April 28, 1936. C. SPAETH 2,038,767

SYSTEM FOR THE STORING AND HANDLING OF VOLATILE OR VAPORIZABLE LIQUIDS

Filed May 19, 1934 2 Sheets-Sheet 1

FIG. 1

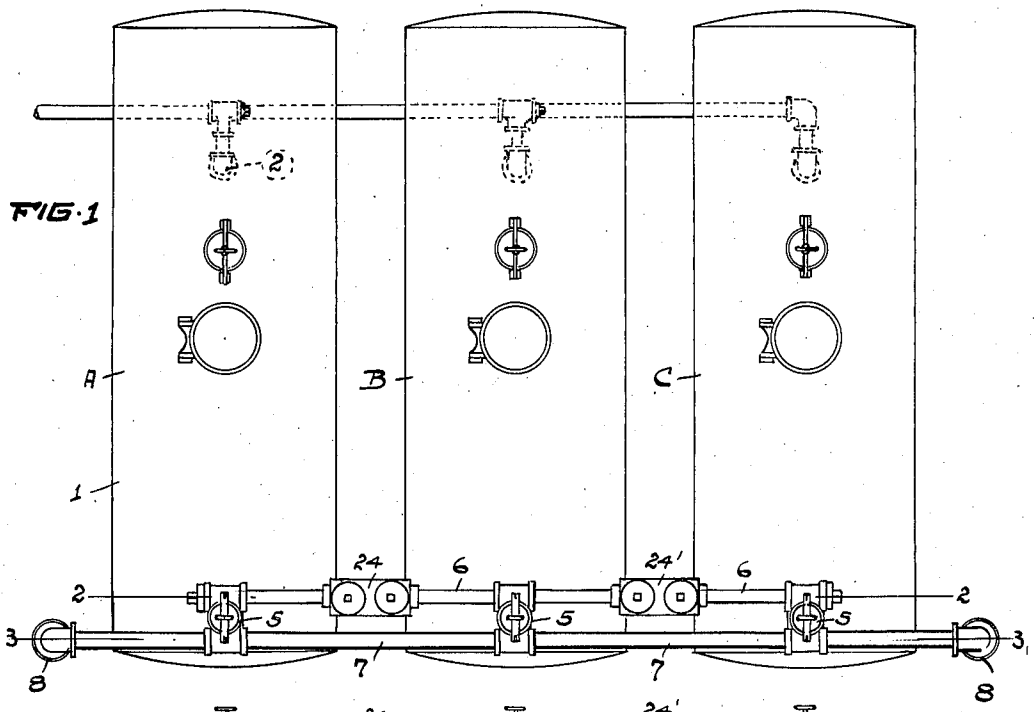


FIG. 2

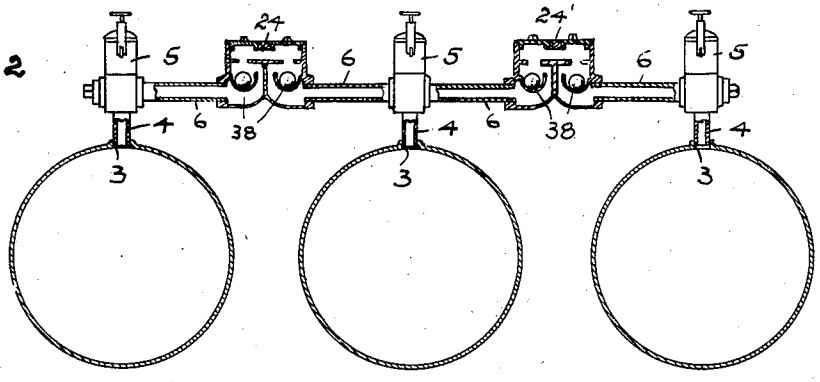
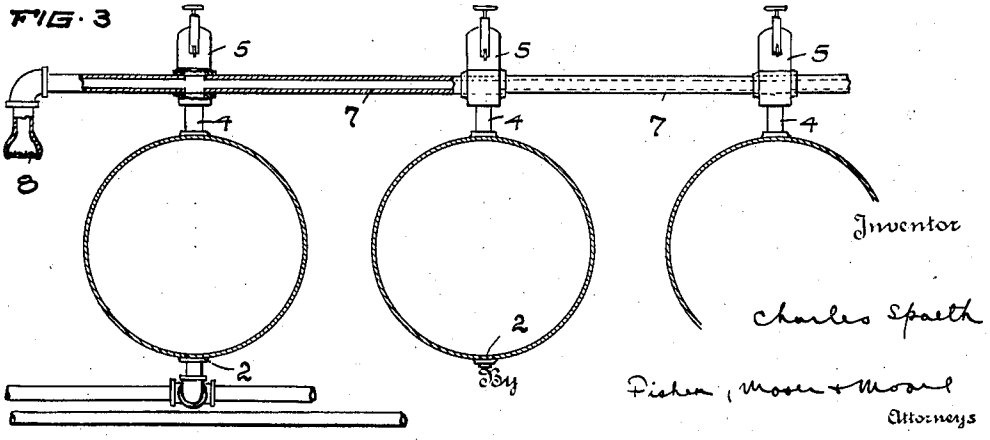


FIG. 3



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SYSTEM FOR THE STORING AND HANDLING OF VOLATILE OR VAPORIZABLE LIQUIDS

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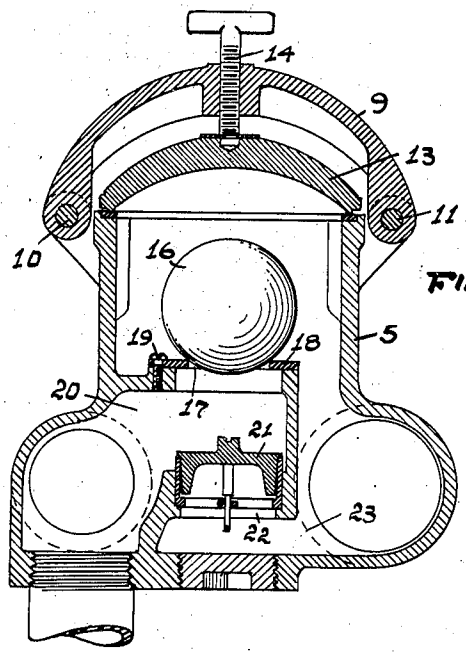


FIG. 4

FIG. 6

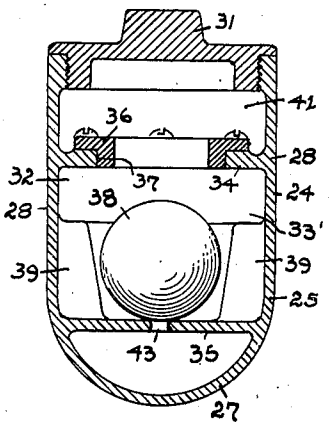
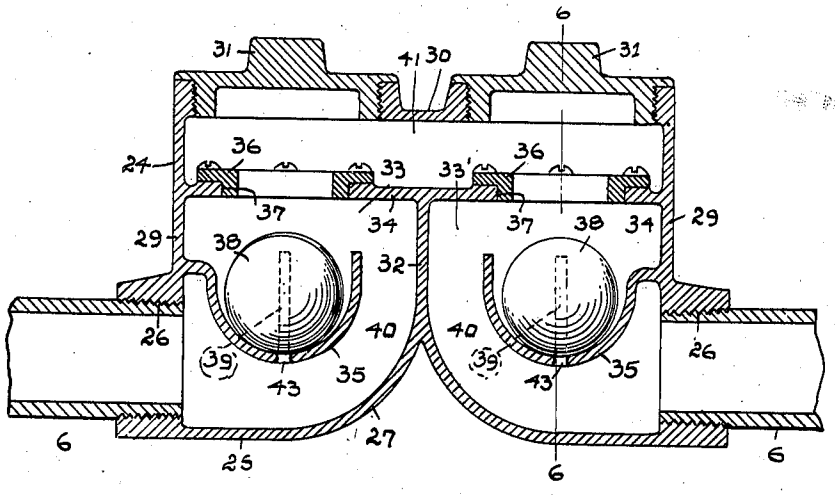


FIG. 5



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UNITED STATES PATENT OFFICE

2,038,767

SYSTEM FOR THE STORING AND HANDLING OF VOLATILE OR VAPORIZABLE LIQUIDS

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Application May 19, 1934, Serial No. 726,479

8 Claims. (Cl. 220—85)

This invention relates to a system for the storing and handling of volatile or vaporizable liquids, such as gasoline or the like.

It has been the custom at refineries and other places where these liquids are stored and handled in large quantities to employ a plurality of tanks. These tanks generally communicate with each other and with the atmosphere so that the pressure may be equalized throughout the system.

When a quantity of gasoline or similar volatile liquid is placed in a container, it is well known that owing to changes in temperature and other conditions such as exist during the filling and refilling of the tanks, the vapor pressure continually varies and undergoes a so called breathing action, during which the vapor from the liquid escapes to the atmosphere and air is drawn into the container. As previously stated herein, it has been the practice to connect up a series of such containers or tanks together, so that the vapor from one tank may pass to another, thus distributing and equalizing the pressure throughout the system. This has resulted in considerable saving of vapor which would otherwise have been passed to the atmosphere, however, when the several tanks of the system are filled with different kinds or grades of gasoline, considerable loss has resulted due to the fact that during filling operations the liquid from one tank would frequently overflow into other tanks of the system.

The general object of the present invention is to provide means whereby the vapor is permitted to pass from one tank to another tank of the system, while liquid overflowing from any tank or tanks of the system cannot find its way into another tank of the system. This is of particular importance where one or more of the different grades of the gasoline in the series of tanks contains lead.

In the accompanying drawings wherein one embodiment of the present invention is illustrated:

Figure 1 is a plan elevation of a series of storage tanks illustrating a vapor control system embodying overflow check valves which permit free circulation of vapor between the individual tanks, but prohibit circulation of liquid between the tanks;

Figure 2 is a sectional view partly in elevation on line 2—2 of Figure 1;

Figure 3 is a sectional view partly in elevation on line 3—3 of Figure 1;

Figure 4 is a longitudinal sectional view through one of the equalizer valves;

Figure 5 is a longitudinal sectional view through the overflow check valve; and

Figure 6 is a cross sectional view through the overflow check valve, the section being taken on line 6—6 of Figure 5.

Referring more particularly to the drawings 1 denotes a series of metal tanks of any desired capacity and preferably of the vertical type. While any suitable number of tanks may be employed, but three tanks designated A, B and C respectively, are shown. Each tank is provided with an opening 2 adjacent its lower end, through which liquid may be drawn from or pumped into the tank. Other openings 3 in the top or vapor end of the several tanks respectively receive pipes 4 depending from one side of vapor control valve housings 5, one of which is mounted above each tank.

The several vapor openings 3 of the respective tanks A, B and C communicate with each other through a horizontally disposed connecting pipe or manifold 6. Another pipe or manifold 7, parallel with and adjacent to the pipe or manifold 6, connects the pressure side of the vapor control valve with each of the other vapor control valves. Each end of the pressure manifold 7 is open to provide air intake ports 8, which are preferably screened against the ingress of dirt and other foreign matter.

The vapor control valves comprise the main casing or housing 5, to the top of which a yoke 9 is hinged at one end as at 10, the other end of the yoke being detachably locked in closed position by any suitable means, such as a cotter pin 11. A valve housing cover 13 is held in closed position by means of a bolt or the like 14. A relatively heavy spherical ball 16 is seated within a valve opening or seat 17 formed in a removable gasket 18 which is in turn held in position by suitable fastening screws 19. A passage 20 places the opening 17 in communication with the pipe 4 and manifold 6. A second valve 21 is seated within a valve opening or passage 22 which communicates with the manifold 7 through the medium of a passage 23. The valve 21 is preferably constructed of a light metal in order that it will respond to relatively low pressures. As the construction so far described is not new per se further detailed description thereof seems unnecessary.

From the foregoing it will be understood that the initial vapor pressure generated by each of the tanks A, B and C is conducted through the individual pipe connections 4, to the interior of

the valve housings 5, and from there distributed throughout all the tanks through the manifold 6. This action will continue until the pressure is sufficient to open the ball valves 16, whereupon the excess pressure will be permitted to flow into the manifold 7 from whence it may escape through the air intake ports 8, and/or pass back through passage 23 and valve 21 into manifold 6 for distribution to the various tanks.

With the construction just described, it will be noted that when either of the tanks A, B and C is filled to overflowing, the liquid from that tank will follow the course taken by the excess vapor. Consequently the liquid can and will under such circumstances flow from one tank into the other, and as a result different types, grades and colors of gasoline will become mixed and unfit for ready sale or use.

I overcome the above mentioned objectionable mixing of the different kinds of liquid by providing a plurality of overflow check valves 24, 24'. These valves, while permitting the exhaust of vapor to the atmosphere and permitting of the hereinbefore described distribution of the vapor pressure throughout the system, effectually prevent the passage of the gasoline from one tank to another. The number of valves employed depends upon the number of tanks in the system, one valve being necessary between adjacent tanks. In the present system wherein but three tanks, A, B and C are used, two overflow valves 24 will suffice, one between tanks A and B and the other between tanks B and C. These valves 24 consist of a housing or casing 25 provided at its opposite ends with threaded openings 26 for convenient mounting in the conduit or manifold 6. The only change necessary is to break away a sufficient portion of manifold 6, to accommodate the valve 24, and to thread the opposing ends of the broken away portion of the pipe or manifold 6 for connection with the threaded openings 26.

The casing or housing 25 of each overflow check valve 24 consists of a curved bottom wall 27, vertical side walls 28, end walls 29 and a top 30, the latter being provided with removable covers or plugs 31 at each end thereof. A centrally disposed transverse vertical division wall 32 divides the valve casing into two compartments 33, 33' and a horizontal partition or wall 34, arranged below and parallel to the top 30, constitutes the top of the chambers 33. Projecting inwardly from each end wall 29, into the respective chambers 33, intermediate the top and bottom thereof is a trough shaped member 35. A ball float valve 38 loosely seated within each member 35 is confined therein for limited vertical movement by a removable gasket 36, in turn suitably secured in place within an opening 37, formed in the wall 34. Guide ribs 39 guide the valve 38 in its movements to and from its seats.

The mode of operation of the overflow check valves is as follows: Assuming for illustrative purposes that during filling operations an over supply or quantity of gasoline or other fluid is pumped into the tank A, the excess fluid will enter the vapor control valve of tank A through pipe 4, and will then pass on through manifold or conduit 6 and into chamber 33 of overflow check valve 24 for tanks A and B. The vapor is free to flow through passage 40, around and over ball float valve 38 and thence out through opening 37 and passage 41 into and through chamber 33' and thence on through manifold 6 to the vapor control valve for tank B, in the manner previously described. However, the gasoline cannot pass from one side of overflow check valve 24 to the other, that is from chamber 33 to chamber 33' and vice versa. When the gasoline rises sufficiently high in chamber 33, the valve 38 will be elevated, until the latter closes the opening 37, by seating against the gasket 36. If the pumping is continued beyond this point the overflow gasoline will back up in the vapor control valve for tank A and lift ball valve 16 from its seat thus permitting the gasoline to escape into and through the breather manifold 7. If desirable, containers, not shown, may be placed beneath the end of manifold 7 to catch the overflow. When the tank A is drawn upon, the gasoline in chamber 33 will drain back into the tank, the trough shaped member 35 being provided with a drain opening 43 for this purpose.

It will be obvious from the foregoing that any overflow from tank B will be taken care of by both overflow check valves 24, 24' but that the overflow gasoline will be forced into the chamber 33' of valve 24, instead of the chamber 33 thereof. Both ends of these valves function in precisely the same manner.

Having thus described my invention, what I claim is:

1. In a volatile liquid storage system, the combination of a series of atmospherically sealed chambers, a primary manifold connecting the vapor side of each of said chambers, a secondary manifold open to the atmosphere and connected in parallel with said primary manifold, double acting valve means positioned between said secondary and said primary manifolds and overflow check valves in said primary manifold adapted to permit free flow of vapor through said primary manifold.

2. In a volatile liquid storage system, the combination of a series of atmospherically sealed chambers, a primary manifold connecting the vapor side of each of said chambers, a secondary manifold connected in parallel with said primary manifolds, double acting valve means positioned between said secondary and said primary manifolds, and means in said primary manifold for checking the flow of liquid through said primary manifold, said latter means permitting free flow of vapor therethrough.

3. In a volatile liquid storage system, the combination of a series of atmospherically sealed chambers, a primary manifold connecting the vapor side of each of said chambers, a secondary manifold connected in parallel with said primary manifold, double acting valve means positioned between said secondary and said primary manifolds, atmospheric intake ports connected to said secondary manifold, and means in said primary manifold for checking the flow of liquid through said primary manifold, said latter means permitting free flow of vapor therethrough.

4. In a volatile liquid storage system, the combination of a series of atmospherically sealed chambers, a primary manifold connecting the vapor side of each of said chambers, a secondary manifold connected in parallel with said primary manifold, double acting valve means positioned between said secondary and said primary manifolds, atmospheric ports connected to said secondary manifolds, and means in said primary manifold for checking the flow of liquid through said primary manifold in opposite directions, said latter means permitting free flow of vapor therethrough.

5. In a volatile liquid storage system, the combination of a series of atmospherically sealed

chambers, a primary manifold connecting the vapor side of each of said chambers, a secondary manifold open to the atmosphere arranged parallel to said primary manifold, means connecting said primary and secondary manifolds in parallel, double acting valve means in said connecting means, and overflow check means in said primary manifold for checking the flow of liquid therethrough, said latter means permitting free flow of vapor therethrough.

6. In a volatile liquid storage system, the combination of a series of atmospherically sealed chambers, a primary manifold connecting the vapor side of each of said chambers, a series of overflow check means in said primary manifold arranged so that each overflow check means is located between the connection of two adjoining sealed chambers, a secondary manifold open to the atmosphere arranged parallel to said primary manifold, means connecting said primary and secondary manifolds in parallel and double acting valve means in said connecting means, said overflow check means checking the flow of liquid through said primary manifold and permitting free flow of vapor therethrough.

7. In a volatile liquid storage system according to claim 6 overflow check means in said primary manifold provided with two check valves for checking the flow of liquid in opposite directions.

8. In a volatile liquid storage system having atmospherically sealed chambers connected by primary and secondary manifolds with each other and the open atmosphere, double acting valve means positioned between said primary and secondary manifolds and overflow check means in said primary manifold, said overflow check means checking the flow of liquid through said primary manifold and permitting free flow of vapor therethrough.

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