Sept. 22, 1942. W. D. COOK 2,296,598

METHOD FOR DISPENSING VOLATILE LIQUIDS

Filed Dec. 12, 1940 2 Sheets-Sheet 1

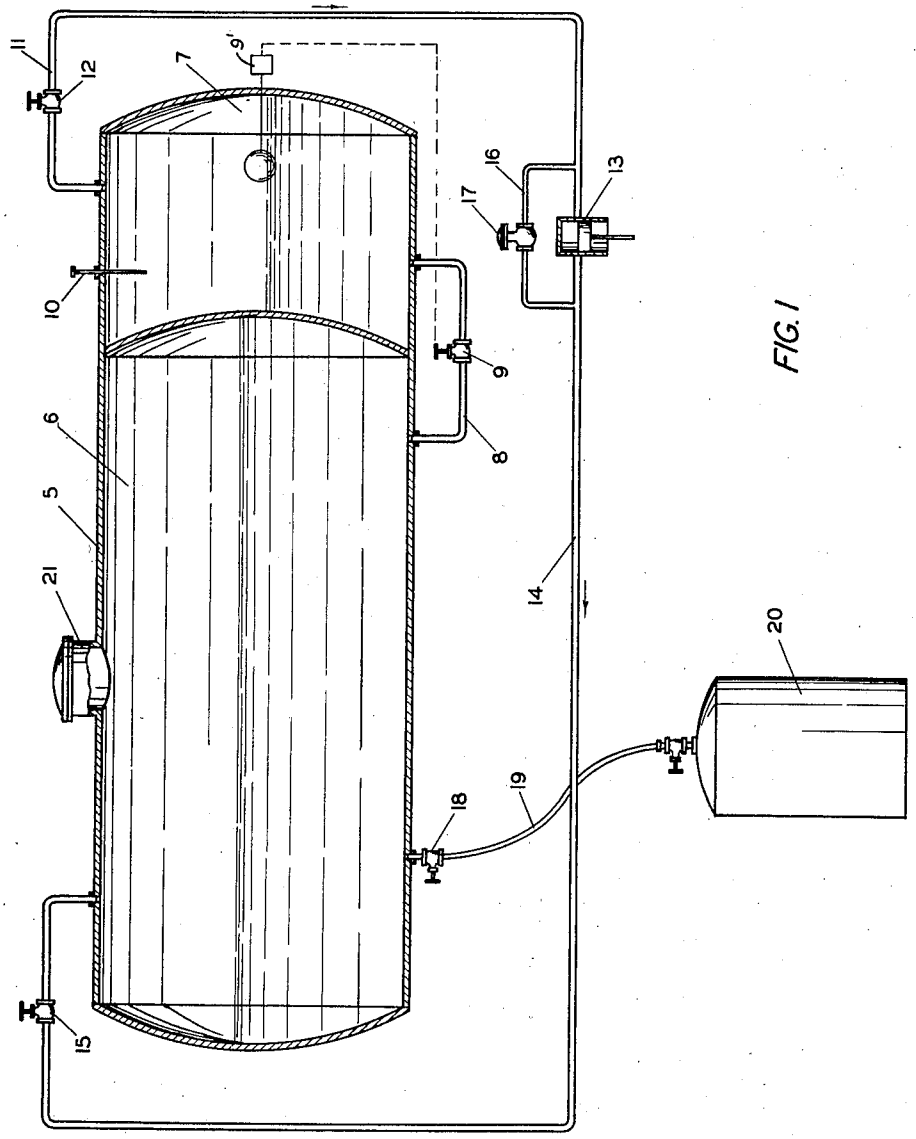

FIG. 1

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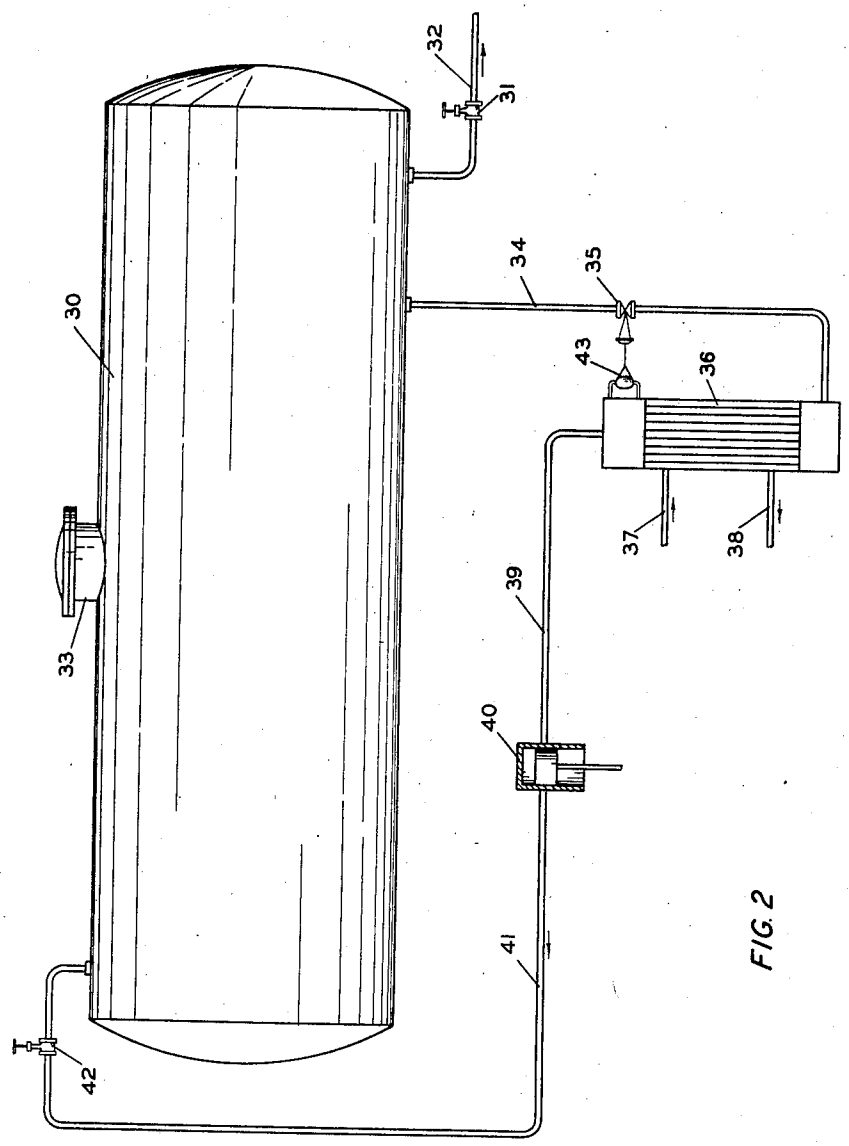

FIG. 2

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METHOD FOR DISPENSING VOLATILE LIQUIDS

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2 Claims. (Cl. 62—1)

This invention relates to a method of transferring volatile liquids from one container to another.

Several methods have been devised for transferring liquefied gases from one vessel to another. In marketing liquefied petroleum gases it is often necessary to transfer the liquefied gases several times before they finally reach the customer. While satisfactory methods have been devised for transferring the liquefied gases from one large container to another large container, a special problem is encountered in transferring the liquefied gases, as a liquid, from a storage tank or transport truck tank to the small containers such as those used for home consumption of liquefied petroleum gases. Pumps have been devised for handling this liquid but the initial cost of such pumps is high and maintenance is appreciable since these liquids possess very little if any lubricating properties. A method of transfer sometimes used involves heating the liquid in the first container to raise its vapor pressure and thus force the liquid into the second container. It is apparent that this method involves the use of large quantities of heat when used with large containers, that there is danger of hazard from overheating, and that the liquid must be cooled by suitable means between the containers to prevent rise in vapor pressure in the receiving container. The present invention effects an increase in the pressure on the liquid in the first container without an appreciable increase in the temperature of the liquid.

An object of this invention is to provide a novel method of increasing the pressure in a liquid containing vessel.

Another object of this invention is to provide an improved method for the transfer of volatile liquids from one vessel to another.

In accordance with the present invention the pressure on the liquid in the first container is raised sufficiently to cause it to flow at a rapid rate into a second container. This is accomplished by evaporating a portion of the liquid in heat exchanger or vaporization zone at a reduced pressure, compressing the vapors from the vaporization zone and passing the vapors to the vapor space of the first container.

The method of this invention will be more readily understood by reference to the accompanying drawings.

Figure 1 is a diagrammatic elevation view, partly in vertical cross-section, of one form of apparatus suitable for carrying out the present invention.

Figure 2 is a diagrammatic elevation view of another form of apparatus illustrative of the present invention.

With reference to Figure 1, the numeral 5 designates a container of suitable construction having a main compartment 6 and an auxiliary compartment 7 connected by a pipe 8 through a valve 9. Valve 9 is controlled by a liquid level indicating means 9'. A dip tube gauge 10 of conventional design is provided in the auxiliary compartment. A pipe 11 from the top of the auxiliary compartment is provided with a valve 12 and is connected to the intake of a compressor 13. From the discharge of compressor 13, the pipe 14 leads to the top of the main compartment 6 through a valve 15. The compressor may be by-passed through a pipe 16 in which is a control valve 17 operable by a differential in pressure between the pipe 14 and the pipe 11. A valved outlet 18 in the main compartment 6 may be connected to a suitable conduit 19 for transferring liquid from the container 5 to a second container or receiver 20. The main compartment has an inlet or opening for filling designated by the numeral 21, and may be provided with the customary gauging and safety devices not shown in the drawings.

In operation, the container 5 may be mounted on a vehicle or it may be stationary. A quantity of volatile liquid is supplied to the main compartment 6 through the inlet 21. Liquid from the main compartment may be admitted as desired to the auxiliary compartment through the pipe 8 and the valve 9. The liquid in the container will exert a pressure on the container equal to the vapor pressure of the liquid. It has been found that the pressure on the liquid may be increased by the addition of vapors to the vapor above the liquid in the main compartment. To accomplish this, vapors are withdrawn from the auxiliary compartment 7 through the pipe 11 to the compressor 13 where they are compressed and from which they pass through the pipe 14 to the vapor space above the liquid in the main compartment 6. There is some tendency for the vapor to condense or dissolve into the liquid but the effect of such condensation or solution is to heat the surface of the liquid thus raising the vapor pressure of the liquid at the liquid-vapor interface without substantially increasing the temperature of the main body of liquid. The compressor serves also to reduce the pressure in the auxiliary compartment by withdrawal of

vapors therefrom. The reduction in pressure lowers the temperature of boiling of the liquid which in turn makes atmospheric or low temperature heat available for vaporizing the liquid in the auxiliary compartment. The control valve 17 in the pipe 16 serves to prevent damage to the equipment through carelessness of the operator.

With reference to Figure 2, the numeral 30 designates the container from which volatile liquid is to be transferred to a second container or receiver through the valve 31 and discharge conduit 32. The container is provided with a suitably protected inlet designated by the numeral 33. The pressure on the liquid in the container is increased in a manner analogous to that described in connection with Figure 1. From the container 30 liquid may be withdrawn through the pipe 34 and float-controlled valve 35 to a vaporizer 36 operating at reduced pressure. The vaporizer is an indirect type heat exchanger to which heating fluid is supplied through the pipe 37 and from which the heating fluid is discharged through the pipe 38. Vapors from the vaporizer are withdrawn through the pipe 39 to the compressor 40 from which they are passed through the pipe 41 and valve 42 to the vapor space of the container 30. The float-controlled valve 35 is operated by a float 43 in the vaporizer in such a manner that the liquid level in the vaporizer is maintained substantially constant. This prevents liquid from passing through the pipe 39 into the compressor 40. The compressor 40, by withdrawal of vapors from the vaporizer, reduces the pressure therein and lowers the boiling point of the liquid in the vaporizer. Thus low temperature heating fluid, such as exhaust gases and cooling water from internal combustion engines may be utilized to supply the heat of vaporization in the heat exchanger. Obviously even air may be used as the cooling fluid.

I claim:

1. The method of raising the pressure in a liquid container comprising continuously passing a portion of the liquid from the container to a vaporizing zone, maintaining a constant supply of liquid in said zone, vaporizing a part of the liquid at reduced pressure, compressing the vapors so formed and passing the compressed vapors to the vapor space in the liquid container.

2. The method of transferring liquefied gas from one container to another comprising withdrawing a portion of the liquefied gas into a heat exchanger subjected to atmospheric temperature, maintaining a constant supply of liquid in said heat exchanger, vaporizing a portion of the liquefied gas at a reduced pressure, passing the vapor thus formed to the vapor space of the first container to increase the pressure therein, thereby causing liquefied gas to flow at an increased speed to the second container without substantial change in temperature.

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