

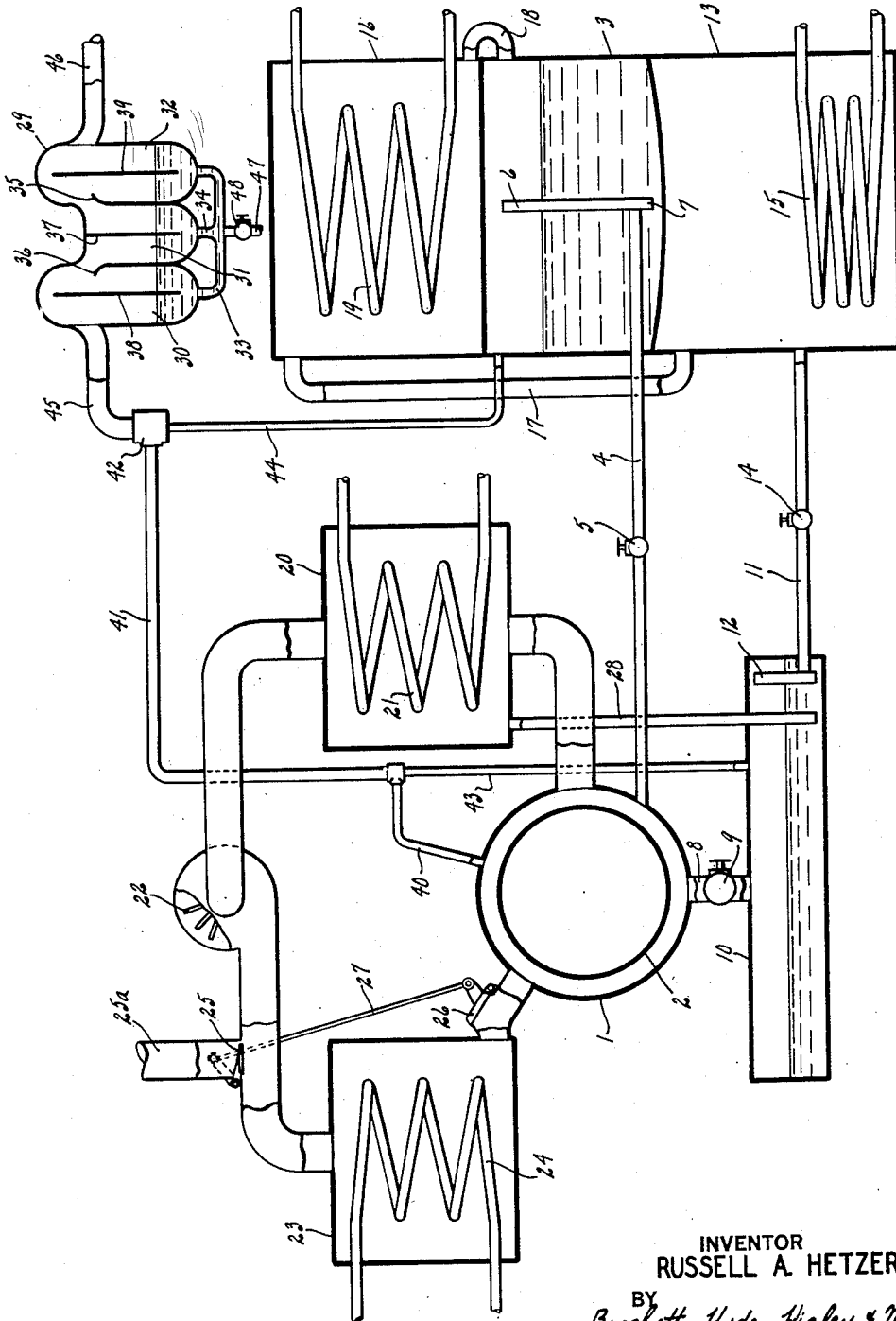
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R. A. HETZER

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LIQUID SEAL VENT

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INVENTOR
RUSSELL A. HETZER

BY
Brockett, Hyde, Higley & Meyer
ATTORNEYS

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LIQUID SEAL VENT

Russell A. Hetzer, Madeira, Ohio, assignor to The American Laundry Machinery Company, Norwood, Ohio, a corporation of Ohio

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5 Claims. (Cl. 183—21)

My invention relates to vents and more particularly to liquid seal vents for vessels, tanks or systems in which a volatile liquid or solvent is being stored or utilized.

5 In fabric treating apparatus it is desirable in economical operation to repeatedly utilize the same supply of detergent and to have the detergent equally effective in each operation. In such apparatus, means are therefore provided to
10 remove the foreign matter, such as dirt or grease, from the detergent after the treating operation.

To prevent the loss of solvent and its contact with moisture in the air, it is also desirable to have the vessel or system closed to the atmosphere. This is particularly important in treating
15 vessels or systems in which carbon tetrachloride is utilized as the detergent, because carbon tetrachloride, especially when hot, reacts with water to form hydrochloride acid, and consequently, if
20 atmospheric air is being continuously drawn into and expelled from the system, the hydrochloric acid formed by the reaction of the moisture in the air with the carbon tetrachloride will materially weaken the fabric being treated and may
25 even attack the metal parts of the vessel or apparatus. To avoid the necessity of constructing the vessel or system of excessively strong material and to obviate the possibility of injury to the apparatus or system as the result of abnormal
30 pressure or vacuum conditions, some means are preferably provided to prevent the formation of such abnormal conditions within the apparatus or system.

It is therefore an object of my invention to provide an improved liquid seal vent for tanks
35 or systems in which a volatile solvent is being stored or utilized. Another object of my invention is to provide a liquid seal vent for tanks, vessels or cleansing systems by means of which
40 air may be vented to the atmosphere when abnormal pressure conditions exist within the tank or system and air may be drawn into the system when the pressure within the tank or system falls materially below atmospheric pressure. A
45 further object of my invention is to provide an improved vent for tanks or systems which is simple in form, compact in arrangement, and by means of which abnormal pressure or vacuum
50 conditions within the tank or system may be quickly relieved and which is effective in preventing the influx of air or the egress of solvent vapors when normal, or substantially normal pressure conditions, exist within the tank or system.

55 My invention will be better understood by ref-

erence to the accompanying drawing in which the single figure illustrates diagrammatically a sectional view of my improved vent as applied to dry cleansing systems.

The invention is particularly designed for use
5 in conjunction with any suitable form of cleansing system in which a volatile solvent, such as carbon tetrachloride, is utilized as the cleansing medium, as illustrated in my copending application Ser. No. 462,061, filed on June 18, 1930,
10 since issued as Patent 2,041,711 on May 26, 1936, to which reference may be had if desirable or necessary, although it will be understood that I do not desire to limit my invention in this respect.

As illustrated in the drawing, the fabric cleansing system comprises a treating vessel 1 which is
15 provided with the usual rotatable goods containing drum 2. A storage tank 3 is mounted at approximately the same or somewhat higher level than the treating vessel 1 and, as illustrated, contains a supply of volatile liquid to be utilized in
20 the treating operation. Carbon tetrachloride is preferably employed as the volatile detergent although other volatile solvents, such as benzene, may be utilized. The conduit or pipe 4 connects
25 the bottom of the storage tank 3 with the treating compartment 1 and is provided with a valve 5 for regulating the amount of treating medium which passes from the storage tank to the treating compartment.

To prevent any water or moisture which may
30 collect on the surface of the treating material within the storage tank 3 from flowing into the treating compartment 1 through the conduit 4, the portion of the conduit 4 within tank 3 is
35 provided with a T-connection having branches 6 and 7. The branch 6 extends upwardly to a point above the level of the treating medium within the storage tank and the branch 7 has
40 its open end slightly above the bottom of the tank 3. When valve 5 is opened for supplying solvent to the treating compartment 1, treating medium will drain from storage tank 3 until it
45 has reached a level which is slightly below the point of connection of the branch 6 with the conduit 4. At this point the flow of treating medium will stop. As the level of solvent in the storage tank 2 can never drop to the point of the opening of the branch 7, water or moisture floating on
50 the surface of the treating medium will not be drained into the treating compartment.

A drain conduit 8 provided with a valve 9 leads
55 from the bottom of the treating compartment 1 to the sump tank 10 and a conduit 11 having a T-connection with the pipe 12 disposed within

sump tank 10 extends from the sump tank to a still 13. The T-connection serves to prevent water floating on the surface of the solvent in the sump tank from flowing into the still in the same manner as the T-connection in the storage tank prevents the water from flowing into the treating compartment.

In renovating the used treating medium, the valve 14 controlling the conduit 11 is opened and the detergent is permitted to flow into the still 13. Still 13 is provided with a coil 15 through which a suitable heating fluid, such as steam, may be passed.

The vapors from the still 13 pass to the condenser 16 through a conduit 17 and the condensate flows through the conduit 18 into the storage tank 3. The condenser 16 is provided with a coil 19 through which a suitable cooling fluid, such as water, may be passed.

In addition to the apparatus which recirculates and renovates the treating medium, suitable means is provided for drying and deodorizing fabric in the treating compartment before removal of the fabric. This apparatus comprises a condenser 20 provided with a cooling coil 21, a fan 22 and an air heater 23 provided with a steam coil 24, all connected in circuit with the treating compartment 1. The circuit is provided with suitable valves 25 and 26. When valves 25 and 26 are closed heated air may be repeatedly passed through the treating compartment in a closed circuit to dry the fabric. Valves 25 and 26 are provided with a connection 27 whereby these valves may be simultaneously opened, in which position valve 25 serves to prevent air from passing into the heater 23. When the valves are in the open position, atmospheric air may be drawn into the treating compartment through valve 26 and discharged to the atmosphere through conduit 25a to deodorize the fabric, the condenser 20 serving to reclaim any treating medium which is vaporized from the fabric by the circulation of air therethrough. The condensate drains from the condenser 20 into the sump tank 10 through a conduit 28 which extends below the level of liquid which is always maintained in the sump tank.

In accordance with my invention, an improved liquid seal vent is provided which serves to effectively equalize the pressure throughout the system and by means of which abnormal pressure or vacuum conditions existing within the tank or system may be relieved. This means comprises a receptacle or vessel 29 having a plurality of compartments including an inner compartment 30, a sealing compartment 31 and an outer compartment 32 which are interconnected at their lower portion by means of conduits 33 and 34 having a comparatively small cross sectional area. The side walls of compartment 31 terminate below the top of the receptacle and are flared outwardly as indicated at 35 and 36. Extending downwardly from the top of the receptacle 29 is a baffle 37 which extends below the surface of the liquid normally present in compartment 31. The compartments 30 and 32 are also provided with baffles 38 and 39 which extend below the normal surface of the liquid but which terminate a short distance from the top of the receptacle.

In connecting my improved vent to a cleansing system of the type specified, conduits 40 and 41 from the washer, conduits 43 and 41 from the sump tank, and conduit 44 from the storage tank, lead to the T-connection 42. A common conduit

45 extends from the T-connection 42 to the liquid seal receptacle 29.

The operation of my improved vent as applied to a cleansing system of the type specified will now be apparent. When the treating medium or solvent for a washing operation is admitted to the treating compartment 1 from the storage tank 3, the air which this treating medium or solvent displaces in the treating compartment flows by the conduits 40, 41 and 44 into the space in the storage tank formerly occupied by the liquid. When the treating medium is drained into the sump tank 10 it displaces a quantity of vapor in the sump tank which passes upwardly through conduit 43 and downwardly through the conduit 40 into the treating compartment to equalize the pressure in the treating compartment. In a similar manner, during the distillation process, excess vapors which are not condensed by condenser 16 may pass into the storage tank 3 and if the pressure in the storage tank 3 rises, vapors are passed from the storage tank through the conduits 44, 41, 40 and 43 into the treating compartment and sump tank 10.

In view of the arrangement of the liquid seal which prevents free communication of the vapors within the system to the atmosphere, it will be apparent that a pressure substantially above atmospheric may exist in all parts of the system before vapors escape to the atmosphere. Similarly, air will not flow into the system until the pressure is substantially below atmospheric. Under normal operation, it will therefore be apparent that the system will be entirely closed against free communication with the atmosphere.

In the event, however, that excessive pressure conditions occur in the system, the excess vapors will flow through the conduit 45 over the baffle 38 and will exert pressure upon the liquid on the left-hand side of the baffle 37. A portion of the water in the compartment 31 will be forced downwardly through the conduit 34 but as conduit 34 has a comparatively small cross sectional area, most of the liquid will be forced upwardly over the baffle 35 into the compartment 32, thereby providing immediate relief. The excess of air will then escape to the atmosphere through conduit 46 and the liquid will then be returned through the conduits 33 and 34 to its normal position. In the event that a partial vacuum should occur in the system, as might be the case if operation of the apparatus is discontinued or the apparatus is suddenly cooled, air would be drawn through conduit 46, would pass over the baffle 39, a portion of the water in the right-hand leg of compartment 31 would be forced downwardly through the conduit 34 and a portion would be forced over the flaring wall 36 into compartment 30, and air would be drawn into the system. The liquid in the seal would then return to its normal position through the conduits 33 and 34.

The particular arrangement of the liquid seal with its flaring walls which lead into compartments on both sides of the seal, and the return conduits which permit the liquid to return to its normal position, are advantageous because excess pressure may be quickly relieved and the proper amount of liquid may be maintained in the seal. Abnormal vacuum or pressure conditions which might impair the safety of the apparatus may therefore be effectively relieved and a seal is still provided which prevents free communication of the solvent vapors to the atmosphere.

Baffle 38 in compartment 30 and baffle 39 in compartment 32 are preferably also provided.

Baffle 38 serves to catch any entrained liquid solvent which might be present in the air escaping from the system. It will also be apparent that the solvent vapors carried by the air will be condensed and the condensate will accumulate in the conduit 33 from whence it may be withdrawn at desired intervals through the conduit 47 which is provided with a valve 48. If desired, the conduit 45 may extend to the sump tank 10 or to other parts of the apparatus. In a similar manner, baffle 39 serves to separate moisture from the air passing into the system.

When carbon tetrachloride is employed as the detergent in the system I preferably utilize water in the liquid seal vent, or a liquid in which the solvent is not more than slightly soluble or from which the solvent will separate. If water is utilized the solvent vapors which are condensed will settle in the conduit 33 on account of their higher specific gravity and may be recovered. It will also be understood that the number of compartments in the vent may be increased without departing from the spirit of my invention.

From the foregoing description it will be apparent that I have provided an improved liquid seal vent by means of which the liquid forming the seal may be maintained at a comparatively constant level.

It will also be seen that my improved vent is particularly useful in connection with cleansing systems, and especially those in which carbon tetrachloride is utilized as a detergent, because it prevents free communication with the atmosphere until abnormal pressure or vacuum conditions exist within the system and also because it enables the solvent to be condensed from the vapors passing from the system and is effective in removing moisture from air flowing into the system.

Since the conduits 33 and 34 have a comparatively small cross sectional area, it will also be apparent that any sudden rise or fall of pressure within the system or apparatus may be immediately relieved by forcing the liquid from the central sealing compartment over the flaring side walls into either the outer or inner compartment.

To those skilled in the art many modifications of and widely different embodiments and applications of my invention will suggest themselves without departing from the spirit and scope thereof. My disclosure and the description are purely illustrative and are not to be in any sense limiting.

What I claim is:

1. A liquid seal vent for vessels or systems in which a volatile solvent is being stored or utilized comprising a receptacle containing a liquid which is connected to the tank or system, said receptacle being divided into a plurality of compartments including a sealing compartment having side walls extending materially above the liquid level, an inner compartment and an outer compartment provided with a vent opening, a baffle extending from the upper portion of the receptacle to a position normally beneath the liquid in the sealing compartment thereby dividing the sealing compartment into two portions, the air space in one of such portions being in communication with the tank or system through the inner compartment and the air space in the other portion being in communication with the atmosphere through the outer compartment and its vent opening, and intercommunicating restricted conduits connecting the three compartments.

2. A liquid seal vent for vessels or systems in

which a volatile solvent is being stored or utilized comprising a receptacle containing a liquid which is connected to the tank or system, said receptacle being divided into a plurality of compartments including a sealing compartment having outwardly flaring side walls extending materially above the liquid level, an inner compartment and an outer compartment provided with a vent opening, a baffle extending from the upper portion of the receptacle to a position normally beneath the liquid in the sealing compartment thereby dividing the sealing compartment into two portions, the air space in one of such portions being in communication with the tank or system through the inner compartment and the air space in the other portion being in communication with the atmosphere through the outer compartment and its vent opening, and intercommunicating restricted conduits connecting the three compartments.

3. A liquid seal vent for vessels or systems in which a volatile solvent is being stored or utilized comprising a receptacle containing a liquid which is connected to the tank or system, said receptacle being divided into a plurality of compartments including a sealing compartment having side walls extending materially above the liquid level, an inner compartment and an outer compartment provided with a vent opening, a baffle extending from the upper portion of the receptacle to a position normally beneath the liquid in the sealing compartment thereby dividing the sealing compartment into two portions, the air space in one of such portions being in communication with the tank or system through the inner compartment and the air space in the other portion being in communication with the atmosphere through the outer compartment and its vent opening, and interconnected restricted conduits having an inlet or discharge opening at the bottom of each compartment.

4. A liquid seal vent for vessels or systems in which a volatile solvent having a greater specific gravity than water is being stored or utilized comprising a receptacle containing water which is connected to the tank or system, said receptacle being divided into a plurality of compartments including a sealing compartment having side walls extending materially above the liquid level, an inner compartment and an outer compartment provided with a vent opening, a baffle extending from the upper portion of the receptacle to a position normally beneath the liquid in the sealing compartment thereby dividing the sealing compartment into two portions, the air space in one of such portions being in communication with the tank or system through the inner compartment and the air space in the other portion being in communication with the atmosphere through the outer compartment and its vent opening, and interconnected restricted conduits having an inlet or discharge opening at the bottom of each compartment in which the liquid solvent accumulates when solvent vapors are vented to the atmosphere, and conduit means connected to the restricted conduits for recovering the solvent.

5. A liquid seal vent for vessels or systems in which a volatile solvent having a greater specific gravity than water is being stored or utilized comprising a receptacle containing water which is connected to the tank or system, said receptacle being divided into a plurality of compartments including a sealing compartment having side walls extending materially above the liquid level,

an inner compartment and an outer compartment provided with a vent opening, a baffle extending from the upper portion of the receptacle to a position normally beneath the liquid in the sealing compartment thereby dividing the sealing compartment into two portions, the air space in one of such portions being in communication with the tank or system through the inner compartment and the air space in the other portion being in communication with the atmosphere through the outer compartment and its vent opening, a restricted conduit located below the

receptacle the inlet of one end of which is at the bottom of the inner compartment and the inlet of the other end being at the bottom of the outer compartment, the middle portion of said conduit being provided with a branch conduit, the inlet or discharge outlet of which is connected to the sealing compartment, and conduit means communicating with the bottom of the restricted conduit whereby condensed solvent vapors may be conducted from the receptacle.

RUSSELL A. HETZER.