Jan. 9, 1940. V. I. HOOPER ET AL 2,186,925

VALVE

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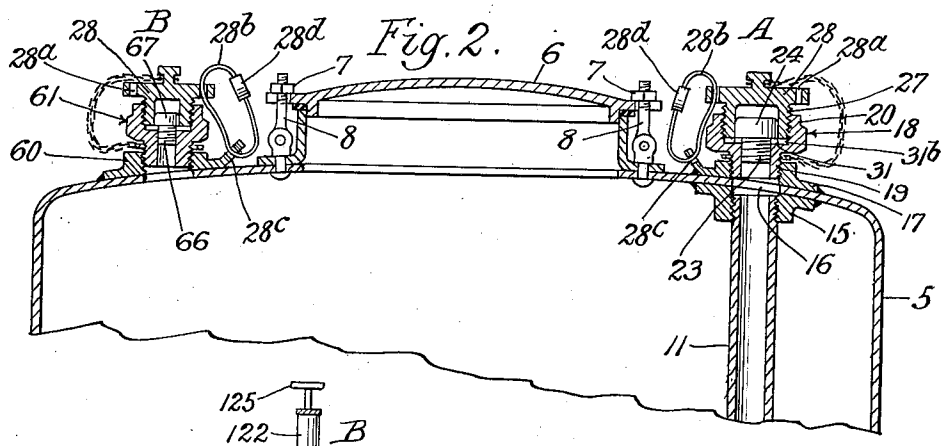

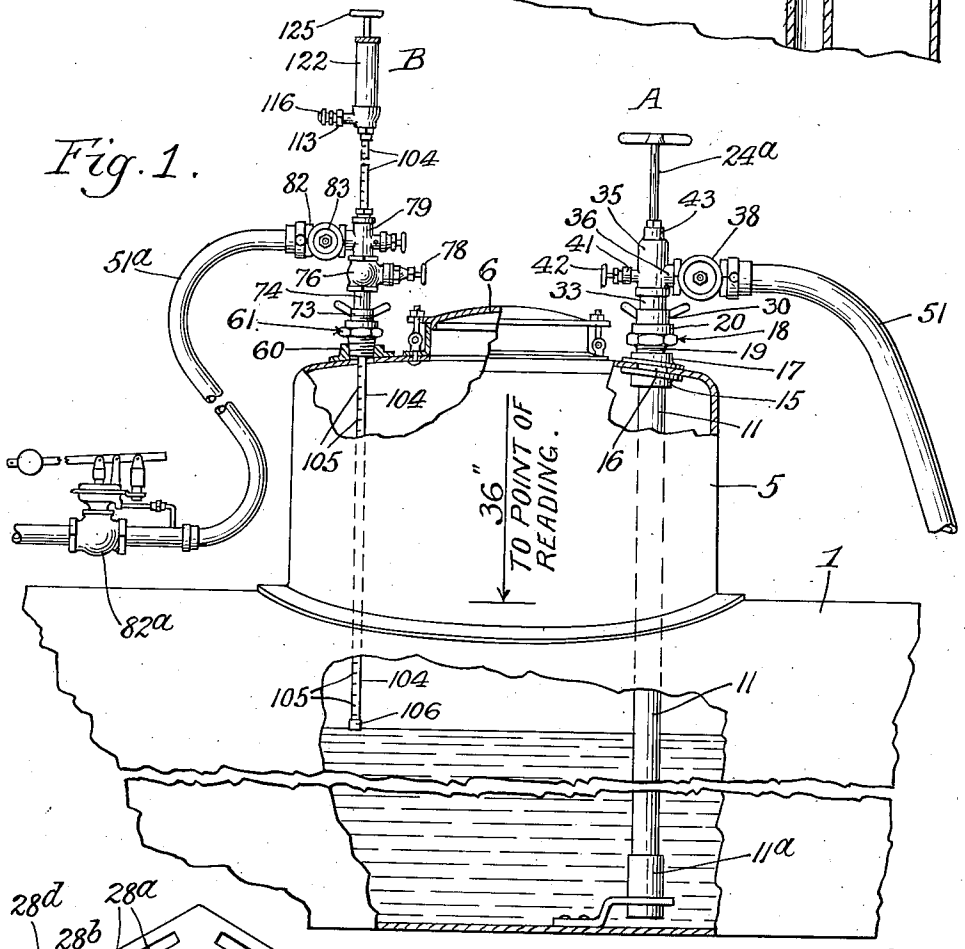

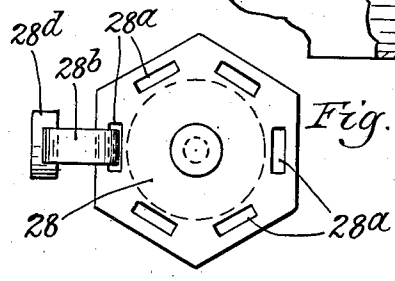

Fig. 8.

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Fig. 3.

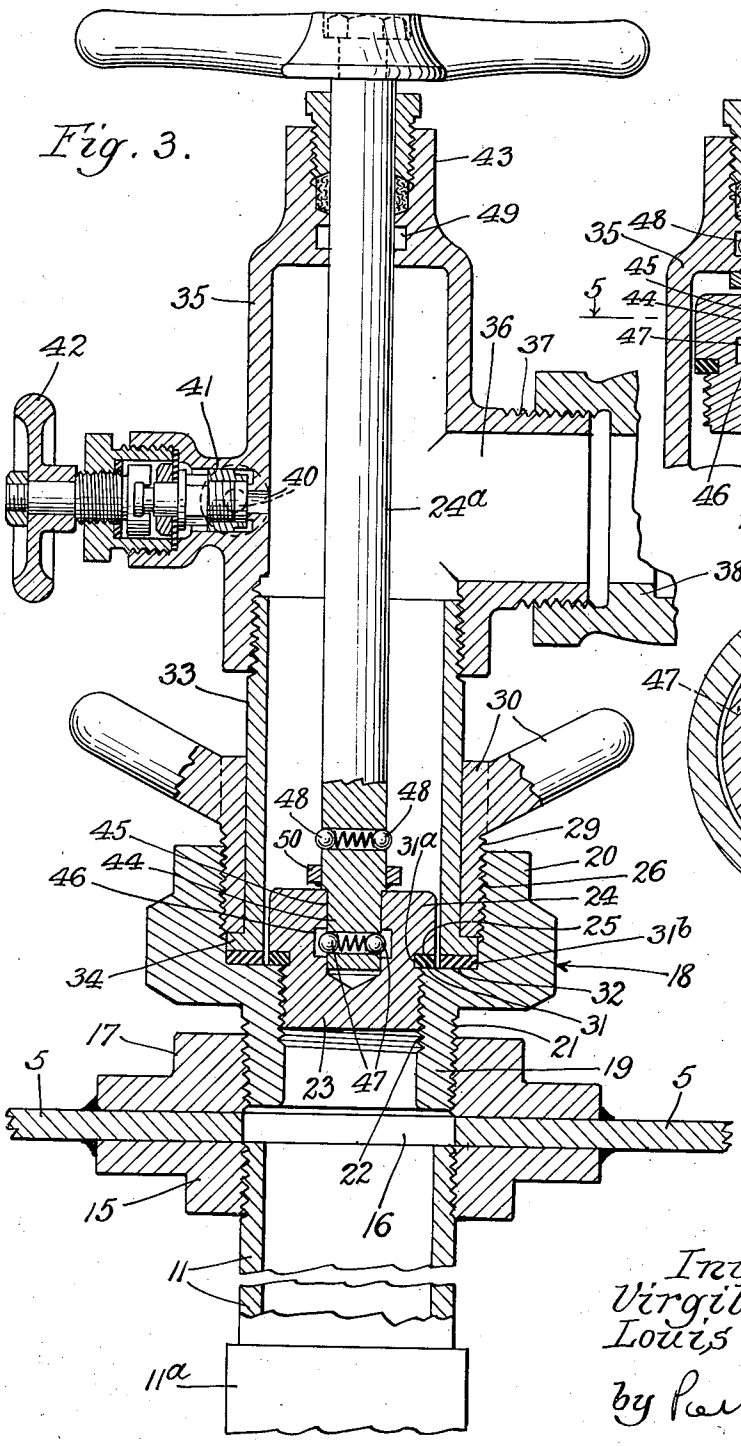

Fig. 4.

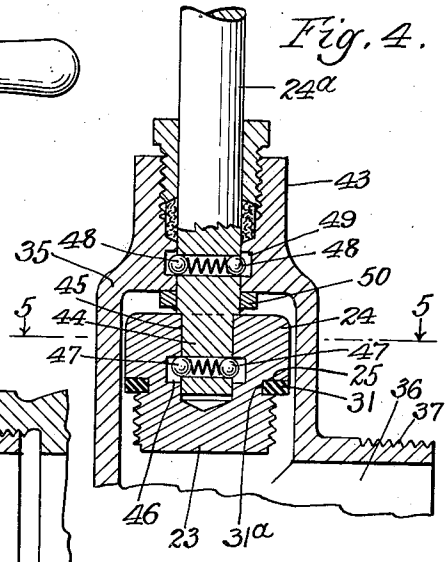

Fig. 5.

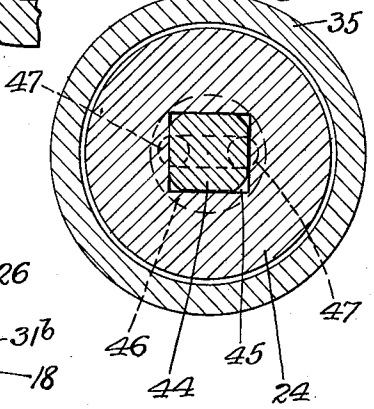

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Fig. 6.

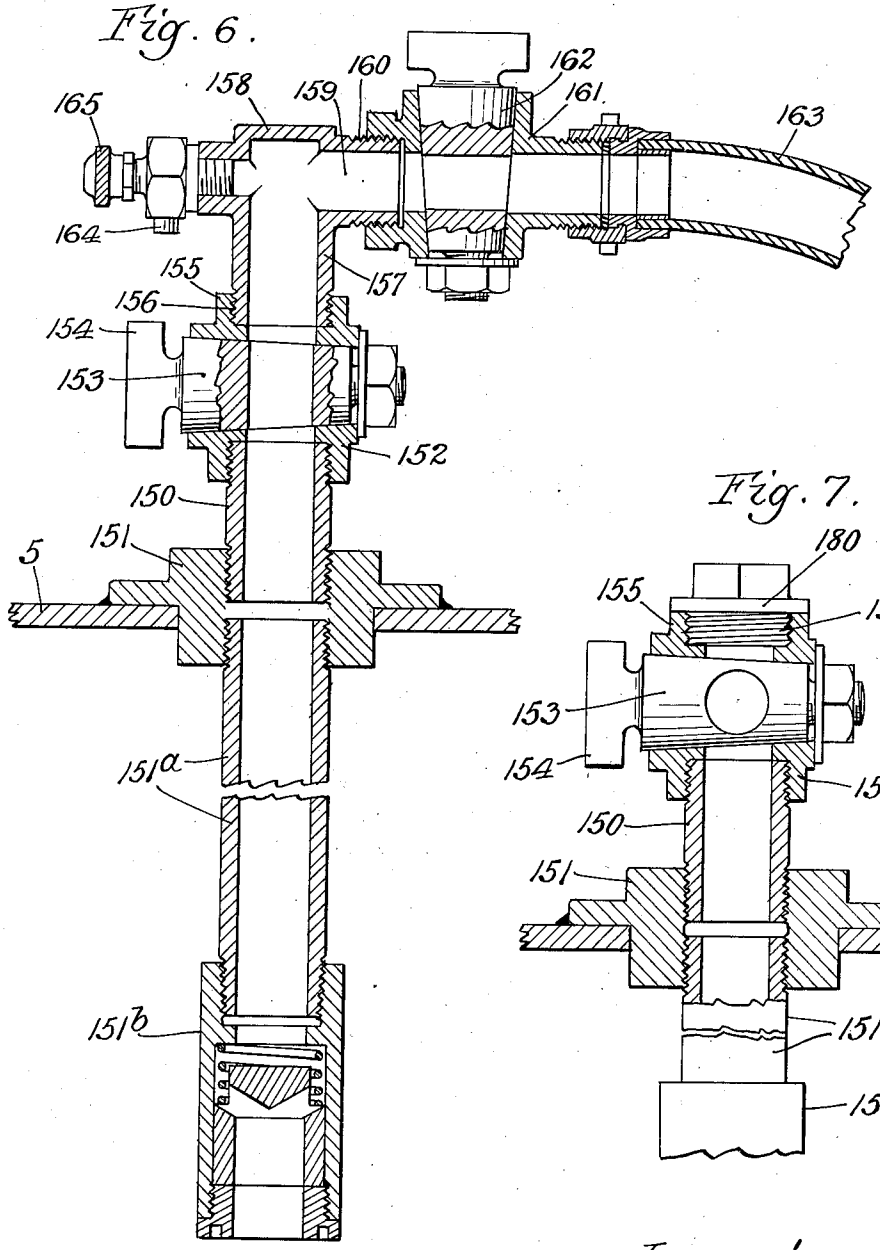

Fig. 7.

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UNITED STATES PATENT OFFICE

2,186,925

VALVE

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Application May 11, 1938, Serial No. 207,419

9 Claims. (Cl. 62—1)

Our invention relates to a loading assembly for the loading and unloading of liquids or gases or mixed liquids and gases. One purpose is the provision of an improved loading and unloading assembly for loading such materials into a tank or tank car.

Another purpose is the provision of improved means for loading or unloading liquids or gases while preventing any undesired venting or escape to the atmosphere.

Another purpose is the provision of improved means for maintaining the interior of a tank or storage or shipping container for liquids, gases or the like closed to the atmosphere during the insertion or removal of the fittings necessary to feed fluids to or remove them from a tank or closed space.

Another purpose is the provision of an improved means for handling liquids, gases, or mixed liquids or gases for shipment or storage, whereby the release of any substantial part of such materials is prevented during either loading or unloading or both.

Another purpose is the provision of improved valve means for tanks, cars and the like.

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 is a partial side elevation with parts broken away, illustrating the application of our improved valve means to a tank car;

Figure 2 is a vertical longitudinal section through a part of the dome of a tank car, illustrating the tank car in condition for shipment;

Figure 3 is a vertical section, illustrating part of the loading assembly applied to the loading inlet;

Figure 4 is a partial section, illustrating some of the parts shown in Figure 3 in a different position;

Figure 5 is a section on the line 5—5 of Figure 4;

Figure 6 is a vertical section through a variant assembly;

Figure 7 illustrates the variant assembly when the car is ready for shipment; and

Figure 8 is a detail.

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

It will be understood that whereas we have shown our invention as applied to a tank car, it may be applied to a wide variety of containers, including fixed tanks, buried tanks and the like.

Referring to the drawings, 1 indicates any suitable tank herein shown for the purpose of illustration as the type of tank which is employed in connection with tank cars. 5 is a tank car dome shown as having a removable cover plate 6 normally held in position by any suitable nuts and bolts 7, 8. It will be understood that any other suitable securing means may be employed.

Referring to Figure 1, we illustrate a loading and unloading assembly generally indicated as A and a gauging and vent assembly generally indicated as B. The assembly A is the primary subject matter of the present application and the vent assembly B will be described only cursorily as it forms the subject matter of a separate application.

Referring to Figure 2, the eduction pipe 11 which will be understood to terminate closely adjacent the bottom of the tank is shown as screw-threaded or otherwise secured to the flange 15 which is secured to the inner surface of the top of the dome. It may be welded, bolted or otherwise secured. It is in line, however, with the loading aperture 16 formed in the dome 5. Alined above the aperture 16 we illustrate a flange member 17 in which is positioned the fitting generally indicated as 18 which is shown on a larger scale at the bottom of Figure 3. It may include for example a lower portion 19 of minimum diameter and an upper and preferably concentric portion 20 of greater diameter. 11a is an excess pressure valve.

In the particular embodiment shown in Figure 3 we illustrate the portion 19 as outwardly screw-threaded at 21 and in screw-threaded relationship with corresponding threads formed in the passage aperture of the flange 17. The inner face of the member 19 is shown as screw-threaded as at 22 to receive corresponding threads of a closure plug 23 having an upper enlargement or head 24 with a downward shoulder 25. The portion 20 is inwardly screw-threaded as at 26 and is formed to receive the threads 27 of any suitable closure cap 28, as shown in Figure 2, when the assembly is removed and the closure is substituted. Also, the same screw-threading is adapted to receive the threads 29 of the wing nut 30 which forms a part of the loading assembly below described. Thus the fitting receives selectively either the closure cap 28 or the loading assembly of Figure 3.

In order to provide a proper seal for the contents of the tank during shipment, we may provide the closure 28 with a plurality of apertures 28a about the flange of the closure cap. Through

these apertures 28a may pass any suitable sealing strip 28b which in turn may be looped through an eye 28c mounted on or secured to the flange or fitting 17 or 60. 28d is any suitable seal in the loop or band 28b.

Assume that the tank is being shipped, either full or empty, it is preferably shipped with the closure 28 in place as shown in Figure 2 and with the closure plug 23 firmly screwed down against the gasket 31. The gasket 31 is shown as received in a recess 31a in the plug 23 whereby when the plug is raised from its seat it carries the gasket with it. The gasket 31 is shown as concentrically located within the outer gasket 31b, but if desired a single gasket may be employed. In any event, the single gasket or the two gaskets form a seal and the parts are so proportioned that when the cap 28 is screwed into position its lower edge also abuts against the outer gasket, both gaskets resting upon the single annular supporting or sealing surface 32, which is preferably but not necessarily perpendicular to the axis of the assembly. The gasket means herein shown are advantageous but a tapered thread or a ground joint or any other suitable sealing means may be employed.

Assuming that the outer closure 28 has been removed, as shown in Figure 3, a passage member 33 may be applied to the fitting. It is shown as having a bottom flange or shoulder 34 against which the wing nut 30 abuts and which preferably conforms to the surface 32 or to the gaskets 31 or 31b, whereby when the wing nut 30 is tightened the member 33 is locked effectively in relation to the fitting 18 and surrounds the plug 23, 24. We illustrate the member 33 as having applied thereto an upper portion or extension 35 which may have a side passage or lateral extension or other outlet portion 36. We illustrate it as screw-threaded as at 37 to receive any suitable valve assembly 38, as shown in Figures 1 and 3. This valve assembly might, of course, be located intermediate the ends of the below described loading or unloading hose 51 or at the opposite end of the hose. We find it convenient to have it associated directly with the passage members 33, 35. It is important in any event that closure means be provided so that the space within the members 33, 35 which constitutes a passage may be closed to the atmosphere and may also be cut off from the loading or unloading zone. The diameter of the enlargement 24 of the closure plug 23 is slightly less than the interior diameter of the members 33, 35.

We illustrate venting means adaptable to provide atmospheric or outside communication with the space between the closure 23 and the valve 38. We illustrate for example an outlet passage 40 of restricted diameter which is controlled by any suitable valve mechanism generally indicated as at 41 and having an exterior handle 42. It will be understood, however, that any suitable means may be employed whereby the operator can permit the escape of gases from the space within the members 33. 35. This is of importance in connection with the application of the loading assembly. It is also important as permitting the user to determine whether or not the plug 23 is tightly in position at a time when the members 33, 35 are in the position in which they are shown in Figure 3. It is also possible to employ this valve or vent to drain liquid from the said space and, in general, to relieve pressure from that space when necessary.

It will be understood that whereas we have shown a screw-threaded closure plug 23, other closure means might be employed. However, a screw-threaded plug is convenient and efficient. When such a plug is employed, it is necessary to unscrew it while the assembly 33, 35 is in place and to position it out of the line of flow between the tank and the passage 36. We therefore provide a control stem 24a which may be rotatably and slidably mounted in the end 43 of the member 35. The lower end of the stem may be squared or otherwise formed as at 44 in order to penetrate the corresponding aperture 45 of the plug 23, 24. Thus when the stem 24a is rotated it rotates the plug 23.

The aperture 45 of the plug may be provided with a recess 46 to receive the thrust balls 47 which serve as a locking means to prevent the plug 23 from dropping from the end of the stem after it has been unscrewed or released. Similar balls 48 are located in a somewhat higher portion of the stem 24a and are adapted, as shown in Figure 4, to penetrate the locking channel 49 in the member 43. Thus the operator has merely to withdraw the stem 24a to topmost position, as limited by the abutment member 50 in order to lock it and the plug 23 in an upward position above and out of line with the passage 36 and the flow of material into and out of the tank.

We thus provide means for putting the interior of the passage formed by the members 33, 35 and 36 into communication with the interior of the tank while maintaining such space closed, and while preventing any escape of gases from the interior of the tank. It will be understood that we may obtain the same result through different means, but the screw-threaded plug is illustrated as a practical and operative solution of the problem.

Assume that the closure 28 has been removed and the loading assembly, including the parts 33 and 35 has been applied, the interior of the loading assembly is thereafter put in communication with the interior of the tank. The operator can connect the valve 38 with any suitable source of liquid or gas to be loaded or transported, for example by the pipe or hose 51. When all connections have been made, the valve 38 can be opened and pressure may be applied by gravity or otherwise to cause the liquid or gas to flow inwardly along the hose 51 through the open valve 38 inwardly along the passage 36 and downwardly through the member 33, and thus into the tank which can then be filled to any predetermined level or pressure.

The operator can sample or gauge, if desired, by employing the slip tube gauge 104 which will later be described. In handling some substances, however, no separate gauging or sampling or venting means are necessary and the assembly B of Figure 1 may be dispensed with. It will be understood, also, that under some circumstances and with some substances the eduction pipe 11 may be omitted.

When the tank is filled to the desired level or pressure, the valve 38 can be closed and the plug 23 thrust into locking position and rotated by the stem 24a until firmly locked. The valve 41 can then be employed to determine whether or not the plug is fully locked and also to exhaust pressure from the space within the members 33 and 35 above the plug prior to removing the loading assembly. Thereafter, the wing nut 30 can be rotated to releasing position and the

loading assembly may then be removed and the shipping closure or cap 28 put back in place.

Referring to the vent side or the assembly B, it will not be described in great detail as it does not of itself form part of the present invention and is described and claimed in a co-pending application. We illustrate it, however, as including a flange or passage member 60 which may be secured to or may be formed integrally with the dome 5. Secured to the member 60 is a fitting generally indicated as 61 and generally like the fitting 18 of Figure 3. It may be interiorly screw-threaded to receive any suitable plug or closure 66, 67 resembling the plug 23, 24. Similarly, the passage member 74 may be removably secured to the fitting 61 as by means of the wing nut 73. A valve 76 closes the upper portion of the passage member 74. The valve, which may be a gate valve, is controlled by any suitable external handle 78. An upper passage or elbow 79 is positioned thereabove, having a lateral passage having a valve 82 controlled by the handle 83 and in communication with the hose 51*a* which may, if desired, have associated therewith any suitable back pressure regulator 82*a*.

Slidable downwardly through the assembly above described is a slip tube gauge 104 having calibrations 105 and a bottom member or abutment 106. If desired, a pump cylinder 122 may be mounted on the upper end of the slip tube gauge 104 and any suitable handle 125 may be employed to actuate it and draw up the liquid through the tube 104 in the event that there is insufficient pressure within the tank 1 to cause the liquid to rise in the tube. The escape of the liquid may be controlled for example by any suitable valve assembly 113 with the control handle or knob 116. It will be understood that when the above described venting and gauging and sampling assembly is in position, gas may be released through the hose 51*a* and by means of the tube 104 samples may be taken from time to time and the level of the liquid in the tank may be determined. When the tank is prepared for shipping the above assembly is removed and a closure 28, similar to that for assembly A, is screwed into the fitting 61.

In Figures 6 and 7 we illustrate an alternative form of our invention. Whereas in the form of Figures 1 and following, a closed plug 23 is employed, we can use a valve assembly which is externally operable and which is secured to or permanently left on the tank. Referring to Figure 6, a nipple 150 extends upwardly from the tank. It may for example be screw-threaded into a flange 151. 151*a* indicates any suitable eduction pipe, which extends to the bottom of the tank and which is employed with materials and under circumstances rendering an eduction pipe necessary. 151*b* indicates an excess pressure valve which serves to prevent escape of liquid in the event of breakage or premature opening of the valve assembly.

152 is any suitable valve housing having a valve 153 therein shown as controlled by the exterior handle 154. Whereas we illustrate in Figure 6 a stop cock, it will be understood that any other suitable type of valve may be employed. The valve housing has an upper channel having a flange 155 inwardly screw-threaded as at 156 to receive the removable passage member 157. The passage member is shown as having a closed end 158 and a side passage member 159 which is screw-threaded as at 160 to receive a valve housing 161 having an exteriorly operable valve 162. This valve is also shown as a stop cock but any suitable valve such as a gate valve may be substituted therefor.

In communication with the passage 159 through the valve housing 161 is any suitable loading and unloading hose 163 which may extend to a source of liquid or fluid supply or, when the assembly is being used for unloading, may lead to any suitable delivery or storage zone. The interior of the passage member 157 between the valves 153 and 162 is provided with an additional outlet or vent 164 controlled by any suitable valve having for example an external handle 165. It will be understood that the vent 164 is of substantialy smaller cross sectional area than the areas controlled by the valves 153 or 162. It may be employed to vent the interior of the passage member 157 to the atmosphere or otherwise.

Referring to Figure 7, it will be understood that the nipple 150 when the passage member 157 is removed, may be closed by having the valve 153 turned to the closed position. An additional closure may be employed in the shape of the screw-threaded plug 180 which is received in the threads 156 of the valve housing flange 155. Thus the form of Figures 6 and 7 differs from the form of valve assemblies shown in the earlier figures in that the valve 153 and the actuating means therefor are mounted on the tank dome and need not be removed.

It will be realized that where in the specification and claims we use the term "passage fitting" or "passage fitting associated with the tank", we wish these terms to be interpreted with sufficient breadth to include the formation of a passage integral with the tank or integral with the dome cover or cover plate, it being a matter of choice as to whether or not such a fitting or its equivalent be made removable or be separately formed and thereafter applied permanently to the tank, or if it be formed as part of the tank, dome or cover.

Where in the specification and claims we describe the plug or closure as screw-threaded, it will be understood that we wish such term to be interpreted with sufficient breadth to cover any locking arrangement whereby the plug or closure is locked or unlocked in response to rotation thereof.

For example, it will be understood that where we employ an externally screw-threaded wing nut in connection with an internally screw-threaded fitting 20, the relation of the parts may be reversed and the wing nut and the housing 35 may engage the exterior rather than the interior of the fitting flange.

It will be realized that whereas we have described and illustrated a practical and operative device, nevertheless many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of our invention. We therefore wish our description and drawings to be taken as in a broad sense illustrative or diagrammatic, rather than as limiting us to our precise showing. The use and operation of our invention are as follows:

The prime purpose of our invention is to avoid the enormous losses which take place in the current handling of volatile liquids such as gasoline, casinghead gasoline and the like, which are prevailingly shipped in insulated containers. In handling highly volatile liquids, it is exceedingly disadvantageous and wasteful to permit such liquids or the gases therein or associated there-

with to exhaust to the atmosphere whether during loading or unloading. Our invention enables an operator to load volatile liquids to a tank and to unload them without at any time permitting the storage or shipping zone to be in direct communication with or to exhaust to the atmosphere. Our invention is applicable not merely to shipping volatile liquids from point to point, but for fixed or buried storage systems from which liquids or gases are thereafter dispensed or used. It may be used in connection with buried butane or propane systems used for house heating, cooking or the like.

A practical advantage of our loading assembly is that it can be applied to and used in connection with existing equipment, such as tank cars, without any substantial modification of the present structures and without the necessity of applying new and expensive equipment to tanks, tank cars and the like. A further advantage is that our removable valve assembly or assemblies can be kept at loading or unloading points and may be carried to or removed from fixed tanks, whereby a given assembly or group of assemblies may be employed in connection with a large number of different cars, tanks or the like.

We can readily adapt existing cars or tanks to our invention by applying to them the preferably removable and semi-fixed fitting **19**, **20** with the closure plug **23** and the outer cover **28**. Thus only inexpensive elements are applied to or are moved with or are installed on the tank cars or tanks while the more expensive and delicate valve assemblies such as are shown at A in Figure 1 may be applied to the tank or car at the time of loading or unloading and may be removed when the loading or unloading operation is completed and may be stored and serviced at the loading or unloading point. Thus they are at all times in the hands of competent operators and are not subjected to the hazards of travel or to the abuse which they would receive at the hands of employees who have no direct responsibility for them. It will be clear that a large number of cars can be handled by the employment of a small number of loading or unloading assemblies or units.

In handling volatile liquids and particularly inflammable liquids, the prevention of any substantial exhaustion to the atmosphere results in an enormous saving of the substances handled. It also greatly increases safety, since it prevents the exhaustion to the atmosphere of the large quantities of inflammable gases which are released in current practice. A further advantage is the great saving in time.

As an example of the problem faced, during the loading and transit of casinghead gasoline, a considerable portion of the gasoline is driven into vapor so that when the tank car arrives at its destination a very substantial pressure has been built up in the tank. Prevailingly in the present practice the closure cap is removed and the gaseous contents under pressure are simply wasted to the atmosphere. This venting has to be permitted since otherwise it would be dangerous for the operator to remove the dome cover **6**. Some cars are even provided with á safety cover which prevents their removal until this pressure is vented off. This venting may require several hours, which involves a substantial loss of time. The presence of the vapor in the atmosphere is a hazard since a spark from a passing locomotive may ignite the vapor. As a matter of fact, many lives have been lost from this cause. The wastage of material is great. In hot weather, cases are known where as much as 3,000 gallons of gasoline have been wasted from a ten thousand gallon load. The wastage is seldom less than 300 gallons per load, even in cold weather. This involves not merely a money loss to the shipper but a waste of a limited natural resource.

Whereas our invention is particularly applicable to and valuable with the handling of volatile and inflammable liquids, it lends itself to the economical handling of a wide variety of liquids, both where pressure is present and where pressure is absent. Lubricating oils, for example, may be efficiently handled through our removable valve assembly. A partial list of substances which can advantageously be handled includes gasoline, propane, butane, crude oil, lubricating oil, alcohols, volatile solvents, acids, malodorants, poison gases, chlorine gas, and liquefied gases in general.

The excess pressure valve *11a* is useful as preventing undesired escape of the contents of the tank in the event that the valve assembly is broken off or prematurely removed or improperly opened.

We claim:

1. In a removable valve assembly for a tank or the like having an aperture and a closure therefor, a passage member and means for removably securing the passage member in sealing relation to the aperture of the tank, while such aperture is closed, means supported upon said passage member for non-rotatably engaging the closure of such aperture for removing it from a position sealing such opening or for fully restoring the closure to said position while said passage member is in place, said means including an actuating part exterior of said passage member, an additional passage member in fluid flow communication with said first-mentioned passage member, a separate closure for said additional passage member independent of said first closure, and means for actuating said separate closure to move it into and out of closing position.

2. In a removable valve assembly for a tank or the like having an aperture and a closure therefor, a passage member and means for removably securing the passage member in sealing relation to the aperture of the tank, while such aperture is closed, means supported upon said passage member for non-rotatably engaging the closure of such aperture for removing it from a position sealing such opening or for fully restoring the closure to said position while said passage member is in place, said means including an actuating part exterior of said passage member, an additional passage member in fluid flow communication with said first-mentioned passage member, a separate closure for said additional passage member independent of said first closure, means for actuating said separate closure to move it into and out of closing position, independent means for venting pressure to the air from the interior of said first mentioned passage member, and means for operating said venting means independently of the closure for the tank and for said additional passage member.

3. In a removable valve assembly for a tank or the like having an aperture and a closure therefor, a passage member and means for removably securing the passage member in sealing relation to the aperture of the tank, while such aperture is closed, means supported upon said

passage member for non-rotatably engaging the closure of such aperture for removing it from a position sealing such opening or for fully restoring the closure to said position while said passage member is in place, said means including an actuating part exterior of said passage member, an additional passage member in fluid flow communication with said first-mentioned passage member, a separate closure for said additional passage member independent of said first closure, means for actuating said separate closure to move it into and out of closing position, independent means for venting pressure to the air from the interior of said first mentioned passage member, said venting means including an outlet of substantially reduced cross-section in relation to the cross-sectional area of said additional passage member, and means for operating said venting means independently of the closure for the tank and for said additional passage member.

4. The combination with the filling opening structure of a tank and a closure for such structure provided with a socket, of a removable valve assembly detachably secured to said structure, said assembly comprising a passage member, an operating stem traversing said passage member and having one end projecting therefrom, means secured to said end for moving said stem, means at the other end of said stem removably received in said socket, means detachably locking the second-mentioned means in said socket, and an additional passage member in fluid flow communication with said first mentioned passage member, and independent valve means for said additional passage member.

5. The combination with the filling opening structure of a tank and a closure for such structure provided with a socket, of a removable valve assembly detachably secured to said structure, said assembly comprising a passage member, an operating stem traversing said passage member and having one end projecting therefrom, means secured to said end for moving said stem, means at the other end of said stem removably received in said socket, means detachably locking the second-mentioned means in said socket, an additional passage member in fluid flow communication with said first mentioned passage member, valve means therefor, and additional means for venting pressure from the interior of said first mentioned passage member to the open air.

6. In a removable valve assembly for tanks and the like, a passage fitting on the tank, a closure plug removably screw-threaded in the passage of the fitting, said fitting including an internally threaded portion of greater diameter than said plug, a passage member and means for releasably securing it to said last-mentioned threaded portion of the fitting while the plug is in place, an operating element traversing said passage member and having one end projecting therefrom, means secured to said end for moving said element, and means for securing the opposite end of said element detachably and non-rotatably to the closure plug of said fitting to permit said plug to be removed from a position sealing said fitting or restored to said position.

7. In a removable valve assembly for tanks and the like, a passage fitting on the tank, a threaded closure plug bodily and removably screw-threaded in the passage of the fitting, said fitting including an additional interiorly screw-threaded portion of greater diameter than that in which the closure plug is screw-threaded, a passage member, and means for rotatably securing it to said fitting while the plug is in place, an operating element traversing said passage member and having one end projecting therefrom, means secured to said end for moving said element, means for securing the opposite end of said element detachably and non-rotatably to the closure plug of said fitting to permit said plug to be removed from a position sealing said fitting or restored to said position, said passage member including an outwardly extending shoulder about the lower edge of said passage member, said shoulder being dimensioned to fit within said additional interiorly screw-threaded portion of the fitting, and an exteriorly screw-threaded nut surrounding said passage member above said shoulder and threadedly engaged with the interiorly screw-threaded portion of the fitting whereby to seal the passage member to the fitting while the plug is in place.

8. In a removable valve assembly for tanks and the like, a removable passage fitting on the tank, a bodily removable closure plug screw-threaded in the passage of the fitting, a passage member and means for removably securing it to the fitting while the plug is in position within the fitting, the interior diameter of the passage member being greater than the exterior diameter of the plug, an operating element traversing said passage member and having one end projecting therefrom, means secured to said end for moving said element, means for securing the opposite end of said element detachably and non-rotatably to the closure plug to permit the closure plug to be removed from a position sealing said fitting or restored to said position, a lateral passage extending from said first passage member and a valve therefor, a vent member in communication with said passage member, and a valve for controlling said vent member and means for actuating said valve to vent said passage member to the air, irrespective of the position of said plug and of the first-mentioned valve.

9. In a removable valve assembly for tanks and the like, a removable passage fitting on the tank, a closure plug bodily removable and screw-threadingly mounted in the passage of the fitting, a passage member and means for removably securing it to the said fitting while the plug is in position within the fitting, an operating element traversing said passage member and having one end projected therefrom, means secured to said end for moving said element, means for securing the opposite end of said element detachably and non-rotatably in the closure plug of said fitting to permit the closure plug to be removed from a position sealing said fitting or restored to said position, an additional passage member in communication with said first passage member, a valve controlling said second passage member and carried thereby, said first passage member being provided with an additional outlet passage of restricted diameter in communication with the space between said valve and said closure plug, and a valve controlling said last mentioned passage and means for actuating it from the outside to cause venting to the air.

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