through the circuitous passageway 121 and openings 122, as indicated by the arrows 155.

Although it is not necessary to do so, it is found desirable to fill the container below the retaining nut 114 with felt 75 for the same purposes and with the same results as that described in connection with the embodiment illustrated in Fig. 3.

Although certain improved embodiments of the present invention have been shown and described herein and ways have also been suggested by which the present invention may be utilized in various dispensing systems, it will be apparent to those skilled in the art that various and further uses, modifications and changes may be made without departing from the spirit or substance of the invention set forth in the objects and description, the scope of which is commensurate with the appended claims.

What is claimed is:

1. In combination, a container buried below the frost line for storing a fuel having a vapor pressure less than the vapor pressure of butane, a second container supported inside the first, porous means in the second container for dividing the container into minute passageways, means for supplying to one of the containers the vapor of a fuel having a vapor pressure in excess of butane, and means for withdrawing a mixture of said vapor and the first fuel from the other of said containers.

2. In combination, a container buried below the frost line for storing a fuel having a vapor pressure less than the vapor pressure of butane, a fitting connected to the container, a second container supported inside the first upon the fitting, means in the second container for dividing the container into minute passageways, means for supplying to one of the containers the vapor of a fuel having a vapor pressure in excess of butane, and means for withdrawing a mixture of said vapor and the first fuel from the other of said containers.

3. In combination, a container buried below the frost line for storing a fuel having a vapor pressure less than the vapor pressure of butane, said container having an opening through a wall

thereof, a fitting connected to the container in communication with the interior of the container through the opening, a second container insertable through the opening and supported inside the first upon the fitting, porous means in the second container soaked with liquid of the fuel in the first container, means for supplying to one of the containers the vapor of a fuel having a vapor pressure in excess of butane to pass through said porous means, and means for withdrawing a mixture of said vapor and the first fuel from the other of said containers.

4. In combination with a tank for storing fuel in its liquid phase, a device slidably mounted with respect to the tank for determining the level of liquid in the tank comprising, a conduit, a valve for controlling the outflow of fuel from the tank through the conduit, a back pressure check valve means permitting the inflow of vapor to the tank through the conduit, and means for receiving said vapor and bringing said vapor and liquid fuel into intimate contact in the tank.

5. In combination with a tank for storing fuel in its liquid phase, a gauge device slidably mounted with respect to the tank for determining the level of liquid in the tank comprising, a conduit, a valve for controlling the outflow of fuel through the conduit from the tank, a back pressure check valve permitting the inflow of vapor to the tank through the conduit, and means for receiving said vapor and bringing said vapor and liquid fuel into intimate contact including an element comprising a porous material soaked with the liquid in the tank.

6. In combination with a tank for storing fuel in its liquid phase, a device slidably mounted with respect to the tank for determining the level of liquid in the tank and for introducing a vapor fuel comprising, a conduit, a valve for controlling the outflow of fuel through the conduit from the tank, a back pressure check valve means permitting the inflow of vapor to the tank, and means for bringing said vapor and liquid fuel present in the tank into intimate contact, including an element comprising a porous material slidably mounted upon the conduit to expose alternatively the conduit to the interior of the tank directly and the interior of the tank through said material.

7. In a liquefied petroleum gas dispensing system, the combination of a storage tank buried below the ground, a container in said tank, means for educting liquid from the tank to the container including a float valve responsive to the amount of fuel in the container, a conduit bypassing the float valve for supplying vapor from the tank to the bottom of the container, means for supplying vapor under pressure to the tank, and means for educting vapor from the container to conduct same to a place of use.

8. In a liquefied gas dispensing system having a buried storage tank for storing fuel in its liquid form and a fitting mounted with respect thereto, the combination of a storage tank above-ground containing a supply of liquefied petroleum gas therein, a conduit leading from the above-ground tank to the below-ground tank including a passageway through the fitting to conduct gas from the above-ground tank to the below-ground tank, a pressure regulator in said conduit, and an eduction conduit including a passageway through the fitting for removing vapor from the below-ground tank, and means interposed between said passageways for bringing the liquid fuel and said gas into intimate contact with one another.

9. In a liquefied gas dispensing system having a buried storage tank for storing fuel in its liquid and vapor phases and a fitting mounted with respect thereto, the combination of a storage tank above-ground containing a supply of liquefied petroleum gas therein, a conduit leading from the top of the above-ground tank to the below-ground tank including a passageway through the fitting for conveying gas in its vapor phase from the above-ground tank to the below-ground tank, a pressure regulator in said conduit, an eduction conduit including a passageway through the fitting for removing vapor from the below-ground tank, and means interposed between said passageways for bringing the liquid fuel and said gas in its vapor phase into intimate contact with one another including a porous material.

10. In combination with a tank for storing fuel in its liquid phase, a device mounted upon the tank for determining the level of the liquid in the tank and comprising a conduit element, a bleed passageway connecting the conduit element with atmosphere for the outflow of fuel from the tank through the conduit, a back pressure check valve means permitting the inflow of vapor to the tank through the conduit, a removable cover means for enclosing the check valve means for sealing the bleed passageway from atmosphere including an element for connecting it to a source of supply of liquefied petroleum gas in its vapor form, and means arranged to receive vapor and for bringing said vapor and liquid fuel into intimate contact in the tank.

11. In a liquefied petroleum gas dispensing system having a pressure storage tank, a unitary fitting connected to the tank and having an outlet connected to a service conduit leading to a pressure regulator, means for admitting liquefied petroleum gas to the tank including a back pressure check valve and a connector member, and means upon the connector member for interchangeably connecting the admitting means with a source of liquefied petroleum gas in its liquid phase and a source of liquefied petroleum gas in its vapor phase, and means for bringing said gas in its vapor phase and gas in its liquid phase in the tank into intimate contact with each other between said check valve and outlet.

12. In a liquefied petroleum gas dispensing system having a pressure storage tank buried below the frost line of the ground, a unitary fitting connected to the tank and having an outlet connected to a service conduit leading to a pressure regulator, means for admitting liquefied petroleum gas to the tank including a back pressure check valve for opening under the inflow of a gas under pressure, a connector member carried by said means, means upon the connector member for interchangeably connecting the admitting means with a source of liquefied petroleum gas in its liquid phase and a source of gas in its phase under pressure and means for bringing said vapor gas in its vapor phase and gas in its liquid phase in the tank into intimate contact with each other between said check valve and outlet.

13. In a liquefied petroleum gas dispensing system having a pressure storage tank, a unitary fitting connected to the tank and having an outlet connected to a service conduit leading to a pressure regulator, means for admitting liquefied petroleum gas to the tank including a back pressure check valve, a source of liquefied petroleum gas under pressure in its vapor phase, means for reducing the pressure of the vapor gas, means for interchangeably connecting the admitting means with a source of liquefied petroleum gas in its

liquid phase and said gas at a reduced pressure, and means for bringing said vapor gas in its vapor phase and gas in its liquid phase in the tank into intimate contact with each other between said check valve and outlet.

14. In a liquefied petroleum gas dispensing system, the combination of a storage tank buried below the ground, a container supported in said tank, means for educting liquid from the tank to the container including a float valve responsive to the amount of fuel in the container, a conduit by-passing the float valve and extending from a point near the top of the tank and having an opening within the container and near the bottom thereof, means for supplying vapor to the tank at a predetermined pressure for passage through said conduit, and means for educting vapor from the container.

15. In a liquefied petroleum gas dispensing system, the combination of a storage tank buried below the ground, a fitting connected to the tank, a container in said tank supported with respect to the fitting, means for educting liquid from the tank to the container including a valve responsive to the amount of fuel in the container, a conduit extending from a point near the top of the tank and having an opening near the bottom of the container whereby vapor is supplied from the tank to the bottom of the container, means for educting vapor from the container, a porous means in the container between said conduit and educting means, and service conduit means for conveying the educted vapor to a place of use at service pressure.

16. In combination with a tank for storing fuel in its liquid phase, a device mounted with respect to the tank for gauging the level of liquid in the tank including a conduit, a valve for controlling the outflow of fuel from the tank through the conduit during gauging operations, check valve means opening in the direction of flow admitting fuel vapor to the tank through the conduit, means for introducing gas in its vapor phase through said valve into said conduit, and means for receiving said vapor fuel and bringing said vapor fuel and liquid fuel into intimate contact in the tank.

WILLIAM C. BUTTNER.
HAROLD L. NORWAY.

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