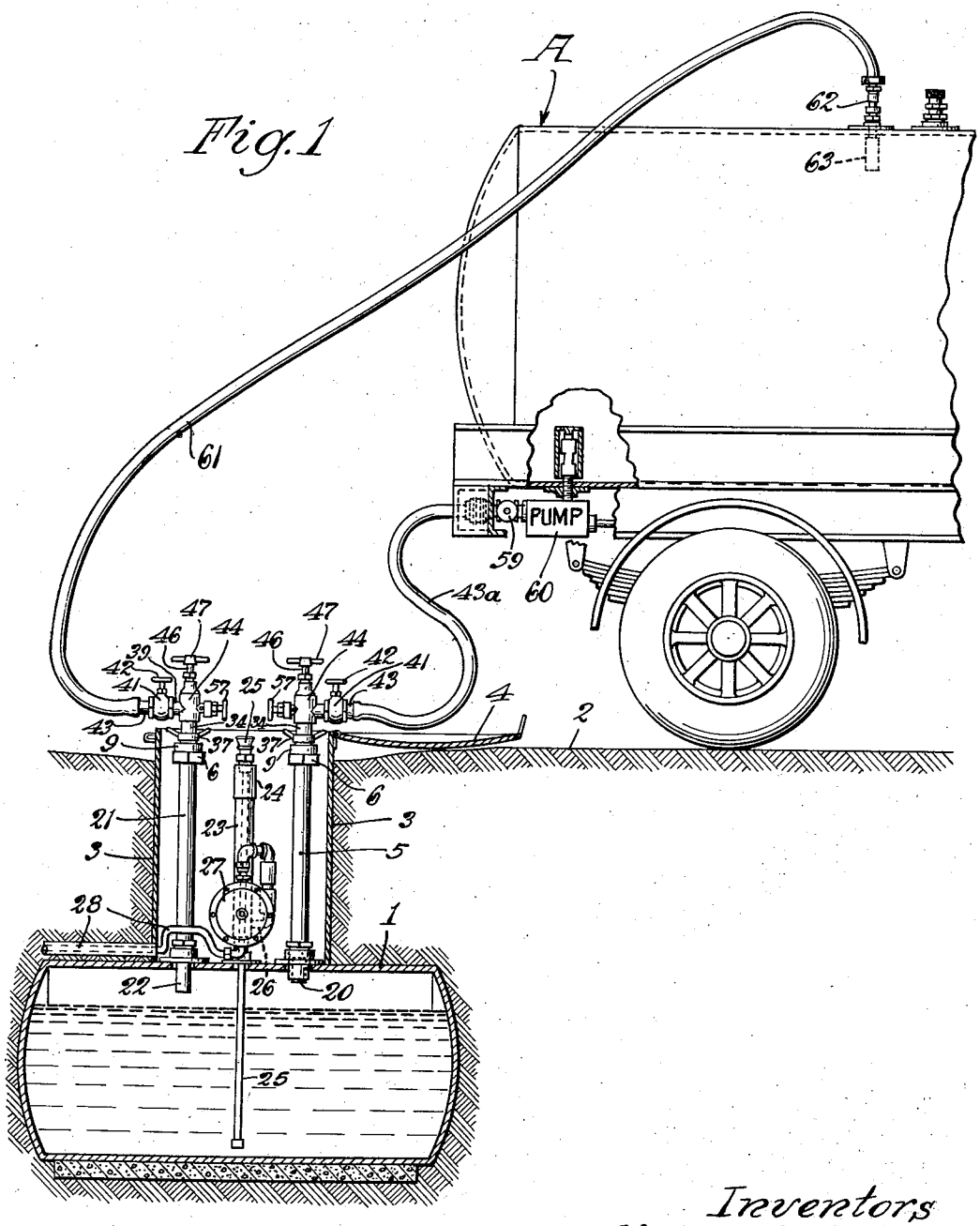
Dec. 17, 1940. V. I. HOOPER ET AL 2,224,963

METHOD OF LOADING TANKS

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Fig. 1



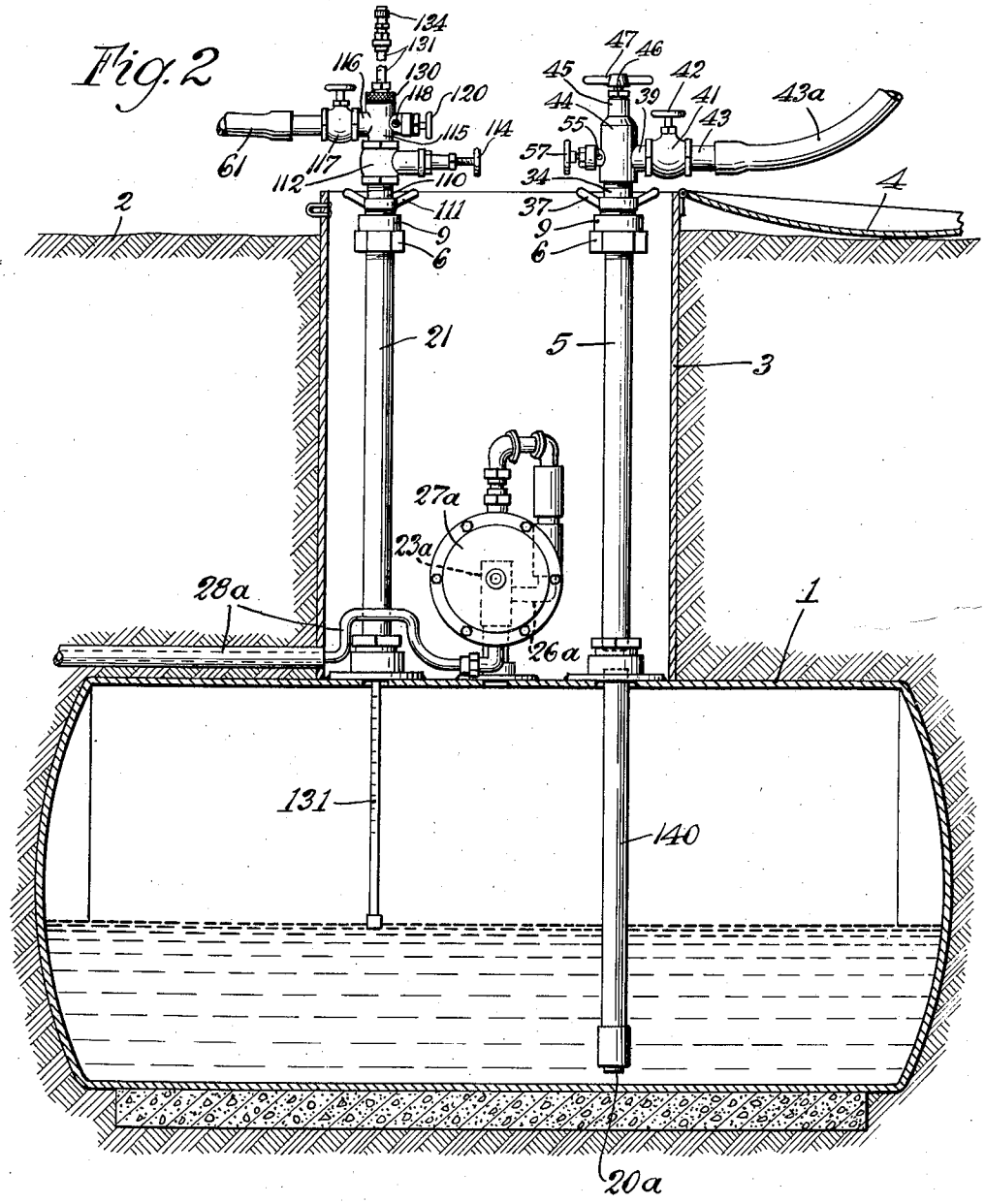
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Fig. 2



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Fig. 4

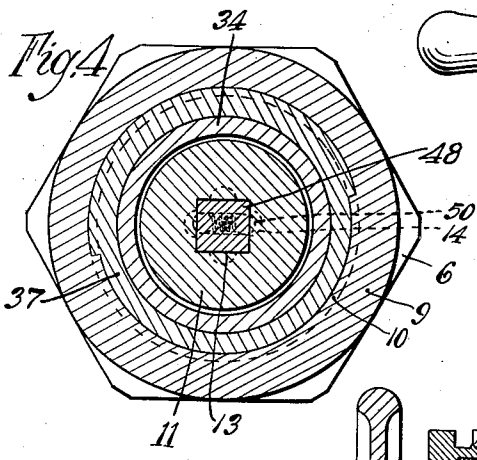


Fig. 3

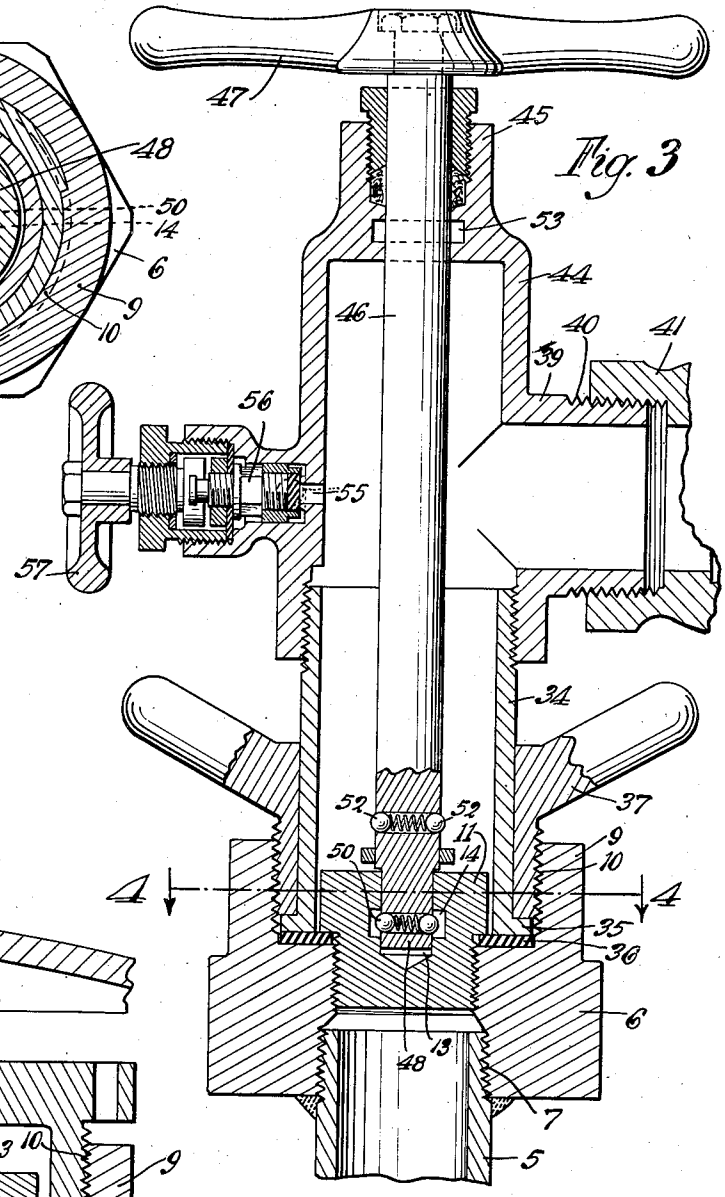
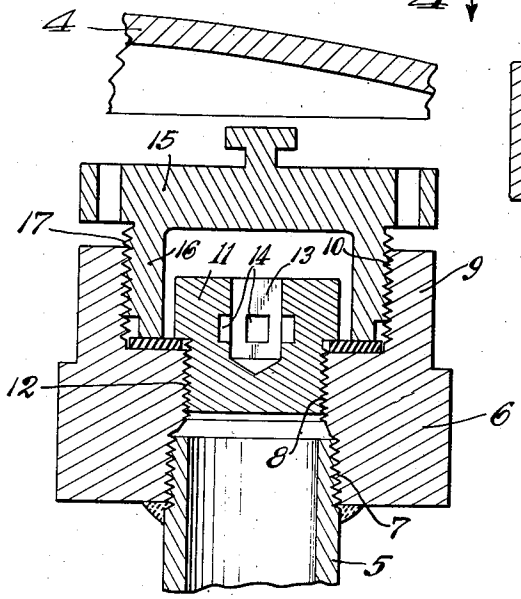


Fig. 5



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Fig. 6

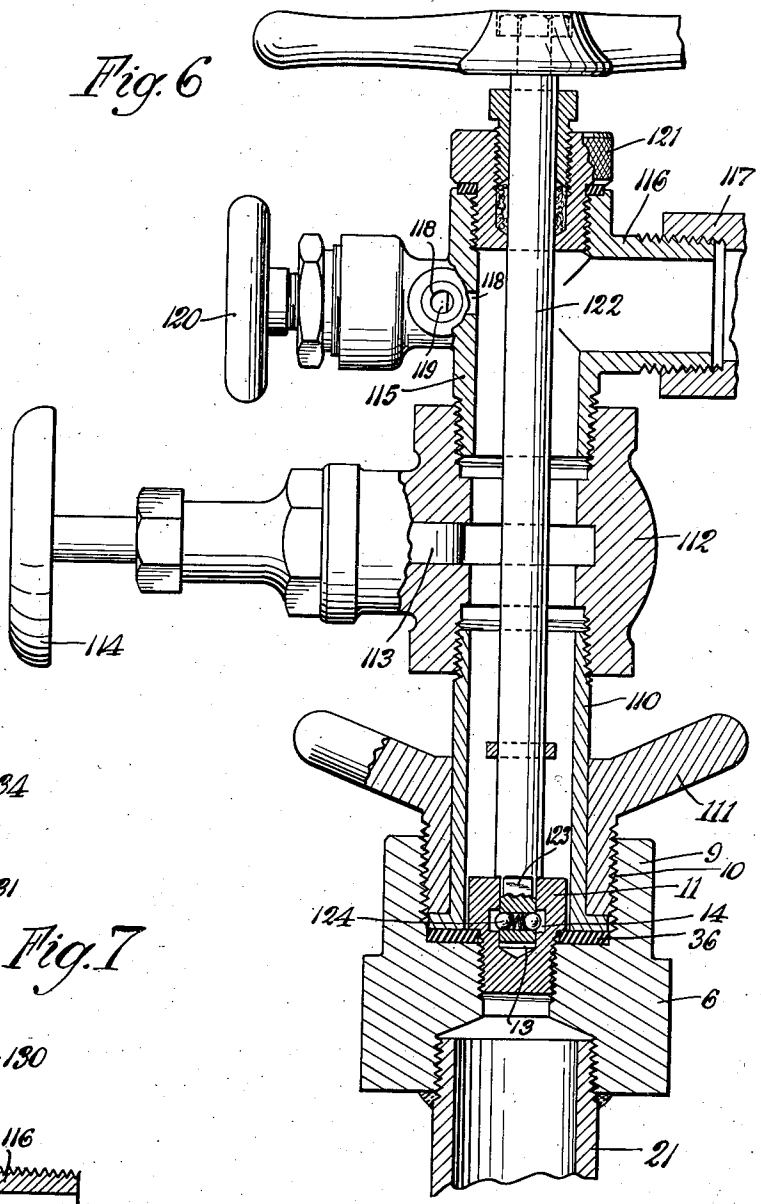
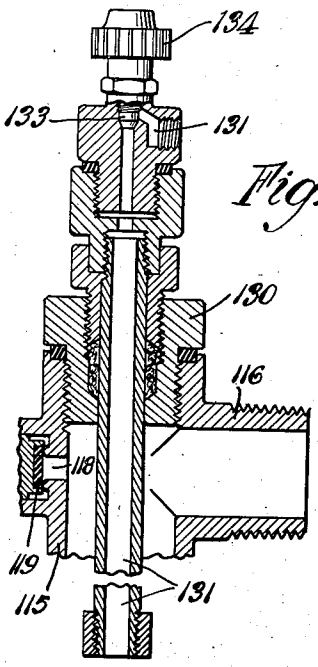


Fig. 7



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2,224,963

METHOD OF LOADING TANKS

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Application July 9, 1938, Serial No. 218,412

6 Claims. (Cl. 62—1)

Our invention relates to an improvement in methods of handling fluids and is particularly adaptable to unloading volatile liquids or liquids containing volatile gases. As examples we may indicate propane, butane, gasoline and the like. It will be understood, however, that our invention is applicable to a wide variety of liquids and gases, including those not under pressure and not developing pressures or releasing gases under pressure. However, we describe it and show it herein as applied to the delivery of fluids, for example propane or butane, to fixed tanks for local dispensation.

One purpose of our invention is to provide an efficient method of delivering propane, butane or the like from trucks or cars to fixed storage or dispensing tanks.

Another purpose is the provision of an improved method for preventing tampering with the contents of a fixed tank, and for preventing "bootlegging" or access to the tank for filling purposes or otherwise by unauthorized operators.

Other purposes will appear from time to time in the course of the specification and claims.

We illustrate our invention more or less diagrammatically in the accompanying drawings, wherein

Figure 1 illustrates an enlarged section through a fixed storage tank, with a delivery truck and the valve and passage system of the fixed tank illustrated in side elevation;

Figure 2 is a vertical section on an enlarged scale through a storage tank, with parts in side elevation, illustrating a variant valve and pipe system;

Figure 3 is a vertical section through an inlet member removably secured to the fixed tank installation;

Figure 4 is a section on the line 4—4 of Figure 3;

Figure 5 illustrates a portion of the tank inlet with closure caps in position, as when the tank has been filled;

Figure 6 is a vertical section illustrating a variant form of removable connection; and

Figure 7 is a section illustrating the application of a slip tube gauge structure to the structure shown in Figure 6.

Like parts are indicated by like symbols throughout the specification and drawings.

Referring first to Figure 1, 1 indicates a buried tank of the type which may be employed for butane, propane or the like. It is herein shown as buried a substantial distance in the earth, indicated at 2. 3 is a tank assembly well, whereby the tank is put into communication with the surface. The assembly well may have hinged or otherwise secured thereto a cover 4 which may be swung into the open position in which it is shown in Figure 1 when access to the interior of the device is desired.

5 generally indicates a vertical passage member upwardly extending from the tank 1, having at its upper end a fitting 6 as shown in Figure 5. This fitting may be screwthreaded or otherwise secured to the pipe 5 as at 7 and is shown as having an interiorly screw-threaded passage 8 and an upward flange 9 interiorly screw-threaded as at 10. When the parts are in the closed position in which they are shown in Figure 5, the inner closure plug 11 is in closed position with its reduced screw-threaded portion 12 screwed into the screw-threaded portion 8 of the member 6.

13 indicates a control aperture in the top of the plug 11 which may be square or of any other suitable shape and which has lateral extensions or indentations 14, the purpose of which will later appear. 15 is an outer closure plug having a downwardly extending flange 16 exteriorly screw-threaded as at 17, which may be screwed into the threads 10 of the flange 9.

In the form of Figure 1 the pipe 5 is provided with any suitable check valve structure 20 at its lower end and is normally located above the level of the liquid in the tank. 21 indicates a second pipe having at its upper end fitting and closure means just as described in connection with the pipe 5 and shown in Figure 5. At its lower end is the excess flow check valve 22. 23 is a third pipe extending upwardly from the tank 1 and which has any suitable fitting at the top thereof as at 24, in which is slidably received the slip tube gauge member generally indicated as 25, the purpose of which will later appear and which is of a diameter substantially less than the diameter of the pipe 23. 26 is a gas outlet line extending from the pipe 23 to any suitable reducer structure generally indicated as at 27, from which extends a service line 28 effective to carry gas from the interior of the tank 1 to the point of use. The slip tube gauge 25 does not of itself form part of the present invention and may be used to gauge the contents of the tank and to determine the amount of liquid in the tank. It may of course be employed to determine when the tank has been filled to a predetermined, desired level, during the filling operation.

Assuming that the tank is somewhere near

empty and that it is the wish of the operator to fill it, the cover plate 4 is removed and the loading valve assembly generally indicated in Figure 3 is applied. The valve assembly includes a bottom valve passage member 34, with a bottom ledge 35 which is adapted to engage the gasket 36 when the closure 15 is removed. Its central aperture is somewhat greater than the exterior diameter of the plug 11 so that it can be put in place or removed without disturbing said plug. It may be locked in position by the wing nut 37, the threads of which engage the threads 10 of the flange 9.

In communication with the upper end of the member 34 is a T having a side branch 39 screw-threaded as at 40 to receive the valve housing 41 in which is any suitable valve controlled by the exterior handle 42. 43 is any suitable passage to which may be secured a loading hose or line 43a extending to a suitable source of supply, such as the truck shown in Figure 1. It will be understood that a truck such as that in Figure 1 will be understood to be included in the installation shown in Figure 2, the truck being below described in somewhat greater detail.

The upper branch 44 of the T is alined with the passage member 34 and is of generally the same diameter. Slidable and rotatable in its end portion 45 is a stem 46 controlled by an exterior handle 47 provided with a squared portion 48 adapted to penetrate the correspondingly formed aperture 13 in the closure plug 11. Spring balls or other spring members 50 may engage apertures 14 in the plug whereby, when the plug 11 has been unscrewed by rotation of the handle 47, it may be upwardly withdrawn until the plug is located in the upper branch 44 of the T and above the side branch 39, so that it does not interfere with the passage of fluid into the tank. When withdrawn into the upward position by a sliding movement of the stem 46, the upper balls 52 engage locking apertures 53 in the end members 45. The closure plug 11 is then held out of the line of flow between the tank and the valve housing 41.

When the operator is loading the tank and has applied the above described valve assembly, he can open the valve controlled by the handle 42 and permit the liquid to flow from the truck generally indicated as A into the tank 1. When the tank is filled to the desired level, which may be ascertained by the employment of the slip tube gauge 25, the operator then moves the closure plug 11 into closing position and rotates it until it is tightly drawn downwardly against the gasket 36. He preferably then closes the valve in the housing 41 and, before removing the valve assembly, he vents its interior to draw off any pressure that may remain therein.

This venting may be performed through the venting apertures 55 controlled by any suitable valve structure generally indicated as 56, with its associated exterior operating handle 57. After the operator has vented the interior of the loading valve assembly, he can then disconnect it from the flexible filling tube 43a and from the flange 9. Incidentally, the venting enables the operator to know whether or not the plug 11 is screwed tightly in place, as if there is any escape about the plug 11 it will cause a continuing flow outwardly through the vent passage 55, which will be easily observed by the operator.

When the valve fitting is removed, the operator returns the closure 15 to the position in which it is shown in Figure 5 and closes the top closure plate 4. Preferably, in order to prevent venting of inflammable gases near the dwelling house, the operator will not disconnect the above described valve assembly from the hose connecting it to the truck until he has left the premises. Or, if he so desires, he can leave the valve assembly at all times secured to the end of the flexible hose. It will be understood, of course, that any additional valve means which may be necessary may be employed in connection with the flexible hose. Referring to Figure 1, we indicate a hose 43a with a valve 59 separating it from any suitable pump structure 60. Thus the hose is provided in effect with a valve at each end, since the valve controlled by the handle 42 closes the discharge end of the hose.

Whereas it may be practical under some circumstances to employ but a single connection with the truck tank A, namely the hose 43a, a return vapor passage may also be advantageous. In such event it will be understood that a valve assembly which may be identical with that above described may be applied to the top of the pipe 21. In such event, a return gas hose 61 may extend to any suitable inlet 62 at the top of the tank A which in turn is provided with a check valve 63 of any suitable type which prevents the escape of vapor from the tank A but permits vapor to return to the tank from the fixed tank 1 and the passage 21 when the vapor pressure in the fixed tank 1 exceeds the vapor pressure in the moving tank A.

Whereas in the form of our invention above described, we have illustrated a slip tube gauge 25 as applied to the tank itself, it will be understood that in the event we wish to gauge a tank in which a fixed gauge is not so supplied, we may employ the valve assembly shown at the left of Figure 2, and shown in greater detail in Figures 6 and 7. In the place of the valve assembly shown in detail in Figure 3 and which is also shown as employed at the right of Figure 2, we illustrate a variant assembly shown in Figures 6 and 7. This variant assembly includes a passage member 110, a wing nut 111, an intermediate valve housing 112, a valve 113, a valve handle 114, and an upper passage member 115. The upper passage member has the side passage 116 in communication with the valve housing 117 which is the equivalent of the valve housing 41 of Figures 1 and 3. 118 is a vent controlled by any suitable valve structure 119 with an exterior handle 120 corresponding to the vent assembly 55, 56, 57 of Figure 3.

In the place of the closed end 45 we illustrate a removable plug 121 in which is slidably and rotatably mounted the pin 122 with the squared end 123 and the balls 124 which serves to open and remove the plug 11. When the plug 11 has been removed to a position above the valve 113, the valve 113 can be closed, thus closing off the tank from the atmosphere. The operator can then remove the end 121 with the stem 122 and the closure plug 11 and can replace it with the plug 130 of Figure 7.

Slidably mounted in the plug 130 is the slip tube gauge 131 with its upper outlet 132 controlled by any suitable valve 133 with the exterior handle 134. In the use of the slip tube gauge as a gauging and sampling device, the operator after he has tightened the member 130 opens the valve 113 and slips the slip tube gauge down into the interior of the tank. He can then gauge the height of the liquid and sample it if necessary. It will be understood that the valve

assembly of Figure 6 may be employed in connection with a loading valve assembly such as is shown in Figure 1. This arrangement is particularly adaptable for use when the valve assembly of Figure 6 is connected to the vapor return line.

In this case the vapor return line 61 may be connected to the side passage 116 through the valve housing 117, as shown in Figure 2. While the tank A is not shown in Figure 2, it will be understood that the disposition of the parts, so far as relates to connecting with the tank, is precisely as shown in Figure 1. Thus this assembly may be used with tanks which are not fitted with excess flow valves, or may be used in cases where excess flow valves are employed with means for permitting gauging through them. Thus in Figure 2 the slip tube gauge passes downwardly through the tube 21 and through the space where the excess flow valve 22 appears in Figure 1.

Referring to Figure 2, the passage member 5 adapted for loading the tank 1 may, if desired, be provided with an extension pipe 140 terminating closely adjacent the bottom of the tank, which carries a check valve 20a similar to the check valve 20 of Figure 1. The gas outlet pipe 26a extends from the discharge passage 23a to a reducer structure 27a from which a service line 28a carries the gas from the tank 1 to the point of use. These parts may be similar to the parts illustrated in Figure 1 with the exception of the slip tube gauge.

It will be realized that whereas we have described and shown a practical and operative means for carrying out our method, nevertheless many changes may be made in the size, shape, number and disposition of parts and in the arrangement and use of the various parts without departing from the spirit of our invention, and we therefore wish our description and drawings to be taken as in a broad sense illustrative and diagrammatic rather than as limiting us to our precise showing. Our method may be carried out by a variety of mechanisms and it will be understood that the particular mechanisms herein shown, while adapted for our method, are not of themselves necessary for its use.

In the ordinary use of our method, it will be understood that the movable tank indicated as A may be employed in connection with a mechanism shown in Figures 1 and 2 and shown in greater detail in the different forms of Figures 3 and 6, and Figure 2 should be interpreted as if having shown therein the tank A which is shown in Figure 1.

Under some circumstances the loading line 43a may be employed, extending direct from the tank A to the loading valve of the loading valve assembly shown at the right in Figure 1 and shown in detail in Figure 3. The operator connects the parts as above described and then simply loads through the loading valve assembly into the fixed tank 1. Under some circumstances, however, it is necessary to employ a vapor return line and it may be connected directly to the vapor return assembly shown at the left of Figure 1 and the gauging may be done through the attached gauge. The operator of course has with him the assembly shown in Figures 3 and 7 and when he is loading a tank of the type in which there is no attached gauge, he can attach his gauge to the return vapor assembly as shown at the left of Figure 2, and also can connect the vapor return line 61 to the same assembly.

It will be understood that the specific details of structure employed may be widely varied in connection with the normal use of our method.

We claim:

1. The method of loading a volatile liquid into a fixed tank which includes moving a body of such liquid within loading distance of such tank, applying to an aperture in the tank, while such aperture is closed, a removable passage member, opening said tank aperture by manipulation through said passage member after the passage member has been sealed in relation to said aperture, putting the interior of said passage member into communication with the body of liquid to be loaded, and causing said liquid to flow inwardly through said passage member and aperture into said tank.

2. The method of loading a volatile liquid under pressure into a fixed tank which includes moving a body of such liquid within loading distance of such tank, applying to an aperture in the tank, while such aperture is closed, a removable passage member, opening said tank aperture by manipulation through said passage member after the passage member has been sealed in relation to said aperture, putting the interior of said passage member into communication with the body of liquid to be loaded, causing said liquid to flow inwardly through said passage member and aperture into said tank, terminating such flow when the desired quantity of liquid has been supplied to the fixed tank, thereafter closing the tank aperture, and thereafter removing the removable passage member.

3. The method of loading a volatile liquid into a fixed tank which includes moving a body of such liquid within loading distance of such tank, applying to an aperture in the tank, while such aperture is closed, a removable passage member, opening said tank aperture by manipulation through said passage member after the passage member has been sealed in relation to said aperture, putting the interior of said passage member into communication with the body of liquid to be loaded, causing said liquid to flow inwardly through said passage member and aperture into said tank, terminating the flow of liquid through the passage member, and closing said aperture by manipulation through said passage member, and thereafter removing the passage member.

4. The method of loading a volatile liquid under pressure into a fixed tank having inlet and vent apertures which includes moving a body of such liquid under pressure within loading distance of such tank, applying removable inlet and vent valve assemblies to the inlet and vent apertures of the tank, respectively, while the inlet and vent apertures are closed, thereafter, by manipulation through said removable valve assemblies alone, putting the interiors of the valve assemblies in communication with the interior of the tank, putting the inlet aperture of the tank in communication with said body of liquid by opening the passage through the inlet valve assembly and causing liquid to flow from such body of liquid through such valve assembly and inlet aperture, putting the vent valve assembly in communication with a body of gas associated with said body of liquid while retaining said vent valve assembly closed to the air, and returning gases from said tank through said vent aperture and vent valve assembly to a zone including such liquid and the gases associated therewith.

5. The method of loading a volatile liquid into a fixed tank having inlet and vent apertures

which includes moving a body of such liquid within loading distance of such tank, applying removable inlet and vent valve assemblies to the inlet and vent apertures of the tank, respectively, while the inlet and vent apertures are closed, thereafter, by manipulation through said removable valve assemblies alone, putting the interiors of the valve assemblies in communication with the interior of the tank, putting the inlet aperture of the tank in communication with said body of liquid through the inlet valve assembly and causing liquid to flow from such body of liquid through such valve assembly and inlet aperture, putting the vent valve assembly in communication with a body of gas associated with said body of liquid, returning gases from said tank through said vent aperture and vent valve assembly to a zone including such liquid and the gases associated therewith, closing said inlet and vent apertures, by manipulation through said valve assemblies, after the desired amount of liquid has been supplied to said fixed tank, closing the interiors of said valve assemblies from said body of liquid and the gases associated with said body of liquid, venting the interiors of said valve assemblies, and thereafter removing them from the tank.

6. The method of loading a volatile liquid under pressure into a normally fixed tank, which includes positioning a body of such liquid under pressure in a movable container, moving such container, with the body of liquid therein, to a point adjacent the tank to be filled, sealing to an aperture in the fixed tank, while such aperture is closed, a removable passage member, opening the aperture in the fixed tank, by manipulation through said passage member, after the passage member has been sealed in relation to said aperture and after it is in communication with the body of liquid in the moving tank, putting said removable passage member into communication with the body of liquid in the movable tank, and causing said liquid to flow inwardly through said passage and aperture into said tank, thereafter closing said aperture, by manipulation through said passage member, while said passage member is still sealed in relation to said aperture, and closing the connection between said removable passage member and said movable tank, thereafter venting the interior of said removable passage member, and thereafter removing it from said fixed tank.

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