Sept. 2, 1969 R. W. DAUGHERTY 3,464,465

FLUID TRANSFER APPARATUS

Filed Feb. 3, 1966 2 Sheets-Sheet 1

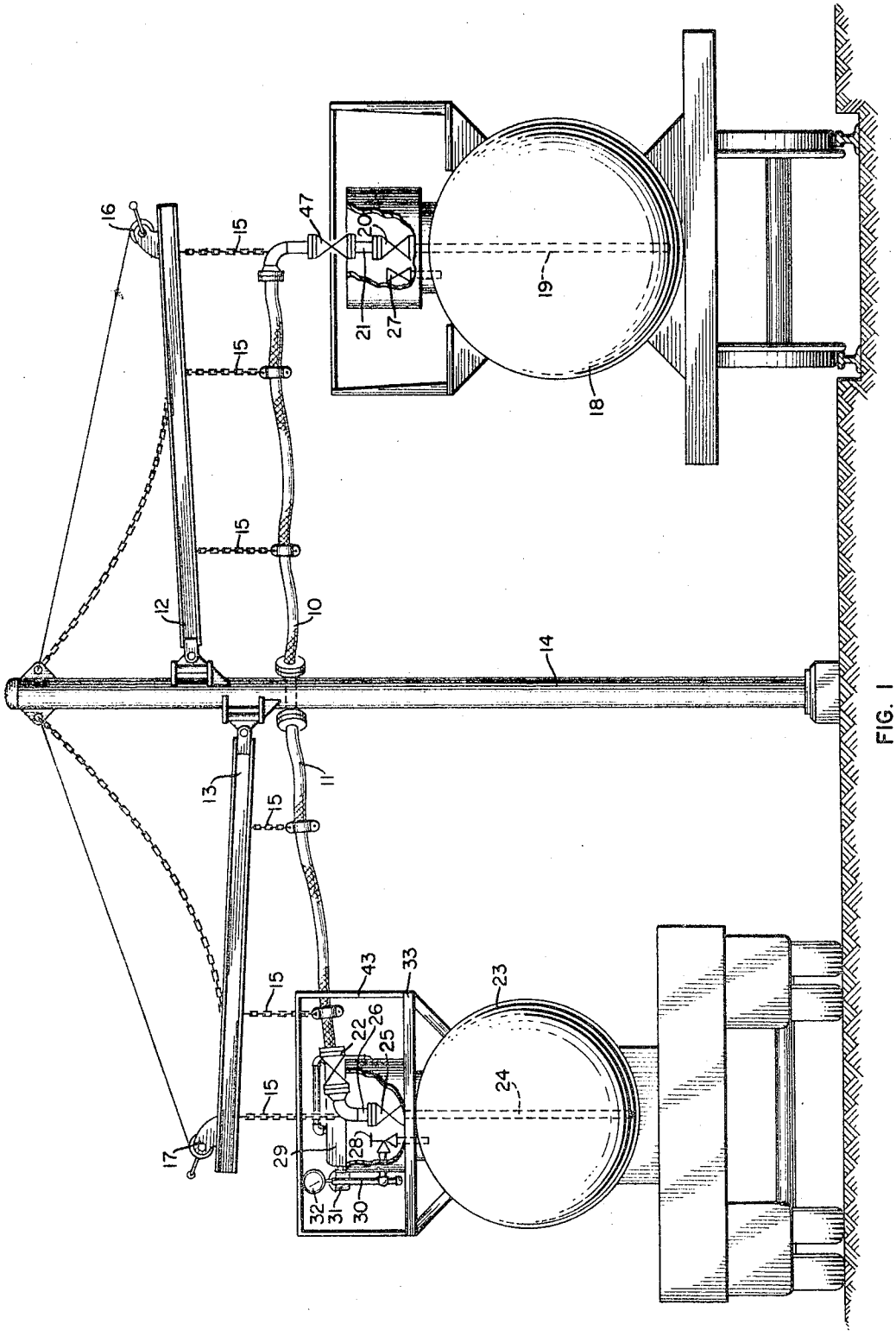



FIG. 1

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FLUID TRANSFER APPARATUS

Filed Feb. 3, 1966 2 Sheets-Sheet 2

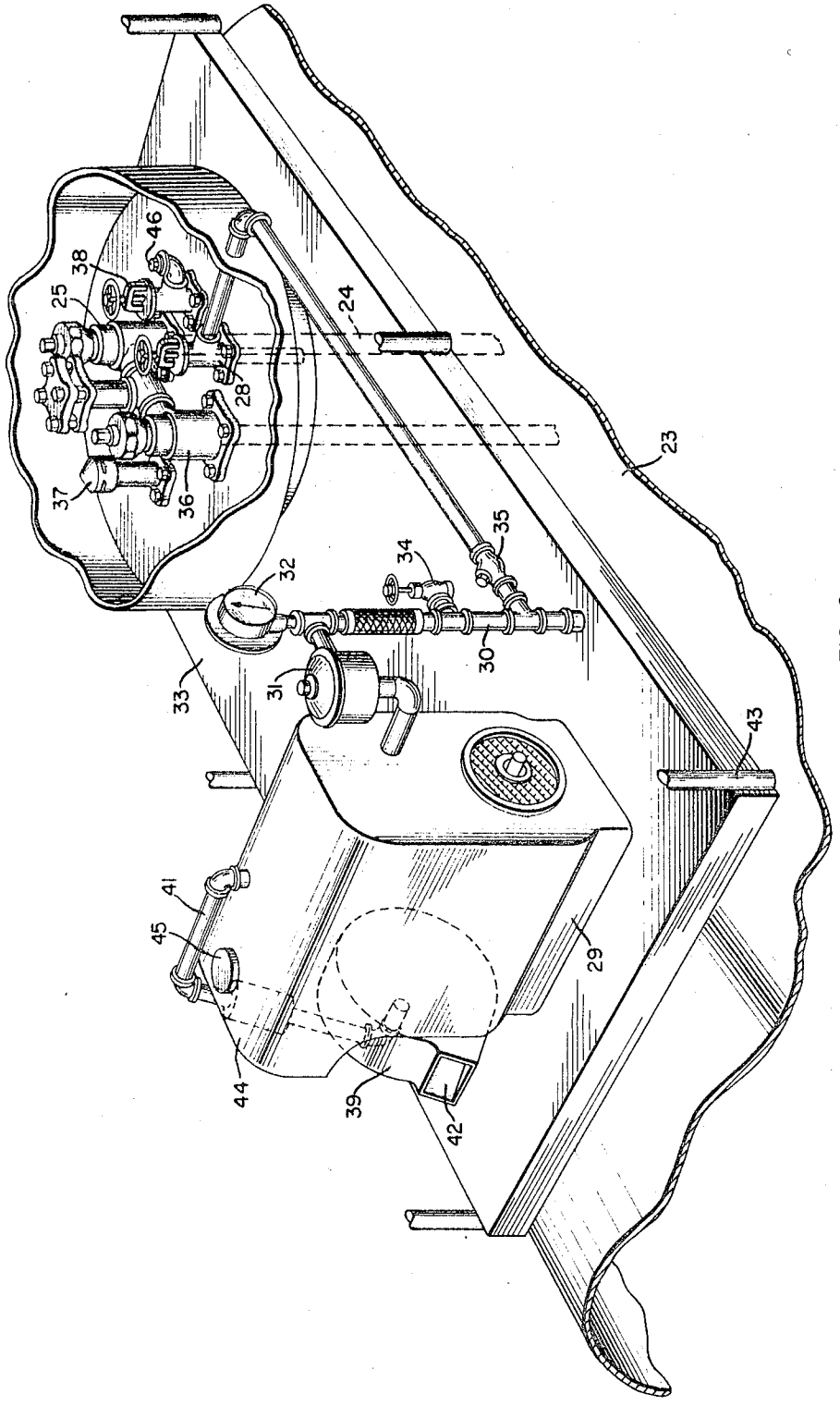



FIG. 2

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# FLUID TRANSFER APPARATUS

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U.S. Cl. 141—59 8 Claims

## ABSTRACT OF THE DISCLOSURE

A self-filling vessel apparatus for combustible or toxic fluids utilizing an internal combustion engine to provide a vacuum within the vessel to be filled and to burn the toxic or combustible vapors produced in the filling operation. A preferred embodiment encompasses a self-filling tank truck for transferring combustible or toxic fluids from a railroad tank car.

## Background of the invention

The expanding need of industry for large volumes of chemical fluids at competitive prices requires the bulk shipment of these fluids in large vessels or containers such as barges and tank cars. These bulk quantities of fluids must be transferred from the large vessels to smaller ones, such as tank trucks or storage vessels, at points of distribution. Generally, bulk quantities of chemical fluids are transferred from one vessel to another by applying inert gas pressure, such as nitrogen, to the surface of the fluid within the large vessel or tank car and forcing the fluid up a stand-pipe within the vessel to another vessel such as a tank truck placed adjacent thereto.

Operation in this manner creates problems, however, in that an inert gas supply must be maintained in high pressure containers, and during the transfer, chemical fluid vapors formed within the receiving vessel are displaced to the surrounding atmosphere by the transferring liquid. These displaced vapors generally collect in high concentrations around the vessels and may create a fire or health hazard to equipment and personnel.

It is an object of this invention to provide a process and apparatus for transferring combustible or toxic fluids from one vessel to another without contaminating the atmosphere.

Another object of the invention is to provide a process and apparatus for transferring combustible or toxic fluids wherein displaced fluid vapors are burned.

A further object of the invention is to provide a process and apparatus for transferring combustible or toxic fluids by a self-contained means.

A still further object of the invention is to provide a process and apparatus for transferring fluids from one vessel to another in a simple and economical manner.

These and other objects of this invention will become readily apparent upon reference to the following description and accompanying drawing in which:

FIG. 1 is an embodiment of an installation for transferring fluids from one vessel to another, and

FIG. 2 is a perspective view of the top portion, partially cut away, of the tank truck of FIG. 1.

Referring to FIG. 1, there are shown load lines **10** and **11** supported by adjustable supports **12** and **13**, respectively, by means of chains **15**. Adjustable supports **12** and **13** are movably fixed upon and supported by column **14** placed in the ground, and the height of support bars **12** and **13** may be varied by rotating cable adjustment means **16** and **17**, respectively.

Load line **10** having end valve **47** is attached to tank car **18** having stand-pipe **19** and stand-pipe valve **20** by coupling means **21**, and load line **11** having end valve **22** is



attached to tank truck **23** having stand-pipe **24** and stand-pipe end valve **25** by coupling means **26**. Air vent valve **27** is provided on tank car **18** and vacuum supply valve **28** is provided on tank truck **23**.

Internal combustion engine **29** is mounted on top of tank truck **23** by means of platform **33**, and the air intake means for internal combustion engine **29** is connected by line **30** to vacuum supply valve **28**.

Suitable vapor filter means **31** and vacuum gauge **32** may be provided in line **30** if desired.

Referring now to FIG. 2, platform **33** having protective railing **43** is mounted on tank truck **23**, and internal combustion engine **29**, having self-contained fuel supply tank **44** with filling means **45**, is fixedly mounted on platform **33**. Air vent valve **34** is provided in line **30** for startup of the internal combustion engine, and check valve **35** may be provided in line **30** as a safety precaution in case of engine backfire through the air intake system.

Alternate stand-pipe and stand-pipe end valve **36** and safety pressure relief valve **37** may be provided on tank truck vessel, if desired. Air vent valve **38** may be provided also; however, in normal operation in accordance with invention, plug **46** may be provided to present air leakage into the system.

Internal combustion engine **29** has exhaust dissipation fan **39** mounted on housing **40** for the internal combustion engine and exhaust fan **39** may be rotated by the engine drive shaft by means not shown. Internal combustion engine exhaust leaves the engine by line **41** and is dissipated in the surrounding atmosphere by fan outlet **42**.

The process of this invention for transferring combustible or toxic liquids from a first combustible liquid containing vessel to a second vessel comprising providing a substantially vacuum-tight connection between the inside of substantially the bottom of a closed combustible liquid-containing vessel to the inside of a second closed vessel; providing a substantially vacuum-tight connection between the inside of substantially the top of the second vessel and the air intake means for an operating internal combustion engine; and maintaining the vacuum-tight connections for a period sufficient to transfer a desired quantity of said combustible liquid from the first vessel to the second vessel may be described most clearly by a description of the general procedure for operation of a preferred embodiment of the invention as shown in FIGS. 1 and 2.

For operation, load line **10** is connected with stand-pipe **19** through valves **17** and **20** by means of coupling **21**, and load line **11** is connected with stand-pipe **24** through valves **22** and **25** by means of coupling **26**. With valve **28** closed, air vent valve **34** is opened and internal combustion engine **29** is started. After the engine is started, valves **17** and **20** and air vent valve **27** on the tank car vessel are opened, and valves **22** and **25** and vacuum supply valve **28** on the tank truck vessel are opened. With these valves open and the internal combustion engine operating, air vent valve **34** is closed creating a vacuum-tight connection between the air intake of the internal combustion engine and the inside of substantially the top of the vessel of tank truck **23** and between the inside of the vessel of tank truck **23** and the inside of substantially the bottom of the vessel of tank car **18**.

Operating in this manner, the fluid vapors in the vessel of tank truck **23** are removed and burned in internal combustion engine **29** reducing the pressure below atmospheric in the vessel of tank truck **23** causing the fluid contained in the vessel of tank car **18** to be forced by atmospheric pressure entering through valve **27** up through stand-pipe **19**, through transfer lines **10** and **11**, and into the vessel of tank truck **23**. Any fluid vapors which are formed during the transfer are exhausted from

the vessel of tank truck 23 through the internal combustion engine 29 and the burned vapors are dissipated to the surrounding atmosphere in minimal concentrations by blower 39.

Although a preferred embodiment shows the connection of the tank truck load line to a stand-pipe within the vessel of the tank truck, it is clear that this standpipe is not necessary to the process of this invention and that it is necessary only that a vacuum-tight connection be provided with the inside of the vessel. Further, it can be seen easily that the loaction of the internal combustion engine and the mounting for the tank truck vessel, i.e. the wheels, are not necessary to this invention.

In a typical installation, using the preferred embodiment of this invention described above, a two cylinder gasoline engine (Wisconsin gas engine Model THD) operating at an engine speed of 2200 r.p.m. maintained a tank truck vessel vacuum of approximately 13 inches of mercury, and 3000 gallons of a combustible liquid containing tetraehyl lead concentrate were transferred from a tank car vessel to a tank truck vessel in one hour. During the operation, the emission from the erhaust fan was analyzed periodically and found to contain only .001 milligram of lead per cubic foot of air as a maximum.

After the transfer of the fluid was completed, the air-vent valve on the air-intake line for the internal combustion engine was opened while the engine was still operating to permit purging of the engine of final quantities of combustible vapors.

As can be seen clearly from the preceding description, the process and apparatus of this invention have many advantages. No external source of pressure or vacuum is necessary to accomplish transfer of the fluids, and combustible or toxic fluid vapors are not permitted to collect in high concentration in the area of the transfer as is the case when trnasfers are made without the benefit of this invention.

While there have been shown, described and pointed out the fundamental novel features of this invention, it is to be understood that various substitutions, changes in form and details of the process and apparatus illustrated may be made by those skilled in the art without departing from the spirit of this invention. It is intended that this invention be limited only as indicated by the scope of the following claims.

I claim:

1. A self-filling vessel apparatus comprising, in combination:
   (a) a closed vessel having at least two openings at substantially the top,
   (b) an internal combustion engine having air-intake means, exhaust means and separate fuel supply means,
   (c) a first substantially vacuum-tight vapor conducting means connecting one of said at least two openings and said air-intake means, and
   (d) a second substantially vacuum-tight liquid conducting means connected to the other of said at least two openings for insertion in the liquid to be loaded into said closed vessel.



2. The apparatus of claim 1 further characterized by said exhaust means comprising a blower operably connected with said internal combustion engine for dissipating the engine exhaust.

3. The apparatus of claim 1 further characterized by said first substantially vacuum-tight vapor conducting means having a closable atmospheric opening between said air-intake means and said one of said at least two openings.

4. An apparatus for transferring combustible liquid from a first closed vessel to a second closed vessel comprising, in combination:
   (a) an internal combustion engine having a fuel supply means, air-intake means and exhaust means,
   (b) said first closed vessel and said second closed vessel each having at least a first and a second opening at substantially the top,
   (c) said first opening in said first closed vessel being a vent and said second opening in said first vessel being operably connected by a substantially vacuum-tight means to the space at substantially the bottom of said first closed vessel,
   (d) said first opening in said second closed vessel and said second opening in said first closed vessel being operably connected by a substantially vacuum-tight disconnectable means, and
   (e) said second opening on said second vessel and said air-intake means being operably connected by a substantially vacuum-tight means whereby when said internal combustion engine is operated the pressure in said second closed vessel is reduced causing combustible liquid in said first vessel to be forced into said second vessel and any combustible vapors formed in said second vessel during the transfer are burned in the operating internal combustion engine.

5. The apparatus of claim 4 further characterized by said internal combustion engine being fixedly attached to said second vessel.

6. The apparatus of claim 4 further characterized by said first vessel being a railroad tank car.

7. The apparatus of claim 4 further characterized by said second vessel being a part of a tank truck.

8. The apparatus of claim 4 further characterized by said internal combustion engine having a blower means operably connected with said internal combustion engine for dissipating the effluent from said exhaust means.

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HOUSTON S. BELL, JR., Primary Examiner

U.S. Cl. X.R.

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