May 28, 1935. E. H. LICHTENBERG 2,003,153

FLUID DISPENSING APPARATUS

Filed Nov. 27, 1933 2 Sheets-Sheet 1

Fig. 1.

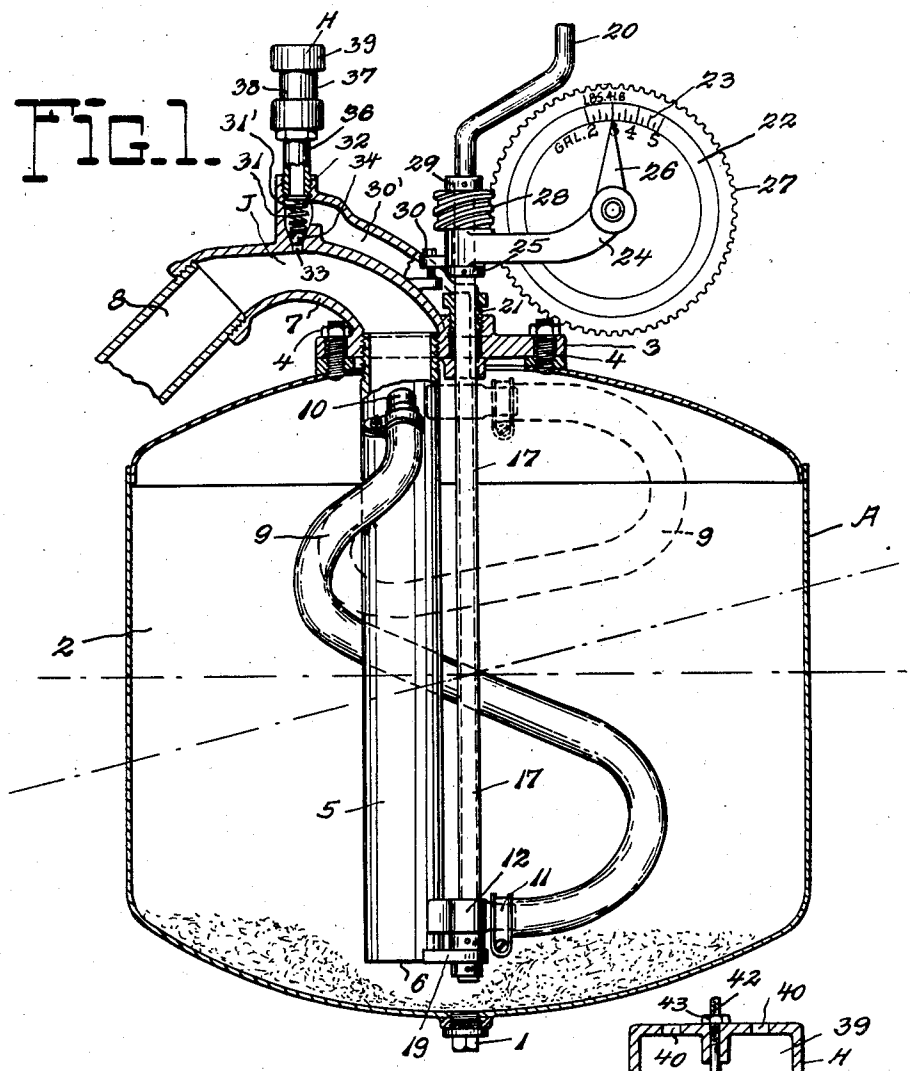


Fig. 4.

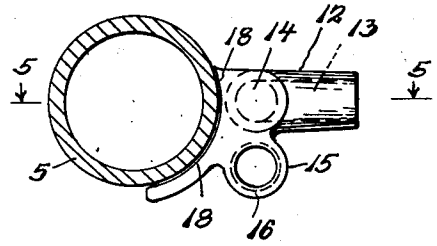
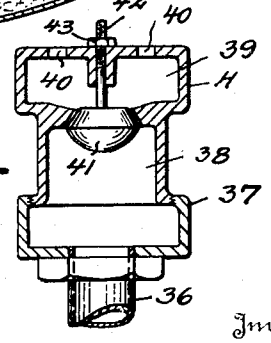


Fig. 6.



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FLUID DISPENSING APPARATUS

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Fig. 2.

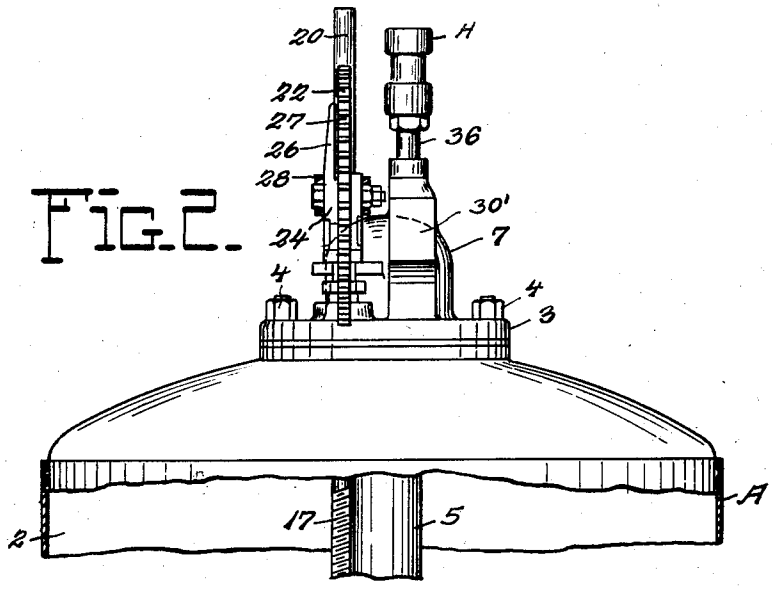


Fig. 3.

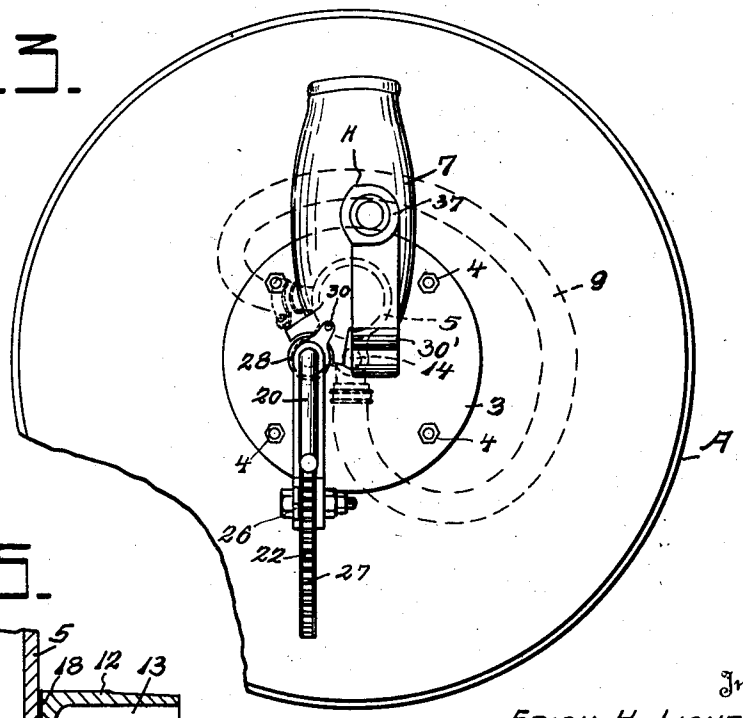
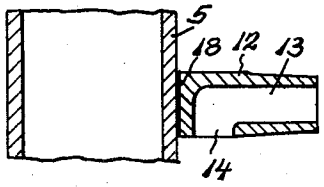


Fig. 5.



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UNITED STATES PATENT OFFICE

2,003,153

FLUID DISPENSING APPARATUS

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Application November 27, 1933, Serial No. 699,990

10 Claims. (Cl. 221—95)

This invention relates to liquid dispensing apparatus of the siphon type and is adapted particularly for supplying measured volumes of fluid to mixing machines, preferably concrete mixers, albeit I do not care to limit the field of use to this one particular application, since it may be employed in other and further capacities, if so desired.

It is of utmost importance in almost any mixing operation wherein fluid is employed, that the fluid be added in the exact volume and this is particularly so in the mixing of cement wherein the exact ratio of fluid to the quantity of cement is necessary to produce a mixture that will come up to the high specification set by highway commissions.

One object of this invention lies in the provision of a fluid dispensing apparatus of the siphon type which will deliver correctly, each and every time, a predetermined and measured volume of fluid, and which embodies the advantageous feature of a means for visibly indicating the volume of fluid so delivered, and it may be preset by the operator.

Another object of this invention is to provide an apparatus for delivering an exact measured volume of fluid each and every time. It is of special importance to point out that the apparatus is such that "split-second" termination of the fluid flow is obtained to preserve the correctness of each volume of fluid delivered.

Another object of this invention lies in the provision of an apparatus wherein the volume of fluid to be delivered may be varied for each and every delivering operation and as an ancillary feature it may be pointed out that the quantity of each volume of fluid for any two successive deliveries of equal volume is not disturbed nor destroyed by tilting of the fluid reservoir.

Another object of this invention is to provide means for bleeding off any entrapped air in the siphon system that might otherwise disrupt the operation of the siphon.

Other objects and advantageous features of the invention are to be observed from the following detailed description and accompanying drawings, wherein like characters of reference indicate corresponding parts, and wherein—

Figure 1 is a sectional view of the preferred form of apparatus embodying my invention, certain of the parts being shown in elevation.

Figure 2 is a detail of the top of the container disclosing the apparatus lying exteriorly thereof, such as the air intake and recording apparatus shown therein.

Figure 3 is a top plan view of Figure 2.

Figure 4 is an end view of the member which is attached to the end of a flexible hose lying within the fluid reservoir of Figure 1, and communicating with the siphon pipe.

Figure 5 is a section taken on the line 5—5 of Figure 4.

Figure 6 is a fragmentary view partly in section showing the relief valve for bleeding off entrapped air in the siphon system.

As before mentioned, this invention has to do with the delivery of measured quantities of fluid through the medium of an apparatus which operates upon a siphon principle. Essentially, it is my aim to interrupt the operation of the siphon after a predetermined interval of operation, by novel means to be hereinafter disclosed, and which is associated with other apparatus in such a manner that this interval may be determined and calibrated and translated into gallons upon a visible indicator so that the operator of the device may "set" the apparatus and rest assured that the proper and correct volume of fluid be delivered.

With reference to the drawings, it will be observed that the siphon apparatus is mounted on the top cover of the container A which may be of any type desired and which has a drain or clean-out plug 1 in the bottom thereof. The walls of this container define a fluid reservoir 2 within which are located the inlet end of the siphon pipe, and associated instrumentalities to be hereinafter mentioned, which are supported from the top cover by means of a plate or head 3 bolted down by means of bolt and nut assemblies 4 and which is suitably tapped to receive the threaded ends of various pipes and glands associated therewith.

Tracing the siphon line, the large pipe 5 is located within the container A and is screw-threaded into the plate 3 and has its lower inlet end 6 spaced from the bottom of the container as shown. This pipe is located slightly to one side of the vertical center line of the container A for a purpose to be hereinafter described. Formed as a part of the plate member 3 is a conduit 7 which communicates with the passage in the pipe 5 and forms a U-bend communicating at its other end with a downwardly extending pipe 8 which is threaded thereinto as shown. The pipe 8 of course, as in all siphons, terminates at its outlet end at a point below the bottom of the container and this end may be valved in the manner shown in my Letters Patent No. 1,869,903 filed December 23, 1929, patented August 2, 1932, to control

the outflow of fluid through the pipe 8 and the inflow of fluid through the pipe 8 to fill the reservoir from an auxiliary container.

To permit of the passage of a predetermined volume of water from the container A, I have provided the assembly which includes a flexible conduit member 9 which may be an ordinary section of hose which has a threaded nipple 10 on one end thereof secured to the siphon pipe 5 to effect communication between the hose and the pipe passage. The other end of the hose is joined by means of the clamp 11 to a member 12 which is of the form shown in Figure 4, which may be a simple machining having a longitudinal bore 13 and a bore 14 normal thereto that provide a lower or inlet passage communicating with the passage in the flexible tube 9. The machining further has an offset portion 15 drilled and tapped as at 16 to accommodate a screw-threaded member 17 as will be hereinafter brought out. This machining also has an arcuate end 18 forming a guide surface bearing on the siphon pipe 5. Referring to the screw threaded rod 17, it will be observed that it is journaled at its lower end in a bearing formed in an extension 19 integral with the pipe 5. The screw threaded rod 17, Figure 3, lies slightly off-center with respect to the rotational axis of the container A, thus bringing the intake opening 14 of the member 12 on the exact vertical axis of the container, A. Hence, tilting of the container to one side or the other does not result in an appreciable variance in the actual volume of water passed for each successive siphoning operation. In actual test it has been found that this variance in volume resulting from different angular positions of the container A when employing the apparatus disclosed herein, does not exceed one pint. The importance of this feature cannot be stressed too much since the quality of a mix depends largely on proper proportioning of the constituents. Rotation of the screw threaded rod 17 feeds the member 12 toward and away from the bottom of the container to vary the positional relation between the lowermost end of the siphon pipe 5, namely the intake 6, and the intake 14 of the hose 9.

This operation is carried out manually through a handle member 20 located exteriorly of the container A. The shank of the rod is sealed against leakage by means of the gland 21 in the zone of the plate 3.

To visibly indicate the volume of water to be dispensed, I have provided the assembly which includes the calibrated dial 22 having calibrations 23 indicating gallons. This dial is supported by an arm 24 mounted on the shank of the member 17 above the gland nut and held in place by the washer 25 which further mounts a fixed pointer 26. The periphery of the dial 22 is toothed as at 27 for cooperation with a worm 28 mounted on the shaft 17 for rotation therewith, which is held in place by the collar 29. The assembly for supporting the dial, namely the arm 24, is such that it may be swung about the axis of the shaft 17 and secured in any one of a number of positions of adjustment by the set screw 30. This is purely to convenience the operator. Obviously, rotation of the handle 20 will rotate the dial 22 as well as adjust the member 12 for height.

The operation of the device is substantially as follows:— The operator desires to pass three gallons of water from container A, and, assuming that the siphon is in readiness for operation, the handle 20 is rotated until the dial and pointer coincide at 3 gallons as shown. This operation moves the member 12 a predetermined distance so that the outlet 14 bears a certain definite positional relation to the inlet 6 or the bottom of the container. It is to be observed that this inlet 14 is at all times above the inlet 6. The flow of fluid through the siphon continues until such time as the level of the water reaches the same plane as the lower plane of the inlet 14 and when there is any further lowering of the surface of the fluid in the container A, there is an immediate and instantaneous passage of air through the hose 9 which equalizes the pressure in the siphon system and instantaneously arrests any further operation thereof or flow of fluid therefrom. It may be pointed out that the tank is more or less self-cleaning since dirt and extraneous matter which may settle to the bottom are passed with the siphon flow out the siphon pipe and to the point of discharge. This keeps the container A clean at all times and free from deposits which may at some time or other become loosened and choke the siphon pipe. Of course the clean-out 1 may be resorted to if the sludge becomes so heavy as to interfere with the normal operation of the siphon and cannot be carried off thereby.

To overcome the disrupting or failure of the siphon system due to entrapped air at some point in the line, I have provided a novel relief valve arrangement generally indicated at H, Figure 1, which is intended to bleed off such entrapped air. It has been found that in a siphon system which incorporates a U-bend as disclosed, air is liable to be entrapped in the zone J often in sufficient volume to occasion the failure of the siphon. To avoid this occurrence, the pipe casting 7 is provided with an auxiliary channel 30' that communicates with the interior of the tank A and with a cross bore 31 which is threaded as at 32 at its upper extremity and passaged at 33 so that communication may be established between the zone J and the zone 31. A ball 34 controls the flow of fluid through the passage 33 and is urged by a weak spring onto its seat. The spring is held in position through engagement with the lower end of a pipe 36 screwed into the part 32 which mounts a chambered casting 37 having a chamber 38 communicating with the passage in the pipe 36 and a chamber 39 thereabove vented as at 40 to the atmosphere and having a float valve 41 for controlling the fluid flow between chambers 38 and 39. The valve is suspended from the casing by a bolt 42 as shown. The degree of travel of the valve 41 is controlled by the nut 43.

In operation it will be assumed that during the filling of container A when back-flow is obtained, in the pipes 8, 7, and 5, water overcomes the resistance of the spring 31' and water enters the tank A through both the main siphon pipe 5 and the auxiliary passage 30' and at the same time fluid enters the pipe 36 and fills the chamber 38, thus causing the float 41 to close against its seat and prevent the escape of water through the vent openings 40. It will be assumed that during this operation a certain volume of air becomes entrapped in the zone J and that the pressure thereon is sufficient to unseat the ball 34, whereupon the air filters through the water in the passage 36 and into the chamber 38 where it rises to the zone of the float valve 41. The water of course is displaced in the zone of the valve 41 and since the said valve depends on buoyancy to main-

tain it in position, the valve drops and the air is vented and upon rise of the water, the valve is again caused to rise against its seat and prevent the escape of water.

This action is substantially as described, although it may go on at any time during the filling of the tank A since it is apparent that the air may rise in the chamber **38** until such time as it collects in sufficient volume to displace the fluid buoying the valve **41**.

When the tank A is completely filled, of course water completely fills the passage **30'**, and the passage **31** and the chamber **38**, so that the pressure on both sides of the ball valve **34** is equalized except the pressure on the other side is overbalanced by the strength of the spring **31'**. If the air has collected in zone J in sufficient quantity to substantially fill the U-bend, starting of the siphon action would not take place when the valve is thrown to the position normally permitting discharge of the tank A; but under such conditions the pressure on the underside of the ball **34** is greater than that in the line **30'** combined with the pressure of the spring **31'** and hence the ball **34** is unseated and the air bubbles out. As the fluid level falls the line **39'** is gradually drained so that the pipe **36** and chamber **38** become drained and air may be taken in to the tank A through the vents **40**, the ball **34** guarding the passage **33**.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is—

1. In a fluid measuring device, a container, the walls of which define a fluid reservoir, a siphon pipe extending into said reservoir and having an inlet end spaced from the bottom of the container, means for admitting a flow of fluid to the siphon pipe during siphoning operation to interrupt the siphon flow, said means comprising a flexible conduit entwined about the siphon pipe and opening at one end to the siphon passage and at the other end into the container, said last mentioned end being disposed at the vertical axis of the container, means for moving the end of the flexible conduit opening into the container relative to the end of the siphon pipe and along the vertical axis of the container to vary the distance therebetween and likewise the volume of fluid passing through the siphon.

2. In a fluid measuring device, a container, the walls of which define a fluid reservoir, a siphon pipe extending into said reservoir, and means for varying the interval of siphon to vary the volume of fluid passed, said means comprising a flexible helical conduit communicating with said siphon pipe and having a vertically movable free end opening into said reservoir, and means at said free end and slidably cooperating with said siphon pipe for guiding said free end during vertical movement thereof.

3. In a fluid measuring device, a container, the walls of which define a fluid reservoir, a siphon pipe extending into said reservoir, and means for interrupting the fluid flow, which comprises a flexible helical conduit communicating with said siphon pipe and having a free end opening into said reservoir, and means for positioning said free end at various points in the direction of the length of the fluid column in the reservoir, said means including a screw shaft extending downwardly within the container and on which is mounted a screw sleeve having an upwardly opening passage therein communicating with the free end of the flexible conduit, the end of which upwardly opening passage lies substantially on the vertical axis of the container, the adjustment of the free end as aforesaid causing expansion and contraction of the fractional parts of the helical convolute of the flexible conduit in a longitudinal direction.

4. In a fluid measuring device, a container having walls which define a fluid reservoir, a siphon pipe extending into said reservoir and having an inlet end, means for varying the interval of siphon to vary the volume of fluid passed, comprising a flexible conduit communicating at one end with the siphon pipe and having an inlet end disposed on the vertical center line of said container, said flexible conduit being wholly disposed within said reservoir, and means for varying the positional relation between the inlet end of said conduit and the inlet end of said siphon pipe.

6. In a fluid measuring device, a container, the walls of which define a fluid reservoir, a siphon pipe extending into said reservoir and having an inlet end spaced from the bottom thereof, means for interrupting the fluid flow of said siphon during operation to vary the amount of fluid discharged, which comprises a flexible conduit communicating at one end with said siphon, and at the other end with the fluid in the reservoir, and means for adjusting said last named end with relation to the siphon inlet which includes a threaded member mounted on the last named end of said conduit, a mating threaded member cooperating therewith, and means for operating said last named threaded member exteriorly of said container.

6. In a fluid measuring device, a container the walls of which define a fluid reservoir, a siphon pipe extending into said reservoir and having an inlet end spaced from the bottom thereof, means for interrupting the fluid flow of said siphon during operation to vary the amount of fluid discharged, which comprises a flexible hose communicating with said siphon pipe at a point above the inlet and having an inlet end communicating with said reservoir, and means for raising and lowering said inlet end to vary the instant when air in said reservoir is admitted to the siphon pipe during operation to interrupt the operation thereof, said means comprising a screw rod, and means associated with said last named means for visibly indicating the volume of fluid passed during a siphoning interval controlled as to its termination by the admission of air to the siphon through the conduit and means for adjusting the position of the visible indicator means to present the same for convenient observation according to the position of the operator.

7. In a fluid dispensing system, a container, the walls of which define a fluid reservoir, a siphon pipe extending into said reservoir for drawing fluid therefrom, adjustable means within said container and associated with the siphon pipe for selectively interrupting the fluid flow during siphon operation, whereby varying amounts of fluid may be passed, and means for releasing entrapped air in the siphon pipe to prevent failure of starting the siphon system, said means including a pair of valves having a chamber therebetween in continuously open communication with said reservoir one of which valves is operable in response to pressure in the siphon system, the other of which is operable in response to variations in water level.

8. In a fluid dispensing system, a means for venting air that collects in said system, which

comprises a member having a pair of fluid chambers therein, one of which communicates with atmosphere, a valve between said fluid chambers operable in response to variations in fluid level, a pipe connecting one of said chambers with said system, and a valve in said pipe operable in response to variations in pressure in said system.

9. A means for releasing entrapped air in pipes forming at least a part of a siphon system or the like, which includes a pair of valves, one of which is operable in response to pressure in the siphon system and the other of which is operable in response to fluid level.

10. A siphon unit for fluid measuring devices of the class described, comprising a head constituting a support, a siphon pipe carried thereby and extending to one side of said head, a substantially U-shaped conduit on the other side of said head and communicating with said siphon pipe, means carried by said head for interrupting siphon action, said means including a flexible conduit communicating at one end with the siphon pipe adjacent the head and the other end of said flexible conduit being open and located adjacent the siphon pipe, means for adjusting the position of the open end of said flexible conduit to vary the distance between said open end and the free end of said siphon pipe, said means coacting with said free end and with said siphon pipe to guide the open end of the flexible conduit longitudinally of said siphon pipe in a zone relatively close to said siphon pipe, means carried by said head and coacting with said adjusting means for indicating the relative position of said open end of the flexible conduit with respect to the free end of said siphon pipe, and vent means carried by said head.

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