

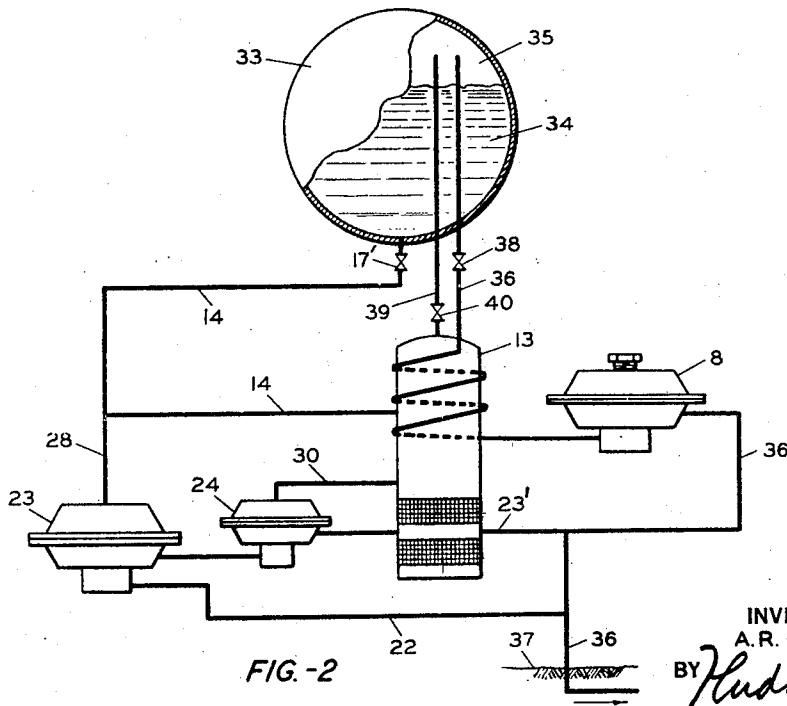
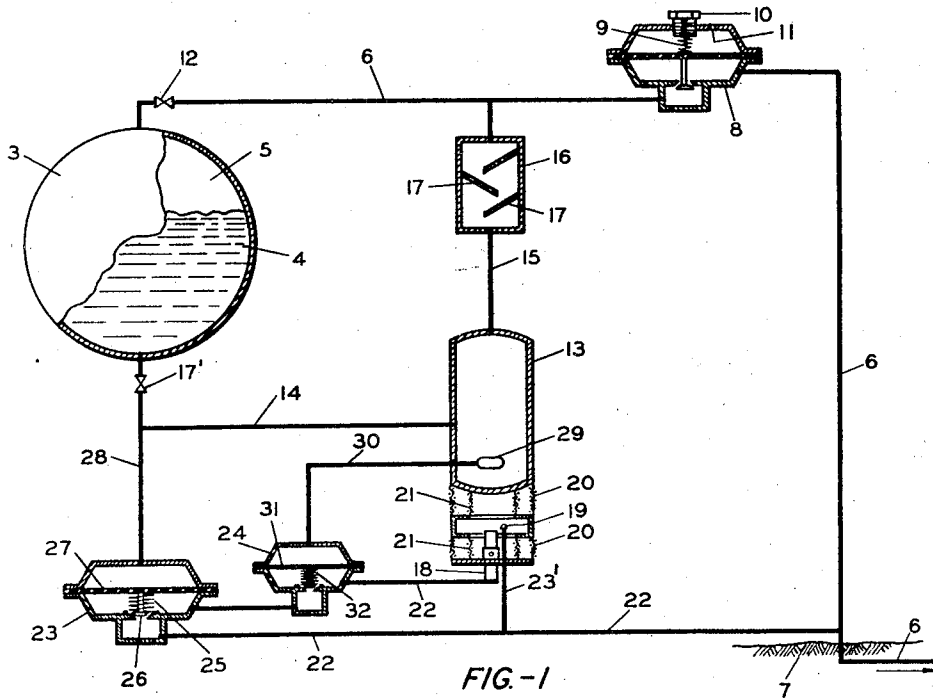
Dec. 21, 1948.

A. R. OLSON

2,456,889

VAPORIZER

Filed June 9, 1945



INVENTOR
A. R. OLSON

BY *Hudson & Young*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,456,889

VAPORIZER

Andrew R. Olson, Bartlesville, Okla., assignor to
Phillips Petroleum Company, a corporation of
Delaware

Application June 9, 1945, Serial No. 598,609

7 Claims. (Cl. 62—1)

1

This invention relates to vaporizers. In a more specific aspect it relates to vaporizers for liquefied inflammable gases. In another more specific aspect it relates to systems for the storage, vaporization, and pressure regulation of liquid petroleum gases such as butane, propane, or mixtures thereof.

One object of my invention is to provide a simplified system for vaporizing such gases.

Another object is to vaporize such gases when atmospheric heat is insufficient by applying heat in a safe manner.

Other objects are to reduce fire hazards and keep vapor lines free from liquid.

Another object is to vaporize and put pressure on such liquefied gases without heating the entire liquid content of the storage tank.

Other objects are to provide safe, cheap, and economical systems for storing and vaporizing liquid petroleum gas.

Numerous other objects and advantages will be apparent to those skilled in the art upon reading the following specification and claims and studying the accompanying drawings in which:

Figure 1 is an elevational view with parts broken away and parts in section of a liquefied gas storage and vaporizing system embodying my invention.

Figure 2 is a view similar to Figure 1 of a modified system embodying my invention.

In Figure 1 a storage tank 3 is provided for storing liquefied gas 4 and vapors 5 of the liquefied gas. In order to utilize vapor 5, a vapor supply line 6 is provided, a portion of which may be under the surface of the ground 7 or not as desired. Line 6, as indicated by the arrow, leads to various appliances such as stoves, gas lights, etc. (not shown).

In order to regulate the pressure in the latter portion of line 6, a pressure regulating valve 8 is provided. The pressure regulating valve shown is of the diaphragm type having a spring 9, the tension of which is adjustable by means of bolt 10 and the pressure of the atmosphere may enter above the diaphragm through an orifice 11. Such pressure regulating valves are well known in the art and any of the usual type may be employed in place of that shown. A shut-off valve 12 may be provided in line 6, preferably adjacent tank 3.

In order to vaporize liquid 4 in accordance with my invention, I provide a vaporizing tank 13 to which the liquid 4 may be supplied by a liquid supply line 14 and from which the vapor is transferred to line 6 by vapor outlet line 15. In order to insure the complete separation of liquid and vapor, I may employ a liquid separator 16, when desirable, and the liquid separator shown has baffle plates 17 for separating the liquid and vapor. However, any other form of vapor liquid separation

2

rator may be employed at this point in place of the one 16 which is shown. I may provide a liquid shut-off valve 17', preferably at a point adjacent tank 3, when desirable.

In order to heat the vaporizing tank 13 to the degree desired, I have provided a burner 18 which may be any of the usual types of burners. I may employ some catalytic substances such as porous platinum (not shown) which will automatically light burner 18 every time the gas is turned on, but I prefer to use a pilot light 19 as being a little more certain in operation, especially after a long period of time.

In order to protect the flame of burner 18 and pilot 19 so that there will be no explosions, a screen is provided which may consist of an outer cylindrical screen 20 and an inner cylindrical screen 21 through which flame cannot be transmitted because of the fineness of the weave of these screens and the heat conducting ability of the materials employed in making screens 20 and 21.

In order to supply gas to burners 18 and 19, a burner supply line 22 may be provided with a branch 23' for supplying the pilot light. Obviously, branch 23' could run back and connect with line 6 independently of branch 22, but generally this would result in duplication of piping and would be unnecessary. However, my invention contemplates the use of a separate line 23' running all the way back to line 6 if desired.

In burner supply line 22 there are two pressure regulators 23 and 24 between burner 18 and supply line 6 (or pilot line 23' if it is desired to maintain a pilot light). Regulators 23 and 24 may be in any order in that line as it does not matter which comes first or second. It is also obvious that in some installations it may be considered unnecessary to have either one of regulators 23 and 24 or to only have one of them, in which case the other regulator and its function or both of them may be eliminated without invention. As shown, regulator 23 has a spring 25 tending to hold valve 26 open while diaphragm 27 transmits the pressure in line 28 which may be a branch of liquid supply line 14 or which line 28 may extend independently back through tank 3.

A thermal pressure fluid supply bulb 29 is disposed so as to be heated by said vaporizing tank 13 and when so heated the thermal pressure fluid vaporizes and places a vapor pressure through line 30 through diaphragm 31 of regulator 24 closing the regulator valve against spring 32.

In Figure 2 is shown a modified embodiment of the invention in which storage tank 33 holds liquefied gas 34 and vapors 35. A vapor supply line 36 is shown which may or may not run under the ground at 37. Vapor supply line 36 contains a regulator valve 8 which is the same as the one in Figure 1. Vapor supply line 36 may contain a

3

shut-off valve 38 preferably located near tank 33. It will be noted that the upper end of line 36 in tank 33 is at a point where the tank contains vapor 35. A vaporizing tank 13, the same as in Figure 1, is provided having a vapor outlet line 39 which may contain a shut-off valve 40, the upper end of line 39 extending into the vapor space 35 of tank 33. Vapor line 36 is shown wound in a helix around tank 13 in heat exchange relation to dry the vapor.

The remainder of Figure 2 is exactly as shown in Figure 1 and the liquid supply line 14, cut-off valve 17', gas supply line 22, pilot supply line 23', regulators 23 and 24, pressure supply line 28, and pressure fluid line 30 are given the same numbers as in Figure 1 because they contain the same structure.

Operation

The operation of Figure 1 is very simple as vaporized gas 5 is supplied to the stoves and other equipment (not shown) through line 6 at a constant pressure regulated by pressure regulator 8. Pressure regulator 8, of course, does not regulate the pressure in tank 3 but only regulates the pressure of gas downstream of regulator 8 in line 6 leading to the stoves (not shown) as indicated by the arrow.

In cold weather, liquid 4 does not vaporize rapidly enough to maintain the pressure in the latter part of line 6 at the desired pressure so it is necessary to add heat to liquid 4 in order to vaporize it. I have found it very uneconomical to add heat to liquid 4 when in tank 3. I take the liquid from tank 4 through line 14 through vaporizing tank 13. When the pressure in vapor 5 falls to a predetermined point, the pressure transmitted through liquid 4 and line 28 to diaphragm 27 becomes insufficient to overcome the resilient force in spring 25 and as a result valve 26 opens and gas flows through line 22 to burn in burner 18.

The burning in the burner 18 is safe even if explosive gases have accumulated outside of screen 20 as a flame will not pass through the closely woven wire screens 20 and 21 so there is no danger of explosion.

As a safety feature, vaporizing tank 13, when heated above a predetermined temperature will vaporize the liquid in thermal liquid containing bulb 29 the vapors of which pass through line 30 to overcome the resiliency of spring 32 and shut off the gas in line 22.

Vapors leaving the top of tank 13 may contain considerable liquid but this liquid is separated out by striking against baffle plates 17 in separator 16 and draining back through line 15 intermittently.

The operation of Figure 2 is similar to that of Figure 1 except that mixed liquids and vapors from vapor outlet line 39 are sprayed into tank 33 and the vapors are drawn off through line 36 and it will be noted that line 36 is wrapped in a helical coil around vaporizing tank 13 in order to provide complete vaporization.

It is believed obvious that I have disclosed illustrative embodiments of my invention capable of carrying out all the objects set forth above and that changes in shape, proportions and arrangement of parts and substitution of equivalent elements may be made without going outside the scope of my invention as defined by the following claims. A large range of positions is possible. For example in Figure 1 tank 13 could be lower or higher while separator 16 is as low as possible and could be much higher without any limit, as long as liquid will feed from 4 to 13 and be separated out in 16.

4

Having described my invention, I claim:

1. A storage and vaporizing system for liquefied gases comprising in combination a storage tank for the liquefied gas, said storage tank having a vapor outlet and a liquid outlet, a vapor supply conduit connected to said vapor outlet, a pressure regulating valve in said vapor supply conduit for limiting the vapor pressure in that portion of said vapor supply conduit on the other side of said regulating valve from said storage tank, a vaporizing tank, a liquid supply conduit connecting said liquid outlet and said vaporizing tank, said vaporizing tank having a vapor outlet, a connecting vapor conduit connecting the vapor outlet of said vaporizing tank with said vapor supply conduit at a point between said storage tank and said pressure regulating valve, a vapor liquid separator in said connecting vapor conduit, means to heat said vaporizing tank comprising a main burner, a main burner supply conduit connecting said main burner and said vapor supply conduit at a point on the other side of said pressure regulating valve from said storage tank, a pilot burner, a pilot burner supply conduit connecting said pilot burner and said main burner supply conduit, a first fluid pressure actuated shut-off valve in said main burner supply conduit at a point between said pilot burner supply conduit and said main burner, a fluid pressure supply conduit connecting said liquid outlet of said storage tank and said first shut-off valve whereby a predetermined pressure in said storage tank actuates said first shut-off valve, a second fluid pressure actuated shut-off valve in said main burner supply conduit at a point between said pilot burner supply conduit and said main burner, a thermal pressure fluid supply bulb disposed so as to be heated by said vaporizing tank, and a thermal pressure fluid conduit connecting said second shut-off valve and said supply bulb whereby a predetermined temperature in said vaporizing tank actuates said second shut-off valve.

2. A storage and vaporizing system for liquefied gases comprising in combination a storage tank for the liquefied gas, said storage tank having a vapor outlet and a liquid outlet, a vapor supply conduit connected to said vapor outlet, a vaporizing tank, a liquid supply conduit connecting said liquid outlet and said vaporizing tank, said vaporizing tank having a vapor outlet, a connecting vapor conduit connecting the vapor outlet of said vaporizing tank with said vapor supply conduit, a vapor liquid separator in said connecting vapor conduit, means to heat said vaporizing tank comprising a main burner, a main burner supply conduit connecting said main burner and said vapor supply conduit, a pilot burner, a pilot burner supply conduit connecting said pilot burner and said main burner supply conduit, a first fluid pressure actuated shut-off valve in said main burner supply conduit at a point between said pilot burner supply conduit and said main burner, a fluid pressure supply conduit connecting said liquid outlet of said storage tank and said first shut-off valve whereby a predetermined pressure in said storage tank actuates said first shut-off valve, a second fluid pressure actuated shut-off valve in said main burner supply conduit at a point between said pilot burner supply conduit and said main burner, a thermal pressure fluid supply bulb disposed so as to be heated by said vaporizing tank, and a thermal pressure fluid conduit connecting said second shut-off valve and said supply bulb whereby a predetermined tem-

5

perature in said vaporizing tank actuates said second shut-off valve.

3. A storage and vaporizing system for liquefied gases comprising in combination a storage tank for the liquefied gas, said storage tank having a vapor outlet and a liquid outlet, a vapor supply conduit connected to said vapor outlet, a vaporizing tank, a liquid supply conduit connecting said liquid outlet and said vaporizing tank, said vaporizing tank having a vapor outlet, a connecting vapor conduit connecting the vapor outlet of said vaporizing tank with said vapor supply conduit, means to heat said vaporizing tank comprising a main burner, a main burner supply conduit connecting said main burner and said vapor supply conduit, a pilot burner, a pilot burner supply conduit connecting said pilot burner and said main burner supply conduit, a first fluid pressure actuated shut-off valve in said main burner supply conduit at a point between said pilot burner supply conduit and said main burner, a fluid pressure supply conduit connecting said liquid outlet of said storage tank and said first shut-off valve whereby a predetermined pressure in said storage tank actuates said first shut-off valve, a second fluid pressure actuated shut-off valve in said main burner supply conduit at a point between said pilot burner supply conduit and said main burner, a thermal pressure fluid supply bulb disposed so as to be heated by said vaporizing tank, and a thermal pressure fluid conduit connecting said second shut-off valve and said supply bulb whereby a predetermined temperature in said vaporizing tank actuates said second shut-off valve.

4. A storage and vaporizing system for liquefied gases comprising in combination a storage tank for the liquefied gas, said storage tank having a vapor outlet and a liquid outlet, a vapor supply conduit connected to said vapor outlet, a vaporizing tank, a liquid supply conduit connecting said liquid outlet and said vaporizing tank, said vaporizing tank having a vapor outlet, a connecting vapor conduit connecting the vapor outlet of said vaporizing tank with said vapor supply conduit, a vapor liquid separator in said connecting vapor conduit, means to heat said vaporizing tank comprising a main burner, a main burner supply conduit connecting said main burner and said vapor supply conduit, a pilot burner, a pilot burner supply conduit connecting said pilot burner and said main burner supply conduit, a fluid pressure actuated shut-off valve in said main burner supply conduit at a point between said pilot burner supply conduit and said main burner, and a fluid pressure supply conduit connecting said liquid outlet of said storage tank and said shut-off valve whereby a predetermined pressure in said storage tank actuates said shut-off valve.

5. A storage and vaporizing system for liquefied gases comprising in combination a storage tank for the liquefied gas, said storage tank having a vapor outlet and a liquid outlet, a vapor supply conduit connected to said vapor outlet, a vaporizing tank, a liquid supply conduit connecting said liquid outlet and said vaporizing tank, said vaporizing tank having a vapor outlet, a vapor conduit communicating between said vapor outlet and said vapor supply conduit, means to heat said vaporizing tank comprising a main burner, a main burner supply conduit connecting said main burner and said vapor supply conduit, a pilot burner, a pilot burner supply conduit connecting said pilot burner and said main burner supply conduit, a first fluid pressure actuated shut-off valve in said main burner supply conduit at a point between said pilot burner supply conduit and said main burner, a fluid pressure supply conduit connecting said liquid outlet of said storage tank and said first shut-off valve whereby a predetermined pressure in said storage tank actuates said first shut-off valve, a second fluid pressure actuated shut-off valve in said main burner supply conduit at a point between said pilot burner supply conduit and said main burner, a thermal pressure fluid supply bulb disposed so as to be heated by said vaporizing tank, and a thermal pressure fluid conduit connecting said second shut-off valve and said supply bulb whereby said second shut-off valve is actuated upon the temperature within said vaporizing tank reaching a predetermined temperature.

6

duit connecting said pilot burner and said main burner supply conduit, a first fluid pressure actuated shut-off valve in said main burner supply conduit at a point between said pilot burner supply conduit and said main burner, a fluid pressure supply conduit connecting said liquid outlet of said storage tank and said first shut-off valve whereby said first shut-off valve is actuated upon the pressure in said storage tank reaching a predetermined pressure, a second fluid pressure actuated shut-off valve in said main burner supply conduit at a point between said pilot burner supply conduit and said main burner, a thermal pressure fluid supply bulb disposed so as to be heated by said vaporizing tank, and a thermal pressure fluid conduit connecting said second shut-off valve and said supply bulb whereby said second shut-off valve is actuated upon the temperature within said vaporizing tank reaching a predetermined temperature.

6. A storage and vaporizing system for liquefied gases comprising in combination a storage tank for the liquefied gas, a vapor supply conduit extending from the upper portion of said storage tank, a vaporizing tank, a liquid supply conduit connecting said storage tank and said vaporizing tank, a vapor conduit extending from said vaporizing tank to the upper portion of said storage tank and communicating with said vapor supply conduit by means of a vapor space within said storage tank, means to heat said vaporizing tank comprising a main burner, a main burner supply conduit connecting said main burner and said vapor supply conduit, a pilot burner, a pilot burner supply conduit connecting said pilot burner and said main burner supply conduit, a first fluid pressure actuated shut-off valve in said main burner supply conduit at a point between said pilot burner supply conduit and said main burner, a fluid pressure supply conduit connecting said liquid outlet of said storage tank and said first shut-off valve whereby said first shut-off valve is actuated upon the pressure in said storage tank reaching a predetermined pressure, a second fluid pressure actuated shut-off valve in said main burner supply conduit at a point between said pilot burner supply conduit and said main burner, a thermal pressure fluid supply bulb disposed so as to be heated by said vaporizing tank, and a thermal pressure fluid conduit connecting said second shut-off valve and said supply bulb whereby said second shut-off valve is actuated upon the temperature within said vaporizing tank reaching a predetermined temperature.

7. The system of claim 6, wherein a secondary vaporizer is provided in said vapor supply conduit, which comprises a section of said vapor supply conduit in heat exchange relation with said vaporizing tank.

ANDREW R. OLSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,237,858	Ballenger	Aug. 21, 1917
1,298,254	Phillips et al.	Mar. 25, 1919
2,234,407	Hodgland	Mar. 11, 1941
2,244,659	Bullowa et al.	June 10, 1941
2,341,380	James	Feb. 8, 1944
2,346,112	Melsheimer	Apr. 4, 1944