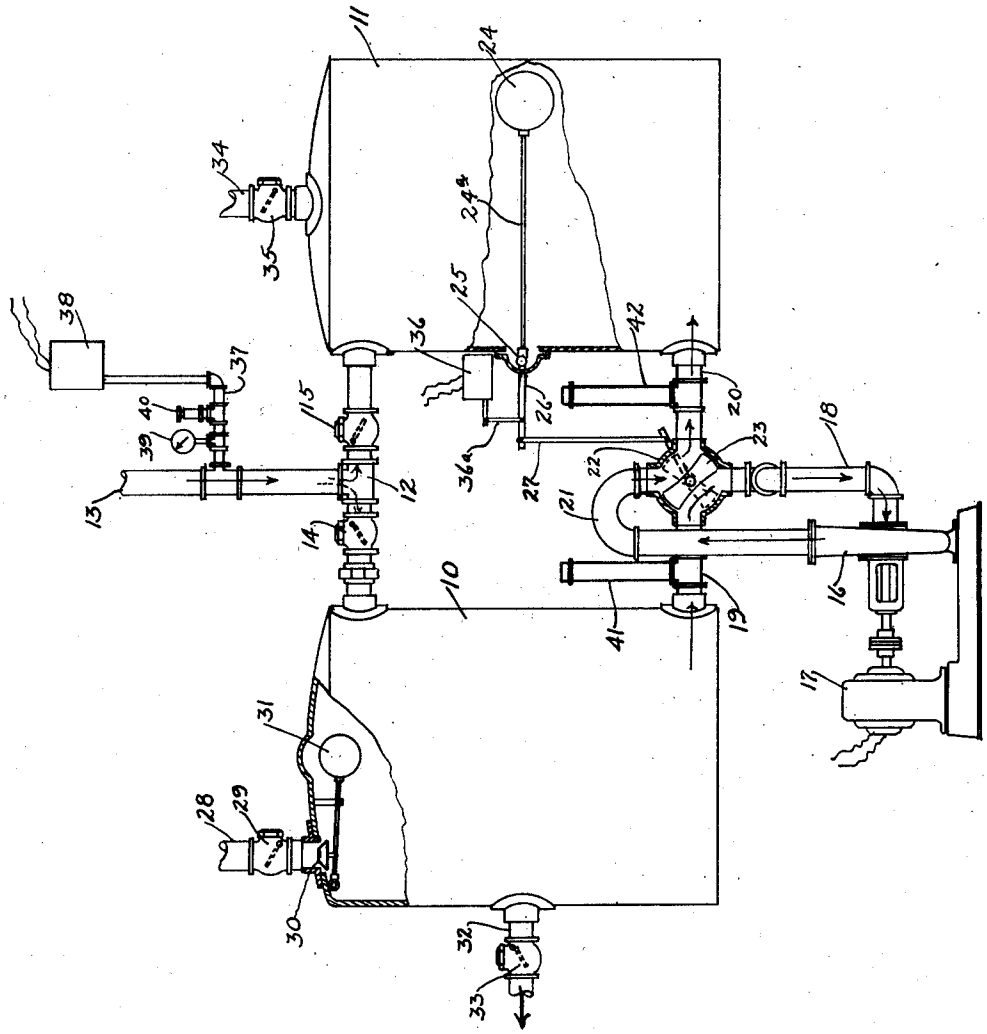
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FLUID HANDLING, SUCTION, AND PRESSURE CREATING APPARATUS

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FLUID-HANDLING, SUCTION AND PRESSURE CREATING APPARATUS.

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This invention relates to improvements in fluid handling, suction and pressure creating apparatus, particularly adapted though not necessarily limited in its use for creating and maintaining a partial vacuum in the return lines of a steam heating system, separating the air from the water, allowing the air to escape to the atmosphere, and returning the water to boiler or hot well.

A further object of the invention is to provide an improved apparatus of this character which may be automatically controlled by the degree of vacuum in the system, or by the height of liquid in a tank or receiver.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawing illustrating this invention, and in which

The figure is a diagrammatic view, partly in elevation, partly broken away, and partly in section, of an apparatus of this character constructed in accordance with the principles of this invention and showing the same in its adaptation to the return line of a steam heating system.

Referring more particularly to the drawing the numerals 10 and 11 designate two receivers, and as shown these receivers may be separate from each other or they may be formed as a unit. In the form of the invention as shown, the receivers are connected through the medium of a suitable pipe connection 12 with the main return pipe 13 of a steam heating system. Intermediate the pipe 13 and the receiver 10 is a check valve 14, and intermediate the pipe 13 and the receiver 11 is another check valve 15. These valves may be of the ordinary and well known construction and are adapted to open inwardly so as to permit returns to flow from the pipe 13 into the respective receivers.

Co-operating with the receivers 10 and 11 is a pump 16, preferably of the centrifugal type, which may be operated by means of a suitable motor 17. The inlet or suction side of the pump 16 is connected by means of a pipe 18 with each of the receivers 10 and 11, through the medium of pipes 19—20, and the discharge outlet of the pump 16 is also connected or has communication with the receivers through the medium of a pipe 21 and the pipes 19 and 20. A valve casing 22 is arranged preferably at the junction of the pipes 19, 20, 18 and 21, and a valve 23, preferably of the four-way type, is arranged in the casing 22 for controlling the communication between the respective pipes and also for controlling the direction of flow of the liquid to and from the receivers 10 and 11.

This valve 23 is preferably controlled by means of any ordinary and well known means (not shown) so that when actuated it will be given a quick, rotary and substantially ninety degree movement for moving it from the position shown in full lines to the position shown in dotted lines in the drawing, and vice versa.

Arranged within one of the receivers, (here shown as the receiver 11) is a float 24, the supporting rod 24ª of which is mounted upon a fulcrum 25, and the float is connected with the actuating mechanism for the valve 23, through the medium of an arm 26 and link connection 27, so that as the water rises and falls in the receiver 11, the float 24 will correspondingly rise and fall and through this movement of the float the valve 23 will be operated.

The receiver 10 is provided with an outlet 28 for permitting the air to escape and this outlet is controlled by means of a check valve 29 which opens to permit the air to escape and will close to prevent air from entering the receiver 10 through the outlet 28.

A valve 30 is also provided for controlling the outlet 28 and this valve is controlled in its operation by means of a float 31, so that when the receiver 10 is filled with liquid the float 31 will rise and will cause the valve 30 to close the outlet 28. At this time pressure will be built up in the receiver 10 so as to force the liquid from the receiver 10 through an outlet 32 to the boiler or hot well. This outlet 32 is controlled by means of a suitable check valve 33 of the ordinary and well known construction.

The receiver 11 is also provided with an outlet 34 to permit air to escape and is controlled by means of a check valve 35 which opens to permit the air to escape and closes to prevent air from entering the receiver 11 through the outlet.

The operation of the mechanism thus far described is as follows. Assuming that the apparatus is in operation and the valve 23 is in the position shown in full lines in the drawing, and the receivers 10 and 11 are each

about half full of liquid, then the liquid from the receiver 10 will be drawn through the pipe 19, valve casing 22, pipe 18, into the suction side of the pump 16 and will be discharged through the pipe 21, valve casing 22, pipe 20, into the receiver 11.

The check valves 29 and 33 being normally closed, the withdrawing of liquid from the receiver 10 produces a vacuum in the upper portion of the receiver, causing the check valve 14 to open so that returns will be drawn from the pipe 13.

At the same time liquid will be filling the receiver 11, driving any air therein contained out through the check valve 35 to the atmosphere. The liquid rising in the receiver 11 will cause the float 24 to raise. When the receiver 11 is nearly filled and the float has reached its highest point, the valve 23 will be operated through the medium of the link connection 27 to the snap switch (not shown) which actuates the valve 23, causing the valve to move substantially ninety degrees or from the position shown in full lines to the position shown in dotted lines in the drawing. This will cause the flow of liquid to be reversed, that is from the receiver 11 to the receiver 10, through the pipe 20, valve casing 22, pipe 18, pump 16, pipe 21, valve casing 22, pipe 19, into receiver 10, filling the receiver 10 and emptying the receiver 11.

As the liquid is drawn from the receiver 11, the returns are drawn thereinto through the check valve 15, and air is expelled from the receiver 10 through the outlet 28 as the receiver 10 fills with liquid. When nearly all of the liquid has been withdrawn from the receiver 11, the float 24 will have fallen to its lowest position, and by its weight will again operate the snap switch, causing the valve 23 to again turn substantially ninety degrees or from the position shown in dotted lines to the position shown in full lines in the drawing, causing a reversal of the flow of liquid or from the receiver 10 to the receiver 11.

Thus it will be seen that as long as the pump 16 is running, action of the float 24 will cause automatically the flow of liquid alternately from one receiver to the other, but the direction of operation of the pump device 16 will be constant. The effect is that there will be an alternate suction and displacement in each of the receivers 10 and 11.

When liquid is being pumped from the receiver 10, causing suction therein, returns will be drawn in through the check valve 14. The receivers being of substantially the same area, it will be apparen that if additional liquid is drawn into the receiver 10, it will not be emptied when the receiver 11 is full and flow is reversed. Liquid will then be pumped from the receiver 11 to the receiver 10, but as liquid is being withdrawn from the receiver 11, additional liquid may be drawn in through the check valve 15. It will be apparent that any additional liquid flowing into receiver 11 during this cycle of operation will also be pumped into receiver 10 as reversal of flow will not occur until float 24 reaches its lowest position.

The additional liquid entering either receiver 10 and 11, accumulates in the receiver 10. When the flow starts into the receiver 10 from the receiver 11, any air above the liquid in the receiver 10 will be forced through the outlet 28 to the atmosphere, and the rising liquid in the receiver 10 then acts on the float 31 causing the valve 30 to close the outlet 28. Thereupon full pressure of the pump will be manifest against the contents of the receiver 10, causing any excess liquid to be forced through the outlet 32 to the boiler or hot well. This action will continue until all of the excess liquid is returned to the boiler or hot well.

The motor 17 may be controlled in its operation through the medium of the float 24 and to that end there may be provided a switch device diagrammatically illustrated as at 36 which controls the circuit to the motor, so that when the float 24 reaches its highest point the switch will be operated through the medium of a suitable connection 36ª, to complete the circuit through the motor to start the latter, and when the float reaches its lowest point the switch will again be operated to interrupt the circuit through the motor and thereby stop the latter.

When it is desired to automatically control the action of the motor 17 which operates the pump 16, by the degree of vacuum in the return pipes, a pipe 37 may be provided which may have communication with the pipe 1 and may lead to a suitable vacuum switch device diagrammatically illustrated at 38. The switch device may be adjusted so as to start the motor at a predetermined low vacuum and stop it when a predetermined high vacuum is reached.

These switches may be so connected that when sufficient liquid accumulates in the tank 11 to cause float 24 to reach its highest point the motor will operate irrespective of degree of vacuum in return lines, and cease to operate when excess water is discharged to boiler or hot well and vacuum is at predetermined high degree, when vacuum reaches the predetermined low degree, the motor will operate until desired high degree is reached irrespective of float control.

A vacuum gauge 39 and a vacuum relief valve 40 may also be provided and may be connected either with the pipe 37 or with the pipe 13.

When it is desired to control the operation of the motor when no vacuum is to be maintained, as at night, the vacuum controlled switch 38 may be cut out, in any desired manner not shown, the float controlled switch d

vice 36 will then act to start the motor 17 when the float reaches a high position and stop the motor when the float reaches its lowest position, and both the motor controlling switches 38 and 36 may be cut out when it is desired that the operation of the apparatus shall be continuous.

If desired and in order to cushion any shock which might be caused by the reversal of the flow of the liquid, suitable air chambers 41 and 42 may be provided and may be connected respectively with the pipes 19 and 20.

While the preferred form of the invention has been herein shown and described it is to be understood that various changes may be made in the details of construction and in the combination and arrangement of the several parts, within the scope of the claims, without departing from the spirit of this invention.

What is claimed as new is:—

1. An apparatus for withdrawing fluids from a source of supply, separating the air and liquid therefrom and then discharging the liquid from the apparatus, said apparatus embodying two receivers, a centrifugal pump, and means for automatically controlling the suction and discharge of the pump for causing liquid to be alternately pumped from one of said receivers to the other whereby alternate suction and pressure will be created within each of said receivers.

2. In an apparatus for creating and maintaining a partial vacuum in the return line of a steam heating system, separating the air from the liquid and returning the liquid to a point of use, the combination with the return line, two receivers, each having communication with the said return line, a centrifugal pump for circulating liquid to and from each of the receivers, and means operating automatically to control the suction and discharge of the pump for causing liquid to be alternately pumped from one of said receivers to the other whereby alternate suction and pressure will be created in each of the said receivers.

3. In an apparatus for creating and maintaining a partial vacuum in the return line of a steam heating system, separating the air from the liquid and returning the liquid to a point of use, the combination with the return line, two receivers, each having communication with the said system, a pump operable to circulate liquid to and from each of the said receivers, means for controlling the direction of flow of the liquid, thereby causing alternate suction and pressure to be created in each of the said receivers, and means for automatically controlling the operation of the said controlling means.

4. In an apparatus for creating and maintaining a partial vacuum in the return line of a steam heating system, separating the air from the liquid and returning the liquid to a point of use, the combination with the return line, two receivers each having communication with the said system, a centrifugal pump operable to circulate liquid to and from each of the said receivers, means for controlling the direction of flow of the liquid thereby causing alternate suction and pressure to be created in each of the said receivers, and means automatically controlled by the height of liquid in one of the said receivers for controlling the operation of the said controlling means.

5. In an apparatus for creating and maintaining a partial vacuum in the return line of a steam heating system, separating the air from the liquid and returning the liquid to a point of use, the combination with the return line, two receivers, one of said receivers having communication with the said system, a centrifugal pump operable to circulate liquid to and from each of the said receivers, means for controlling the direction of flow of the liquid thereby causing alternate suction and pressure to be created in each of the said receivers, and means automatically controlled by the height of liquid in one of the said receivers for controlling the operation of the first recited means, the second recited means including a float device in one of said receivers.

6. In an apparatus for withdrawing fluids from a conduit, separating the air from the liquid and discharging the liquid, the combination of a conduit, two receivers, one of said receivers having communication with the said conduit, a pump for circulating liquid to and from each of the receivers, means for reversing the flow of liquid into and out of the said receivers, and a float device in one of the said receivers and to the action of which float device the operation of the said reversing means is automatically responsive.

7. In an apparatus for creating and maintaining a partial vacuum in the return line of a heating system, separating the air and liquid and returning the liquid to a point of use, the combination with a return line, two receivers, a pump for circulating liquid to and from each of the receivers, means operating automatically to reverse the flow of liquid from one of the receivers to the other for causing alternate suction and pressure to be created in each of the receivers, and means for cushioning the shock caused by the reversal of the flow of the liquid.

8. In an apparatus for withdrawing fluids from a conduit, separating the air from the liquid and discharging the liquid, the combination with a conduit, two receivers, one of said receivers having communicattion with the conduit, a pump, the inlet and outlet of said pump having communication with each of the receivers, means automatically controlled by the height of the liquid in one of the receivers for controlling the direction of flow

of the liquid from one receiver to the other whereby the liquid will be alternately pumped from one receiver to the other to cause alternate suction and pressure to be created in the said receivers.

9. In an apparatus for withdrawing fluids from a conduit, separating the air from the liquid and discharging the liquid, the combination with a conduit, two receivers, one of said receivers having communication with the conduit, a pump, the inlet and outlet of the pump having communication with each of the receivers, a single valve device for controlling the direction of flow of the liquid to and from the pump and for reversing the flow of liquid whereby the liquid will be alternately pumped from one of the receivers to the other to cause alternate suction and pressure to be created in the said receivers, and means for automatically actuating the said valve.

10. In an apparatus for withdrawing fluids from a conduit, separating the air from the liquid and then discharging the liquid, the combination with a conduit, two receivers, one of the receivers having communication with the conduit, a pump, the inlet and outlet of the pump having communication with each of the receivers, a single valve device for controlling the direction of flow of the liquid to and from the pump and for reversing the flow of liquid whereby the liquid will be alternately pumped from one of the receivers to the other to cause alternate suction and pressure to be created in the said receivers, and means controlled by the height of the liquid in one of the said receivers for actuating the valve device.

In testimony whereof I have signed my name to this specification, on this 2nd day of April, A. D. 1925.

BENJAMIN SKIDMORE, JR.