

Oct. 6, 1936.

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2,056,828

METHOD AND APPARATUS FOR TRANSFERRING VOLATILE LIQUIDS

Filed May 1, 1935

Fig. 1.

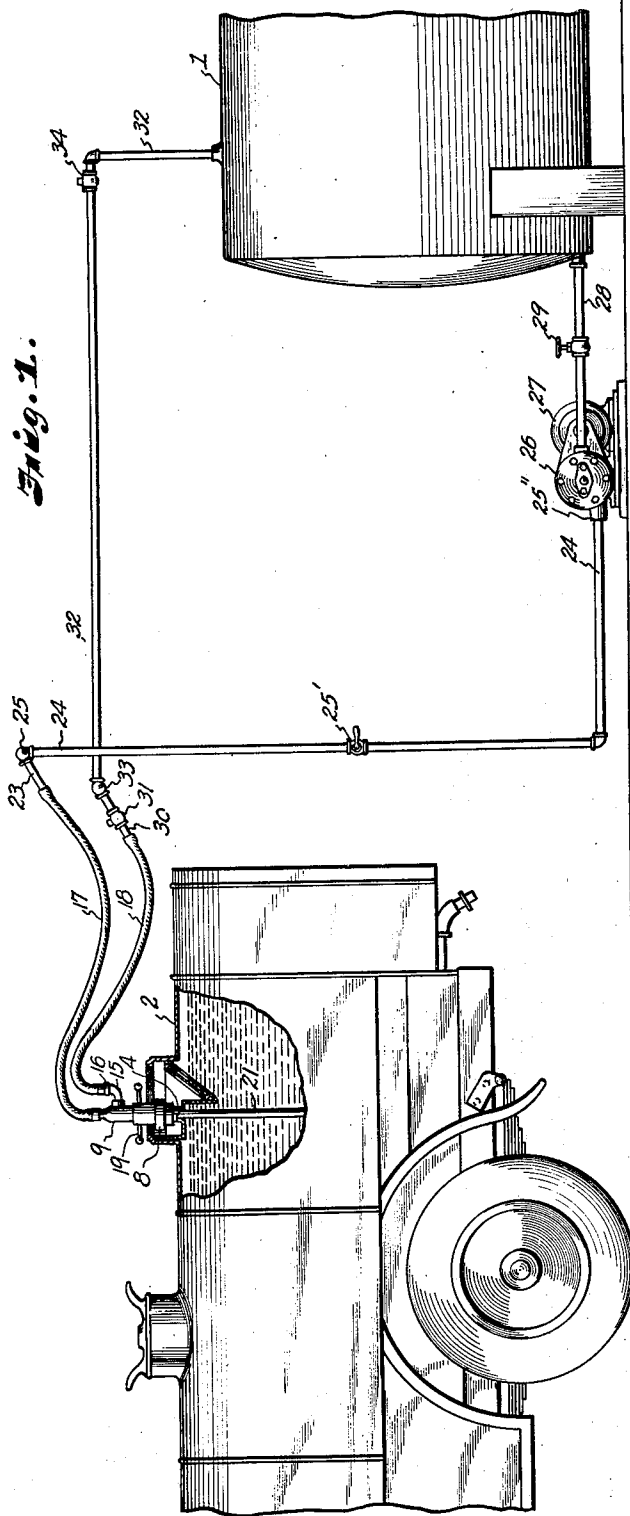


Fig. 4.

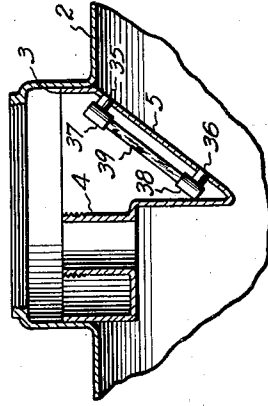


Fig. 3.

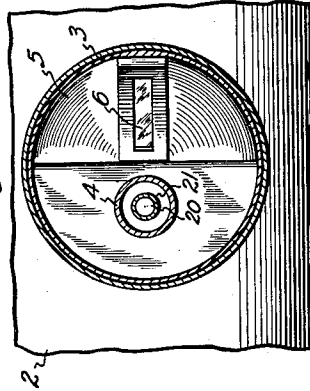
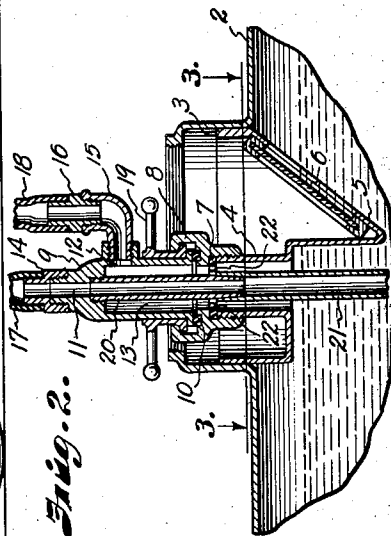


Fig. 2.



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2,056,828

METHOD AND APPARATUS FOR TRANSFERRING VOLATILE LIQUIDS

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Application May 1, 1935, Serial No. 19,242

4 Claims. (Cl. 221-67)

My invention relates to a method and apparatus for transferring volatile liquids and more particularly to a method and apparatus for transferring gasoline and light volatile hydrocarbons in a closed system where loss is prevented by transferring both the liquids and gas concurrently from one container to another.

In transferring volatile liquids from one container to another such as in loading gasoline from bulk storage to tank vehicles, the problem of vapor loss from the tank being filled is a serious one. For example, at average atmospheric temperature and pressure, pumping gasoline from one container to another entails considerable vaporization of light fractions which are not reabsorbed into the gasoline. If a tank is partly full, gasoline vapors in proportion to the vapor pressure of the gasoline will fill the space above the liquid. If the vapor space contains 100 percent of gasoline vapors, ordinarily 27 cubic feet of this vapor can be condensed to form one gallon of liquid. For example, if a 3,000-gallon tank truck or vehicle were filled with gasoline vapors, these vapors could be condensed to form approximately 40 gallons of gasoline. It will readily be appreciated that a considerable loss would be entailed if the vapors from an 80,000-barrel tank were lost.

It is now general practice to exhaust vapors to the air when filling a tank and to allow air to be drawn in to occupy the space formerly taken by the liquid when emptying a tank. When air is drawn into a tank by emptying, there must be a further vaporization of light gasoline for establishing a vapor pressure equilibrium. By avoiding contact of air with the volatile liquid during transfer from one container to another, savings in liquid volumes are obtained.

One object of my invention is to provide a method whereby vapor loss in transferring volatile liquids from one container to another is minimized.

Another object of my invention is to provide an apparatus for transferring volatile liquids from one container to another with a minimum of vapor loss.

Other and further objects of my invention will appear from the following description.

In the accompanying drawing which forms part of the instant specification and is to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views;

Figure 1 is an elevation with parts broken away, showing one mode of apparatus embodying the

apparatus and capable of carrying out the process of my invention.

Figure 2 is a sectional view of a fitting shown in Figure 1.

Figure 3 is a sectional view taken on a line 3-3 of Figure 2.

Figure 4 is a detail view showing a modification.

In general, my invention contemplates the provision of intercommunicating means between the vapor spaces of two containers and intercommunicating means between the liquid spaces of the same containers. The procedure is such that, while liquid is being transferred from one container to another, vapor is being transferred in the opposite direction of the flow of liquid.

More particularly referring now to the drawing, gasoline or a similar volatile liquid is stored in bulk in tank 1. Tank 2 represents the tank of a tank truck into which gasoline or a similar volatile liquid from bulk storage tank 1 is to be passed or from which liquid is to be pumped into storage tank 1. In the form of the invention shown, a diaphragm 3 is permanently fitted to the tank 2. The diaphragm is provided with a tubular projection 4 and a depressed portion having an inclined wall 5 which is fitted with a gauge glass 6. The upper portion of the tubular projection or nipple 4 is threaded and adapted to threadedly receive connecting member 8. A suitable gasket 7 is provided between the upper end of nipple 4 and a seat portion formed internally of the connecting member 8 to form a tight joint therebetween. A casting 9 is seated upon a gasket 10 provided in the connecting member 8. The casting 9 is provided with three openings 11, 12, and 13. A nipple 14 is adapted to be threadedly secured in communication with opening 11. An elbow 15 is adapted to be threadedly positioned in opening 12. A nipple 16 is threaded in elbow 15. A flexible conduit 17 is secured to nipple 14 and a flexible conduit 18 is secured to nipple 16. The connecting member 8 may be rotated by means of a wrenchlike member 19 which is detachably secured in any suitable manner thereto so that the assembly can be quickly placed in position on nipple 4. A pipe 20 is threadedly secured at the end of bore 11. The pipe 20 is of smaller diameter than the bore 13 as can readily be seen by reference to Figure 2. A pipe 21 is secured to pipe 20. Pipe 21 may be made with its upper portion tapered and supported by diaphragm gasket 7, permanently in the tank. Openings 22 are provided in the diaphragm 7 for the passage of vapors into bore 13. The lower

end of pipe 21 extends to the bottom of the tank 2. Flexible conduit 17 is in communication at its other end with pipe 23 which is in communication with pipe 24 through adjustable joint 25. A suitable valve 25' is provided in pipe 24. One end of pipe 24 communicates with the discharge end 25'' of a pump 26 which is driven by a suitable motor 27. Pump 26 takes suction from tank 1 through pipe 28 which is controlled by valve 29. In the assembly shown, the tank 2 is being filled from tank 1. It is to be understood, of course, that by reversing the pump connections, gasoline or like volatile liquid may be pumped from tank 2 to tank 1. Flexible conduit 18 communicates with pipe 30 which is provided with a valve 31. The other end of pipe 30 communicates with pipe 32 through movable joint 33. A second check valve 34 is provided in line 32, the end of line 32 communicating with the vapor space of tank 1.

In the form shown in Figure 4, inclined wall 5 is provided with a pair of ducts or pipes 35 and 36, which carry the usual gauge glass connections 37 and 38, between which a gauge glass 39 is fitted.

In operation, it being assumed that the method of the instant invention has been in use, tank 2 being empty of liquid gasoline but containing gasoline vapors, the assembly described is fitted to the nipple 4. In fitting the assembly to the nipple, the connecting member 8 may be rotated by hand, wrench 19 supporting the assembly and permitting motion therebetween. When the connecting member 8 is hand tight, it may be finally secured by rotating wrench 19 which will secure the connecting member 8, rotating it through any suitable detachable connecting means, as for example a key and slot. The assembly in place, it will be observed that conduit 18 is in communication with the vapor space of tank 2 through nipple 16, elbow 15, bore 13, openings 22, and the bore of nipple 4 which communicates with the vapor space. It will also be observed that conduit 18 is in communication with the vapor space of tank 1 through pipes 30 and 32. Likewise, the liquid containing or lower portion of tank 2 is in communication with a similar portion of tank 1 through pipe 21, pipe 20, bore 11, duct 17, pipe 23, pipe 24, pump 26, and pipe 28. The valves 25' and 29 are opened and the pump is started. Gasoline or like volatile liquids, as for example, volatile hydrocarbons, will flow from tank 1 through pipe 28 and be pumped by pump 26 through pipe 24, pipe 23, conduit 17, thence into the tank 2. As the gasoline passes into tank 2, vapors present therein and such gasoline as may be vaporized by passing into a tank of lesser vapor pressure than exists in tank 1, will rise and pass through openings 22 into bore 13 which communicates with conduit 18. The vapors pass through check valve 31 when the pressure within the tank 2 exceeds that in tank 1. After passing through check valve 31, the vapors pass through pipe 32, check valve 34, and thence into the vapor space of tank 1.

It will be seen that I have accomplished the objects of my invention. The vapors which are normally lost in filling a tank are conserved by being returned to the source of supply. Furthermore, air is kept from being drawn into the storage tank. Such gasoline laden air as might be

present in the truck tank is passed into the storage tank, thus saving gasoline. Furthermore, the light, volatile ends are those which are desirable in gasoline for ease of starting, especially in cold weather. If gasoline is handled repeatedly, in the present method of handling it, a large percentage of these light ends will be lost. This not only represents a loss in gasoline but reduces the quality of the remaining gasoline.

It will be observed that the invention is not to be limited to handling gasoline but is applicable to any volatile liquid. If desired, a condenser may be fitted in the vapor line 32 for condensing the vapors before they are passed into tank 1.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and sub-combinations. This is contemplated by and is within the scope of my claims. It is further obvious that various changes may be made in details within the scope of my claims without departing from the spirit of my invention. It is, therefore, to be understood that my invention is not to be limited to the specific details shown and described.

Having thus described my invention, what I claim is:

1. In a liquid transferring system, a supply reservoir, a receiving tank, a filling connection for said receiving tank, a conduit positioned within said filling connection and spaced therefrom to provide a passageway, said conduit extending to a point in proximity to the bottom of said tank, said passageway communicating with the upper portion of the interior of said tank, a fitting provided with two ducts, means for detachably connecting said fitting to said filling connection with said ducts in respective communication with said conduit and said passageway, a pipe providing access between the duct communicating with said passageway and the supply reservoir above the liquid level therein, a pipe connecting the other of said ducts with a lower portion of said reservoir and a pump in said pipe.

2. In a liquid transferring system, a supply reservoir, a receiving tank, a filling connection for said receiving tank having two passageways formed therein, one of said passageways communicating with a conduit extending to a point in proximity to the bottom of the receiving tank, the other of said passageways communicating with the upper portion of the interior of the receiving tank, means for providing communication between the passageway communicating with the upper portion of said tank and the upper portion of the reservoir, a pipe connecting the other of said passageways with the lower portion of said reservoir, and a pump interposed in said pipe.

3. In a liquid transferring system as in claim 1 wherein said filling connection is provided with a recessed portion extending into the tank, a part of one wall of said recessed portion being formed of transparent material.

4. In a liquid transferring system as in claim 1 wherein said filling connection is provided with a recessed portion extending into said tank and a gauge glass fitted exteriorly of one wall of said recessed portion.

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