July 13, 1948. O. L. GARRETSON 2,445,059

HEATER

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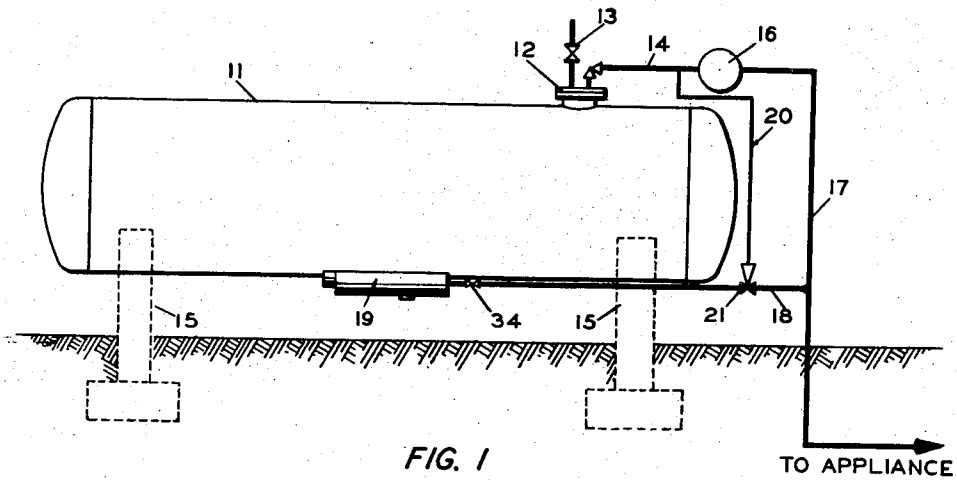


FIG. 1

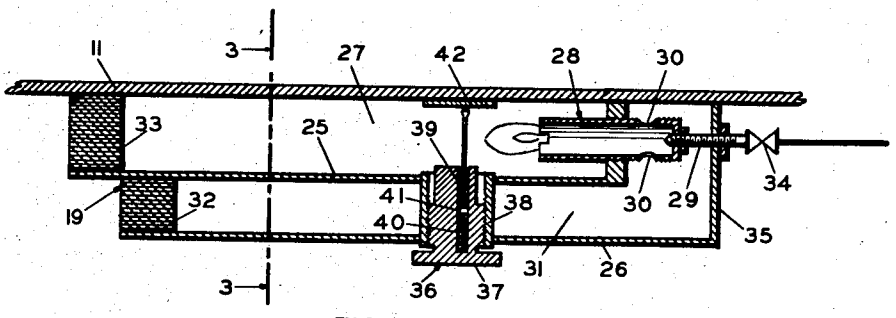


FIG. 2

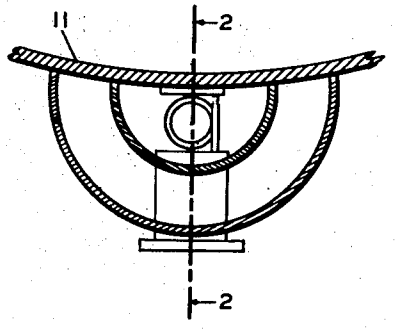


FIG. 3

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HEATER

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6 Claims. (Cl. 62—1)

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This invention relates to heaters. In one of its more specific aspects it relates to a heater assembly adapted to the heating of a liquefied gas in a storage tank to insure vaporization and a flow of gas under all conditions.

In northern and other areas of the United States, especially in the winter season, liquefied petroleum gases have been found to require some heating to assure a flow of gas under all conditions to points of consumption. Heating of the liquid fluel in installations using butane is necessary on account of the boiling point and vapor pressure considerations. Even propane, normally boiling at very low temperature and having a relatively high vapor pressure at ordinary atmospheric temperature, requires some heating in many localities. Rapid vaporization during heavy load periods further increases the necessity for heating.

One object of my invention is to provide a compact heating unit for use in heating liquefied petroleum gas storage tanks.

Another object of my invention is to provide a heating unit which is efficient in operation and easy and simple to control.

Still another object of my invention is to provide a heating assembly which is safe to use in connection with liquefied petroleum gas installations.

Still other objects and advantages will be apparent to those skilled in the art from a careful study of the following disclosure, which taken in conjunction with the attached drawing, forms a part of this specification.

In the drawing Figure 1 illustrates diagrammatically one particular application of my heater assembly.

Figure 2 is a longitudinal section of my heater assembly illustrating in a diagrammatic manner its construction and taken on the line 2—2 of Figure 3.

Figure 3 is a cross sectional view of my heater assembly taken on the line 3—3 of Figure 2.

Referring to the drawing and specifically to Figure 1, reference numeral 11 indicates a storage tank such as is used in the storage of liquefied petroleum gases for service purposes. The tank is equipped with a manhole and cover 12 which latter carries a safety valve assembly 13, and a gas outlet line 14. The tank is shown resting on supports 15. A pressure reducer 16 serves to reduce pressure from a tank pressure to that suitable for service line purposes. The pipe 17 is a service line leading from the pressure reducer 16 to points of consumption, not shown.

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A branch line 18 leads from the service line 17 to my heater assembly 19. A pressure responsive device 20 serves to control the rate of flow of gas through a valve 21 to the heater 19. This pressure responsive device is installed and operated in such a manner that as pressure within the tank increases beyond a certain limit the device operates the valve 21 to reduce the flow of fuel gas to the heater and vice versa.

In Figure 2, a section of the storage tank wall 11 is shown as the support for the heater mechanism 19. A housing member 25 which may be of semi-circular cross section as shown or of rectangular cross section, and the wall of tank 11 serve to form a combustion chamber 27. One end wall of this combustion chamber serves as a support for a burner member 28 which may extend through this end wall as shown. The burner 28 may be of any type of burner desired, provided it serves the purpose at hand. As illustrated, the burner is a Bunsen type burner having a fuel orifice in member 29. As fuel passes through this orifice air for combustion is drawn in through openings 30 so that the flame extends beyond the barrel of the burner into the combustion chamber 25.

Partially surrounding the housing member 25 is a second and larger housing member 26 which provides an annular space 31 between the two semicircular shaped housings. This housing member 26, like member 25, may be of a semicircular cross section, or may be rectangular or any other shape, providing it serves its purpose. Housing 26 extends from a point adjacent or in close proximity to the open end of housing 25 to a point beyond and spaced from the closed end of housing 25.

I have herein shown the housing members 25 and 26 as being substantially semicircular in cross section, with housing 26 being the larger to form the annular space 31. This annular space 31 is intended to serve mainly as an air preheating space. The air for supporting the combustion enters space 31 through the porous end wall 32 and while travelling toward the air openings 30 in the burner barrel is preheated which preheated air is used in admixture with combustion fuel in an attempt to increase the combustion heat of the heater. Burned gases pass through the combustion chamber 27 to exit through a porous end wall 33 of this chamber 27. A manually operated valve 34 is inserted in the fuel line in case it is desired to close off the burner for any purpose. This valve is usually kept in a fully open or closed condition and its operation is entirely independ-

ent of the pressure operated flow control valve 21, shown in Figure 1. The burner end of the housing member 26 has an end wall 35 which serves the double purpose of providing an air tight end to the annular space 31 and serving as a supporting means for the orifice member 28 of the burner.

The porous end wall members 32 and 33 involve the Davy safety lamp principle and may be made of such heat conducting material as copper or other substantially non-corrodible metal. These members may be of a wire gauze or screen form or layers of corrugated or honeycombed sections of thin copper or other suitable sheeting.

A lighter member 36 is a lighter assembly adapted to light the burner member 28 without danger of an explosion. This assembly is composed of a plug member 37 threaded to be inserted as shown into a threaded sleeve member 38. The sleeve member 38 is rigidly attached into the wall member 25 and into wall member 26 as shown. The circular line of contact of the sleeve 38 with the housing member 25 should be sealed against leakage of air from annular space 31 to the combustion chamber space 27.

Into the plug member 37 is drilled a hole 39 as shown and into the bottom of the hole is inserted a small helical compression spring 40. On top of this spring is inserted a small metal disc 41 which should preferably be attached to the spring in such a manner as to remain fixed in a substantially horizontal manner.

Just above this screw plug assembly 36 and attached rigidly to the bottom of the tank 11 is a small scratch plate 42 which is merely a piece of roughened metal intended to serve as a match scratcher.

The arrangement of the combustion chamber 27 above most of the annular space 31 provides a sort of chimney effect to assist circulation of air for combustion purposes. In addition the jet effect of the fuel gas issuing from the orifice in member 28 expedites this air circulation. Thus cool air for supporting combustion enters the annular space 31 through gauze or fire check 32 and becomes somewhat warmed by contacting the warm housing member 25. This warmed air then is drawn through the openings 30 in the burner tubes and combines with the gas at the tip of the burner in the form of a flame. This flame may or may not impinge directly on the bottom of the tank 11, but in most cases I prefer that this flame actually contact the tank in order to be most effective as a heating means. The warm burned gases then travel the length of the combustion space 27 and finally exit through the fire check member 33.

To light the burner, it is merely necessary to remove the plug member 37 and into the hole 39 which is off center of the plug insert a match, as shown in Figure 2. The plug with the match is then screwed back into place, at a point in close proximity to and ahead of the mouth of burner 28, until the match head almost touches the strike plate 42. Then upon further turning of the plug member 37 the match head is fired by friction against the strike plate 42, the valve 34 is then opened to the flow of fuel, the flame lights and the heater is in service. The term "match" includes flint type and other lighting means.

As the contents of the tank becomes warmed the tank pressure increases, and the pressure responsive device 20 operates valve 21 to control the flow of fuel to the burner.

Figure 3 shows a cross section of the heater taken on the line 3—3 of Figure 2, and assists in showing the general construction.

My heater is a compact unit which can be manufactured as an integral part of the tank or it may be installed separately as desired.

Flame impingement either directly on the tank or in close association therewith assists in maintaining a rather high temperature differential from outside to inside the tank so as to affect relatively rapid heat transfer.

The double chamber (combustion chamber and annular space) provides a means for preheating the air used in the fuel burner.

The fire check members reduce the fire hazard so that the heater assembly may be used under all conditions.

A simple and safe means is provided for igniting the burner to start a heater in operation.

The off center mtach hole in the screw plug makes for easy and safe "match scratching."

Any type of burner means may be used providing it is adapted to operate satisfactorily in such a general combination as herein described.

It will be obvious to those skilled in the art that many modifications and alterations of my broad idea may be made and yet remain within the intended spirit and scope of my invention.

Having described my invention, I claim:

1. A heater assembly for vaporizing liquefied petroleum gas, in combination with a storage tank, comprising two semi-tubular members concentrically disposed and forming a semi-annular space therebetween and having a common longitudinal axis, said semi-tubular members positioned in substantially gas tight relation with the exterior surface of said tank and at a point approximately at the bottom thereof, two of the ends of said semi-tubular members in close proximity to one another being open while the other two ends of said semi-tubular members are closed and the closures are spaced apart; a burner means extending through said closed ends into the space between the inner semi-tubular member and the tank bottom; and an opening in said burner means intermediate the closed ends of the semi-tubular members.

2. A heater assembly for vaporizing liquefied petroleum gas, in combination with a storage tank, comprising two semi-tubular members concentrically disposed and forming a semi-annular space therebetween and having a substantially common longitudinal axis, said semi-tubular members positioned in substantially gas tight relation with the exterior surface of said tank at a point near the bottom thereof, two of the ends of said semi-tubular members in close proximity to one another being fitted with fire check means and open for gaseous flow while the other two ends of said semi-tubular members are closed and the closures are spaced apart; a burner mea extending through the closed ends of said semi-tubular members and into the space between the inner semi-tubular member and the tank surface; and an opening in said burner means at a point intermediate the two closed ends of the semi-tubular members, said opening in said burner means providing gaseous communication between the semi-annular space and the space between the inner semi-tubular member and the tank surface.

3. The heater assembly of claim 2 wherein a safe match lighting means extends into the interior of the inner one of the two semi-tubular members at a point near the end and ahead of

said burner means; said lighting means comprising a plug threadedly inserted through the semi-tubular members at said point, said plug having an opening the longitudinal axis of which is substantially parallel with but off center with respect to the longitudinal axis of said threaded plug, said opening adapted to hold a match stick in such a manner that the head end of said match touches an abrasive scratching means fixed to said tank surface.

4. A heater assembly, for vaporizing liquefied petroleum gas, in combination with a storage tank, comprising a first housing rigidly affixed adjacent the bottom portion of said storage tank so that said storage tank comprises a portion of the walls of said housing, one end of said housing being open and the other end closed to form a first chamber therein which is gas-tight except for the open end; a second housing partially surrounding said first housing and extending from a point in close proximity to the open end of said first housing to a point beyond and spaced from the closed end of said first housing, that end of said second housing nearest the closed end of said first housing being closed and the other end open, said second housing being positioned so as to form a second gas-tight chamber around a portion of said first housing, throughout its length, except at the open end of said second housing; burner means extending through the closed ends of said first and second housings and into said first chamber; and an opening in said burner means within said second chamber, said opening and said burner means providing for gaseous communication between the two chambers.

5. A heater assembly, for vaporizing liquefied petroleum gas, in combination with a storage tank, comprising a first housing rigidly affixed adjacent the bottom portion of said storage tank, one end of said housing being open and the other end closed to form a first chamber therein which is gas-tight except for the open end; a second housing partially surrounding said first housing

and extending from a point in close proximity to the open end of said first housing to a point beyond and spaced from the closed end of said first housing, that end of said second housing nearest the closed end of said first housing being closed and the other end open, said second housing being positioned so as to form a second gas-tight chamber around a portion of said first housing, throughout its length, except at the open end of said second housing; burner means extending from said second chamber through the closed end of said first housing and into said first chamber; an opening in said burner means within said second chamber, said opening and said burner means providing for gaseous communication between the two chambers, and fuel supply means extending through the closed end of said second chamber to communicate with said burner means.

6. The heater assembly of claim 5 wherein a safe match lighting means extends into said first chamber at a point in close proximity to and ahead of the mouth of said burner means; said lighting means comprising a plug threadedly inserted through the walls of said first and second housings and having an opening the longitudinal axis of which is substantially parallel with but off center with respect to the longitudinal axis of said threaded plug, said opening adapted to hold a match stick in such a maner that the head end of said match touches an abrasive scratching means fixed to said tank surface.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,319,819	Martin	May 25, 1943
2,408,084	Martin	Sept. 24, 1946