March 24, 1936. A. LANSER 2,034,914

DEVICE FOR SEPARATING GAS FROM LIQUID

Filed Dec. 19, 1932

FIG. 1.

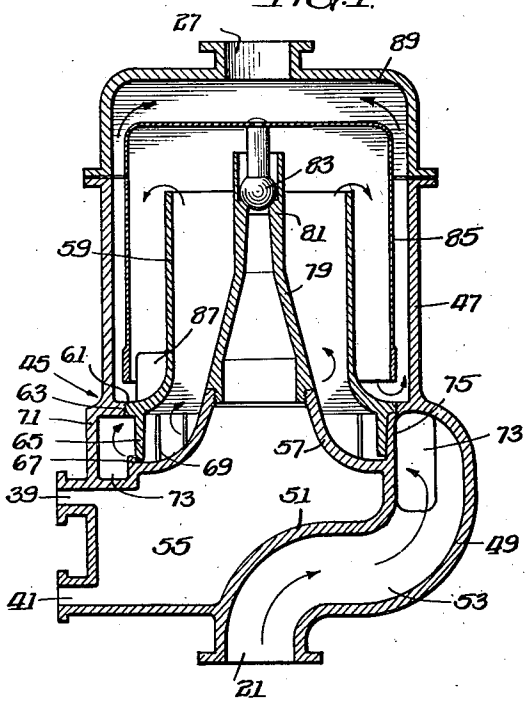


FIG. 3.

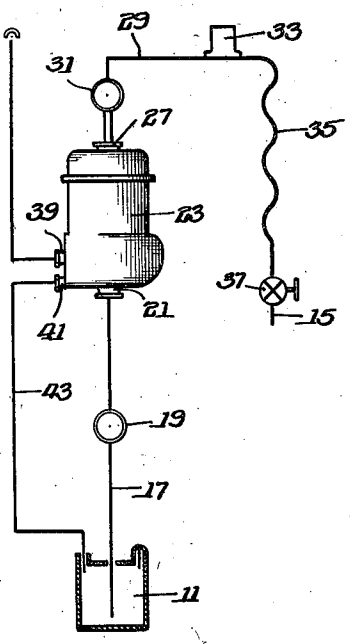
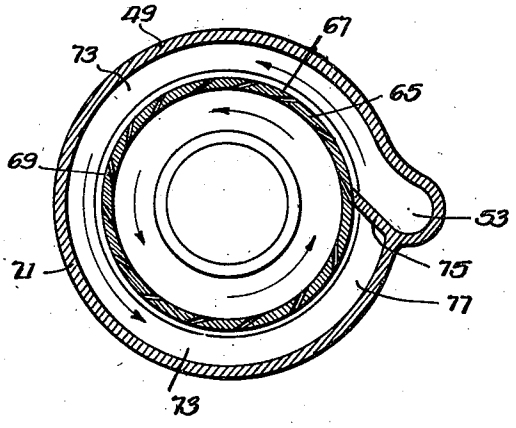


FIG. 2.



Inventor:
Alfred Lanser
By: Cox & Moore attys

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DEVICE FOR SEPARATING GAS FROM LIQUID

Alfred Lanser, Corseaux-Vevey, Switzerland, assignor, by mesne assignments, to S. F. Bowser & Company, Inc., Fort Wayne, Ind.

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12 Claims. (Cl. 183—2.5)

This invention relates in general to a means for and method of separating, from a liquid, the gases which it may contain and has more particular reference to an air separator for installation in a fluid dispensing system, such, for instance, as a gasoline delivery device.

An important object of my invention is to provide an air separator of the character mentioned, in which the liquid, being treated to separate out the contained gases, is given a centrifugal swirling movement without requiring sudden changes in the direction of the movement of the liquid in passing through the separator.

Another important object resides in providing an economical and simple structure, which is compact, efficient in operation, and of durable construction and which can be manufactured at low cost.

Another important object is to provide in a device of the character described, a swirling chamber in which the liquid, being treated, may be subjected to centrifugal action in order to separate the entrained air or other gases effectively.

Another important object is to provide a device constructed to admit the liquid into the swirling chamber under uniform pressure at all points in the circumference of the swirling chamber.

Still another important object is to provide means for removing the separated gases and returning such liquid as may be removed with the gases to the input of the device.

Another important object is to provide a centrifugal air separator of improved construction and efficient operation.

Another important object resides in providing a centrifugal air separator having means to feed the fluid to be treated into the separator tangentially in order to provide a swirling action without using mechanical agitators.

Another important object is to provide a separator having means to seal the outlet through which the separated air is removed, and to open the air outlet only when air actually has been separated from the fluid in order to minimize the possibility of the escape of fluid through the air outlet and to seal the separator, except when it is necessary to remove the separated air.

Numerous other objects and advantages will be apparent from the following description, which, taken in connection with the accompanying drawing, discloses a preferred embodiment of my invention.

Referring to the drawing:

Figure 1 is a vertical section taken through the device embodying my present invention;

Figure 2 is a horizontal section of the device illustrated by Figure 1; and

Figure 3 is a diagrammatic section of a liquid system showing one mode of installing the air separator in such a system.

To illustrate my invention, I have shown on the drawing in Figure 3, a system for delivering fluid from a suitable storage tank 11 and dispensing the same at the remote delivery nozzle 15. The fluid is pumped through a suitable conduit 17, by means of the pump 19 into the inlet 21 of an air separator 23, the details of which are shown in Figures 1 and 2 of the drawing, and which is constructed in accordance with the teachings of my present invention.

The air separator has a liquid outlet 27 connected by a suitable conduit 29, preferably through a metering device 31, and a sight glass indicator 33 to a delivery conduit 35, which is preferably a flexible hose, such as is ordinarily employed in the dispensation of gasoline, the delivery conduit 35 terminating preferably in a valve 37 controlling the discharge nozzle 15.

The air separator 23 also has an outlet 39 for removing the separated air from the device and an outlet 41 connected by means of a suitable conduit 43 to deliver any fluid, which may be removed from the main fluid stream with the separated air, back to that part of the system which is connected to the inlet 21 of the separator.

In the illustrated embodiment, the liquid outlet 41 is shown connected by means of the conduit 43 to the storage tank 11.

The air separator 23 comprises a main casing 45 having an upstanding preferably cylindrical wall 47 formed on a base 49 having a partition 51 dividing the base into an inlet channel 53, into which the inlet 21 opens, and an air outlet or ejector chamber 55, the partition 51 being extended as at 57 to form a substantially conical portion separating the chamber 55 from the space within the upstanding walls 47.

The walls of the casing 45 also are provided with outlet openings for the chamber 55, said openings forming the air and liquid outlets 39 and 41. A substantially cylindrical element 59 is housed within the upstanding wall portion 47, the same having an annular outwardly extending threaded flange portion 61, making threaded engagement with an inwardly extending flange 63 formed in the casing 45 at a point spaced above the partition portion 47. The cylindrical mem-

ber 59 is also formed with a substantially cylindrical flanged portion 65 extending downwardly of the threaded flange 61 and sealingly engaging in an upstanding annular flange 67 formed in the casing 45 at the base of the conical partition portion 57.

The depending flange 65 is provided with slots or openings 69 and, with the walls 71 of the casing 45 immediately below the threaded flange 63, forms an annular channel 73 communicating at one end with the inlet channel 53 and separated at its other end from the inlet channel by means of an upstanding wall portion 75 forming a continuation of the partition 51. The casing 45 is so formed that the cross-sectional area of the channel 73 decreases from the end communicating with the inlet channel 53 toward its end 77 which abuts the upstanding portion 75 of the partition 51. The cylindrical member 59 flares inwardly above the upper end of the slotted flanged portion 65 and the conical partition portion 57 is provided with an extension 79, preferably threaded thereon, forming a nozzle extending upwardly within the upper portions of the cylindrical member 59, said nozzle portion having an upwardly opening end 81 providing a valve seat for receiving a ball valve 83 which is connected to a bell 85 comprising an inverted cup-shaped member to the bottom of which the ball valve 83 is connected and the side walls extend downwardly within the annular space defined by and between the upper portions of the cylindrical member 59 and the cylindrical upwardly extending walls 47 of the main casing.

The cylindrical member 59 also has an outwardly extending flange 87 at its base, which extends substantially to the lower edge of the bell 85.

A cover 89, having an outlet opening forming the fluid outlet 27, is sealingly secured across the upper edge of the casing in order to complete the structure of the air separator. Fluid, to be treated, enters the inlet 21 and travels upwardly through the channel 53 and into the annular channel 73, the decreasing cross-sectional area of which applies a uniform fluid pressure inwardly upon the flanged portion 65. The fluid, under the influence of this uniform pressure passes through all of the slots 69 at a uniform rate and acquires a centrifugal swirling action within the space defined by and between the cylindrical member 59 and the conical portion 57 and its nipple-like extension 79. The swirling fluid travels upwardly along the upwardly extending walls of the cylindrical member 59, the centrifugal action imparted to the swirling fluid assisting in separating the air therefrom at this point. The liquid finally escapes over the upper edge of the member 59 and passes downwardly through the annular space defined by and between the member 59 and the bell 85, the swirling action continuing until the fin 87 is reached. The liquid then passes under the lower edge of the bell and upwardly through the annular space defined by and between the bell and outer wall of the casing to the outlet 27 whence the fluid passes to the delivery line. The air and other gases separated from the fluid collects in the upper portion of the bell 85.

When a sufficient amount of air is thus collected, the bell will be raised slightly by the pressure of the accumulated gases and will lift the valve 83 from its seat 81, whereupon the separated air, carrying with it a small quantity of liquid will pass downwardly through the member 79 into the chamber 55 whence the air will escape through the outlet 39, while the entrained liquid for the most part will gravitate through the outlet 41 and back to the reservoir 11.

It should be noted that the valve 83, due to the weight of the bell will normally remain closed until a sufficient amount of air has collected so that if the liquid being treated contains no separable air the device will be sealed against the escape of fluid through the nipple 79 and the chamber 55. This feature promotes the efficiency of the device by reducing the possibility of fluid loss as by evaporation through the air outlet 39.

The flange or flanges 87, which are or may be arranged in spaced intervals around the member 59, in addition to checking the swirling movement of the fluid after the separable air has been removed, also serve to guide and maintain the bell 85 in a substantially vertical position.

The valve 83 also is of substantially spherical construction so that it will maintain sealing engagement with its seat 81 even though the bell may be tilted slightly from its normal vertical position.

It should likewise be noted that on account of the decreasing cross-sectional area of the channel 73, the liquid is forced through the openings 69 at a uniform rate throughout the entire circumference of the flange 65 and consequently no choking is produced and a greater swirling speed of the liquid within the member 59 is attained.

It is thought that the invention and numerous of its attendant advantages will be understood from the foregoing description and it is obvious that numerous changes may be made in the form, construction, and arrangement of the several parts without departing from the spirit or scope of my invention or sacrificing any of its attendant advantages, the form herein described being a preferred embodiment for the purpose of illustrating my invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

1. A device for separating gases from liquids containing the same comprising means to impart a swirling action to the liquid being treated in order to promote the separation of gases contained in the liquid so swirled, a bell to collect the separated gases during the swirling action and normally closed valve means operable in response to the separation and collection of removable quantities of gases in the bell to permit the removal of such gases therefrom.

2. A device for separating gases from liquids containing the same comprising means forming a separating chamber into which liquid to be treated may be introduced under pressure, a liquid inlet chamber separated from the separating chamber and communicating therewith at intervals circumferentially of the separating chamber, means to introduce liquid under pressure into the inlet chamber, said inlet chamber having a cross-sectional area uniformally decreasing throughout its length from the fluid inlet thereto whereby the fluid, passing from the inlet chamber through the openings into the separating chamber, will do so at a uniform rate at all points in the circumference of the separating chamber.

3. A device for separating gases from liquids containing the same comprising means forming a separating chamber into which liquid to be treated may be introduced under pressure, a liquid inlet chamber separated from the separating chamber and communicating therewith through tangential

openings at intervals circumferentially of the separating chamber whereby fluid passing from the inlet chamber to the separating chamber will be given a swirling action in the separating chamber to promote the separation of air and liquid in the separating chamber, means to introduce fluid under pressure at one end of the inlet chamber, said inlet chamber having a cross-sectional area uniformly decreasing through its length from the inlet end thereof in order to deliver fluid through the tangential opening into the separating chamber at a uniform rate at all liquid inlet points in the circumference of the separating chamber.

4. A device for separating gases from liquids containing the same comprising a casing, partition means in said casing defining an annular separating chamber having tangential inlet openings arranged circumferentially in the lower portions of the separating chamber, an annular inlet chamber communicating with said inlet openings, means to deliver fluid to be treated under pressure to the annular inlet chamber, an air outlet chamber extending centrally of the separating chamber and terminating at its upper end in a valve seat opening at the upper end of the separating chamber, a bell enclosing the upper open end of the separating chamber and having walls spaced from and encircling the walls of the separating chamber to provide a downwardly opening outlet for the liquid discharged at the upper end of the separating chamber, said bell having a valve normally engaging the side of the air outlet whereby liquid to be treated may be introduced into the inlet chamber and enter the separating chamber through the tangential openings therebetween with a swirling action to promote the separation of the air and liquid in the separating chamber, the liquid escaping outwardly at the upper end of the separating chamber and the separated air escaping through the valved opening centrally of the separating chamber.

5. A device, for separating gases from liquids containing the same, comprising means forming an annular inlet chamber, means forming an annular separating chamber adjacent the inlet chamber, and a partition separating said chambers and formed with inclined openings at substantially spaced apart points through which the liquid is delivered into the separating chamber in swirling condition from the inlet chamber in order to promote the separation of gases from the liquid, said inlet chamber having an inlet for the liquid to be treated and having a variable cross-sectional configuration in order to equalize the pressure at all openings through which the liquid is delivered from the inlet chamber to the separating chamber.

6. A device, for separating gases from liquids containing the same, comprising an annular separating chamber having walls defining an upwardly facing gas discharge opening, means to deliver liquid to be treated into the lower portions of said separating chamber and to impart a swirling action to the liquid so delivered in the seperating chamber, bell means to collect gases separated from the liquid during the swirling action at the upper end of the chamber whence said gases may escape through said upwardly facing discharge opening, means forming an annular receiving chamber for gas-free liquid encircling said separating chamber in position to receive gas-free liquid discharged at the upper end of said separating chamber, said bell means enclosing the upper end of the separating chamber and having walls extending in said receiving chamber and disposed in position to control the delivery of the collected gases through said discharge opening.

7. A device, for separating gases from liquids containing the same, comprising an annular separating chamber having walls defining an upwardly facing discharge opening, means to deliver liquid to be treated into the lower portions of said separating chamber and to impart a swirling action to the liquid so delivered in the separating chamber, means forming an annular receiving chamber for gas-free liquid encircling said separating chamber in position to receive gas-free liquid discharged at the upper end of said separating chamber, and a bell enclosing the upper end of the separating chamber and adapted to collect, at the upper end of the chamber, gases separated from the liquid during the swirling action, said bell having walls extending in said receiving chamber with the lower edge of said walls extending below the discharge opening at the upper end of the separating chamber, said receiving chamber having an outlet for gas-free liquid located above the lower edge of said bell.

8. A device, for separating gases from liquids containing the same, comprising means forming a separating chamber and means to impart a swirling action to liquid in said chamber in order to promote the separation of the gases contained in the liquid, means comprising a bell to collect the gases separated from the liquid during the swirling action, and a conduit extending axially of said separating chamber for removing the separated gases, normally closed valve means in the upper end of the conduit, and said bell being operable in response to the collection of a removable quantity of gas to open said valve means and permit discharge of the gases through said axially extending conduit.

9. A device, for separating gases from liquids containing the same, comprising means forming a separating chamber, means to impart a swirling action to liquid in said chamber in order to promote the separation of the gases contained in the liquid, movable means to collect the gases separated from the liquid during the swirling action, a conduit extending axially of said separating chamber for removing the separated gases, and valve means movable with the collector means and normally closing said conduit and operable in response to the accumulation of removable quantities of gases to open said conduit for the removal of said accumulated gases therethrough.

10. A device for separating gases from liquids containing the same comprising a chamber provided with means to impart a swirling action to the liquid being treated in order to promote the separation of gases therein, a bell in the chamber to collect the separated gases during the swirling action and normally closed valve means mounted on the bell and operable in response to the separation and collection of removable quantities of gases within the bell to permit the removal of such gases from the bell.

11. A device for separating gases from liquids containing the same comprising means forming a swirling chamber in which the liquid being treated may be subjected to centrifugal action in order to promote the separation of air or other gases contained therein, an air ejector chamber connected with the swirling chamber, valve means normally sealing the ejector chamber from the swirling chamber, and means to collect the separated gas and movable to shift said valve when a removable quantity of gas has accumulated

whereby to permit the accumulated gas to escape through said valve to the ejector chamber.

12. A device for separating gases from liquids containing the same comprising a swirling chamber, means to impart a swirling action to the liquid being treated in the swirling chamber whereby to permit the separation of gases contained in the swirled liquid, collector means to collect the separated gases in the swirling chamber and movable in response to the collection of gas, a gas outlet, and a valve for said gas outlet mounted on the collector means and operable in response to the collection of removable quantities of gases in said collector means to permit the removal of such gases from the device.

ALFRED LANSER.