Feb. 4, 1930. R. PORTE 1,746,165

LIQUID DISTRIBUTOR

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Fig. 1.

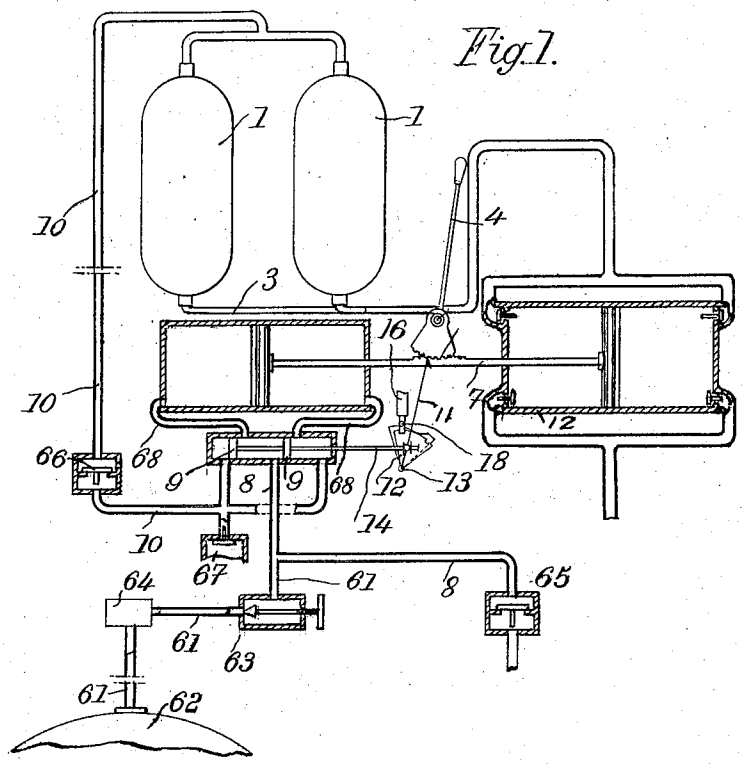


Fig. 2.

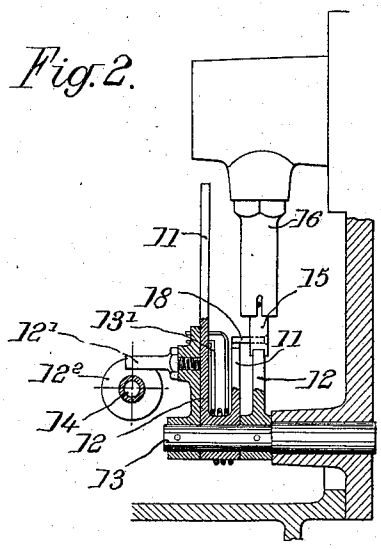
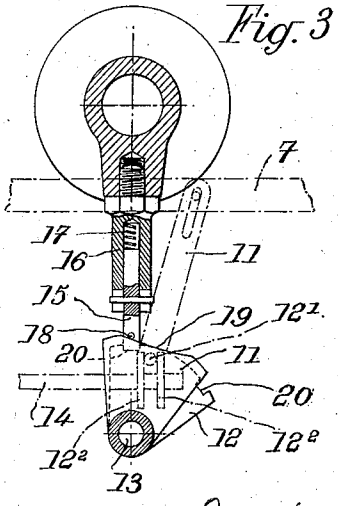


Fig. 3



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LIQUID DISTRIBUTOR

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Fig. 4.

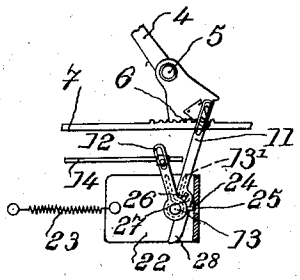


Fig. 5.

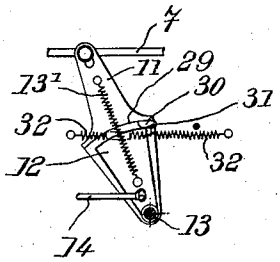


Fig. 6.

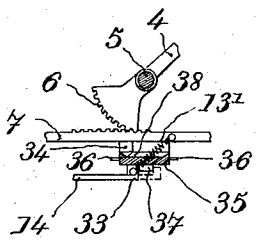
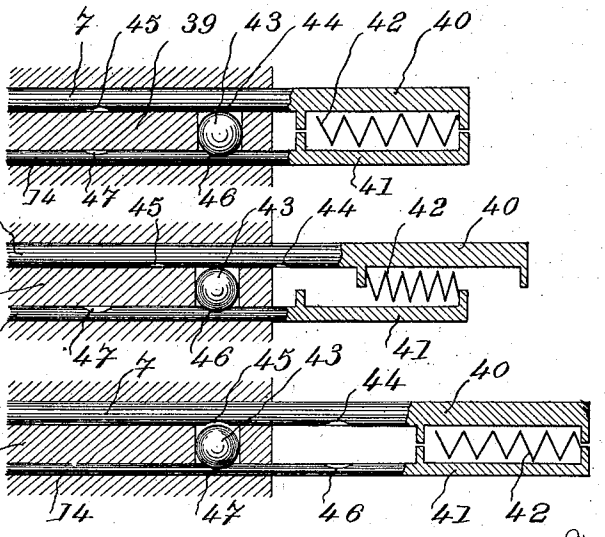


Fig. 7.

Fig. 8.

Fig. 9.



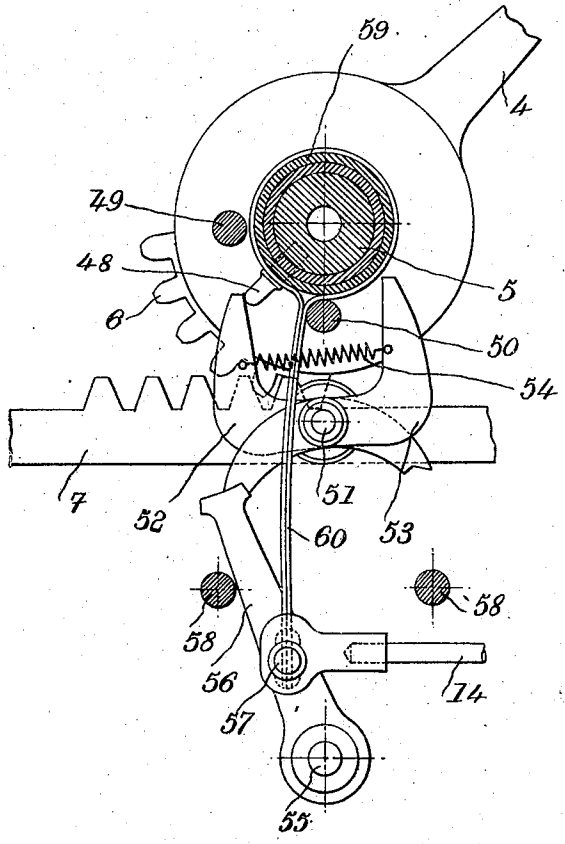
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Fig. 10.



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Patented Feb. 4, 1930 1,746,165

UNITED STATES PATENT OFFICE

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LIQUID DISTRIBUTOR

Application filed June 1, 1926, Serial No. 112,899, and in Belgium June 5, 1925.

The present invention relates to liquid distributors having measuring chambers adapted to be emptied quickly under gaseous pressure. The invention concerns itself, more especially, with apparatus to be used in connection with gasoline and similar carburating liquid.

One of the objects of the invention is to combine with a measuring vessel, a pump for feeding liquid thereto and a machine for effecting a rapid emptying thereof, the pump and the machine being coupled together and having a common control. The machine for accelerating the emptying operation is arranged so as to function either as a compressor feeding gas under pressure to the measuring vessel or as a compressed air motor driving the pump.

Another object of the invention is to provide a distributing system in connection with the above mentioned compressing machine or motor arranged so as to prevent the machine from coming to rest except in the positions where the machine is drawing in or discharging air.

A further object is to provide means for utilizing at least part of the compressed gases from the compressor-motor when the latter functions as a motor, for accelerating the discharge of the measuring vessels.

Still, further objects will appear in the course of the description which will now be given in connection with drawings.

Fig. 1 is a diagrammatic view of the apparatus in one form of execution.

Fig. 2 is a section through the slide valve shown in Fig. 1 taken perpendicularly and at right angles to the plane of the figure.

Fig. 3 is a section through the slide valve taken at right angles to that shown in Fig. 2.

Figs. 4 to 10 are a series of detailed sections of the elements entering into the structure of the various valve reversing mechanisms designed to be used with the compressor-motor.

The machine comprises a pair of measuring vessels 1 and a double acting pump 2 mounted in tandem with an air compressor 3 connected to the measuring vessels. The pump and compressor are arranged to be actuated at the same time by a lever 4 connected through a shaft 5 to the toothed sector 6 which engages a rack on rod 7 connecting the pistons of the pump and the compressor. Air is drawn into the compressor through tube 8 and through the intermediary of the slide valve 9 and conduit 10, reaches the measuring vessels 1.

When compressor 3 is to be used as a motor a supplementary system of conduits must be provided and also means for preventing stoppage of the valve 9 except at the extreme inflowing and discharge positions. One arrangement for preventing stoppage at intermediate positions is shown in Figs. 1 to 3 and comprises two levers 11 and 12 mounted on a common shaft 13, said levers being capable of assuming different angular positions relatively to one another. Lever 11 is loosely mounted on the shaft 13 while lever 12 is firmly attached thereto. Both levers are subjected to the action of a spring 13^1 (Fig. 2). Lever 11 is attached in any appropriate manner to rod 7 and oscillates back and forth therewith. Similarly, lever 12 is connected to stem 14 of slide-valve 9 and causes the latter to oscillate with it. When lever 11 oscillates in any given direction, lever 12 at first remains at rest. As soon as lever 11 reaches the end of its course, which means that the pistons of the pump and of the compressor have also reached the end of their respective courses, lever 12 is in position to be entrained, through the intermediary of spring 13^1, in the oscillating movement of lever 11. Stem 14, and therefore, slide-valve 9 will move with lever 12 from one extreme position to the other. To assure the latter taking place quickly there is provided a latch 15 slidably mounted in a fixed member 16. The latch is urged outwardly by a spring 17 and carries a finger 18. Finger 18 is arranged to slide on cam 19 formed integrally with lever 11 while latch 15 alternately engages with one or the other of two notches 20 formed in lever 12. At the end of each oscillation of lever 11, cam 19, through the intermediary of finger 18, raises latch 15 thus freeing lever 12 and permits the latter to oscillate quickly under the action of spring 13^1 in the same direction as lever 11. The motion of lever 12 to

stem 14 may be communicated by a finger 12^1 fixed on lever 12 and extending between a pair of discs 12^2 fixed on stem 14.

Another arrangement for assuring proper reversing movement of valve 9 is shown in Fig. 4 and comprises a fixed shaft 13, a control lever 4 mounted on shaft 5, two levers 11 and 12 similar to those previously described connected to rod 7 and stem 14 respectively and to one another by a spring 13^1. The two levers actuate one another by means of a latch 22 having an opening 24 therein which engages alternately with one or the other of two pins 25, 26 mounted on lever 12 through the intermediary of a pair of bosses 27, 28 formed on lever 11 and a spring 23. The manner in which the interengaging parts function to reverse the valve 9 is as follows:—the parts being in the position shown in Fig. 4 and the slide being at one extreme position i. e. with the boss 27 on lever 11 in contact with the latch, with pin 25 in opening 24 and with lever 12 occupying the position shown against the tension of spring 13^1, continued movement of lever 11 will cause the boss 27 to push the latch until pin 25 disengages itself from opening 24. Lever 12 will then be free to move and, under the action of spring 13^1, will oscillate to the opposite extreme position until pin 26 enters opening 24 in the latch. When the movement in the opposite direction takes place, boss 28 on lever 11 comes into play and moves the latch 22 so as to actuate slide-valve 9 to its opposite extreme postion.

Another valve reversing mechanism is shown in Fig. 5 which comprises a pair of levers 11 and 12 similar to the preceding ones, mounted on a shaft 13 and connected together by a spring 13′ and to members 7 and 14, respectively. The lever 11 carries a cam element 29 having its lower surface concentric with the shaft 13. A T-shaped member 30 is pivotally mounted on a shaft 31 fixed with respect to the frame and extending parallel to shaft 13. The upper or horizontal bar of the T, during the movement of the piston rod 7, bears against the cam surface 29 and the T is thus prevented from movement. The downwardly extending or vertical bar of the T constitutes a lug to retain the lever 12 against movement, even though the spring 13′ tends to draw this member 12 in the direction of and after the lever 11. Balanced springs 32, 32 are connected to the downwardly extending bar of the T to return it after actuation to the position of rest as shown in Fig. 5. The various parts cooperate to function as follows: When the levers 11 and 12 (and also the pump and compressor pistons) are adjacent one extreme position, being the left hand one in Fig. 5, the upper surface of the horizontal bend of the T will fit against the curved surface of cam 29 on lever 11, and the body of the T member 30 will be prevented from movement, so that the downwardly extending lug of the T member will prevent a movement of the lever 12 when the piston rod 7 moves toward the right. This movement of the lever 11, however, will act through the spring 13′ to produce a tendency of the lever 12 to rock clockwise about the shaft 13. The lever 12, however, is held at rest by this lug until the lever 11 has moved so far toward the right in a clockwise direction that the curved surface of cam 29 has passed from above the horizontal bar of the T member 30. The pull of spring 13′ then upsets the balanced effects of the spring 32, and the T member 30 rocks counterclockwise about its pivot 31, thus releasing the lever 12 which is snapped quickly in a clockwise direction, moving the valve rod 14 to shift the reversing valve as before. As soon as the lever 12 has cleared the T member 30, the latter is returned by its balanced springs 32, 32, to the position shown in Fig. 5, and as soon as the piston rod 7 moves toward the left again, the lever 12 (this time at the left hand upper corner of the lever) is prevented from following the lever 11 until the lever 11 has moved so far toward the left that the curved surface of the cam 29 has again passed from above the horizontal bend of the T member 30, so that this member can rock again.

In another form of valve reversing mechanism shown in Fig. 6, the stem 14 of the slide-valve is provided with a bent portion or arm 33 and rod 7 with a lateral pin 34. Element 35 is interposed between members 33 and 34 and is tiltably mounted on shaft 36 parallel to elements 7 and 14. When the rods 7 and 14 reach extreme position, member 35 is held at rest by pin 34 and, by means of an arm 37 abutting against arm 33 which is under the action of spring 13^1 holds the stem 14 at rest. When rod 7 begins the move toward its other extreme position, pin 34 causes element 35 to tilt on shaft 36 through the intermediary of a cam 38 formed on 35. Arm 37 then releases arm 33 and stem 14, under the action of spring 33, quickly executes the reversing movement. When rod 7 moves in the opposite direction the apparatus reassumes its original position.

In the reversing mechanism shown in Figs. 7, 8 and 9, rods 7 and 14 are arranged to be parallel and relatively close to one another. The two rods slide in a pair of slide-ways formed in a block 39 and have their extremities shaped to form the upper and lower halves, 40 and 41, of a chamber carrying a compression spring 42. A ball 43 having a diameter slightly greater than the distance between rods 7 and 14 is introduced into the body of block 39 and pairs of spherically shaped notches 44, 45 and 46, 47 are formed in rods 7 and 14 respectively. The notches, the ball, the spring and the rods are so arranged that when the rods 7 and 14 are at

one extreme position (Fig. 7), the half chambers lie opposite one another and ball 43 simultaneously engages notches 44 and 46. When rod 7 starts toward its other extreme position spring 42 is compressed and tends to move rod 14 in the direction of rod 7. Since the spring is not strongly compressed during the beginning of this movement, it does not drag rod 14 with it. In moving toward the extremity of its course, rod 7 disengages notch 44 from ball 43 (Fig. 8), but the latter remains wedged between the straight portions of rod 7 and notch 46 and prevents the movement of rod 14. The spring 42 is, in the meantime being compressed more and more and exerts an increasing pull on rod 14. When rod 7 finally arrives at its extreme position, notch 45 comes opposite the ball and the latter being now between two notches i. e. 45 and 46, releases rod 14. The latter, under the pressure of spring 42 then quickly executes the reversing movement in the direction taken by rod 7 (Fig. 9) and notches 47 and 46 come into position opposite ball 43. When rod 7 moves in the opposite direction, rod 14 is again held in position until rod 7 reaches the end of its course and is then released to take up its original position shown in Fig. 7. Ball 43, it is to be understood, can be replaced by other mechanisms having the same blocking function as, for example, by a latch.

In another reversing mechanism shown in Fig. 10, there is provided a finger 48 mounted on shaft 5 and a pair of pins 49 and 50 formed on toothed sector 6 which is keyed to shaft 5. A pair of bent levers 52, 53 are mounted on a shaft 51 attached to the frame of the machine. The two levers cross one another like a pair of shears. Their arms, on the side facing shaft 5, are fitted with a spring 54 tending to draw them together. On another shaft 55 attached to the machine frame, there is mounted a lever 56 carrying a pin 57 which is free to move in a transverse slot arranged in the end of rod 14. The free end of lever 56 is formed so as to fit into and interengage with notches formed in the lower extremities of bent levers 52 and 53. A collar 59 is fitted loosely over shaft 5 and is encircled by a spring 60 whose extremities extend to and are fixed upon pin 57. The various elements should be arranged so that when rod 14 is at its extreme left position (position shown in Fig. 10), lever 56 engages in the terminal notch of lever 53, pin 50 is in contact with the right side of spring 60 and pin 48 contacts with the inner face of bent lever 52. With the apparatus in this position, movement of lever 4 from right to left, will move toothed sector 6, rod 7 and, therefore, the pistons of the pump and compressor, in the opposite direction. Before the pistons arrive at their extreme right position, pin 49 will contact with the left face of spring 60, but lever 56, which is held in position by the notch on lever 53 will remain at rest. When the pistons reach the end of their course toward the right, pin 48 will contact with the internal face of bent lever 53 and will turn the latter in the clockwise direction, thereby freeing lever 56. 56, under the tension of spring 60 will then move quickly in the counter-clockwise direction and displace rod 14 toward its extreme right position. Lever 56 will come to rest against right hand stop 58 and will engage in the terminal notch of lever 52 while bent lever 53 under the action of spring 54 will return to its normal position. The reversing movement in the opposite direction takes place in a manner similar to that just described and need not be given in detail.

When machine 3 is to function as a motor instead of as a compressor the following piping system is combined with that already described in connection with the use of said machine as a compressor: a compressed air tank 62, a pipe line 61 connecting the tank to conduit 8, a valve 63 inserted between 61 and 8, a pressure regulator 64 inserted in line 61 between valve 63 and tank 62, an automatic inlet valve 65 attached to line 8, a valve 66 in line 10 for preventing back flow of air, and a second valve 67 located on the upstream side of valve 66 in line 10 and serving to release a certain amount of air when the air pressure becomes too great. Valve 67 is arranged so as to be actuated at pressures exceeding those necesary to raise valve 66.

In an apparatus equipped with the above piping system and with any one of the reversing mechanisms described, the mode of operation is as follows:

Machine 3 as motor.—Valve 63 is opened and the air from tank 62 flows into line 61, thus closing valve 65, and passes into conduit 8, then between the pistons of slide valve 9 into one or the other of the two conduits 68 and finally into contact with one side or the other of the piston of machine 3 functioning as motor. Movement of the piston in machine 3 is communicated by rod 7 to pump 2 and liquid is thereby lifted into the measuring vessels 1. The compressed air escaping from 3, can be used to accelerate the discharge of the measuring vessels after passing through line 10 and past valve 66 to the top of the vessels 1.

Machine 3 as compressor.—Valve 63 remains closed and lever 4 is actuated back and forth. The movement transmitted to rod 7 causes machine 3 to function as compressor. Air is drawn in through valve 65, passes through line 8, then between the pistons of valve 9 to that side of the piston functioning as inlet. Air is being compressed, meanwhile, on the other side of the piston and passes through line 10 past valve 66 to the top of the measuring vessels 1.

What I claim is:—

1. In an apparatus of the class described, the combination of two measuring chambers of given capacity, a pump for supplying liquid to said measuring chambers, a device connected to said pump, a valve mechanism connected to said device to control selectively the inlet and outlet of fluid thereto, a compressed air storage tank, inlet and outlet pipes for said device and controlled by said valve mechanism, valved branched conduits from said inlet conduit to the atmosphere and to said storage tank, and valved branched conduits from said outlet conduit to the atmosphere and to said measuring chambers, the valves of the branched conduits being selectively operable whereby said device may be used either as a motor for operating said pump and for applying discharged air from the motor to the measuring chambers, or as a compressor for supplying air to the measuring chambers for aiding in the discharge of the liquid from said measuring chambers.

2. In an apparatus of the class described, the combination of two measuring chambers of given capacity, a pump having a piston for supplying liquid to said measuring chambers, a cylinder having a piston therein, means for connecting said pistons, a valve mechanism connected to said connecting means to control the inlet and outlet of fluid for said cylinder, a compressed air storage tank, inlet and outlet pipes for said cylinder connected with said valve mechanism, valved branched conduits from said inlet pipe to the atmosphere and to said storage tank, and valved branched conduits from said outlet pipe to the atmosphere and to said measuring chambers, the valves of the branched conduits being selectively operable whereby said cylinder with the piston therein may be used as a motor for operating said pump and for supplying discharged air from the motor to the measuring chambers, or as a compressor for supplying air to the measuring chambers, for aiding in the discharge of the liquid from said measuring chambers.

3. In an apparatus of the class described, the combination of two measuring chambers of given capacity, a pump having a piston for supplying liquid to said measuring chambers, a cylinder having a piston therein, means for connecting said pistons, a valve mechanism connected to said connecting means to control the inlet and outlet of fluid for said cylinder, a compressed air storage tank, inlet and outlet pipes for said cylinder connected with said valve mechanism, valved branched conduits from said inlet pipe to the atmosphere and to said storage tank, valved branched conduits from said outlet pipe to the atmosphere and to said measuring chambers, the valves of the branched conduits being selectively operable, whereby said cylinder with the piston therein may be used as a motor for operating said pump and for supplying discharged air from the motor to the measuring chambers, or as a compressor for supplying air to the measuring chambers, for aiding in the discharge of the liquid from said measuring chambers, and manually operated means engaging said piston connecting means whereby said pistons may be moved by hand if desired.

4. In an apparatus of the class described, the combination of a measuring chamber, a pump for supplying liquid to the said chamber, means to supply liquid to and draw off the liquid from said chamber, a fluid actuated device to operate said pump, a valve mechanism to control the inlet and outlet of fluid to said device, quick throw means connected to said device and pump to move said valve mechanism at the completion of a pump stroke, a compressed fluid storage tank and a conduit therefrom to supply compressed fluid through the valve mechanism to the inlet of said device, and a conduit from the outlet of said device to the measuring chamber to aid in the discharge of the liquid from the measuring chamber.

5. In an apparatus of the class described, the combination of a measuring chamber, a piston pump and a conduit for supplying liquid to the said measuring chamber, a cylinder, a piston in said cylinder, means connecting said pump and cylinder pistons, a valve having a casing and operating mechanism actuated by said connecting means, a compressed fluid storage tank, conduits connecting said tank to the cylinder, through the valve casing so that the valve controls the flow of fluid to and from the cylinder, and a conduit connecting the outlet from said cylinder and valve casing to the measuring chamber to aid in the discharge of the liquid from the measuring chamber.

6. In an apparatus of the class described, a measuring chamber, a pump having a reciprocating piston, a cylinder having a reciprocating piston, means connecting said pistons, fluid pressure supply means communicating with said cylinder and including a flow controlling device, an atmospheric connection likewise governed by said flow controlling device, and a valve operating mechanism including two relatively movable elements, means to hold one element against movement, a connection between said held element and the flow controlling device, a connection between said pistons and the other element whereby to move the latter, means to release said holding means at the end of the stroke of said other element, and means to actuate said held element after its release whereby to reverse the flow into and out of said cylinder.

7. In an apparatus of the class described, a measuring chamber, a pump having a piston for supplying liquid to said chamber, a

cylinder having a piston, a connecting rod extending between said pistons, conduits for leading fluid to and from said cylinder, a reversing valve for controlling said conduits, a conduit from the outlet of said reversing valve to the measuring chamber so that the fluid from said cylinder will aid in the discharge of liquid from the measuring chamber, means to hold said valve against movement, a spring connection between said rod and valve so that the valve tends to move with the rod, and means for releasing said holding means when the rod reaches the end of its stroke.

In testimony whereof I have hereunto set my hand.

RENÉ PORTE.