June 8, 1954

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GASOLINE SERVICE STATION PUMP WITH GAS AND WATER SEPARATOR

Filed May 7, 1951

2,680,538

3 Sheets-Sheet 1

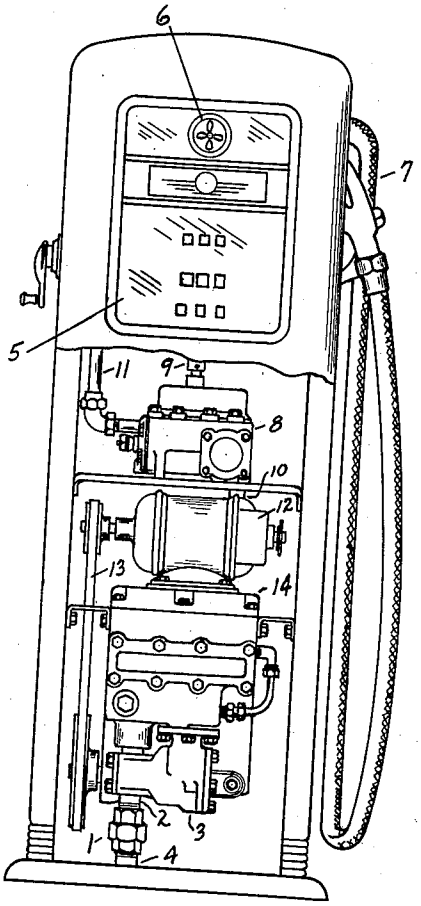



FIG. 1

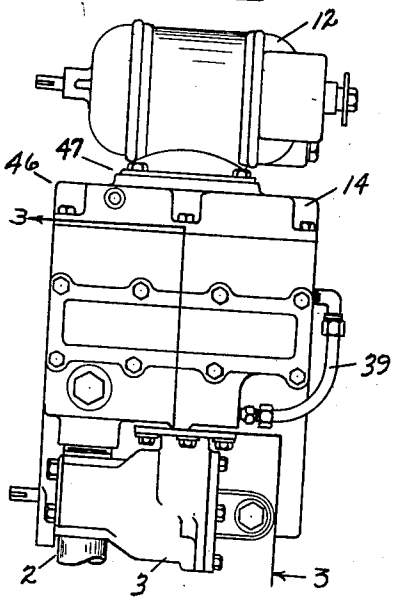



FIG. 2

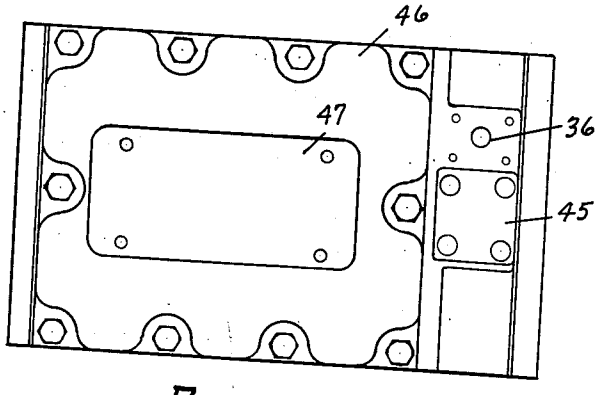



FIG. 5

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3 Sheets-Sheet 2

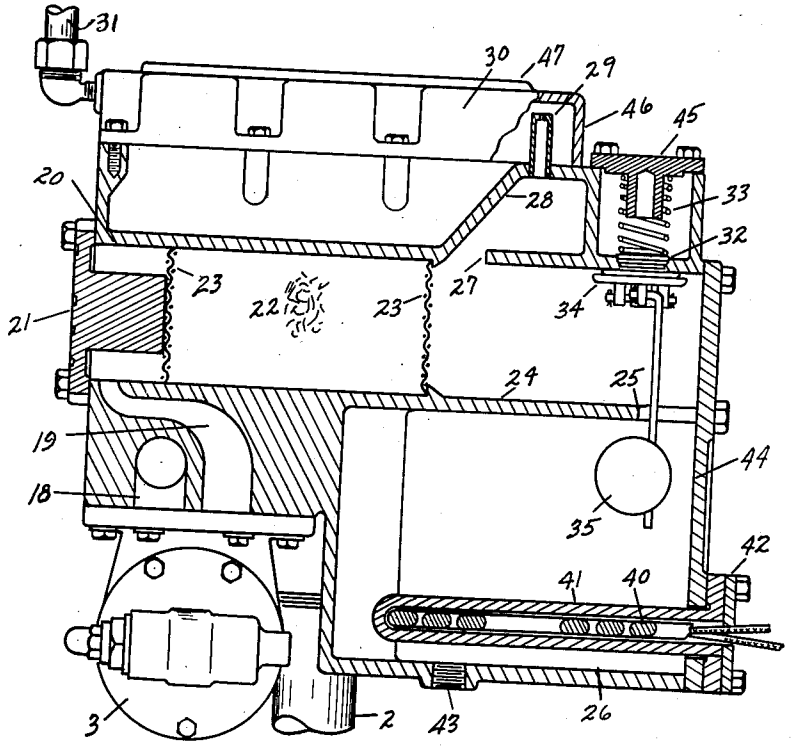



FIG. 3

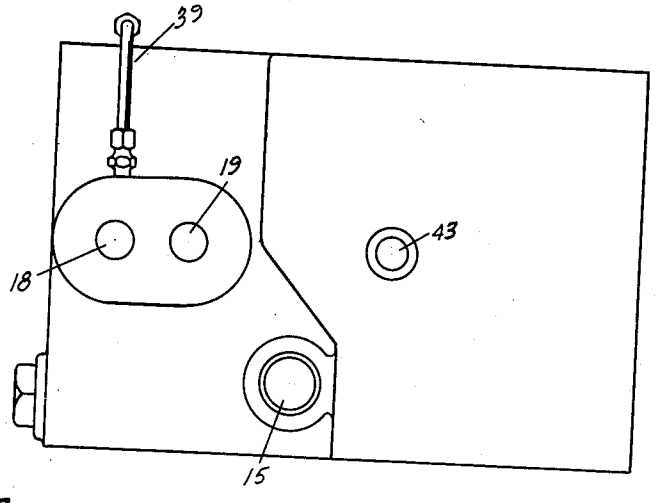



FIG. 4

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3 Sheets-Sheet 3

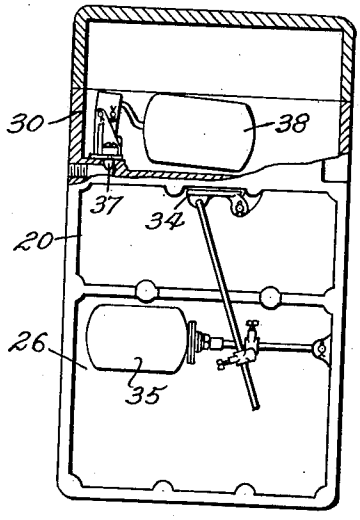



FIG. 7

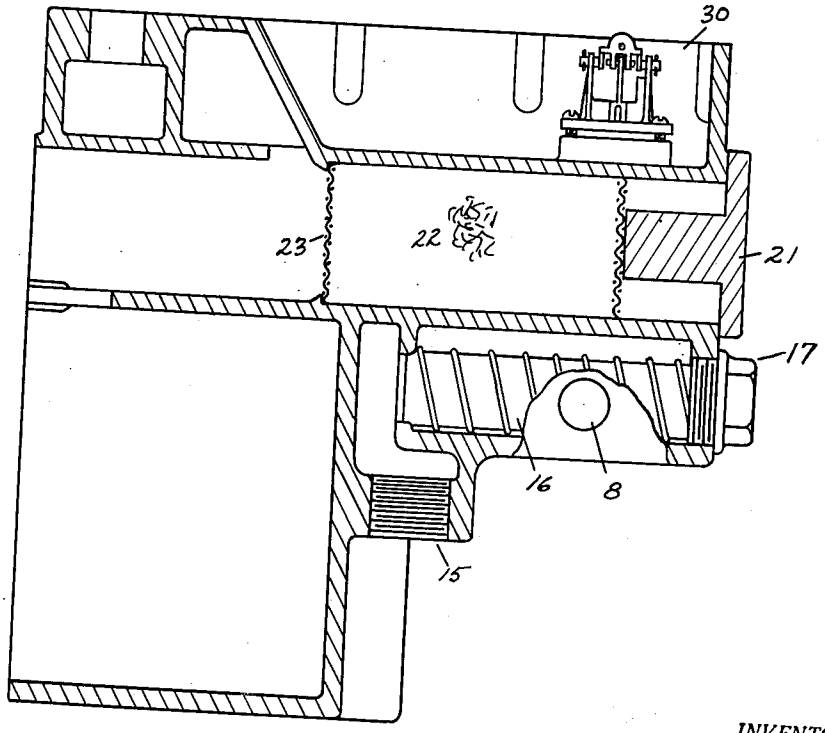



FIG. 6

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# UNITED STATES PATENT OFFICE

2,680,538

## GASOLINE SERVICE STATION PUMP WITH GAS AND WATER SEPARATOR

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4 Claims. (Cl. 222—23)

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In gasoline service stations, water accumulates in the gasoline storage tanks and is sometimes mixed with the gasoline delivered by the dispensing pump. Not only does the water have a harmful effect upon the motor vehicle operation, but it also decreases the accuracy and service life of the pump meter.

While the harmful effects of water in gasoline have long been understood and gasoline dehydrators have long been available, the commercial use of such dehydrators has been confined to installations where the pump, dehydrator, and meter were installed as separate units. Such installations are not adapted to filling stations generally with the result that most filling stations have no provisions for eliminating water from the gasoline.

Service station dispensing pumps are severely restricted by the operating requirements and by regulations of the Underwriters and of Weights and Measures. The pump suction must be as close to the ground as possible and free from restriction so as to avoid cavitation. Weights and Measures require some provision for eliminating air between the pump discharge and the meter. Weights and Measures and the Underwriters place limits on the location of the computer dial.

This invention is intended to provide a computing gasoline service station pump interchangeable with the present pumps and complying with the regulations of the Underwriters and of Weights and Measures which also includes a gasoline dehydrator incorporated in the pressure chamber between the pump discharge and the meter. This pressure chamber is an essential part of the pump both for the delivery of gasoline to the meter and for air eliminators and by incorporating the dehydrator into the pressure chamber it is feasible to include dehydration in a pump which is interchangeable with the standard service station pumps.

In the drawings, Fig. 1 is a front elevation partly broken away of a gasoline service station pump, Fig. 2 is an enlarged front elevation of the pumping and water and air separation unit, Fig. 3 is a section on line 3—3 of Fig. 2, Fig. 4 is a bottom view of the water and air separation unit with the pump removed, Fig. 5 is a top view of the unit with the motor removed, Fig. 6 is a section on line 6—6 of Fig. 5, and Fig. 7 is a top view of the air and water separation unit broken away to show the floats controlling the atmospheric and water chambers.

In the drawing, 1 indicates a union connecting

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the suction inlet pipe 2 for the pump 3 to the drop pipe 4 leading to the gasoline storage tank. For a volatile fluid such as gasoline, the maximum lift is approximately 12 to 15 feet so that the pump 3 must necessarily be located close to the ground. At the top of the pump, the computer register is indicated at 5, the sight gauge at 6, and the discharge hose at 7. By requirement of the Weights and Measures, the sight gauge 6 must be at the high point of the gasoline discharge line. By requirements of Weights and Measures and the Underwriters, the computer register 5 must be located so as to be visible by the driver and so it can be electrically illuminated within the requirements of the Underwriters. These requirements combine to locate the computer register within a rather narrow range insofar as gasoline service station pumps are concerned.

Below the computer register is a meter 8 having a drive 9 to the register, an intake line 10, and a discharge line 11 leading through the sight gauge 6 to the discharge hose. If the meter is to correctly register the amount of gasoline delivered, it is essential that the incoming line 10 and the meter be filled with gasoline at all times and that no air be mixed with the gasoline. Below the meter is a driving motor 12 having a belt drive 13 to the pump. The driving motor is mounted on top of a casing 14 housing the pump inlet and discharge and water and air separators presently to be described.

The pump suction inlet pipe 2 is threaded into an opening 15 (Fig. 6) leading to a strainer 16 accessible for cleaning upon removal of a plug 17. The gasoline flowing through the strainer enters a pump inlet passage 18, which is above the pump so that if the pump loses its prime for any reason, there still will be some gasoline contained within the pump. The pump discharges through a passage 19 to a pressure chamber 20 having its front end closed by a removable cover plate 21. The gasoline entering the pressure chamber 20 flows through a pack of a substance selectively wettable by gasoline and not by water such as excelsior 22 arranged between screens 23. While flowing through the excelsior 22, particles of dirt are filtered out of the gasoline and any water in the gasoline, whether in the form of drops or emulsion, is brought together in the form of large drops which settle on the bottom wall 24 of the chamber and flow through an opening 25 into a sump 26. While flowing through the excelsior 22, there is also a tendency for any air entrained in the gasoline

to be segregated and to collect near the top of the chamber 20. Upon leaving the excelsior 22, substantially all of the water in the gasoline has been segregated. The gasoline leaving the excelsior flows past a way 27 leading to a dome or trap 28 on the upper side of the chamber 20. At the top of the dome is a restricted orifice 29 discharging into a chamber 30 vented to atmosphere by a vent line 31. From one aspect, a certain fraction of the gasoline flowing into the pressure chamber 20 is bypassed through the trap 29 and is discharged into an atmospheric chamber 30 where the air has a chance to separate from the gasoline and to flow out through the vent line 31. Since the way 27 to the trap 28 is in the upper part of the pressure chamber 20 and is of relatively smaller cross-section than the trap, the mixture of gasoline and air within the trap is relatively quiet and there is substantially no danger of back flow through the way 27 which might result in the mixing of air in the gasoline. No gasoline flows out of the chamber 20 until the pressure is sufficient to overcome a check valve 32 held closed by a spring 33. There is also a flapper valve 34 controlled by a float 35 in the sump 6 which raises to shut off the flow through the valve 32 whenever the water level in the sump rises to a point at which there is danger of re-entraining water in the gasoline flowing through the valve 32. So long as the water level in the sump 26 is below the danger level, the float 35 sinks in the gasoline and holds the flapper 34 in the lowered position. It is only when the water level rises that the float 35 raises the flapper to the shut position. Through the coaction of the spring check valve 32 and the flapper 34, gasoline is always maintained above the check valve and no water can flow through the valve. The gasoline flowing through the check valve flows out through an opening 36 (Fig. 5) to which the lower end of the meter intake line 10 is connected.

Since at all times during the operation of the pump there is a continual flow of gasoline and air (if present) through the orifice 29, it is necessary that some provision be made for returning the excess gasoline to the pump. This is effected through a float controlled valve 37 which is closed whenever a float 38 is in the position shown in Fig. 7. As the gasoline level rises in the atmospheric chamber 30, the float 38 lifts the valve 37 and connects the bottom of the atmospheric chamber to a line 39 leading back to the pump suction inlet 18. The float controlled valve 37 insures that primarily gasoline is returned to the suction inlet and that the air which may be discharged through the orifice 29 has a chance to vent to the atmosphere through the vent line 31.

In cold climates where temperatures are below freezing, freezing of water in the sump is prevented by an immersion type electric heating element 40 enclosed in a casing 41 projecting into the lower part of the sump and removably secured thereto by a cover plate 42. Since the heating element is kept out of contact with the gasoline by the casing 41, there is no fire hazard. Other heaters are available. At infrequent intervals, the water collected in the sump 26 is drained through an opening 42 which is normally closed by a plug.

With this arrangement, both water and air elimination are provided within a space such that the result can be accomplished within a standard gasoline service station pump. Furthermore, the arrangement is such that all of the components can be easily serviced. The pump 3 is bolted onto the under side of the assembly and can be removed for replacement or service without breaking the intake line 2 from the underground storage tank. The excelsior 22 can be removed and replaced by removing the cover plate 21, which is accessible from the front of the unit. The intake strainer 17 can be removed for cleaning by unthreading a plug 17, which is likewise accessible from the front of the unit. The float 35 and flapper 34 are accessible for servicing upon removal of an end plate 44. The spring loaded check valve 32, which keeps the discharge lines 10, 11 and the hose full of gasoline, can be serviced by removal of a plate 45 on which the spring 33 is seated. This plate can be removed without interfering with the line 10. The atmospheric chamber 30 has its top wall formed by a removable cover 46 which on its upper surface has a pad 47 on which the motor is mounted.

What is claimed as new is:

1. In a computer type gasoline service station dispensing device having a casing housing in the upper part thereof a computer and a meter driving the computer, an intake line to the meter having a spring loaded check valve preventing reverse flow back through the meter and preventing flow to the meter until the gasoline pressure overcomes the spring loading, a discharge line from the meter leading to a delivery hose, and a pump in the lower part of the casing having a suction inlet for connection to a storage tank and having a discharge, the combination of a pressure chamber mounted in the casing between the pump discharge and the check valve and having one end connected to the pump discharge and the other end connected to the check valve, a pack of excelsior intermediate the ends of the pressure chamber through which the gasoline flows and in which entrained water is segregated, a drain from the lower part of the pressure chamber beyond the excelsior as regards the flow of gasoline, a sump connected to the drain, a float in the sump of specific gravity to sink in gasoline and float in water, a valve controlled by the float for shutting off the flow of gasoline to the intake line to the meter in response to a rise of the water level in the sump, a dome-like chamber for collecting air having an inlet from the pressure chamber in front of the check valve as regards the flow of gasoline, an orifice leading from the upper part of the dome through which a fraction of the gasoline entering the pressure chamber flows, said orifice being of greatly restricted cross-section compared to the inlet, a chamber vented to the atmosphere receiving the discharge from the orifice, a float controlled valve controlling the flow from the atmospheric chamber, and a line leading from said last valve to the pump suction inlet.

2. In a computer type gasoline service station dispensing device having a casing housing in the upper part thereof a computer and a meter driving the computer, an intake line to the meter having a spring loaded check valve preventing reverse flow back through the meter and preventing flow to the meter until the gasoline pressure overcomes the spring loading, a discharge line from the meter leading to a delivery hose, and a pump in the lower part of the casing having a suction inlet and discharge, the combination of a pressure chamber casing having a suction inlet for connection to a storage tank and inlet and discharge passages registering with

the pump inlet and discharge upon attachment of the pump to the pressure chamber casing, the discharge passage being at one end of the pressure chamber casing and the other end of the pressure chamber casing being connected to the check valve, a pack of excelsior intermediate the ends of the pressure chamber through which the gasoline flows and in which entrained water is segregated, a drain from the lower part of the pressure chamber beyond the excelsior as regards the flow of gasoline, a sump connected to the drain, a float in the sump of specific gravity to sink in gasoline and float in water, a valve controlled by the float for shutting off the flow of gasoline to the intake line to the meter in response to a rise of the water level in the sump, a dome-like chamber for collecting air having an inlet from the pressure chamber in front of the check valve as regards the flow of gasoline, an orifice leading from the upper part of the dome through which a fraction of the gasoline entering the pressure chamber flows, said orifice being of greatly restricted cross-section compared to the inlet, a chamber vented to the atmosphere receiving the discharge from the orifice, a float controlled valve controlling the flow from the atmospheric chamber, and a line leading from said last valve to the pump suction inlet.

3. In a computer type gasoline service station dispensing device having a casing housing in the upper part thereof a computer and a meter driving the computer, an intake line to the meter having a spring loaded check valve preventing reverse flow back through the meter and preventing flow to the meter until the gasoline pressure overcomes the spring loading, a discharge line from the meter leading to a delivery hose, and a pump in the lower part of the casing having a suction inlet for connection to a storage tank and having a discharge, the combination of a pressure chamber having one end connected to the pump discharge and the other end connected to the check valve, a body of material preferentially wettable by gasoline and not by water and having the properties of segregating water drops or emulsion from gasoline intermediate the ends of the pressure chamber through which the gasoline flows, a drain from the lower part of the chamber beyond the body as regards the flow of gasoline, a sump connected to the drain, a float in the sump of specific gravity to sink in gasoline and to float in water, and a valve controlled by the float for shutting off the flow of gasoline to the intake line to the meter in response to a rise of the water level in the sump.

4. In a gasoline service station dispensing device including a pump, a pressure chamber having one end connected to the pump discharge and having at the other end an outlet including a check valve, a pack of material having the properties of segregating entrained air and water drops or emulsion from gasoline intermediate the ends of the pressure chamber through which the gasoline flows, a drain from the lower part of the pressure chamber beyond the excelsior as regards the flow of gasoline, a sump connected to the drain, a float in the sump of specific gravity to sink in gasoline and float in water, a valve controlled by the float for shutting off the flow of gasoline to the outlet in response to a rise of the water level in the sump, a dome-like chamber for collecting air having an inlet from the pressure chamber in front of the check valve as regards the flow of gasoline, an orifice leading from the upper part of the dome through which a fraction of the gasoline entering the pressure chamber flows, said orifice being of greatly restricted cross-section compared to the inlet, a chamber vented to the atmosphere receiving the discharge from the orifice, a float controlled valve controlling the flow from the atmospheric chamber, and a line leading from said last valve to the pump suction inlet.

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