July 11, 1944. P. E. WAUGH 2,353,206

LIQUID DISPENSING DEVICE

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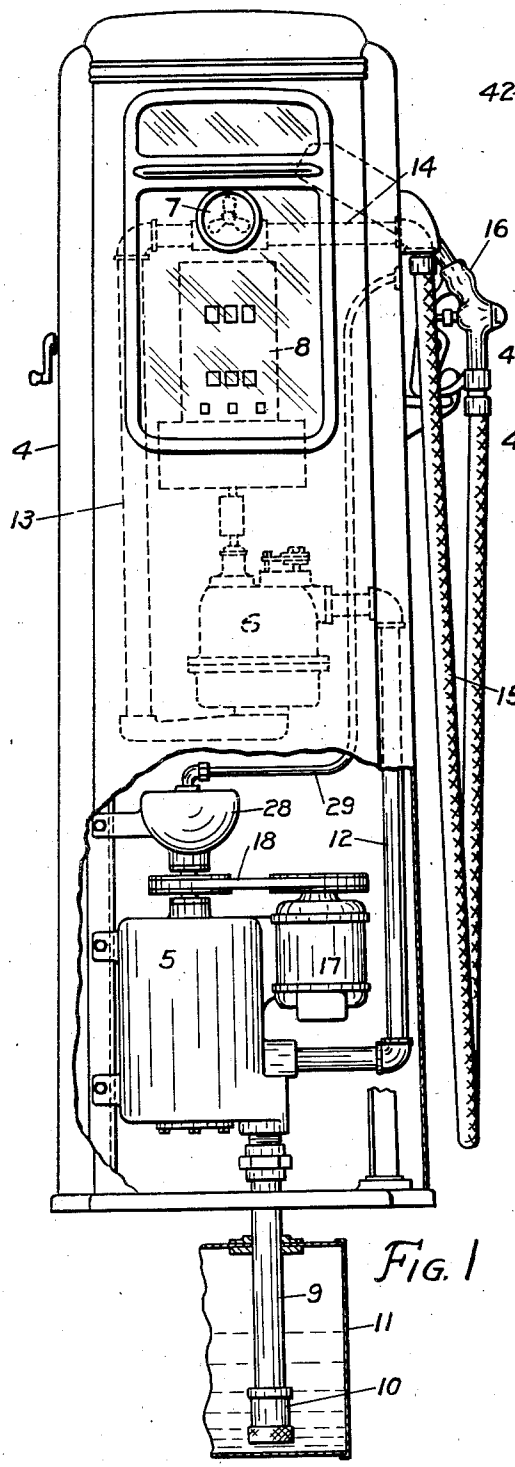


FIG. 1

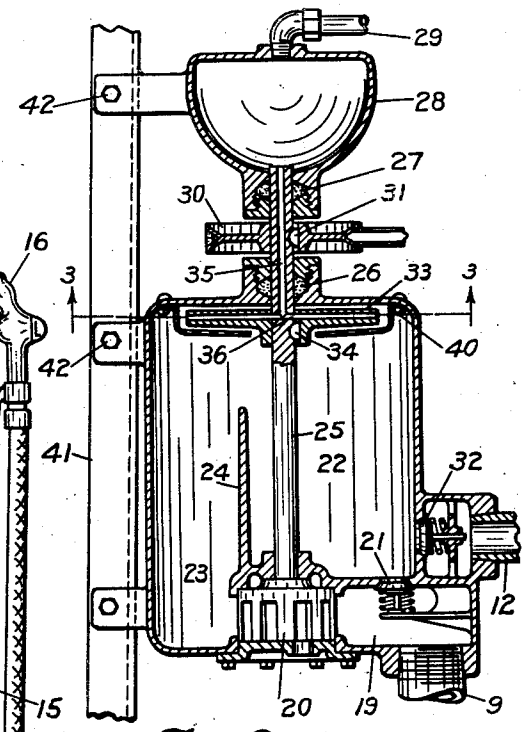


FIG. 2

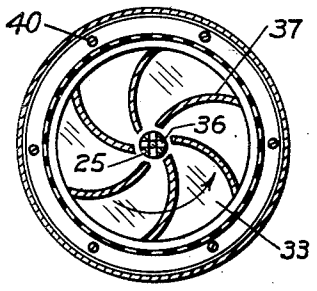


FIG. 3

INVENTOR.
Paul E. Waugh
BY: Cox & Moore
ATTORNEYS.

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LIQUID DISPENSING DEVICE

Paul E. Waugh, Fort Wayne, Ind., assignor to Tokheim Oil Tank and Pump Company, Fort Wayne, Ind., a corporation of Indiana

Application July 1, 1939, Serial No. 282,543

20 Claims. (Cl. 222—72)

This invention relates to a process and apparatus for separating air and/or gases from liquid being dispensed and, more particularly, to a service station pump for dispensing gasoline and other motor fuel wherein means is provided during the dispensing operation for continuously separating air and gases from the gasoline or other liquid.

Among the objects of the present invention are to provide a process and apparatus adapted for use in connection with the dispensing line of a liquid dispenser, including service station pumps adapted to dispense gasoline and other motor fuel, wherein the air and gas are separated from the liquid as the latter is being dispensed and are ejected through a constantly open orifice to atmosphere and wherein the air-free liquid is prevented from escaping or passing through said constantly open vent; to provide an air separating means and method for liquid dispensing wherein the separating means is provided with a constantly open orifice wherein means is provided for tending to eject or cause a mixture of fluids to pass therethrough and wherein additional means is provided for preventing one type of fluid from passing through the separator orifice while permitting another type of fluid to pass freely therethrough; to provide an air separator for a liquid dispenser such as a service station pump wherein gasoline flowing through the dispensing line, passes into a separating chamber to free the air and gas therefrom, wherein the air separation chamber has a constantly open orifice to atmosphere and wherein means is provided for creating a predetermined pressure in said separation chamber tending to force air and liquid through the constantly open orifice and wherein additional means is provided for centrifuging the liquid within said chamber in such a manner as to cause it to move away from the constantly open aperture whereby to preclude the liquid passing therethrough while permitting the free passage of air therethrough; to provide an air separator for a service station pump having in combination with the usual fluid force pump adapted to force liquid into a separation chamber, which is provided with a spring loaded valve adapted to open under a predetermined pressure and which separation chamber is provided with a constantly open orifice and wherein means is provided associated with said orifice comprising a second pump of greater efficiency with respect to liquid than the main dispensing pump when taken with its by-pass valve but of lower efficiency with respect to gas or air, the pressure within the air separator chamber being determined so that the second pump will permit the passage of air through the constantly open port but will prevent the passage of liquid therethrough; to provide a service station pump which combines a liquid forcing pump for forcing liquid through the dispensing line with a by-pass valve together with a spring loaded delivery valve associated with an air separation chamber connected with the discharge side of said pump and with the by-pass valve and spring loaded delivery valve wherein the air separation chamber has a constantly open vent to atmosphere for the discharge of separated air and gas to atmosphere and wherein there is associated with this constantly open vent a second pumping means having a greater efficiency for liquid than the first pump when taken with said valves but of lower efficiency with respect to air or gas than the pressure within the air separator chamber as determined by the delivery or relief valve whereby to cause a sufficient counter-active pressure to be exerted on the liquid in the separation chamber which tends to escape through the constantly open port so as to prevent the same from escaping while at the same time permitting the passage of air therethrough; to provide an air separator disposed in the dispensing line of a service station pump in advance of the meter and through which liquid is adapted to flow during a dispensing operation, said air separator chamber having means for separating the air and gas from the gasoline as it flows therethrough and having means freely to eject the air or separated gas therefrom while precluding the escape of liquid therefrom during dispensing without the use of liquid return lines from the air separator back to the system; to provide such type of air separator having, in combination with the air separator chamber and the constantly open port to atmosphere, an expansion chamber adapted to permit the liquid in the air separator chamber and in the system to expand during hot weather while idle and at the same time having means for causing said expanded liquid automatically to be drawn back into the separation chamber and passed through the liquid dispensing line without permitting said liquid to escape to atmosphere along with the ejection of separated air and/or gas to atmosphere; to provide an air separator disposed in the dispensing line having a separation chamber provided with a constantly open orifice and including associated

means during dispensing for maintaining the liquid in the separation chamber under pressure, while permitting air and gas to flow freely through a constantly open aperture while preventing liquid from discharging through said aperture and at the same time preventing access of outside air to the liquid in the separation chamber whereby to cut down gasoline evaporation to the minimum; to provide an air separator disposed in the dispensing line of a service station pump having a constantly open orifice through which air and gases are free to be discharged together with means for maintaining the separation chamber under pressure during dispensing whereby to preclude evaporation of the more or less volatile liquid being dispensed; to provide an air separator for a gasoline pump, constructed and arranged to separate and discharge air and gas while preventing evaporation of gasoline through the air discharging orifice; to provide these and other objects of invention as will be apparent from a perusal of the following specification when taken in connection with the drawing, wherein:

Figure 1 shows the conventional type of gasoline pump, parts of the housing being broken away to show the location of the instant invention.

Figure 2 is a cross sectional view of the invention.

Figure 3 is a section taken on line 3—3 of Fig. 2 showing the passages in the air separating device.

Referring now more particularly to the drawing:

The invention is shown in connection with a dispensing device of the service station pump type, it being understood that in so far as the broad aspects of the invention are concerned it may be utilized in any type of dispensing device in which it is desirable to separate air or other gases and to discharge them free of the dispensed or flowing liquid. Inasmuch as the invention is adaptable to the separation of air and gas from volatile motor fuel, I have disclosed the invention in connection with a service station pump of the conventional type.

The pump is shown as having a housing **4** which encloses the various elements making up a service station pump assembly including the air separator **5**, the meter **6** and the sight gauge **7**. The meter, which may be of any conventional type, is shown as driving the conventional type of computer **8**. The suction pipe **9** forming a portion of the dispensing line connects the pump proper of the separator **5** to a foot valve **10** located in the bottom of the reservoir or tank **11** containing the gasoline or other liquid to be dispensed. A pipe **12** likewise forming a part of the dispensing line directs the liquid from the air separator chamber to the meter **6**. From the meter **6** the liquid or gasoline flows by the pipe **13** through the dispensing line **14** to the conventional type of hose **15** which likewise forms a part of the dispensing line and which hose is shown as provided at its outer end with a nozzle **16** having the usual type of manual control valve. An electric motor **17** is shown mounted on the side of the air separating device. This motor not only drives the pump but is also utilized to drive an actuatable element of the air separator by means of a belt **18**.

Referring particularly to Fig. 2, the suction pipe of the dispensing line is shown connected to a suction port **19** of the pump **20**. This pump preferably may be any type of positive displacement pump or may be a centrifugal pump. In the present embodiment the pump is provided with a by-pass valve **21** which is well known in the art and is shown enclosing a passage between the chamber **22** and a suction chamber **19**. In the present instance, the air separating device and the pump mechanism are included in a single unit or assembly but may be otherwise formed. The pump **20** discharges into a portion **23** of the chamber **22** which is formed by a baffle or separating partition or plate **24**. The displacement pump **20** is shown securely attached to the lower end of the drive shaft **25** which shaft extends upwardly through the packing gland **26** of the separation chamber **22** and continues upwardly through another packing gland **27** of the expansion chamber **28**. The expansion chamber **28** is vented to atmosphere by a small or restricted tube **29** which is constantly open to atmosphere through the side of the housing **4**. Between the two stuffing boxes **26** and **27** means is provided in the shape of a pulley **30** securely attached by means of a key **31** to the shaft **25** for rotating the pump shaft. Near the bottom of the separation chamber **22** a liquid outlet or outer flow port is provided which is normally closed by means of a delivery valve **32**. The valve **32** is provided with a spring of sufficient strength to cause a definite, substantial pressure to exist in the separation chamber **22** before any liquid can pass through the outlet port **12** of the dispensing line.

Means is provided for connecting the separation chamber **22** with the expansion chamber **28** by means of a constantly open, relatively large orifice or channel through which the separated air, vapors and other gases may freely pass during the dispensing operation or prior thereto and through which the liquid in the separation chamber and in flow line may pass or expand during hot weather while the pump is standing idle. In addition, means is provided in association with the chamber **22** and with the constantly open orifice connecting the chamber **22** with the expansion chamber **28** which, while permitting the free passage of air and gas therethrough, serves to prevent during dispensing operation the passage of liquid therethrough and into the expansion chamber **28**. In short, means is provided for precluding the passage of liquid therethrough and this is accomplished by exerting a pumping action tending to cause any liquid which might otherwise be forced through this constantly open passage due to the pressure in the dispensing line, to flow downwardly or backwardly into the chamber **22**. In the type of means which I have utilized for exemplification of such a means, I provide in the chamber **22** a centrifugal impeller **33** securely attached by means of a key **34** to a driving shaft **25**. This driving shaft has a centrally located bore **35** which extends from the upper end downwardly through the center of the shaft to a point level with the impeller or slightly therebelow. This impeller **33** is of the closed type and in the shaft several holes **36** are drilled to allow communication between the bore **35** and the inner space of the impeller **33**. The impeller is better shown in Fig. 3. It has a suitable number of vanes **37** shaped according to the art of centrifugal pumps and arranged in a direction in relation to the rotation of the impeller to cause liquid or gasoline to be thrown outwardly from the impeller. As shown in Fig. 3, the arrow indicates a counterclockwise rotation and the

vanes 37 are shaped to suit such rotation. About the impeller 33 a perforated cup-shaped baffle is attached to the separator body by means of screws 40, which baffle prevents agitation of the entire vessel of liquid but which allows free flow or communication between the impeller chamber and the separation chamber.

The entire air separating device, that is, the pump, air separator and the expansion chamber, is rigidly attached to the pump frame member 41 by means of cap screws 42.

Operation

In the operation of the present device, when the motor switch which is generally associated with the nozzle support as shown in the upper right hand portion of Fig. 1 is closed it causes the motor 17 to start which, in turn, rotates the pump shaft 25 by means of a belt 18. This will immediately operate the displacement pump 20, to suck gasoline from the underground reservoir 11 and force it through the dispensing line 12. The gasoline is discharged from the pump 20 into the separation chamber 22 through the port 23. The valves 21 and 32 in the air separator associated with the pump 20 are designed to open at different pressures. Delivery valve 32 has a spring which causes it to open at a pressure of approximately 20 pounds, while the valve 21, which is the pump by-pass valve, is adapted to open at a pressure of approximately 22 pounds. When the valve in the hose nozzle 16 is closed or when the delivery valve, if one is used, is closed, then no liquid will pass valve 32 and pressure will be created in the chamber 22 until it reaches 22 pounds which causes the by-pass valve 21 to open. The opening of this valve allows the liquid to by-pass through the pump as is well known in the art. When the shaft 25 is rotated, both the pump 20 and the centrifugal impeller 33 are rotated together. The impeller 33 is so designed as to attempt, if liquid were present in the chamber 28, to draw the same into the separation chamber 22. However, in normal operation no liquid will be present in the expansion chamber 28. Because of the fact that the centrifugal impeller cannot build up sufficient air pressure, there is no forced delivery of air from the chamber 28 into the separation chamber 22. However, if, from a leaky suction line or from the vapor and gasoline forming from the pumping of volatile liquid, if entrained air or gas should be drawn in with the gasoline through the pump 20 into the chamber 22, this air will rise to the top of the chamber because of the difference of specific gravities. The impeller 33 is made of suitable diameter as compared to its speed of rotation so as to be capable of producing a higher liquid pressure than the valve 21 will allow. Due to this fact, the pressure formed and governed by the pump 20 and the valve 21 will never equal the possible liquid efficiency of the impeller 33. Therefore, no liquid will ever pass or be forced through the impeller passages 35 and 36 into the expansion chamber 28, during operation of the device.

Hence it will be seen that by reason of the constantly open vent and the associated impeller mechanism any air which may be delivered to the separation chamber 22 will be vented freely to atmosphere, but at the same time no liquid will be allowed to pass due to the centrifugal action of the impeller vanes. When the attendant opens the nozzle valve 16 the gasoline will pass through the valve 32, flow through the flow line 12 to the meter 6 where it is measured and recorded by the computer 8. The measured liquid leaves the meter 6 by the line 13 and flows through the sight gauge 7 and the pipe 14 to the hose 15 and to the nozzle 16.

Under some conditions during idleness of the pump the liquid may expand in the dispensing line into the expansion chamber 28. Such occasion would be when the dispensing operation has drawn cold contracted liquid from the underground tank into the dispensing system so that on a warm day when the liquid is exposed to atmospheric temperature it will then expand and the pump having been idle the increased volume of liquid will be forced through the impeller 33 to the passages 35 and 36 into the expansion chamber 28. The expansion chamber may be of any suitable size to accommodate the maximum expansion in any climate. In the dispensing operation, upon opening the nozzle valve the liquid will flow from the separation chamber 22 and, because of the greater liquid efficiency of the centrifugal impeller 33, the expanded liquid will be drawn from the expansion chamber 28 through the passages 35 and 36 into the chamber 22 so that chamber 28 will be drained before the pump 20 can deliver any more gasoline to the discharge line. As soon as all of the surplus liquid is delivered by the impeller 33 and only air is present, no further delivery of air or liquid will occur by this impeller.

From the foregoing it will be seen that the present air separator requires but few parts, requires no introduction of a return from the expansion chamber to the suction side of the pump or to the underground tank and requires no floats, check valves or other devices as now used in the art. The invention is not restricted to the type of pump 20 shown as this pump could equally well be a centrifugal pump or it could be any type of vane or rotary pump. If a pump should be employed for the pump 20 which, because of mechanical advantages, would be run at a slower rate of speed than suitable for the impeller 33, reduction gearing of any type could be introduced between the two pumps to allow the impeller 33 to travel at a higher speed than the delivery pump 20. The pumps could be driven by two separate motors or by two separate shafts having different sized gearing from the same motor. However, the illustrated form is the preferred one where only one belt is required and the impeller 33 could be made of suitable design to compensate for its slower speed of rotation.

It will thus be seen that when the main pump is operating to create a pressure in the separation chamber, the by-pass valve and the action of the pump determines the maximum pressure therein which tends to force the liquid and the air out through the opening. It will also be appreciated that the action of the second pump, in the present instance, the centrifugal impeller, is such that this latter pump is more efficient with respect to liquid than the main dispensing pump when taken with its by-pass valve but has a lower efficiency with respect to gas or air than the pressure within the air separator chamber as determined by the relief valve by which condition one type of fluid, to-wit, air and/or gas is permitted to pass freely to atmosphere, and another type of liquid, to-wit, gasoline or motor fuel being dispensed, is prevented from being passed through the constantly open vent to atmosphere. Thus it will be seen that my present

invention is admirable in all respects as an air separator in a liquid dispensing device, particularly for a gasoline service station pump, since it eliminates the necessity of providing a liquid return line from the air separator back to the suction side of the pump or back to the underground tank or back to any part of the system. It will also be seen that by placing the centrifugal impeller directly within the separation chamber, the action is to centrifuge the liquid away from the constantly open atmosphere with a greater force than the pressure within the separation chamber, tending to force this liquid outwardly through the constantly open vent whereby the lower end of the constantly open vent is connected to the separated air and/or gas within the upper portion of the separation chamber which may pass freely therethrough to atmosphere without danger of any liquid escaping. It will also be appreciated that by reason of the expansion chamber at the upper end of the constantly open vent, when the pump is idle and if, for any reason, an expansion of the liquid in the dispensing line takes place, this expansion will automatically be taken care of by the expansion chamber and upon subsequent resumption of the dispensing operation the first action of the pumping means in the separation chamber is to suck this expansion liquid from the expansion chamber downwardly into the separation chamber and cause it to be passed through the dispensing line while at the same time permitting the free passage of air and/or gas through the constantly open vent.

It will also be appreciated that by reason of my construction the air separator keeps the liquid in the separation chamber **22** under pressure as distinguished from the conventional type of air separator heretofore used, which allows liquid together with some air to pass from the compression or separation chamber to a float or atmospheric pressure chamber. In prior devices, in handling a volatile fluid such as gasoline the gasoline in this float or atmospheric pressure chamber is thus more readily exposed to atmospheric pressure and consequently a quicker evaporation occurs than if the liquid be confined under pressure as it is in chamber **22** of the present invention. My present type of air separator tends to prevent evaporation by maintaining chamber **22** under pressure and in addition, due to this pressure, atmospheric air is precluded from entering the chamber during dispensing. At the same time, liquid is precluded from being discharged through the opening **35** and air and/or gas may freely pass therethrough.

With regard to the orifice or passage **35**, this passage may be of any size. As a matter of fact, the larger, the better up to a certain point, for it is the centrifugal action of the impeller that performs the function of preventing liquid from discharging therethrough, while permitting the air freely to escape therethrough, and therefore the larger the passage through the shaft, the more efficiently the device will operate to drain the expansion chamber **28** of liquid due to expansion during idleness.

What I claim is:

1. In a dispensing line of a liquid dispenser, means connected in series in said line forming a liquid and gas separation chamber, means for pumping liquid to be dispensed through said line and into said chamber, said separation chamber having a constantly open orifice to atmosphere, whereby the pressure of said pumping means tends to force liquid being dispensed and gas therein through said orifice, centrifugal pumping means disposed in said separation chamber and associated with said orifice and adapted to centrifuge the liquid tending to pass outwardly through said orifice, away from said orifice while permitting the free passage of gas therethrough.

2. In combination with the dispensing line of a service station pump, a first pumping means for creating a flow through said dispensing line, a gas separator chamber connected in series in said line on the discharge side of said pump, a spring loaded by-pass for said pump, a constantly open vent for said separation chamber, and additional pumping means associated with said constantly open vent and exerting a force on the liquid in said chamber in excess of the pressure of said spring of the by-pass preventing passage of liquid in said chamber through said orifice during dispensing.

3. In combination with a dispensing line of a service station pump, a first pump for creating a flow through said dispensing line, a gas separator chamber associated with the discharge side of said pump, a spring loaded by-pass for said pump adapted to receive liquid from the separation chamber and to return liquid back to said pump, a liquid outlet for said separation chamber, a spring loaded valve for said liquid outlet adapted to open at a lower liquid pressure in said chamber than the pressure at which said spring loaded by-pass opens, a constantly open vent for said separation chamber, and a centrifugal pump disposed in said separation chamber and associated with the constantly open vent, said centrifugal pump being constructed and arranged to centrifuge the liquid away from said vent with a force greater than the force of the spring of said by-pass while permitting the free passage of gas through said vent.

4. An air separator for a liquid dispensing system in combination with means forming a separation compartment, a liquid inlet to said compartment, pumping means for forcing liquid through said liquid inlet, a liquid outlet for said compartment, said pumping means having a spring loaded by-pass valve adapted to open at a predetermined pressure, said separation compartment having therein a shaft having an associated constantly open vent connecting the interior of said separation compartment with atmosphere, said vent having associated therewith a centrifugal impeller on said shaft, and means to actuate said shaft and impeller to centrifuge liquid in said chamber away from said vent during dispensing with a force greater than the pressure at which said by-pass valve opens whereby to preclude passage of liquid to atmosphere during dispensing while freely discharging air through said vent to atmosphere.

5. An air separator for a liquid dispenser comprising a casing, said casing having a partition forming an inlet chamber adapted to be connected to the inlet side of a dispensing line, a pump in said casing having its inlet connected to said inlet chamber and its outlet connected to a main chamber in said casing, said inlet chamber having a spring loaded by-pass valve connecting the inlet of said pump with the main chamber within said casing, said casing having an outlet, said pump having an upstanding shaft passing upwardly through said casing, the upper portion of said shaft having an axial bore opening through the top of said casing, a centrifugal impeller concentrically mounted upon said shaft about the bottom portion of said axial bore, and means for

driving said shaft to rotate said pump and said centrifugal impeller to centrifuge the liquid in said chamber with a force greater than the force of the spring of said by-pass valve.

6. An air separator for a liquid dispenser comprising a casing, said casing having a partition forming an inlet chamber adapted to be connected to the inlet side of a dispensing line, a pump in said casing having its inlet connected to said inlet chamber and its outlet connected to a main chamber in said casing, said inlet chamber having a spring loaded by-pass valve connecting the inlet of said pump with the main chamber within said casing, said casing having a liquid outlet, said pump having an upstanding shaft passing upwardly through said casing, the upper portion of said shaft having an axial bore opening through the top of said casing, a centrifugal impeller concentrically mounted upon said shaft about the bottom portion of said axial bore, means for driving said shaft to rotate said pump and said centrifugal impeller, said impeller centrifuging the liquid in said chamber away from said bore with a force greater than the force of the spring of the by-pass valve, and an expansion chamber having a constantly open connection to the upper end of the bore of said vertical shaft, said expansion chamber having a constantly open connection to atmosphere.

7. In a service station dispenser, the combination with means forming a dispensing line having its end adapted to be connected to a source of liquid supply, a pump, said line being adapted to be connected to the inlet of said pump, a meter connected to the pump discharge, and the discharge of said meter having a portion of the dispensing line connected thereto, means for controlling the dispensing of liquid through said line, means for driving said pump, a gas separation chamber disposed in said line between the pump and the meter, said gas separation chamber having a constantly open conduit connected to atmosphere, and pressure means acting on the liquid in said chamber for preventing the discharge of liquid through said constantly open conduit during dispensing while permitting the discharge of gas therethrough.

8. In a liquid dispensing device, in combination with means forming a dispensing line, a liquid displacement meter in said line, air separating means in said line in advance of the meter including a chamber having a constantly open orifice open to air and into which chamber the liquid to be dispensed is adapted to flow, means actuatable during a dispensing operation for maintaining said chamber constantly under pressure whereby causing the discharge of air in said chamber freely through said orifice, and means precluding the discharge of liquid in said chamber through said open orifice during dispensing.

9. In a liquid dispensing device, the combination of means forming a dispensing line, a meter in said line, means for controlling the flow of liquid through said line, air separator means in said line in advance of the meter, said separating means including a chamber disposed in series in said line, said chamber having a constantly open passage, an expansion chamber connected to said passage, said expansion chamber having a constantly open connection to atmosphere, means actuatable during dispensing for maintaining said first-mentioned chamber under pressure, for discharging air freely through said passage, and means for preventing discharge of liquid through said passage during maintenance of pressure in said chamber, and means for rendering said last named means inoperative whereby to permit a restricted flow of liquid from said first-mentioned chamber into said expansion chamber upon termination of dispensing to accommodate expansion of liquid in the dispensing line due to rise in temperature.

10. In a service station dispenser, the combination of a dispensing line including pumping means for forcing liquid under substantial pressure through said line, an air separating chamber connected in series in said line on the discharge side of the pump and through which chamber liquid is adapted to pass under substantial pressure during the operation of the pumping means, said chamber having a constantly open vent to atmosphere whereby the fluid pressure in said chamber is adapted freely to eject accumulated air directly to atmosphere, and means in said chamber directly engageable with the liquid body under pressure therein for causing a greater pressure than that existing in said chamber to be exerted on said liquid at said open vent and in a direction away from said vent whereby to prevent the discharge of liquid in said chamber through said vent.

11. A gas separating mechanism for a fluid dispenser comprising a chamber having a liquid inlet and a liquid outlet, said chamber being adapted to be connected to a flow line whereby liquid being passed through the flow line is adapted to flow through said chamber during a dispensing operation, said chamber so disposed in said dispensing line including an open vent whereby the liquid in said chamber and also accumulated gas therein tend to discharge through said open vent thereof, and means directly engaging and exerting a force on the liquid body in said chamber in a direction for preventing the liquid from passing through said vent during dispensing flow while permitting the gas in said chamber to pass freely through said vent.

12. In a dispensing line of a liquid dispenser through which liquid is adapted to flow under pressure, means connected in series in said line forming a liquid and gas separation chamber through which the liquid being dispensed flows, said separation chamber having a constantly open orifice to atmosphere, means for producing a fixed predetermined pressure on the liquid within the chamber tending to force the liquid being dispensed and gas therein through said orifice, and means operative during dispensing for exerting a greater force on said liquid in said chamber in a direction away from said orifice preventing the passage of liquid therethrough during dispensing while permitting the free passage of gas therethrough.

13. In a liquid dispensing system, in combination with means forming a dispensing line through which liquid is adapted to flow under pressure, an expansion chamber, an air separator disposed in said line, including a constantly open vent connection with said expansion chamber, said expansion chamber being unrestrictedly open to atmosphere, and said vent connection forming the sole connection between the expansion chamber and the system, and means associated with said constantly open vent exerting a force on the liquid in said chamber for preventing passage of liquid through said vent during dispensing operation while permitting the free passage of air therethrough to said expansion chamber during dispensing.

14. In a service station dispenser, the combination of a dispensing line having its end adapted

to be connected to a source of liquid supply, a pump, said line adapted to be connected to the inlet of said pump, a liquid displacement meter, the discharge line from said pump having a connection to said meter, and the discharge of said meter having a portion of the dispensing line connected thereto, means for controlling the dispensing of liquid through said line, means for driving said pump, and an air separation chamber disposed in said line between the pump and the meter, a by-pass for said pump adapted to open at a predetermined pressure, said air separation chamber having a constantly open port connected to atmosphere, and means associated with said constantly open port and acting on the liquid in the separator with a force greater than the pressure at which said by-pass opens for permitting the free passage of air through said constantly open port while preventing the passage of liquid therethrough during dispensing.

15. In a dispensing apparatus, in combination with means forming a dispensing line through which liquid is adapted to be forced under pressure during the dispensing operation, means for controlling the flow of dispensed liquid through said line, a meter in said line, means in said line in advance of the meter comprising an air separator chamber having a constantly open vent, a plurality of pumps and means for actuating the same, one of said pumps being a positive displacement pump and being disposed to tend to force liquid and air through said constantly open vent in said air separation chamber and the other of said pumps being a centrifugal pump and serving to prevent the passage of liquid in said chamber through said constantly open vent during dispensing while permitting the free passage of air therethrough.

16. A liquid dispensing apparatus comprising a source of liquid supply, a dispensing line connected to said source of supply, a pump for propelling liquid from the supply source through said dispensing line, a gas separator arranged in the dispensing line and adapted to separate entrained gas from the liquid, a gas discharge port leading from the separator through which separated gases are discharged, means associated with said port for preventing the escape of liquid therethrough, and means controlling said last mentioned means to operate said means only during operation of said pump.

17. A liquid dispensing apparatus as defined in claim 16 wherein said liquid escape preventing means associated with the port constitutes an impeller, and wherein the impeller and the pump are driven from a common power source.

18. In a dispensing line of a liquid dispenser, means in said line forming a liquid and gas separation chamber, pumping means for causing liquid to flow under pressure through said line and into said chamber, said chamber having a constantly open orifice to atmosphere, the pressure of liquid in said chamber tending to force the liquid being dispensed and gas therein outwardly through said orifice, and second pumping means arranged to propel fluid in a reverse direction through said orifice and exerting a greater pressure on the liquid than the pressure within said chamber for preventing liquid from passing through said constantly open orifice during dispensing while permitting the free passage of gas through said orifice.

19. A liquid dispensing apparatus comprising a dispensing line adapted to be connected to a source of supply, a chamber disposed in said line, said chamber having an opening to atmosphere through which air and liquid vapor are adapted to pass, a positive displacement pump adapted to propel liquid, liquid vapor and air through said line, a centrifugal pump disposed on the outlet side of said positive displacement pump and adapted to receive liquid, liquid vapor and air therefrom, said centrifugal pump being operatively associated with said chamber opening, and a dispensing outlet, said centrifugal pump being adapted to effect a separation of liquid from the liquid vapor and air, whereby the liquid is delivered to said dispensing outlet and the liquid vapor and air are passed through said chamber opening, and common driving means being provided for both the positive displacement pump and the centrifugal pump whereby a predetermined speed ratio between said pumps is maintained.

20. A liquid dispensing apparatus comprising a dispensing line adapted to be connected to a source of supply, a chamber disposed in said line, said chamber having an opening to atmosphere through which air and liquid vapor are adapted to pass, a positive displacement pump adapted to propel liquid, liquid vapor and air through said line, a centrifugal pump disposed on the outlet side of said positive displacement pump and adapted to receive liquid, liquid vapor and air therefrom, said centrifugal pump being operatively associated with said chamber opening, and a dispensing outlet, said centrifugal pump being adapted to effect a separation of liquid from the liquid vapor and air, whereby the liquid is delivered to said dispensing outlet and the liquid vapor and air are passed through said chamber opening, a pressure controlled by-pass valve arranged in association with the positive displacement pump, in return by-pass relation thereto, and wherein a pressure controlled delivery valve is associated with the dispensing outlet, the operating pressure of said delivery valve being lower than the operating pressure of the by-pass valve, and the pressure force of said centrifugal pump on the liquid being greater than the operating pressure of the by-pass valve.

PAUL E. WAUGH.