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REFRIGERATOR CAR HEATER

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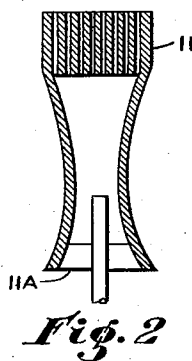
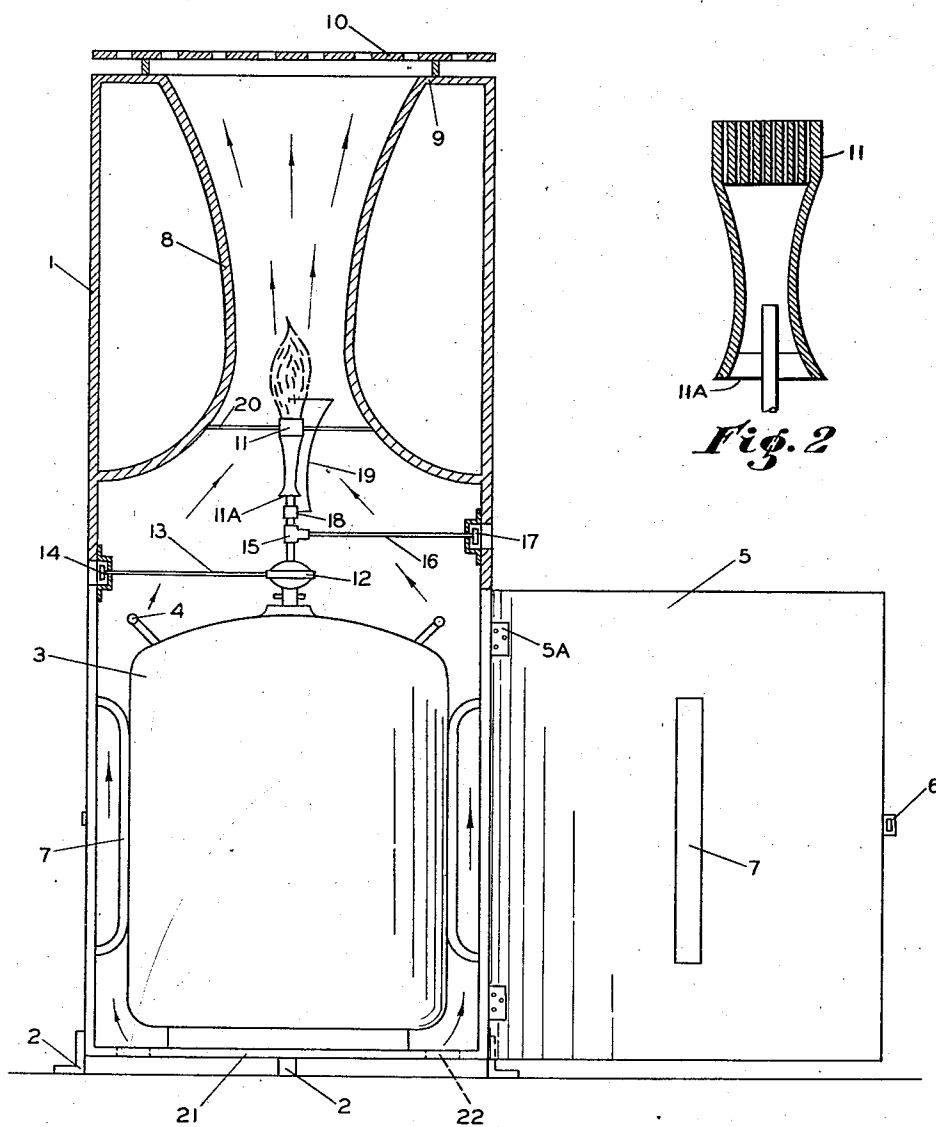


Fig. 1

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REFRIGERATOR CAR HEATER

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4 Claims. (Cl. 126—93)

The present invention relates to portable heaters for use in compartments, such as refrigerator cars, which employ a fuel, such as liquefied petroleum gas. During transportation of perishable foods in refrigerator cars in cold or sub-zero weather, ice is ordinarily not employed in such cars. It has, in fact, been necessary to employ some sort of heating means to control the temperature within the car between rather narrow limits. By furnishing heat to the interior of the car, the freezing of fruits and other perishable products, which renders them unfit for marketing purposes, is avoided.

It has become common practice to employ charcoal heaters for controlling the temperature on the inside of refrigerator cars, but such heaters are known to emit dangerous and obnoxious combustion gases, contaminating food products and continuing to send out heat hours after the supply of additional fuel has been shut off, due to the quantity of fuel necessary to support combustion, which will continue to burn for a long period of time. Various types of liquefied petroleum heaters have been proposed to avoid the objectionable features of the charcoal heaters, but such devices have not been entirely satisfactory. Present devices of the latter-mentioned type are defective in furnishing only localized heat and particularly by failure to accomplish sufficient circulation of air within the car which is necessary to maintain an even and uniform temperature.

A primary object of the present invention is to provide an inexpensive heating device employing liquefied petroleum fuel, such as liquefied propane, which will create a maximum degree of air circulation within a refrigerator car.

Another object of the invention is the development of a heater which will occupy a minimum amount of floor space in said car.

A further object of the invention is to provide a liquefied gas heater which is economical and readily transportable.

Figure 1 is an elevational view partly in cross section of a refrigerator car heater and air circulator embodying my invention.

Figure 2 is a cross sectional view through the automatic blast Venturi burner 11 of Figure 1.

The accompanying drawing illustrates a preferred embodiment of a heater produced in accordance with the present invention. Referring to the drawing, the numeral 1 designates a cylindrical shell of sheet metal or similar material supported on the floor or bulkhead of a refrigerator car. The bottom of the

cylindrical shell has a compartment for the reception of a tank 3, which may have handles 4, containing liquefied petroleum fuel, such as liquefied propane under relatively high pressure. The shell may have a door 5 secured thereto by hinges 5A for the removal of an empty tank and insertion of a full one. The door is secured in closed position by latching means 6. Alternatively, the tank may be permanently secured within the shell and provided with an additional filling connection accessible from the outside. The tank 3 is spaced from the shell by vertical spacers 7 which may be welded to the inside of the shell. The upper portion of the shell is provided with a vertically directed venturi 8 which is welded or otherwise secured to the inside of the shell at its lower end, and at the opposite end to the top 9 of the shell. While the venturi is preferably directed vertically for best results, it is understood that it may be horizontal or at any angle to the horizontal. A grill 10 of foraminous metal or other material is secured to the top of the shell and prevents foreign matter from entering the venturi. A high pressure burner nozzle 11 is connected to the top of the fuel tank and extends into the venturi along its axis at least a sufficient distance so that the end of the nozzle will reach a point just adjacent the vena constricta or throat portion of the venturi. It has been found that location of the burner nozzle at this point creates a maximum suction of cold air through the venturi and thereby renders the device of greatest efficiency. The burner is provided with a gas regulator 12, controlled by rod 13 and knob 14 conveniently located on the outside of the shell. A shut-off valve 15 is provided having a rod 16 and knob 17 also located outside of the shell. The burner may optionally be provided with a safety shut-off device 18 controlled by a strip of metal 19 extending into the flame. Spacers 20 serve to properly position the burner nozzle within the venturi. The cylindrical shell is provided with a bottom plate 21 which has a suitable number of apertures 22 therein for the admission of air to the inside of the shell.

I do not claim to be the inventor of burner 11 as this burner is merely the usual automatic blast Venturi burner, such as manufactured by Charles A. Hones Inc., Baldwin, N. Y., as the "Buzzer" burner. In this burner the venturi entrains substantially all of the primary combustion air for combustion in the gas jet from the gas supply under the gas supply pressure. Some secondary combustion air is supplied by

the atmosphere. The venturi is supported by vanes forming air openings 11a, the vanes being attached to the central gas supply pipe. The top of the burner 11 is perforated as shown and the flame burns above the perforations taking some secondary combustion air from the atmosphere.

The burner nozzle itself is conventionally provided with a venturi having air inlet opening 11A whereby sufficient air is admitted for complete combustion of the gaseous fuel. Thus, air drawn through the cylindrical shell by the inspirating effect of the high pressure burner nozzle is heated by contact with the combustion gases from the burner, but is substantially unconsumed by combustion reactions therewith. The burner is of the high pressure inspirating type. The vapor pressure from the tank to the burner venturi is controlled by regulator 12 which may be adjusted to deliver from 5 to 15 pounds per square inch, depending on the B. t. u. requirements within the car. In the operation of the device after the gas at the burner nozzle has been ignited, air is drawn in at the bottom of the cylindrical shell through the openings 22 and circulates around the fuel storage tank between the spacers 7 and is inspired under relatively high pressure through the venturi by means of hot combustion gases emitted from the burner.

The heater of the present invention effects a continuous circulation of air from the bottom of the car to the top of the car and, thereby accomplishes the maintenance of an even temperature therein. The location of the burner nozzle with respect to the venturi is such that a maximum draft is obtainable and most efficient contact of air with heat emitted from the burner, the air being heated by convection currents. Also, by the arrangement herein provided cold air is drawn from the lowest point in the car. The venturi is large enough to entrain more air than is necessary to furnish secondary combustion air for the combustible gas, in order to carry out the primary object of the invention of creating a maximum degree of air circulation in the car.

I claim:

1. A portable convection air heater comprising a shell having side walls and open to the passage of air at the top and bottom, a vertically directed venturi located in the upper portion of the shell, a storage tank for liquefied gas below said venturi and spaced from said shell to provide vertical air passages between said tank and said shell, a pressure burner connected to the top of the tank and extending into said venturi along the axis thereof, said burner having air openings entraining primary combustion air, said venturi being substantially larger than necessary to entrain all the secondary combustion air required by said burner, said burner blowing a burning combustible mixture of said gas and said primary air up the axis of the venturi in the air entrained in said venturi whereby said air in excess of that necessary for combustion in said venturi is heated and expanded and driven from the ven-

turi by the heavier cold air coming in the bottom of the shell from outside and by the kinetic force of the gas emerging from the burner to cause convection through the shell of a relatively large volume of air.

2. A portable convection air heater comprising a shell having side walls and open to the passage of air at the top and bottom, a vertically directed venturi located in the upper portion of the shell, a storage tank for liquefied gas below said venturi and spaced from said shell to provide vertical air passages between said tank and said shell, a pressure burner connected to the top of the tank and extending into said venturi along the axis thereof, said venturi being substantially larger than necessary to entrain all the combustion air required by said burner, said burner blowing a burning combustible mixture of said gas and said air up the axis of the venturi whereby said air in excess of that necessary for combustion in said venturi is heated and expanded and driven from the venturi by the heavier cold air coming in the bottom of the shell from outside and by the kinetic force of the gas emerging from the burner to cause convection through the shell of a relatively large volume of air.

3. A portable convection air heater comprising a shell having side walls and open to the passage of air at the top and bottom, a vertically directed venturi located in the upper portion of the shell, a storage tank for liquefied gas, a pressure burner connected to the top of the tank and extending into said venturi along the axis thereof, said burner having air openings entraining primary combustion air, said venturi being substantially larger than necessary to entrain all the secondary combustion air required by said burner, said burner blowing a burning combustible mixture of said gas and said primary air up the axis of the venturi in the air entrained in said venturi whereby said air in excess of that necessary for combustion in said venturi is heated and expanded and driven from the venturi by the heavier cold air coming in the bottom of the shell from outside and by the kinetic force of the gas emerging from the burner to cause convection through the shell of a relatively large volume of air.

4. A portable convection air heater comprising a shell having side walls and open to the passage of air at the top and bottom, a vertically directed venturi located in the upper portion of the shell, a storage tank for liquefied gas, a pressure burner connected to the top of the tank and extending into said venturi along the axis thereof, said venturi being substantially larger than necessary to entrain all the combustion air required by said burner, said burner blowing a burning combustible mixture of said gas and said air up the axis of the venturi whereby said air in excess of that necessary for combustion in said venturi is heated and expanded and driven from the venturi by the heavier cold air coming in the bottom of the shell from outside and by the kinetic force of the gas emerging from the burner to cause convection through the shell of a relatively large volume of air.

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