Oct. 2, 1951 O. MITCHELL 2,569,771

SAFETY DEVICE FOR VAPORIZERS

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Fig. 1.

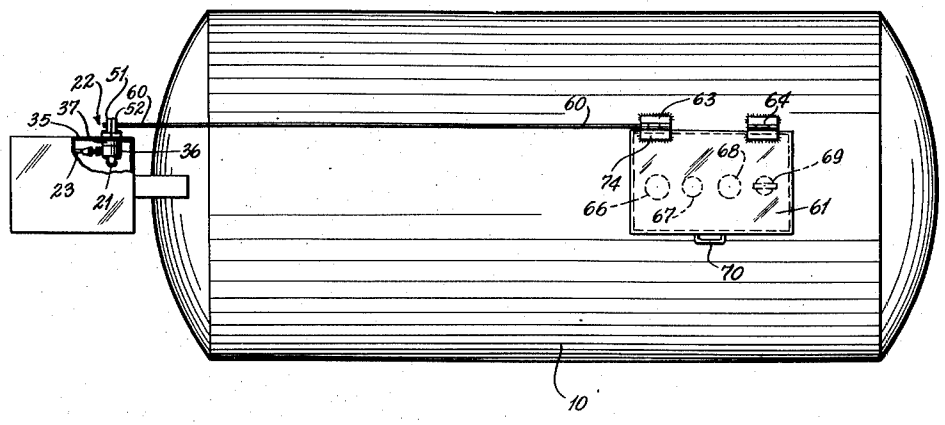
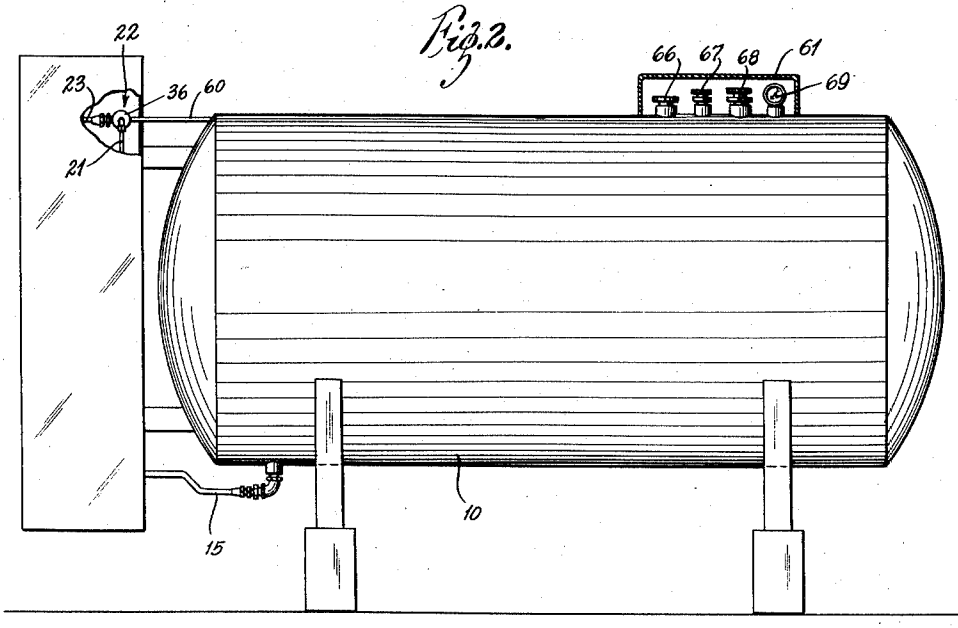



Fig. 2.




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Fig. 4.

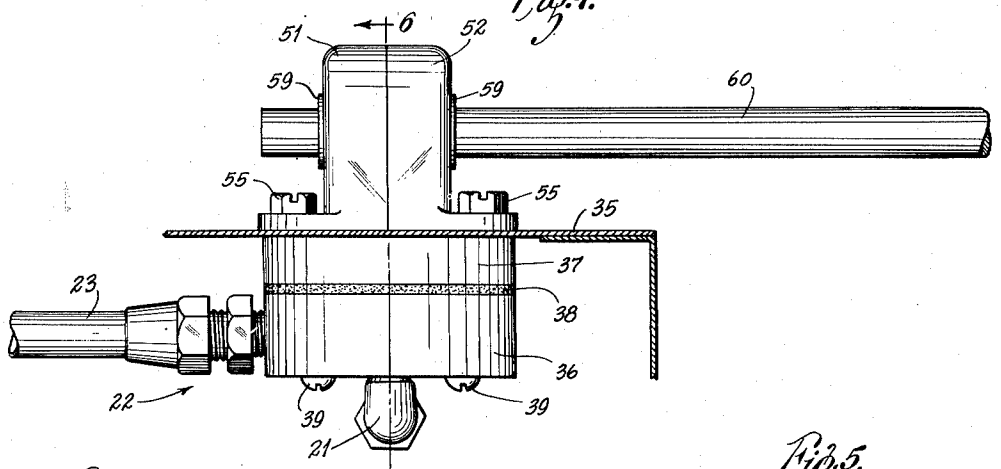



Fig. 3.

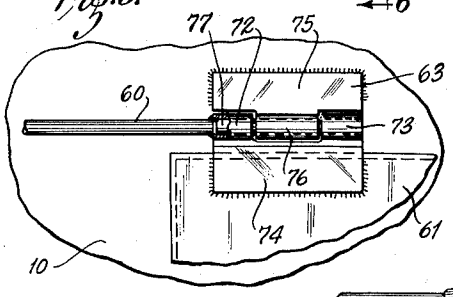



Fig. 5.

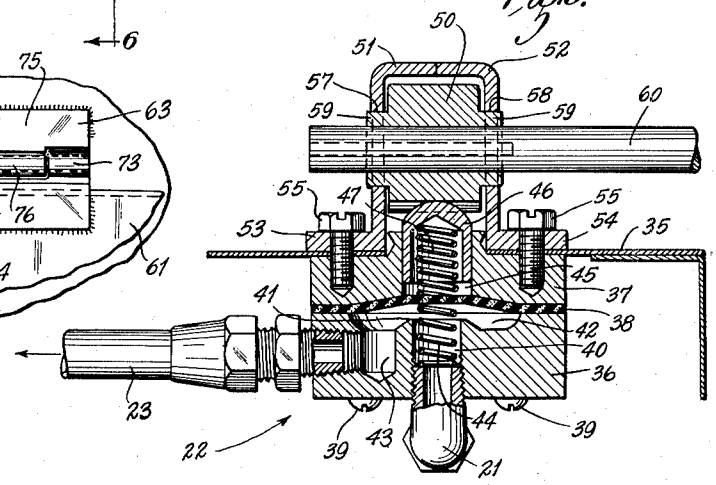



Fig. 6.

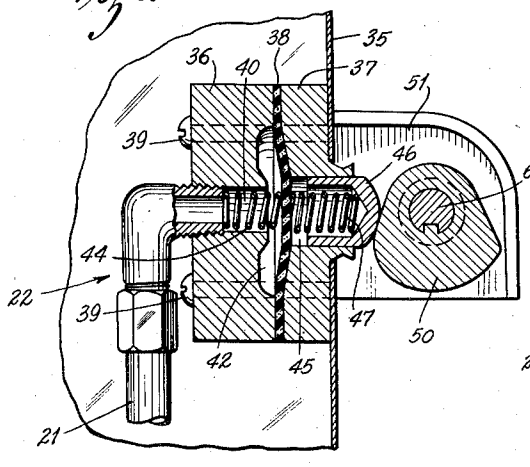
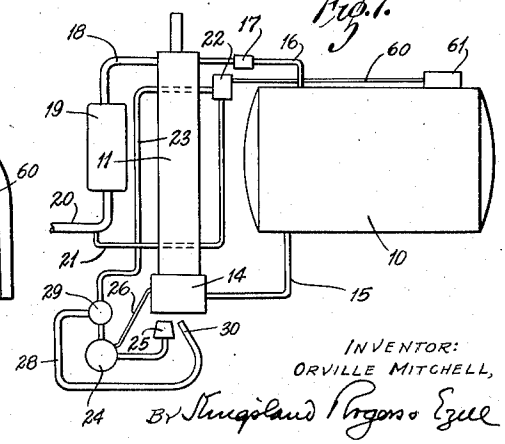



Fig. 7.




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# UNITED STATES PATENT OFFICE

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## SAFETY DEVICE FOR VAPORIZERS

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Application January 12, 1946, Serial No. 640,975

1 Claim. (Cl. 62—1)

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The present invention relates to a safety device for vaporizers. More particularly, it relates to a device for use with vaporizers for liquid fuel, such as propane, having a tank and a vaporizer unit, together with means for cutting off gas flow when the filling mechanism for the main fuel tank is operated.

A particular object of the invention is to provide a fuel tank filler means and positive mechanical connections between that and cut-off means for the gas from the vaporizing unit, such that, when the filler means is operated, the cut-off will be moved to closed position and the gas supply stopped.

A particular object of the invention is to provide a combination of a liquid tank, of the type described, with a flame operated vaporizer unit, having a main flame with a pilot flame, and a valve remote from but mechanically connected to the tank filler means, so that the valve is closed when the tank filler means is operated and the gas to the burners is cut off during the filling operation. A particular object of the invention is to provide such a mechanical means that will operate at the start of any tank filling operation to cut off the gas flow to the burners before any actual filling can occur.

In the drawings:

Fig. 1 is a plan view of the mechanism;

Fig. 2 is a side elevation thereof;

Fig. 3 is an enlargement of a fragment of the hinge construction in plan view;

Fig. 4 is an enlarged plan view of the valve mechanism;

Fig. 5 is a horizontal section through the valve mechanism;

Fig. 6 is a transverse section through the valve mechanism, taken on the line 6—6 of Fig. 4; and

Fig. 7 is a diagram of the overall mechanism.

This device is particularly applicable to a vaporizing system such as is illustrated diagrammatically in Fig. 7, and shown in greater detail in the application of Sam P. Jones, Serial No. 630,786, filed November 26, 1945, and which has now matured into Patent No. 2,558,051, granted June 26, 1951. It is a back pressure, backflow type of vaporizer for use with such gases as liquid propane. It includes a tank 10 and a vaporizer standpipe 11. The vaporizer standpipe has a vaporizer bulb 14 at its bottom, connected by a pipe 15 with the bottom of the tank 10. The standpipe 11 opens into the bulb 14 and liquid may rise in the standpipe to the height of that in the tank 10. The top of the standpipe is also connected into the top of the tank 10 by a pipe 16 having a flow control and check valve 17

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therein. There is an outlet line 18 from the top of the standpipe, which passes through a pressure regulator 19 to a line 20 that leads to any mechanism that is to be operated by the gas generated. A typical mechanism is a gas engine.

The liquid in the bulb 14 is adapted to be heated, so that it will vaporize. To this end, a burner line 21 is taken off of the line 20, after the pressure regulator, and is led up through a valve 22, to be described in detail hereafter. This valve, as will appear, is controlled by the opening mechanism for the filler means of the main tank 10. The outlet line 23 from this valve leads to a thermostat 24, and thence to a main burner 25. The thermostat may be controlled by a tube 26 and bulb (not shown) containing thermal fluid and operating in response to the temperature of the bulb 14. Ahead of the thermostat 24, a pilot line 28 is taken off through a pilot safety valve 29, that may be of the thermocouple type, having an element responsive to the presence or absence of pilot flame at a pilot burner 30.

The operation of this general type of vaporizer involves the generation of vapor from the liquid in the standpipe 11 and its withdrawal into the work line 20. The liquid level in the standpipe 11 will assume that of the liquid in the tank 10 when the device is not operating. The burner 25 will operate when the valve 24 is open, and will cause the liquid to be vaporized to supply the necessary volume of gas. When the demand in the work line 20 is less than the amount of gas being generated in the standpipe, gas pressure will build up in the standpipe above the liquid level, depressing the liquid level and forcing this liquid back into the tank 10. The liquid level will be depressed until the heated surface in contact with liquid is reduced to such a point that an equilibrium is established. Under certain operating conditions, the liquid may be forced substantially completely out of the standpipe and the bulb 14.

At the start, before the burner has had time to generate much gas, a large demand at the work pipe 20 may withdraw all of the vapor from the standpipe 11 and still be unsatisfied. Under such circumstances, the valve 17, operating as a check valve, will open because of the reduction of the vapor pressure in the standpipe 11 with respect to that normally present above the liquid in the tank 10. The vapor in the tank 10 will thereby supplement that from the standpipe and supply the demand until such time as the heater 25 can increase the amount generated in the standpipe to the amount required. Further, when the vapor pressure within the tank 10 is lowered

below a certain value, the valve 17 will open to permit gas to be discharged from the standpipe 11 back into the tank 10 to establish the required minimum pressure conditions therein.

When the thermostat 26 is satisfied, the valve 24 will be closed and the main burner will go off, leaving only the pilot burner 30 ignited. If the pilot burner 30 fails of combustion, the safety pilot valve 29 will close. This will prevent the flow of gas to either of the burners 25 and 30.

The present invention is concerned principally with the disposition of the valve 22. This valve may be mounted at a point convenient to the vaporized device. As shown in detail in Figs. 4 to 6, the valve is mounted on a wall 35 of the housing for the vaporizer unit. It comprises a two-part housing in the form of a valve body 36 and a support 37, between which a diaphragm 38 is clamped, the three parts being held together by suitable screws 39. The diaphragm 38 preferably is of some material such as neoprene.

The inlet 21 opens into a suitable opening 40 in the body member 36. This opening passes by a valve seat 41 into a valve chamber 42. An outlet passage 43 connects with the outlet line 23.

Within the passage 40 of the inlet, a coil spring 44 acts, by compression, against the pipe fitting of the inlet 21 and the center of the diaphragm 38, urging the diaphragm away from the seat 41. The support 37 has a passageway 45 therethrough, coaxial with the passage 41. This passage receives a cup-shaped cam follower 46, in which a coil spring 47 acts under compression against the diaphragm 38, to urge the cam follower outwardly to engage the surface of a cam 50. This cam is mounted in a two-part housing, comprising complementary side pieces 51 and 52, flanged at 53 and 54. The flanges fit on the opposite side of the housing 35 and are clamped to the housing and to the support 37 by screws 55. It will be seen that these screws thereby hold the components of the valve to the housing.

The two complementary housing portions 51 and 52 have side journal openings 57 and 58 that receive journals 59 on the opposite ends of the cam. The cam has a central opening therethrough to receive a shaft 60, to which the cam is keyed, as shown in Fig. 6. The cam has a shape such as that shown in Fig. 6. Preferably, the housing for the cam is open at its bottom.

The shaft 60 extends across the top of the tank 10 to the filler cover 61 thereon. This filler cover is typified by a box-shaped member that is hinged by hinges 63 and 64 to the top of the tank. Preferably, the filler means are at a substantial distance from the vaporizer and from the valve 22. The filler cover covers a liquid level gauge 66, a vapor equalizing valve 67, a filler opening 68, and a pressure gauge 69.

It will be seen that the cover 61 over these filler elements has a handle 70 by which it may be raised on its hinges 63 and 64, to give access to the filler opening.

As shown more particularly in Fig. 3, the hinge 63 has a sleeve portion 72 and a sleeve portion 73 that are attached to the plate 74 fixed to the cover 61. The other plate 75 of this hinge is secured to the tank, and it has a sleeve 76 adapted to interfit with the other two sleeves 72 and 73 to receive a conventional hinge pin 77. It will also be seen that the rod 60 is securely attached to the sleeve 72 that is part of the cover 61 by its attachment to the plate 74 of the hinge.

When the cover 61 is raised, the rod 60 will be turned. The cam 50 has such a shape that,



immediately after the cover 70 is slightly raised, the cam follower 46 will be moved to the left in Fig. 6 and downwardly in Fig. 5. The coil spring 47 is preferably substantially unloaded when the valve is opened. When the button 46 is moved as aforesaid, it will displace the diaphragm 38 until its central portion closes with the valve seat 41 and cuts off communication between the inlet pipe 21 and the outlet pipe 23. In so doing, it will compress the spring 44 which has less strength than the spring 47 when the button is moved to seat the valve.

Reference to Fig. 7 will show that this closure of the valve 22 cuts off the flow of gas to the burners, which immediately become extinguished. Of course, when the burners are extinguished, the pilot safety valve 29 will close automatically. In other words, the first opening movement of the cover 61 causes the safety valve 22 to close and shut off the flow of gas to the two burners. As a result, the filler 68 cannot be opened until the burners are completely extinguished, and no flame exists around the device that might cause an explosion from the volatile liquid discharged into the tank 10. The valve is completely shut off by the time the lid is opened sufficiently to insert a hose connection into the filler cap 68.

When the filling operation is completed and the lid 61 is lowered again to its closed position, the final movement will displace the cam 50 in such wise that the valve mechanism returns to the positions shown in Figs. 5 and 6, leaving communication between the inlet 21 and the outlet 23. It will be necessary to re-operate the pilot safety valve 29 and reestablish combustion at the pilot valve 30 before the main burner can re-ignite.

It will be seen that this mechanism provides a safety device that prevents the presence of flame at the burners of the vaporizer at the time fuel is supplied to the tank 10. It will be seen that the entire operation is mechanical, and that there are, therefore, no places where sparks might be generated to ignite the fuse. The use of a diaphragm valve in this connection is a great advantage because it eliminates completely the possibility of the leakage of any fumes at the valve itself.

What is claimed is:

In a vaporizer unit for vaporizing liquid, a supply tank, a vaporizer chamber, an outlet pipe from the chamber, flame means associated with the vaporizer chamber, a pipe from the outlet to the flame means, a valve in said pipe, a filler opening for the tank spaced from the vaporizer, a cover movable to give access to the opening, rigid mechanical connections between the cover and the valve to close the valve and cut off the flame means when the cover is moved as aforesaid, and a safety cut-off in the pipe between the valve and the flame means to maintain the flame pipe closed when flame is absent.

ORVILLE MITCHELL.


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