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APPARATUS FOR HANDLING FLUIDS

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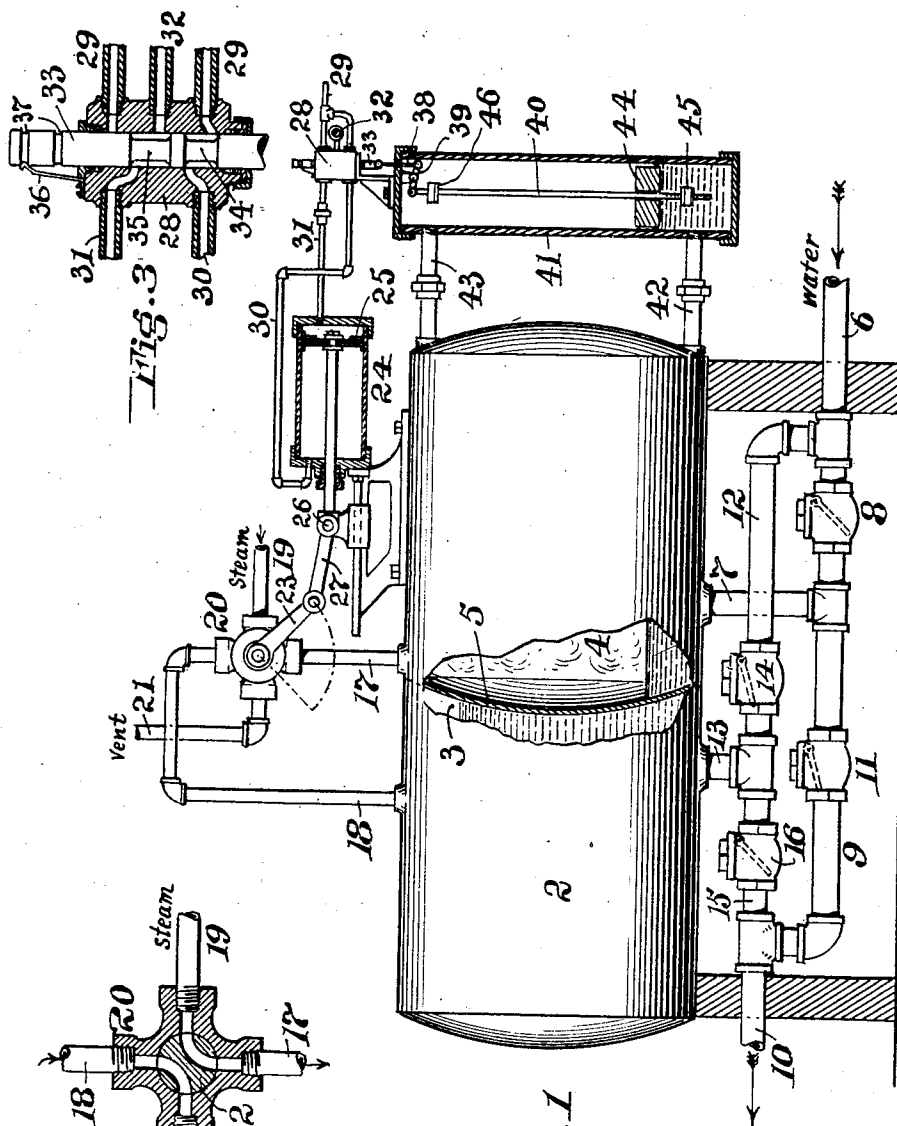


Fig. 1

Fig. 2

Fig. 3

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APPARATUS FOR HANDLING FLUIDS.

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The object of my invention is to provide an automatic apparatus for handling water and other fluids for transferring them from one place to another, and if desired, delivering them against pressures greater than atmospheric pressure without the necessity of the employment of pumps.

My object is also to transfer the water or other fluid in such a manner that the volume transferred may be approximately measured so that the total amount of fluid handled may be determined with reasonable accuracy.

My invention also consists of improvements hereinafter described whereby the above objects and results are attained, said improvements comprising certain organization and combination of parts which are fully described hereinafter and more particularly defined in the claim.

Referring to the drawings: Fig. 1 is a side elevation of my improved apparatus with portions broken away and in section to illustrate the interior details; Fig. 2 is a sectional view of the steam controlling valve employed in connection with the apparatus; and Fig. 3 is a sectional view illustrating the pilot valve for controlling the time of operation of the steam controlling valve.

2 illustrates a large tank and is divided into two compartments 3 and 4 by a transverse division plate 5. It is preferable that the compartments 3 and 4 are of equal capacities, as in the practical utilization of my invention it is desirable that when one of the compartments is filling with the water or other fluid, the contents of the other compartment is being discharged, and by having them approximately of the same cubical content, the time consumed in filling and discharging will be approximately the same.

I will now describe my invention as adapted to handle water, such as receiving it from a source of supply through pipe 6 and discharging it to a place of use, such as a boiler, by pipe 10. Pipe 6 is extended by a vertical pipe 7 to deliver water into the bottom of the compartment 4 and is provided with a check valve 8 to prevent backflow of water from the compartment to the supply pipe 6. The water from the tank 4 may, however, flow through a check valve 11 and a pipe 9 which discharges into the pipe 10 leading to the boiler or other place of use. The water from supply pipe 6 may similarly pass through a branch pipe 12, thence through a check

valve 14 and by pipe 13 into the compartment 3; and from this compartment the water may be delivered through check valve 16 and pipe 15 into the pipe 10 and thence to the boiler or other place of use. So far as the two compartments 3 and 4 are concerned, they are connected with the supply pipe 6 and discharge pipe 10 in precisely the same manner, and in the operation one of the compartments will be receiving water from the pipe 6 while the other is delivering water through the pipe 10, and vice versa.

20 is a four-way steam valve having the rotary plug 22 which is operated by an arm 23. This valve 20 has an inlet steam port with which steam pipe 19 connects for delivering the steam to the compartments 3 and 4 alternately. The valve has also one of its supports connected with a vent pipe 21 for venting the compartments 3 and 4 alternately to the atmosphere in such manner that when steam is being supplied to one compartment, the other compartment is being vented and vice versa. The valve 20 has, furthermore, one of its ports connected by a pipe 17 with the compartment 4 and also has the remaining port connected by a pipe 18 with the other compartment 3. It will now be understood that when the valve plug 22 is in position indicated more particularly in Fig. 2, steam will pass from pipe 19 through pipe 17 into the compartment 4, and pressure of the steam will force the water from said compartments through pipe 7, through check valve 11, pipe 9 and into the discharge pipe 10, and will discharge the said water against any pressure which is less than the steam pressure supplied by the compartment 4. While this is taking place, the check valve 8 closes to prevent the water being blown back into the supply pipe 6. As the compartment 3 is being vented to the atmosphere through pipes 18 and 21, it is manifest that the supply water in pipe 6 will flow through pipe 12, check valve 14, pipe 13, into compartment 3 and fill the same simultaneously with the discharge of the water from compartment 4. If the valve plug 22 is rotated a quarter of a revolution (through ninety degrees) then the steam pipe 19 will be put in communication with compartment 3 through pipe 18 and compartment 4 will be put in venting condition by pipe 17 and therefrom being put into communication with the vent pipe 21. Under these conditions, the steam

pressure will be utilized to force the water from compartment 3 into the discharge pipe 10 and the pressure of the water from the supply pipe 6 will insure its entrance into the compartment 4.

I will now describe the means for controlling the large steam valve 20, which must operate in accordance with the water conditions in one of the compartments, 4 for example. 24 is a hydraulic cylinder and is provided with a piston and piston rod 25, which operates a cross-head at 26 having a connection with the valve arm 23 by a link 27. Fluid pressure is applied to the cylinder 24 to either side of the piston therein as may be required under the control of a pilot valve 28, and suitable pipes. The interior construction of the pilot valve is more fully illustrated in Fig. 3. It comprises a body having a vertical cylindrical bore in which a valve plunger 33 is adapted to reciprocate, the said plunger having two annular recessed portions 34 and 35. The body of the pilot valve is provided with inlet ports connecting with the fluid pressure supply pipes 29 and is also provided with ports respectively connecting with pipes 30 and 31 respectively leading to the opposite ends of the cylinder of the valve operating means. In addition to these pipes, the pilot valve is provided with a venting port in communication with the vent pipe 32. Assuming that the plunger 33 is in the position shown in Fig. 3, it will be seen that the fluid pressure is admitted by lower pipe 29 through the ports and around the annular recessed portion 34 of the plunger and into pipe 30, and thence to the left hand end of the cylinder 24, which brings the valve to the position indicated in Fig. 2, with the result already explained. The other end of the cylinder is vented through pipe 31 and vent pipe 32, communication between them being had through the ports in the pilot valve body and the annular space 35 around the plunger 33. If the plunger 33 is moved upward, then the fluid pressure will be supplied through pipe 31 and the right hand end of the cylinder 24 and the other end of the cylinder will be vented through the pipe 30 in which case the piston will move to the left and the plug 22 of the valve 20 will be rotated through 90°, which will then cause the compartment 4 to be vented and steam delivered into compartment 3. To insure the plunger 33 remaining in vertical positions of adjustment unless forcibly shifted, the upper end of the plunger 33 may be provided with two annular grooves 37 spaced apart and receiving alternately the free end of a friction spring 36 on the pilot valve body.

The pilot valve 28 is operated automatically by a float 44 which rises and falls with the level of the water in the compartment 4. As shown, this float is arranged in a vertical chamber 41 connected at bottom and top with

the lower and upper parts of the compartment 4 of tank 2, respectively by pipes 42 and 43. The float chamber 41 is therefore equivalent to being a part of the compartment 4, as the water rises and falls in it simultaneously with the rise and fall of the water in said compartment. The float 44 surrounds a vertical rod 40 which is provided with collars 45 and 46 respectively, near its lower and upper ends, and with which the float contacts in falling and rising with the object of shifting the rod 40. The upper end of this rod 40 is hinged to a lever 39, whose other end is connected by a link 38 with the plunger 33 by the pilot valve. It will now be manifest that as the float 44 descends (as the water is being discharged from the compartment 4) it will strike the collar 45 and lower the rod 40. The result of this will be to raise the plunger 33 and thereby through the pilot valve cause the piston 25 of the cylinder 24 to be moved from right to left and operate the steam valve 20 accordingly. The result of this is that the steam will then be supplied to the compartment 3 while the compartment 4 will be vented and the reverse operation in respect to receiving and discharging water will take place. When the water in the compartment 4 reaches the proper level, the float will have been brought into contact with the upper collar 46 and thereupon the pilot valve plunger 33 will have been shifted to the position shown. The steam valve will then be shifted back to the position indicated and once more compartment 3 will be vented and steam will be supplied to the compartment 4.

I have described my invention in respect to handling water such as might be employed in supplying feed water to a steam boiler and for handling water for any other purpose where it must be transferred, but I do not restrict my invention to the use of handling water, as it may be employed for handling various fluids according to the particular commercial use to which it is applied. I have further assumed a hydraulically operated motor for actuating the steam valve, but it is manifest that this fluid pressure may be steam or compressed air, if so desired. Furthermore, the steam control valve 20 and means for operating it may be varied, as any motor device may be used so long as it is controlled by the varying water level of the compartment, hence these details may be modified or changed so long as they provide operative devices for accomplishing the same purposes.

It will now be apparent that I have devised a novel and useful construction which embodies the features of advantage enumerated as desirable, and while I have in the present instance shown and described the preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that I do not restrict myself to the details, as the same are

susceptible of modification in various particulars without departing from the spirit or scope of the invention.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

In apparatus for handling fluids, the combination of two stationary compartments, supply and discharge pipes both in communication with the bottom of said compartments for respectively supplying water or other fluid alternately to the compartments for approximately filling them and finally permitting discharge of the said water or other fluid alternately from the compartments, normally closed check valves in the pipes for insuring the proper direction of flow of the fluid, a steam supply pipe, two branch pipes respectively opening into the top of the respective compartments, a four-way valve device for causing the steam from the steam pipe to pass into the branch pipes alternately and also to vent the compartments alternately so that when steam is entering one compartment

the other is being vented, a piston and cylinder for operating the valve device, fluid pressure supply pipes for supplying pressure to the opposite ends of the cylinder for actuating a piston, a pilot valve in the fluid pressure pipes for controlling the fluid pressure to one end of the cylinder and venting the other end and vice versa, said pilot valve, fluid pressure pipe and cylinder being entirely independent of the compartments and the fluid pressure being entirely independent of the steam pressure employed within the compartment, and a float device for actuating the pilot valve adapted to operate automatically at the high and low levels of the fluid in one of the compartments and wholly independent of the other, whereby the operations of filling and discharging the two compartments is automatically controlled by the conditions existing in one of them.

In testimony of which invention, I hereunto set my hand.

FREDERICK C. FARNSWORTH.