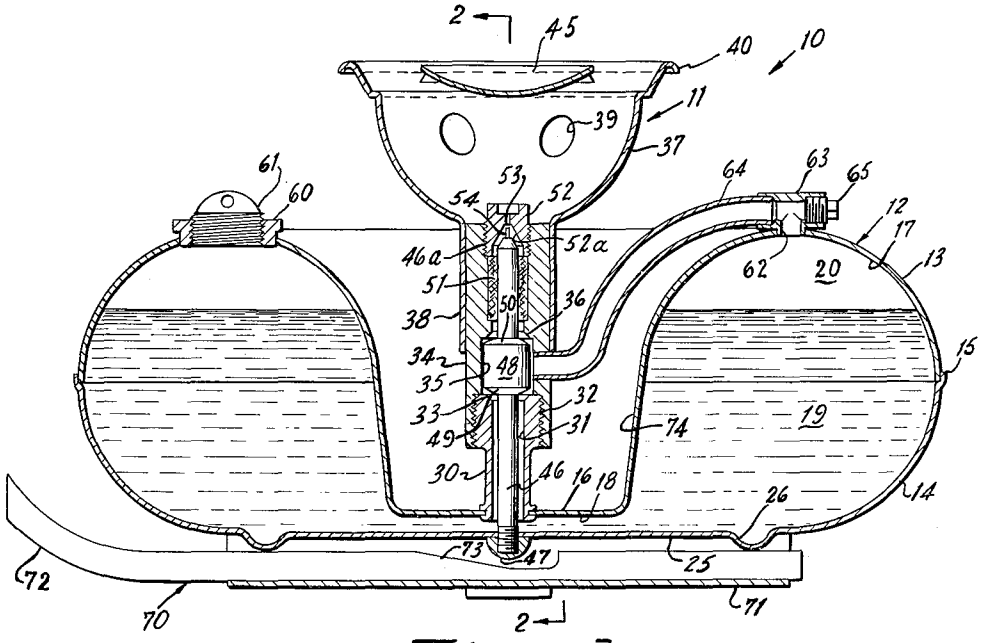
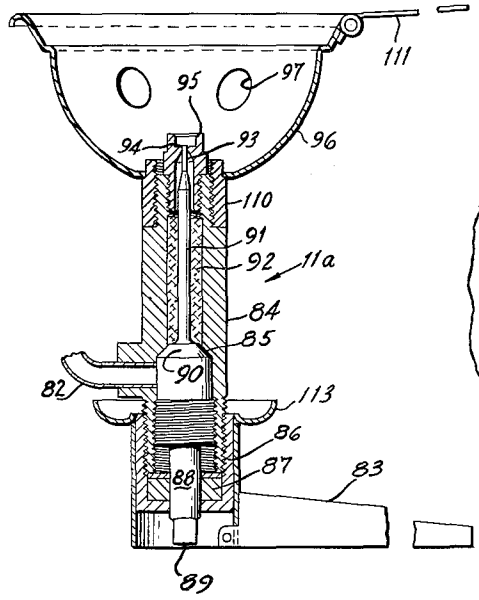
Oct. 9, 1962 I. N. VANT 3,057,399

SELF-PRESSURIZING GASOLINE STOVE

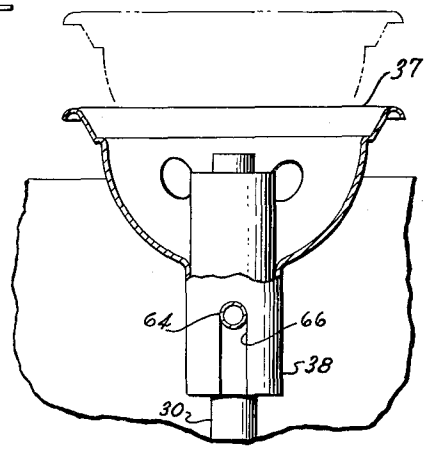
Filed April 15, 1959 2 Sheets-Sheet 1



Fig—1



Fig—3



Fig—2

INVENTOR.
ISADORE N. VANT
BY Edward B. Gregg
ATTORNEY

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SELF-PRESSURIZING GASOLINE STOVE

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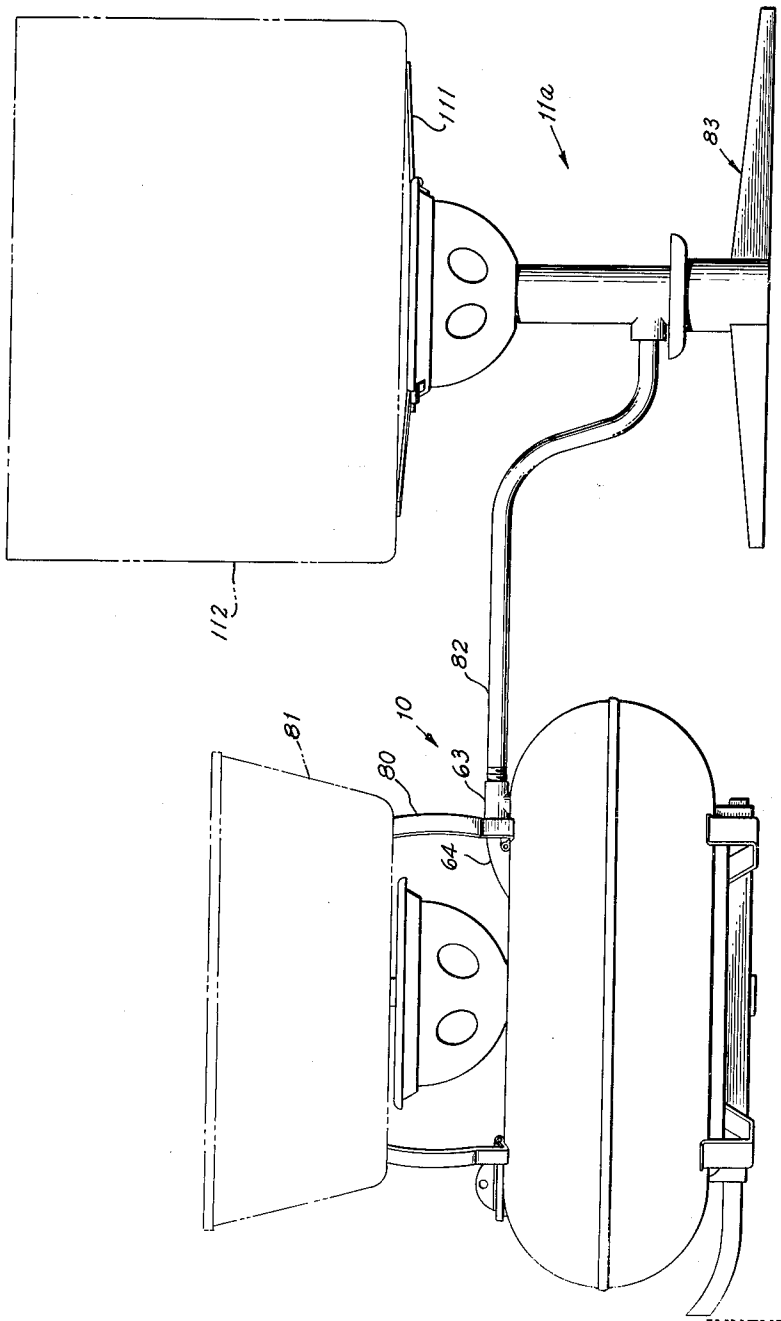

Fig-4

INVENTOR.
ISADORE N. VANT
BY
Edward B. Gregg
ATTORNEY

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SELF-PRESSURIZING GASOLINE STOVE

Isadore N. Vant, 654 Hudson Drive, Santa Clara, Calif.

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This invention relates to a gasoline stove or heater. More particularly the invention relates to a portable gasoline stove which is small in size, which is self-pressurizing, which is safe and reliable and which is easy to operate.

Most gasoline stoves of the portable type used for such purposes as camping require the application of air pressure by means of a pump. Such burners are difficult to start and/or they lose pressure after starting. Also the necessity of carrying an air pump and of employing the pump to generate air pressure is inconvenient. Moreover there is the possibility of dangerous pressure build-up in the fuel tank due to radiant and/or reflected heat.

Self-pressurizing gasoline stoves are available, such as that of my prior Patent No. 2,812,017, issued November 5, 1957, entitled "Automatic Burner." These stoves are self-pressurizing and require no air pressure, but they are usually relatively large such as used for field kitchens in the armed forces. While the stoves of my patent are admirably suited for this purpose they are not without disadvantage in the field of very small portable stoves which are intended to be carried in a pocket, knapsack or the like.

The present invention relates more particularly to the latter class of gasoline stoves. That is to say the present invention relates particularly to stoves which are self-pressurizing and which are quite small in size such that they can be carried about in the pocket of a jacket or in a knapsack.

It is, therefore, an object of the present invention to provide improvements upon gasoline stoves.

It is another object of the invention to provide improvements upon the self-pressurizing type of gasoline stove.

It is a particular object of the invention to provide a self-pressurizing gasoline stove which is very small in size such that it can be carried in a pocket or knapsack.

Yet another object of the invention is to provide a very small, easily portable, self-pressurizing gasoline stove which is easy to start and which is self-regulating with regard to pressure so that an adequate pressure is maintained but dangerously high pressures are avoided.

The above and other objects will be apparent from the ensuing description and the appended claims.

Certain forms of my invention are illustrated by way of example in the accompanying drawings, in which:

FIGURE 1 is a view in vertical midsection of one embodiment of the invention.

FIGURE 2 is a fragmentary view, partly in side elevation and partly in vertical section of the burner portion of the stove of FIGURE 1, generally as seen along the line 2—2 of FIGURE 1.

FIGURE 3 is a view in vertical midsection of an auxiliary burner used with the stove of FIGURE 1.

FIGURE 4 is a view in side elevation of the stove of FIGURE 1 with the auxiliary burner of FIGURE 3 attached.

Referring now to the drawings and more particularly to FIGURE 1, a gasoline stove in accordance with the present invention is there shown and is generally designated by the reference numeral 10. It comprises a burner assembly 11 (hereinafter referred to as "the burner"), a valve controlled vapor generator and a fuel tank 12 which is formed of metal and in two halves, comprising an upper half 13 and a lower half 14 which are joined together by a lap seam 15. A bridge portion 16 is provided.

The tank 12 has an annular or doughnut shape and forms a fuel cavity 17 with a cross or connecting portion 18. The pressure throughout the tank 12 is uniform. A liquid fuel of high vapor pressure is shown at 19 with a vapor space above at 20.

The tank 12 is generally cylindrical in cross section but its bottom portion 25 is flat and is formed with an annular bead 26 for a purpose explained hereinafter.

To the connecting or bridge portion 16 is fixed a tube 30 having an axial bore 31 defining a lower liquid fuel passage and which is threaded at its upper end at 32 and is formed with a valve seat 33 at its extreme upper end. A tubular extension 34 is provided whose inner bore defines an upper vapor passage and which is threaded at its lower end to the threaded upper end 32 of the tube 30 and which has an enlarged axial cavity at 35 whose upper end forms a valve seat 36.

A burner cup 37 is provided which has a downwardly projecting sleeve 38 which is slidable on the tubular extension 34. The burner cup 37 is also formed with air inlet ports 39 and with a curved rim at 40 which provides a suitable flat surface upon which to place and support a pot or other utensil containing food or water. Preferably, however, hinged supports are provided for pots, etc. as shown at 80 in FIGURE 4. A flame spreader 45 is also provided.

A valve stem 46 is provided which is fixed at its lower end, as by means of a nut 47, to the central part of the flat bottom 25 of the fuel tank 12. The midportion of the stem 46 has an enlarged diameter at 48, defining a valve element and this wide portion is formed with lower and upper valve seat engagement surfaces or portions 49 and 50, respectively, for mating with the valve seats 33 and 36, respectively. The upper part of the stem 46 passes through a filter 51. The upper end of the tubular extension 34 is threaded at 46a and is fitted with a nut 52 formed with a feed nozzle 53 into which a needle tip 54, extending from a bevelled portion 52a, on stem 46 can pass. The combination of nut 52 with its feed nozzle 53 and burner cup 37 is defined as the burner. Also the combination of tube 30 and tubular extension 34 are defined as a vapor generator for reasons which will become better understood in connection with the explanation of the operation of this invention.

The fuel tank 12 is provided at its top with a threaded fitting 60 which is closed by a threaded cap or plug 61. The top of the tank 12 is also formed with a vapor outlet opening 62 which is connected by a fitting 63 to a vapor supply tube 64. A threaded plug 65 provides access to one end of the tube 64 for cleaning and the like. The other end of the tube 64 extends through the wall of the tubular extension 34 and communicates with the cavity 35. The sleeve 38 of the burner cup 37 is formed with a slot 66 (see FIGURE 2), so that the sleeve can be rotated to register the slot 66 with the tube 64. The purpose of such slot is as follows: When the burner is not in use, the burner cup 37 is rotated to register the slot 66 with the tube 64 and the burner cup is then pushed down to the position shown in solid lines in FIGURE 2. The burner cup, therefore, projects only slightly above the top of the tank 12, thereby diminishing the space requirements of the stove and adapting it to fit more conveniently into a pocket, knapsack or the like. When it is desired to use the stove, the burner cup 37 is pulled up and is rotated so that the slot 66 is not in registry with the tube 64. In such position, the tube 64 acts as a bottom support for the sleeve 38 and the burner cup 37.

Another feature of the stove 10 is a cam bar 70 which is slidable in brackets 71 fixed to the bottom of the burner 12 and which has a handle 72 for manipulation and a cam rise 73 for a purpose explained hereinafter.

In use, the burner cup 37 will be elevated and rotated as described above so as to occupy the position shown in FIGURE 1. The plug 61 is removed and the stove is tilted so that a small portion of the fuel will flow out through the fitting 60 into a central well 74 formed by the inner side wall of the fuel tank 12 and by the bridge portion 16. If desired, a wick material such as loose asbestos may be placed in the well 74 to soak up the spilled gasoline. The plug 61 is then restored and screwed in tightly. The cam bar 70 is pushed to the right as viewed in FIGURE 1 to cause its rise portion 73 to bear against the nut 47 and thereby exert an upward thrust on the stem 46. Such upward thrust will cause the needle 54 at the upper end of the stem 46 to enter the orifice 53, thereby cleaning it and keeping it free of solid deposits. Moreover, the valve portion 50 of stem 46 will seat against the valve seat 36. Therefore the fuel supply to the orifice 53 is shut off.

As the ignited fuel in the well 74 burns and gives off heat, it will heat the liquid fuel in the tube 30, which acts as a generator. The heat will vaporize some of the liquid fuel and will increase the pressure of the fuel vapor, which will be transmitted to the tank 12 by the vapor tube 64. The fuel in tank 12 will, therefore, be pressurized. After a short time the vapor pressure will be sufficient to issue from the orifice 53 at a velocity which is high enough to suck in primary air through the openings 39 in the burner cup 37. That is to say, a brief preheating in this manner places the stove in proper condition for operation. At this time the cam bar 70 is moved back to the left, thereby permitting the flat, bottom portion 25 of the fuel tank 12 to move the stem 46 automatically downwardly to the position shown in FIGURE 1. The pressurized fuel vapor is then free to travel up through the tube 30 and the filter 51 to the orifice 53. The resulting fuel vapor-air mixture is ignited with a match or lighter, assuming it does not ignite from the heat or flame used for preheating.

Combustion will continue because heat from the flame will heat the fuel in tube 30, thereby vaporizing the fuel, keeping it vaporized and maintaining a steady supply of pressurized fuel vapor to the orifice 53.

It may happen that the flame will overheat the fuel and that the vapor pressure will tend to become excessive. If such a condition is permitted to continue unabated, an explosion may occur or the rate of combustion may become excessive. This is prevented in my stove as follows: As the vapor pressure of the fuel in tube 30 rises, it will be communicated through tube 64 to the tank 12. That portion of the tank wall which is most flexible and most easily distended by the increased vapor pressure is the flat bottom area 25 which is bounded by the annular bead 26. The center of this area where the stem 46 is attached will have the greatest movement in response to pressure. Accordingly, as the pressure increases, the flat area 25 will bulge out, the stem 46 will be pulled down and the valve portion 49 will move closer to its valve seat 33. This will throttle the supply of liquid fuel and will cut it off entirely when the valve 49 seats. Since most of the vapor supply for the burner is from the tube 30, this throttling will diminish the fuel supply and cut down the rate of burning. When the valve 49 seats completely, the burner can operate only on vapor supplied by the tube 64. Therefore the rate of burning subsides quickly and automatically and as the pressure diminishes the flat bottom 25 will return toward its normal position.

By this means the burner is automatically regulated. An adequate fuel vapor pressure is maintained at all times and it does not become excessive.

Referring now to FIGURES 3 and 4, in FIGURE 3 an auxiliary burner 11*a* is shown in detail and it is shown attached to a stove in FIGURE 4.

Referring to FIGURE 4, the stove 10 is shown equipped with hinged brackets 80 which, in the upright position shown, support a vessel such as that shown at 81. The plug 65 shown in FIGURE 1 is removed and an auxiliary vapor tube 82 is connected as shown in FIGURE 4. The other end of the tube is connected to the auxiliary burner 11*a*.

Referring to FIGURE 3, the burner 11*a* has a base 83 and an upright tube 84 which is formed with a valve seat 85. A cap 86 is threaded to the lower end of the tube 84 and a gasket 87 is provided within the cap to seal against a stem 88 which has a squared end 89 to facilitate manipulation. The stem 88 has a conical valve portion 90 for seating against the valve seat 85. The stem 88 is threaded in the tube 84 so that, by turning its squared end 89 one way or the other the valve 90 can be closed or opened.

The stem 88 has an extension 91 which passes through a filter 92 and it terminates in a needle point 93 which can pass through an orifice 94 in a nut 95 threaded into the upper end of the tube 84.

A burner cup 96 having air inlets 97 is provided which has a base 110 threaded on the upper end of the tube 84. The burner cup 96 is also provided with hinged bails 111 which serve as supports for a vessel such as that shown at 112 in FIGURE 4. Also shown in FIGURE 3 is a wick cup 113.

In operation an auxiliary burner such as shown at 11*a* is connected to a stove 10 as illustrated. (More than one auxiliary burner may be used.) The valve 90 is closed until the main burner 11 is operating properly. Advantageously a wick material soaked in fuel is placed in the cup 113 and ignited to preheat the auxiliary burner 11*a*. Then the valve 90 is opened and the burner is lit. Pressure regulation of the main burner 11 in the manner described above maintains a proper fuel vapor pressure for the auxiliary burner 11*a*.

By this means, two or more vessels may be heated simultaneously.

It will, therefore, be apparent that a self-pressurizing gasoline stove has been provided which has the advantages of being self-pressurizing, self-regulating, very small in size, very simple in its operation and easy to manipulate.

I claim:

1. A self-pressurizing, self-regulating gasoline stove comprising a fuel tank having a flexible wall portion having a normal position but which moves from such position in response to internal pressure; a burner for burning fuel vapor; a vapor generator comprising a lower liquid fuel passage communicating with the lower portion of said tank and an upper vapor passage communicating with said liquid fuel passage and also with the upper portion of said tank, said vapor passage being also connected to said burner to supply fuel vapor thereto; said vapor generator being in sufficiently close proximity to the flame of the burner to be heated thereby and to cause generation of vapor from the liquid in the lower liquid fuel passage; a valve for closing and opening communication between the vapor passage and the liquid fuel passage; and means for automatically operating said valve, said means being operated by said flexible wall portion whereby normally said valve is in open position but is moved toward closed position to shut off communication between the liquid fuel passage and the vapor passage whenever the vapor pressure of the liquid fuel rises above a safe level.

2. A self-pressurizing, self-regulating gasoline stove comprising a fuel tank having a flexible bottom wall having a normal position but which moves from such position in response to internal pressure; a burner for burning a fuel vapor; a vapor generator comprising a lower liquid fuel passage communicating with the lower portion of said tank and an upper vapor passage communicating with said liquid fuel passage and also with the upper portion of said tank, said upper vapor passage being also connected to said burner to supply fuel vapor thereto; said vapor generator being in sufficiently close proximity

to the flame of the burner to be heated thereby and to cause generation of vapor from the liquid in the lower liquid fuel passage; a valve for closing and opening communication between the upper vapor passage and lower liquid fuel passage; and a valve stem for automatically operating said valve, said valve stem being attached to said flexible bottom wall whereby normally said valve is held in open position but is moved toward closed position to shut off communication between said lower liquid fuel passage and said upper vapor passage whenever the vapor pressure of the liquid fuel rises above a safe level.

3. A self-pressurizing, self-regulating gasoline burner comprising a fuel tank having a top and a bottom, having a generally annular shape to provide a main annular fuel cavity which encloses and forms a central well and having a flexible wall portion; means forming a bottom for said well; a burner; a vapor generator in the form of an upright tubular member within said well and connected at its lower end to the lower portion of said tank to receive liquid fuel therefrom and to hold a quantity thereof, said tubular member being connected at its upper end to said burner to supply fuel vapor thereto; a vapor supply tube connecting the upper portion of said tank with said tubular member; a valve for opening and closing communication between the upper and lower ends of said tubular member, said valve being located below the connection of said vapor conduit with said tubular member; and a valve stem attached to said valve and operated by said flexible wall portion to maintain the valve open under normal conditions of operation but to close the valve and permit supply of fuel vapor to the burner only through said vapor conduit when the vapor pressure of the fuel supply becomes excessive and moves said flexible wall portion from its normal position.

4. A gasoline stove comprising a fuel tank including a flexible wall portion having a normal position and which moves from said normal position in response to internal pressure; a burner for burning fuel vapor; a vapor generator including a lower liquid fuel passage communicating with the lower liquid filled portion of said fuel tank, an upper vapor passage communicating with said burner, and a cavity between said lower liquid fuel passage and said upper vapor passage; a vapor supply tube connecting said cavity to the upper vapor filled portion of said tank; and a valve element disposed within said cavity and connected to said flexible wall portion for sealing said lower liquid fuel passage with respect to said cavity whenever said flexible wall portion responds to internal pressure.

5. A gasoline stove comprising a fuel tank including a flexible wall portion having a normal position and which moves in opposite directions from said normal position in response to internal and external pressure; a burner for burning fuel vapor; a vapor generator being heated by said burner and including a lower liquid fuel passage communicating with the lower liquid filled portion of said fuel tank, an upper vapor passage communicating with said burner, and a cavity between said lower liquid fuel passage and said upper vapor passage; a vapor supply tube connecting said cavity to the upper vapor filled portion of said tank; and a valve element disposed within said cavity and connected to said flexible wall portion for sealing the said lower fuel passage with respect to said cavity whenever said flexible wall portion responds to internal pressure and for sealing said vapor passage with respect to said cavity whenever said flexible wall portion responds to external pressure.

6. A gasoline stove comprising a fuel tank including a flexible wall portion having a normal position and which moves from said normal position in response to internal pressure; a burner for burning fuel vapor; a vapor generator including a lower liquid fuel passage

communicating with the lower liquid filled portion of said fuel tank, and an upper vapor passage communicating with said burner, said burner heating said vapor generator by heat conduction to cause the generation of fuel vapor; a valve element disposed within a cavity in the passage of said vapor generator and connected to said flexible wall portion for sealing said lower liquid fuel passage with respect to said cavity whenever said flexible wall portion responds to internal pressure; and a vapor supply tube connecting said upper vapor filled portion of said fuel tank to said cavity to communicate with said upper vapor passage whenever said flexible wall portion responds to internal pressure.

7. A gasoline stove comprising a fuel tank including a flexible wall portion having a normal position and which moves from said normal position in opposite directions in response to internal and external pressure; a burner for burning fuel vapor; a vapor generator including a lower liquid fuel passage communicating with the lower liquid filled portion of said fuel tank and an upper vapor passage communicating with said burner, said burner heating said vapor generator by heat conduction to cause the generation of fuel vapor; a valve element disposed within a cavity in the passage of said vapor generator and connected to said flexible wall portion for sealing said lower liquid fuel passage with respect to said cavity whenever said flexible wall portion responds to internal pressure and for sealing said upper vapor passage with respect to said cavity whenever said flexible wall portion responds to external pressure; and a vapor supply tube connecting said upper vapor filled portion of said fuel tank to said cavity to communicate with said upper vapor passage whenever said flexible wall portion responds to internal pressure and with said lower liquid fuel pressure whenever said flexible wall portion corresponds to external pressure.

8. A stove comprising a fuel tank for holding a supply of volatile liquid fuel with the lower portion of the tank being filled with liquid fuel and the upper portion of the tank being filled with fuel vapor, said tank including a flexible wall portion having a normal position and which moves from said normal position in response to internal pressure; a burner for burning fuel vapor; a valve member; a vapor generator having an internal passage including a cavity containing said valve member and defining a lower and an upper passage, said lower passage being connected to said lower portion of said fuel tank and said upper passage being connected to said burner; said vapor generator being in sufficiently close proximity to the flame of said burner to be heated thereby and to vaporize liquid fuel contained therein; a vapor supply tube for connecting said chamber to the upper portion of said fuel tank; and valve element actuating means operated by said flexible wall portion in response to internal pressure for automatically shutting off communication between the liquid fuel contained in said lower passage and said cavity while maintaining communication between said vapor supply tube and said upper passage.

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