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LIQUID DISPENSING APPARATUS

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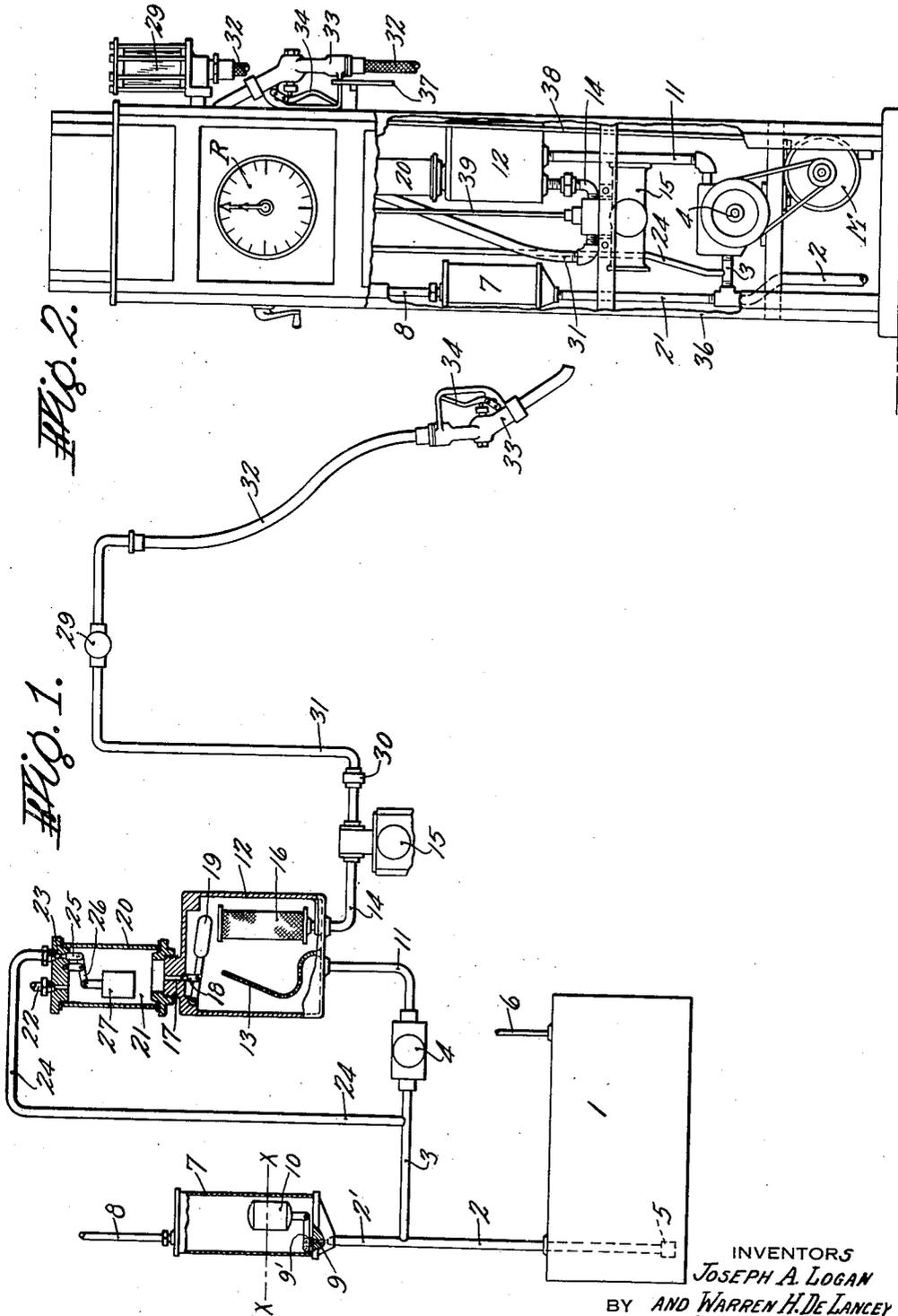


FIG. 2.

FIG. 1.

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LIQUID DISPENSING APPARATUS

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This invention relates to improvements in apparatus for dispensing liquids and, more particularly, gasoline, oils and the like, although the apparatus is capable of other uses.

penditure of less energy than would otherwise be required.

This invention has for its object to provide an improved liquid dispensing apparatus having means on the pressure side of the pump for separating air from the gasoline in the way described in order to avoid undue loss of valuable fuel vapors and having adequate safeguards against operation of the apparatus unless it is in condition to operate correctly.

More particularly, the invention provides means for stopping effective pumping under a condition where the vent valve of the separator, failing to close properly, allows the passage of excessive quantities of gasoline into the air vent passage. In the case of an undue amount of gasoline passing into the vent passage, the pressure flow is stopped before gasoline can escape from such pipe to the atmosphere. Unless and until the trouble is corrected, any subsequent starting up of the pump will result in an early stopping of the pressure flow before serious trouble can occur and the apparatus cannot be usefully operated.

The invention also has for an object to utilize, as a means for stopping effective pumping under the condition described, a valve which responds to the accumulation of an abnormal quantity of liquid in the air vent passage of the separator, to admit air into the suction line of the pump, thereby rendering it ineffective to force liquid to the separator.

A further object of the invention is to provide means responsive to the stopping of the pressure flow, or by the drop in pressure following such stopping of the flow, to drain from the vent passage of the separator that liquid which, accumulating therein, caused the opening of said valve and the stopping of the pressure flow,—thereby enabling the valve to close and recondition the apparatus for useful operation.

These and other objects will best be understood from the following description of the invention taken with the illustrative embodiment of it in the annexed drawing and the scope of the invention will be more particularly pointed out in the appended claims.

In the accompanying drawing:

Fig. 1 is a diagrammatical view of a liquid dispensing apparatus embodying the invention; and

Fig. 2 is an elevational view, with parts in section, showing the apparatus of Fig. 1 embodied in the casing of a conventional pump stand.

Referring to the drawing and first to Fig. 1 thereof, the dispensing apparatus herein shown

5 It is common in apparatus of this kind, to draw up the gasoline from an underground tank by means of a motor driven pump or other suitable means, and force it under pressure through a discharge line, in which is interposed a meter, 10 such discharge line usually terminating with a flexible hose having on its free end a valve-controlled nozzle. It is also customary to interpose in the discharge line between the pump and meter, a separator which functions to separate 15 air from the gasoline and to allow substantially air-free gasoline only to pass to the meter and be measured thereby. A common type of separator, used on the pressure side of the pump, has an air vent which is continuously open but 20 of small cross sectional area as compared to the liquid outlet of the separator. Through this vent there passes air alone, or gasoline alone, or air and gasoline mixed, depending on conditions. This air vent is connected to a trap or secondary 25 separator in which air and liquid are separated by gravity action and from which the air is vented to the atmosphere and the collected liquid is returned to the suction side of the pump. This plan of air separation is open to the objection 30 that gasoline vapors, as well as air, may pass out to the atmosphere by way of the vent pipe of the trap and be lost. It is also open to the objection that the continuous stream which is by-passed through the vent of the separator into and 35 through the trap and back to the suction side of the pump requires the use of additional power which is consumed in useless work and therefore wasted.

This invention is based upon the use of a different plan of air separation calculated to save 40 the gasoline vapor, or some of it, which would be lost with the first-named plan of air separation, and to save the power which would be expended in useless work with said plan in pumping fluid 45 continuously up to and through a continuous vent only to be returned to the pump to be again lifted. With this second-named plan of air separation, the vent of the separator during dispensing operations is opened only when the necessity 50 exists for releasing air from the system and it is normally held closed during pumping by a float, or other suitable means, thereby maintaining the system tight and enabling the desired pressure to be maintained in the discharge line with the ex-

includes a storage tank 1 for the gasoline or other liquid, and a suction line comprising the pipes 2 and 3 extending from the lower part of the tank to the inlet of a power-operated pump 4.

5 The tank 1, usually located underground, is provided with some check valve, usually a foot valve 5, intended to prevent return of liquid from the suction line into the tank. Tank 1 also has a vent pipe 6 which extends upwardly to a sufficient height and provides constant communication between the top of tank 1 and the atmosphere. Connected with the suction line by a pipe 2' is a tank 7 affording within it an expansion chamber. A riser pipe 8, connected to the top of tank 7, provides constant communication between this expansion chamber and the atmosphere. The bottom of tank 7 has a passage 9, connecting the expansion chamber with pipe 2', and this passage is controlled by a valve 9', connected as indicated to a float 10, whereby the valve may be opened in response to a predetermined rise of liquid in the expansion chamber.

10 Connected to the outlet of pump 4 by a pipe 11 is an air separator 12. The pumped liquid enters the lower part of the separator on one side of a baffle 13, which may also be perforated as shown, and travels upwardly over the latter and thence downwardly on the other side of the baffle, leaving through a pipe 14 which connects the lower part of the separator to the meter 15. A cylindrical screen 16 of fine mesh provides the sole communication between the air separator chamber and pipe 14. This screen readily permits the passage of liquid but tends to prevent the passage of bubbles or air or vapor. These bubbles together with such air and vapor as may be liberated from the liquid during its passage around the baffle, rise to the top of the separator to be discharged through a vent passage 17. A valve 18, located within the separator chamber, is provided to close the vent passage 17, after sufficient air has been released and the chamber has become filled with liquid to the desired extent or under the desired pressure. A float 19, or other suitable means, controls this valve.

15 Above the separator 12, and communicating with passage 17, is a tank 20, affording within it a chamber 21 to receive liquid which may from time to time escape through vent passage 17. This chamber is continuously connected to the atmosphere by an upstanding vent pipe 22, which rises to a substantial height as do the other vent pipes 6 and 8. Leading from the upper part of chamber 21 is a passage 23, which is connected by a pipe 24 to the suction side of the pump, as for example to the suction line, as shown, or in any other suitable way. The passage 23 is controlled by a valve 25, connected to one end of a lever 26 which is pivoted at a point intermediate its ends to the upper wall of tank 20. A float 27 is hung from the other end of lever 26. The weight of the long arm of lever 26, together with the weight of the float and its connection to lever 26, overbalance the weight of the short arm of the lever and valve 25, whereby the valve 25 moves to close passage 23 and is normally held in closed position by gravity action. An accumulation of liquid in chamber 21 above a certain level, will raise float 27 and cause the opening of valve 25, whereby air from vent pipe 22 will flow through passage 23 and pipe 24 into the suction line of pump 4, thus rendering the latter ineffective to pump liquid. The suction of the pump, being broken, the pressure flow through the discharge line and separator will cease, just as much as if

the pump 4 stopped. If desired, the pump itself might be stopped but the arrangement, herein disclosed, usually suffices because it stops all useful action of the pump.

20 The dispensing apparatus usually also includes a visible discharge indicator 29 and a valve device 30, interposed in the discharge pipe 31 leading from the meter. Pipe 31 is usually connected to a flexible hose 32 which has on its delivery end a valved nozzle 33. The valve of this nozzle is moved to and held in closed position by a spring and is manually controlled by the hand lever 34. In the nozzle is an outwardly-opening check valve which opens only when the liquid has been placed under a certain pressure and which automatically closes by a spring. An example of one nozzle construction suitable for the purpose is shown in Fig. 4 of De Lancey Patent No. 2,043,035, dated June 2, 1936. The valve device 30 includes a check valve opening outwardly (in the direction of normal flow) under small pressure and closing automatically to prevent return flow. It also involves a reversely-arranged check valve which opens to permit return flow and provide relief for expansion of liquid in the hose, after a substantial pressure, say from 15 to 20 pounds per square inch, has been established. An example of one type of valve device suitable for the purpose, is shown in Fig. 2 of Willson Patent No. 1,964,616, dated June 26, 1934. It is customary also to provide a valve-controlled by-pass from the pressure to the suction side of the pump,—the valve of this by-pass opening at a pressure of from 15 to 20 pounds per square inch. Pump 4 incorporates such a by-pass in its casing in the general manner shown in De Lancey Patent No. 1,870,900, dated Aug. 9, 1932.

25 It is to be noted that the expansion chamber 7 and air separator chamber 12 are located at or about the same level but on opposite sides of the pump and also above the pump. This arrangement enables a levelling off of the liquid contained in said chambers, when pumping stops. At the end of a dispensing operation the separator chamber is full or nearly full of liquid under substantial pressure and so also is the entire discharge line including the pipes 11, 14 and 31 and hose 32. When pumping stops, however, an equalization of pressure between the discharge and suction lines occurs and there is a back flow of liquid through pump 4 until the liquid in both chambers is at the same level. The pump 4, like most pumps used in apparatus of this character, permits when idle a sufficient back flow for this purpose. Liquid cannot flow back into tank 1 if the foot valve 5 is functioning properly, but it can force open valve 9' and rise in tank 7. When the liquid rises high enough in tank 7, the float will maintain valve 9' open. As the liquid falls in chamber 12, float 19 drops and causes valve 18 to open. Both chambers 7 and 12 are then vented to the atmosphere and consequently the liquid in these chambers levels off and atmospheric pressure prevails in the suction line of the pump and in the discharge line up to valve 30. The discharge line beyond valve 30 (the pipe 31 and hose 32) will not drain back except insofar as may be necessary from time to time to relieve excessive pressure.

30 The structure illustrated diagrammatically in Fig. 1 may be incorporated, together with other usual or desirable accessories, into a commercial form of pump stand in any suitable way. One such way is shown in Fig. 2. Here, the pump 4, its driving motor M, the expansion chamber 7,

air separator 12 with the associated piping, are housed in a single casing 36, leaving the indicator 29, hose 32, and nozzle 33 exposed outside the casing. The various vent pipes preferably extend close to the top of the pump stand. This embodiment includes a suitable indicator R, operated from the meter as by a shaft 39 to show in appropriate units the measure of the liquid dispensed. It will be understood that the pump motor M is provided with the usual switch operable from outside the casing 36 by suitable means, indicated in part by the lever 37 and link 38, and that the nozzle 33 during idle periods is hung up on the pump stand, all as is well known in the art.

The operation of the apparatus will next be described. Initially, the apparatus will be primed by operating the pump 4 while the valve of nozzle 33 is held open. The tank 7, being empty, valve 9' will be closed and held closed by its weight and the weight of float 10 and the connections thereto. The operation of pump 4, creating a suction in the suction line and the portion 2', will evacuate all air therefrom and force it into the discharge line and the separator 12. The valve 9' is then held to its seat with the additional pressure due to the suction created. Liquid follows the air and fills the entire suction line and then enters pipe 11 and the air separator 12, forcing the air out through the vent passage 17 until the liquid rises far enough to raise float 19 and close valve 18. After valve 18 closes, a pressure is built up on the liquid in the pipes 11 and 14 and in separator 12 and eventually this pressure becomes sufficient to open valve 30 and allow the air in pipe 31 and hose 32 to be driven out. When liquid begins to pass out of nozzle 33, the valve of the latter is closed. It will also be necessary to initially vent the visible discharge indicator 29 in any suitable or usual way, to free it from all trapped air. The system is then full of liquid. If the pump is then stopped, the liquid in chambers 12 and 7 will level off, as above described, and the pressure in the suction line and in the discharge line up to valve 30 will be equalized and at atmospheric pressure, the valves 9' and 18 being open. This is the normal rest condition of the apparatus.

On starting up the pump for a dispensing operation the pump starts up under a balanced condition on both sides and the starting load is light. Liquid will be initially drawn from chamber 7 through the passage 9 and pipe 2' until the level in this tank lowers sufficiently (to about the level $x-x$) for valve 9' to close. Then all liquid will be drawn up from tank 1 through pipes 2 and 3 in the usual way. The pump forces liquid into separator 12 and drives out the air therein through the then open vent 17 until the liquid rises high enough (preferably close to the top of the chamber 12) to cause valve 18 to close the vent passage. Then the pressure continues to build up in the discharge line until the nozzle valve is opened to dispense the liquid. If the nozzle valve remains closed and the pump continues to operate after having built up the desired pressure in the discharge line, the relief valve in the by-pass of the pump will open and avoid excessive pressure in the discharge line.

The operation of separating the air from the gasoline is well understood by those skilled in the art. The general flow of liquid up on one side of the baffle and then over the top thereof enables some of the air to be freed from the liquid and rise to the top of chamber 12 while the liquid flows down on the other side of the baffle to flow

through screen 16 into the pipe 14. This screen tends to restrain the passage of air bubbles and these rise to the top of chamber 12. The air accumulates at the top of the separator and becomes compressed by the liquid. When enough air collects to cause a lowering of the liquid level far enough to depress float 19, the valve 18 will open and the accumulated air, or some of it, being under pressure will pop out of the vent passage 17 into chamber 21 and pass out to the atmosphere by way of pipe 22. Immediately thereafter, the liquid level quickly rises and float 19 moves valve 18 to close passage 17 before liquid can reach this passage. When the apparatus is functioning properly, liquid should not enter the vent passage 17 at all.

It will be appreciated that a leak through the vent valve gives rise to a dangerous condition. Since the liquid in the separator is under substantial pressure, a small leak at the vent will result in squirting a stream of gasoline into the vent passage. This passage is extended high up in the pump stand and may be enlarged, as by the chamber 21, to allow for the accumulation of liquid during a dispensing operation with the idea of retaining as much liquid as may leak into the vent passage during a normal dispensing operation. At the end of each dispensing operation, the vent passage is, of course, entirely drained.

While the apparatus may be designed to collect and retain all gasoline that may leak into the vent passage during a dispensing operation, there are variable factors such as the size of the leak and the length of the dispensing operation, which at best make such a provision undesirable, as being the best and most practical solution of the problem. Hence, this invention provides means whereby on the occurrence of any bad leak from the separator to the vent passage, the pressure flow will be stopped long before gasoline can be squirted out of the vent passage into the air. If the leak is so small as not to give rise to a dangerous condition, then there will not be enough gasoline accumulated in chamber 21 to raise float 27 and the pump may continue to operate,—the leaking liquid being drained back into the separator on cessation of pumping. The float 27, however, measures the leak and if it is too large in size or if although small in size, the dispensing operation is continued too long, then there results an accumulation of liquid in chamber 21 sufficient to raise float 27 and open valve 25 to vent the suction line of the pump, rendering it ineffective to force more liquid into the separator. If the nozzle 33 is kept open, liquid will continue to flow until the pressure drops to a point too low to force it past the valve 30 and the check valve in nozzle 33. The flow from the nozzle will very soon cease and the operator will be unable to operate the apparatus for any useful purpose. The operator will then stop the motor M of pump 4.

The arrangement for levelling off the liquid in chambers 7 and 12 has an additional function here in connection with the means chosen for stopping effective operation of pump 4. That is, it is essential to drain the float chamber 21 in order to recondition the pump for effective operation. The suction line of the pump must be made tight again by closing valve 25 and to do this the float 27 must be permitted to fall. Hence, the expansion chamber 7 is the enabling means for effecting the closing of valve 25.

With this arrangement, it is, of course, possible to start the pump 4 without correcting the trouble which caused the dangerous leak of liquid. How-

ever, the pump cannot be operated long or usefully because the faulty condition will again result in liquid rising in chamber 21 to operate the float 27 and open valve 25 to admit air into the suction line of the pump. The operator, if he resorts to this practice, will soon tire of the repeated fruitless operations and then take steps to correct the faulty condition and this is just what is desired. The prompt correction of any leak which can by any possibility give rise to a fire hazard is much to be preferred than to allow continued operation of apparatus which is not in proper condition.

The invention makes it not only practical but thoroughly safe to use a separator of the class disclosed on the pressure side of the pump without the usual secondary separator or trap, heretofore provided, to guard against the possibility of gasoline escaping through the vent into the atmosphere. It enables one to use the sort of separator, herein disclosed, wherein there is less loss of gasoline vapor because of the pressure condition maintained within the separator 12. Gasoline vapors, if kept under pressure and in contact with liquid gasoline, tend to condense and become part of the body of liquid gasoline and thus there is less likelihood of any substantial loss of fuel vapor than in the former conventional air separating arrangement, wherein a continuously open vent is provided which allows gasoline vapors as well as air to escape. Also, the work used in pumping a small stream of gasoline through the continuously open vent of such former arrangement only to be returned to the pump to be lifted again, is saved.

What we claim is:

1. In a liquid dispensing apparatus, a delivery conduit, an air separator interposed in said conduit, said separator having a vent opening and an automatic valve for closing said opening whenever the separator is sufficiently filled with liquid and for opening it at other times to release air, a vent conduit connected to said opening and communicating with the atmosphere, means for producing a pressure flow of liquid through said conduit and interposed separator, and means responsive to the presence of a predetermined quantity of liquid in said vent conduit for stopping said pressure flow.

2. In a liquid dispensing apparatus, a delivery conduit, an air separator interposed in said conduit, said separator having a vent opening and an automatic valve for closing said opening whenever the separator is sufficiently filled with liquid and for opening it at other times to release air, a vent conduit connected to said opening and communicating with the atmosphere, means for producing a pressure flow of liquid through said conduit and interposed separator, means responsive to the presence of a predetermined quantity of liquid in said vent conduit for stopping said pressure flow, and means operable when the pressure flow ceases to recondition the second-named means for a subsequent operation.

3. In a liquid dispensing apparatus, a delivery conduit, an air separator interposed in said conduit, said separator having a vent opening and an automatic valve for closing said opening whenever the separator is sufficiently filled with liquid and for opening it at other times to release air, a vent conduit connected to said opening and communicating with the atmosphere, means for producing a pressure flow of liquid through said conduit and interposed separator, means

responsive to the presence of a predetermined quantity of liquid in said vent conduit for stopping said pressure flow, and means operable when the pressure flow ceases to drain said vent conduit of liquid and recondition the second-named means for a subsequent operation.

4. In a liquid dispensing apparatus, a delivery conduit, an air separator interposed in said conduit, said separator having a vent opening and an automatic valve for closing said opening whenever the separator is sufficiently filled with liquid and for opening it at other times to release air, a vent conduit connected to said opening and communicating with the atmosphere, means for producing a pressure flow of liquid through said conduit and interposed separator thereby causing said valve to close the vent opening, and safety means effective in the event of a dangerous leak of liquid past said valve to stop said pressure flow.

5. In a liquid dispensing apparatus, a delivery conduit, an air separator interposed in said conduit, said separator having a vent opening and an automatic valve for closing said opening whenever the separator is sufficiently filled with liquid and for opening it at other times to release air, a vent conduit connected to said opening and communicating with the atmosphere, said vent conduit being so located and constructed as to be capable of complete drainage into the separator through the vent opening thereof, means for producing a pressure flow of liquid through said conduit and interposed separator thereby causing said valve to close the vent opening, safety means effective in the event of a dangerous leak of liquid past said valve to stop said pressure flow, and means operable when the pressure flow ceases for producing a back flow of liquid from the separator into the delivery conduit, thereby enabling any liquid in said vent passage to drain back into the separator.

6. In a liquid dispensing apparatus, a delivery conduit, an air separator interposed in said conduit, said separator having a vent opening and an automatic valve for closing said opening whenever the separator is sufficiently filled with liquid and for opening it at other times to release air, a vent conduit connected to said opening and communicating with the atmosphere, means for producing a pressure flow of liquid through said conduit and interposed separator, a float in said vent conduit, and means operable by rising movement of the float to stop said pressure flow.

7. In a liquid dispensing apparatus, a delivery conduit, an air separator interposed in said conduit, said separator having a vent opening and an automatic valve for closing said opening whenever the separator is sufficiently filled with liquid and for opening it at other times to release air, a vent conduit connected to said opening and communicating with the atmosphere, means for producing a pressure flow of liquid through said conduit and interposed separator, a float in said vent conduit, means operable by rising movement of said float to stop said pressure flow, and means for automatically draining said conduit after the pressure flow has stopped to allow said float to fall and resume its original position.

8. In a liquid dispensing apparatus, a pump, a suction line and a discharge line therefor, an air separator interposed in the discharge line and having a vent and an automatic valve for closing said vent whenever the separator is sufficiently filled with liquid and for opening it at other

times, said suction line having a normally-closed passage for connecting it to the atmosphere, and safety means effective on liquid leakage of said valve to open said passage and render said pump ineffective to force liquid into said discharge line.

9. In a liquid dispensing apparatus, a pump, a suction line and a discharge line therefor, an air separator interposed in the discharge line and having a vent and an automatic valve for closing said vent whenever the separator is sufficiently filled with liquid and for opening it at other times, a vent conduit connected to said opening and communicating with the atmosphere, said suction line having a normally-closed passage for connecting it to the atmosphere, and means responsive to a predetermined accumulation of liquid in said vent conduit to open said passage and vent the suction line of the pump.

10. In a liquid dispensing apparatus, a pump, a suction line and a discharge line therefor, an air separator interposed in the discharge line and having a vent and an automatic valve for closing said vent whenever the separator is sufficiently filled with liquid and for opening it at other times, a vent conduit connected to said opening and communicating with the atmosphere, said suction line having a normally-closed passage for connecting it to the atmosphere, means responsive to a predetermined accumulation of liquid in said vent conduit to open said passage and vent the suction line of the pump, and means operable when the pump is stopped for draining the liquid from said vent conduit sufficiently to enable said last-named means to close said passage.

11. In a liquid dispensing apparatus, a pump which permits back flow when idle, and having a suction line and a discharge line in the form of legs extending above the pump; each leg having a substantial storage capacity with a vent to the atmosphere at the top, the whole discharge leg located so that it is capable of draining toward the pump, a float controlled valve in each leg, one to close the vent on the discharge leg by rising liquid level in that leg, and one to open the storage space in the suction leg on rising liquid and to close it on falling liquid in that leg, the former of the two valves being located at the top and the latter at the bottom of the storage spaces in said legs, whereby when the pump stops the liquid level levels off in the two legs for substantial liquid storage on both sides of the pump at the same level, a suction line connected to and extending below the leg on the suction side of the pump to withdraw liquid from a low level storage tank having means to prevent a drain-back to the latter tank, and means operable in the event of improper closure of the valve in said discharge leg to render said pump ineffective.

12. In a liquid dispensing apparatus, a pump which permits back flow when idle and having a suction line and a discharge line in the form of legs extending above the pump, each leg having a substantial storage capacity with a vent to the atmosphere at the top, the whole discharge leg located so that it is capable of draining toward the pump, a float controlled valve in each leg, one to close the vent on the discharge leg by rising liquid level in that leg, and one to open the storage space in the suction leg on rising liquid and to close it on falling liquid in that

leg, the former of the two valves being located at the top and the latter at the bottom of the storage spaces in said legs, whereby when the pump stops the liquid level levels off in the two legs for substantial liquid storage on both sides of the pump at the same level, a suction line connected to and extending below the leg on the suction side of the pump to withdraw liquid from a low level storage tank having means to prevent a drain-back to the latter tank, and means responsive to the passage of a predetermined quantity of liquid into the vent on the discharge line to render operation of the pump ineffective, the levelling off of liquid in said legs when the vent valve in the discharge leg opens enabling the liquid to drain out of the vent passage into the discharge leg, thereby reconditioning said last-named means and the pump for subsequent operation.

13. In a liquid dispensing apparatus, a pump having a suction pipe for drawing liquid from below the pump level, a delivery conduit, a normally closed valve controlling the outlet of said conduit, an expansion chamber connected at the bottom to the suction side of the pump, a separator chamber connected at the bottom to the discharge side of the pump, both of said chambers having storage capacity located at the same level which is at or above the pump level, a vent to the atmosphere from the top of each chamber, a float-operated valve to control the inlet at the bottom of the expansion chamber and operable to open under fluid pressing to get in said chamber and to close when the chamber is nearly empty of liquid to prevent air passing into said pipe, an automatic valve to close the vent at the top of said separator chamber and operable to open said vent when the pump is idle, said pump being of a kind to permit back pressure flow through it when idle, and means responsive to the presence of a predetermined quantity of liquid in the vent of the separator chamber to stop effective operation of said pump.

14. In a liquid dispensing apparatus, a pump having a suction pipe for drawing liquid from below the pump level, a delivery conduit, a normally closed valve controlling the outlet of said conduit, an expansion chamber connected at the bottom to the suction side of the pump, a separator chamber connected at the bottom to the discharge side of the pump, both of said chambers having storage capacity located at the same level which is at or above the pump level, a vent to the atmosphere from the top of each chamber, a float-operated valve to control the inlet at the bottom of the expansion chamber and operable to open under fluid pressing to get in said chamber and to close when the chamber is nearly empty of liquid to prevent air passing into said pipe, an automatic valve to close the vent at the top of said separator chamber and operable to open said vent when the pump is idle, a float in the vent passage of the second chamber, and means operable on rising of the float to stop effective operation of said pump, the levelling off of liquid when the pump is idle effecting drainage of the last-named vent passage and falling of the last-named float, said last-named means operable on falling of the last-named float to recondition the pump for effective operation.

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