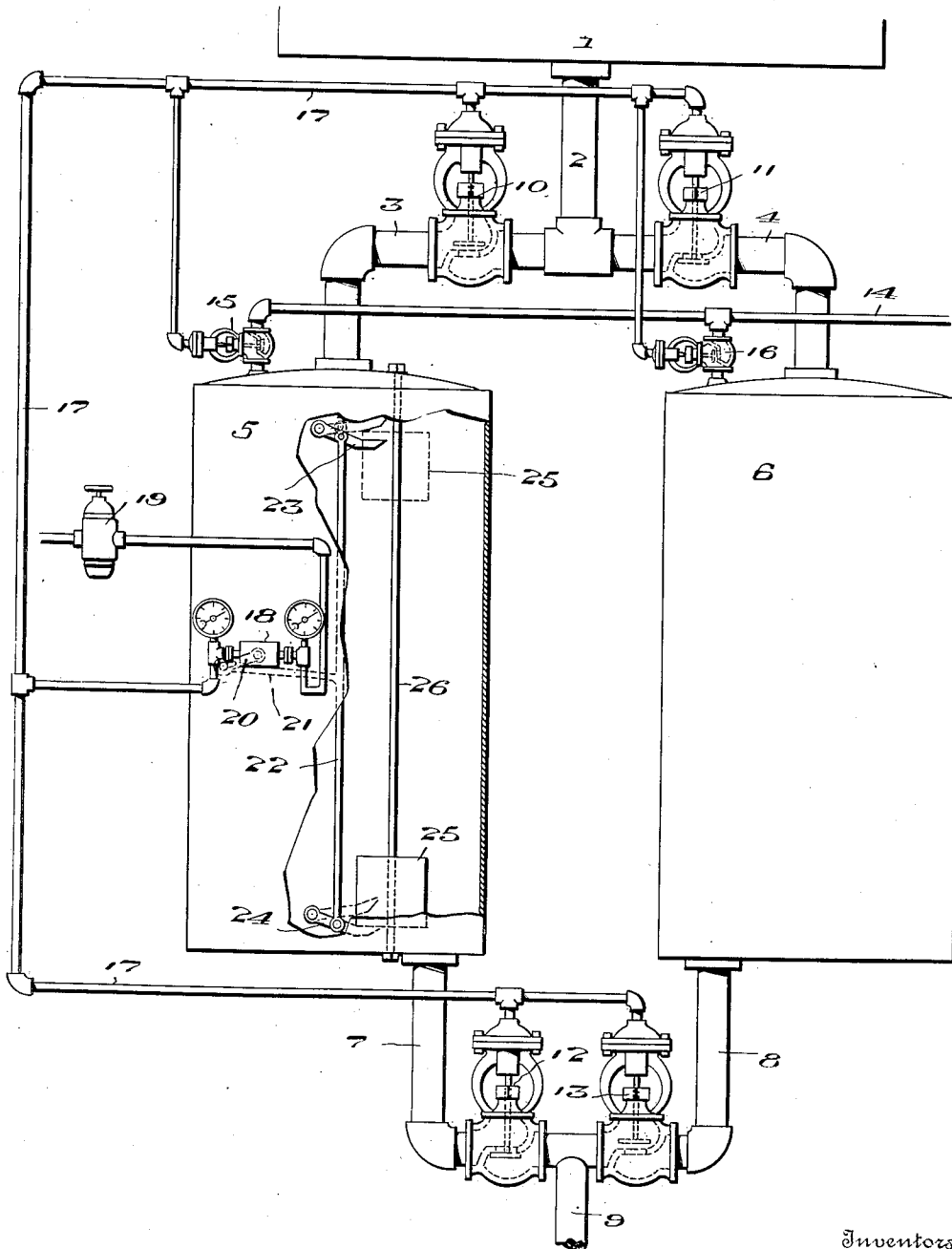


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 APPARATUS FOR TRANSFERRING LIQUIDS.
 APPLICATION FILED NOV. 8, 1916.

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Patented Aug. 2, 1921.



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APPARATUS FOR TRANSFERRING LIQUIDS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, SIDNEY T. ADAIR and HUGH C. FYANS, citizens of the United States, residing at Au Sable Forks, in the county of Essex and State of New York, have invented certain new and useful Improvements in Apparatus for Transferring Liquids; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to apparatus for transferring liquids; and it has for its object broadly the provision of apparatus whereby transfer of liquid from a container to a place of discharge can be effected easily and systematically. A further and more specific object of the invention is to facilitate removal of liquid by gravity from a chamber or vessel in which it is maintained under more or less complete vacuum. The invention has a broad field of usefulness; but it is of especial value when embodied in vacuum evaporator systems, and such an application of the invention will therefore be hereinafter more particularly explained and described for the sake of a concrete example.

A system embodying the principles of the invention comprises a liquid container, such as an evaporating pan or effect, and one or more receivers into which liquid from the container may flow under suitable conditions. In the most desirable form of the invention, two receivers are used and are arranged to work in alternation, one receiver filling with liquid from the container, while the other discharges to any convenient place liquid previously received from the container. Admission of liquid to the receivers and discharge therefrom is controlled, most desirably by automatic means, in such manner as to effect the aforesaid mode of operation. Provision is also made to insure free discharge from each receiver when that receiver is in discharge phase.

By way of illustrative example, a typical installation or system embodying the principles of the invention is shown in the accompanying drawing. This drawing, which is mainly diagrammatic in character, illustrates the apparatus in elevation, certain parts being shown broken away and in section. In the drawing, 1 represents a container for liquid, such as an evaporator effect, adapted to maintain liquid under re-

duced pressure. This container is connected by a main outflow pipe 2, having branches 3 and 4, to receivers 5 and 6 which are located at a level below that of the container 1. Discharge pipes 7 and 8 lead from the respective receivers to a common discharge as at 9.

Pipes 3 and 4 are provided, respectively, with valves 10 and 11, while pipes 7 and 8 are similarly valved at 12 and 13 respectively. The valves 10, 11, 12 and 13 are here shown as diaphragm valves of a well known type in which fluid pressure on the diaphragm tends to move the valve stem in one direction, downwardly in this instance, against the action of a spring or other resilient means normally tending to move the valve stem in the opposite direction. It will be noticed that valves 10 and 13 seat upon downward movement of the valve stem, while 11 and 12 on the contrary are unseated by downward movement of the valve stem.

Means should be provided for admitting a pressure medium to each of the receiver tanks 5 and 6 when either of them is discharging, so that free discharge may not be hindered by formation of a partial vacuum above the surface of the liquid. This could be accomplished simply by venting the tanks to atmosphere at the proper time, but where the system includes a vacuum evaporator, it is more desirable to admit steam into the receivers for this purpose as will be hereinafter more fully explained.

To this end the installation here illustrated includes a low pressure steam line 14 supplied from any suitable source of steam supply (not shown), said steam line being connected with receiver 5 by way of diaphragm valve 15, and with receiver 6 by way of a similar valve 16. Valves 15 and 16 are of the same general type and operate in substantially the same way as valves 10—13 previously described. It will be seen that fluid pressure on the diaphragm of valve 15 tends to unseat the valve, while pressure on the diaphragm of valve 16 seats the valve.

The valve system above described is automatically controlled and operated in the present example by rise and fall of the liquid level in one of the receivers. The diaphragm chamber of each of the valves is connected to a compressed air line 17 to which air is supplied at say 15 pounds pressure through a controlling valve 18 and a reducing valve 19 from a suitable com-

pressor or other source of supply (not shown). The controlling valve 18 is operable upon suitable actuation, either to connect the line 17 to the source of supply, or to
 5 cut off the supply of compressed air from the line 17. Mechanism for accomplishing this automatically at proper times is here shown as comprising an arm 20 having its end slotted to engage the end of an arm 21
 10 of a vertical rod 22, which latter is pivotally connected to levers 23 and 24, both pivoted within the receiver 5 as shown. A float 25 is arranged to slide vertically up and down on guide rod 26, following the rise and fall
 15 of liquid in the receiving tank. In its lowermost position, shown in full lines, the float strikes lever 24 and moves it downward, drawing rod 22 downward and operating controlling valve 18 in such manner as to
 20 cut off the supply of compressed air and vent the line 17. In its extreme upper position, the float strikes the lever 23, moves rod 22 upwardly and opens communication between the compressed air supply and line 17.
 25 Suitable means (not shown) may be provided to prevent downward movement of the operating rod 22 until the float has descended sufficiently to strike lever 24.

The operation of the complete apparatus
 30 is as follows. Assuming the parts to be in the positions shown, with the float in its lowermost position, receiver 5 has just finished discharging while receiver 6 has just finished filling. The float 25 has just pushed
 35 lever 24 down so that the air line 17 is cut off from the compressed air supply and there is no pressure (above atmospheric) on the various valve diaphragms. The diaphragm valves are all in the positions into
 40 which their controlling springs normally tend to move them. Thus valve 10 is open, and valves 12 and 15 are closed, while valve 11 is closed and valves 13 and 16 are open. Liquid now flows from the container or effect 1 into the receiver 5, while receiver 6
 45 discharges its contents through 8 to 9, this discharge being free by reason of the admission of steam through valve 16. The admission of air to insure free discharge is
 50 ordinarily disadvantageous since it would ultimately find its way into the effect. The use of steam, which may be simply exhaust steam, is especially advantageous in that when the contents of the receiver are completely discharged and liquid has begun to
 55 enter again through container 1, the steam condenses in large measure, the pressure in the receiver and the effect being thus partially or wholly equalized, and the free flow
 60 of liquid from the container into the receiver being thus facilitated.

When the receiver 5 has been filled to a predetermined sufficient extent, the float 25
 65 attains its upper position, indicated in dotted lines, and actuates the controlling valve 18

to connect the line 17 to pressure, whereupon the various diaphragm valves assume positions respectively opposite to those shown in the drawing. Receiver 5 is now cut off
 70 from container 1 and is open to discharge and to the steam supply; while receiver 6, being now empty, is closed to discharge and to the steam line, and is open to the container. Receiving tank 5 now discharges,
 75 the float 25 continuing to descend until it strikes the lever 24 and throws it down into the position shown, thus completing a cycle of operations. Tank 5 now fills while tank 6 discharges, and so on, the two receivers
 80 thus continuing to work in alternation. Liquid may thus flow substantially without interruption from the container 1 into one receiver or the other, so long as the system remains in operation. The operation may
 85 be stopped by cutting off the discharge through pipe 9 by means of a valve (not shown), or in any other convenient manner.

It is obvious that the flow of liquid into and out of the receiving tanks can be regulated and controlled by forms of mechanism
 90 other than that herein described, the particular mechanism illustrated being merely one example of operative means suitable for the purpose and desirable in practice.

What we claim is:

1. In apparatus of the character described, the combination, with a vacuum evaporator, of a pair of closed receivers located at a lower level than said vacuum pan, pipes for
 100 conducting liquid by gravity from said vacuum pan to said receivers, admission valves in said pipes, discharge pipes leading from said receivers, valves in said discharge pipes, a source of low pressure steam supply connected to said receivers, valves controlling
 105 admission of steam to the receivers, and float-controlled mechanism arranged to operate all the said valves periodically, the arrangement being such that while one receiver is filling the other is discharging, and
 110 steam is admitted to each receiver only while such receiver is discharging.

2. In apparatus of the character described, the combination, with a container adapted to maintain liquid under reduced pressure, of
 115 a pair of receivers connected thereto for gravity flow of liquid from said container, each receiver being adapted to receive liquid from the container and to discharge liquid so received, valve means for controlling flow
 120 to and from said receivers, and mechanism governing said valve means whereby the receivers can be worked in alternation, one filling while the other discharges.

3. In apparatus of the character described, the combination, with a container adapted to maintain liquid under reduced pressure, of a pair of receivers connected thereto for
 125 gravity flow of liquid from said container, each receiver being adapted to receive liquid
 130

from the container and to discharge liquid so received, valve means for controlling flow to and from said receivers, liquid-level-controlled mechanism arranged to operate said valve means so that said receivers work in alternation, one filling while the other discharges.

4. In apparatus of the character described, the combination, with a container adapted to maintain liquid under reduced pressure, of a pair of receivers located at a level below that of the container, valved piping connecting both receivers to the container, valved piping connecting both receivers to a common discharge, a source of steam supply, valved piping connecting each receiver thereto, and valve-operating means whereby all the valves of the system may be operated simultaneously and in such manner that one receiver is open to the container and closed to discharge and to steam, while the other is closed to the container and open to discharge and to steam.

5. In apparatus of the character described, the combination, with a vacuum evaporator, of a pair of closed receivers located at a level below that of the evaporator, valved piping for conducting liquid from the evaporator to the receivers, a valved discharge for each receiver, valved steam-admission means for each receiver, and float-controlled valve-operating mechanism governing the system in such manner that while one receiver is being filled, the other is discharging and steam is being admitted therinto, the receivers working in alternation.

6. In apparatus of the character described, the combination, with a vacuum evaporator, of a closed receiver located at a lower level than the vacuum pan and provided with an inlet and an outlet, conduit means for gravity flow of liquid from said vacuum pan to the receiver inlet, valves controlling liquid flow to said inlet and from said outlet, respectively, valve-operating mechanism arranged to open such inlet valve and close such outlet valve when the liquid level in the receiver reaches a predetermined minimum, and to reverse said valves and discharge the receiver contents when the liquid level in the receiver has reached a predetermined maximum, and means for admitting a pressure medium to the receiver during such discharge.

7. In apparatus of the character described, the combination, with a vacuum evaporator, of a closed receiver located at a lower level than the vacuum pan and provided with an inlet and an outlet, conduit means for gravity flow of liquid from said vacuum pan to the receiver inlet, valves controlling liquid flow to said inlet and from said outlet, respectively, valve-operating mechanism arranged to open such inlet valve and close such outlet valve when the liquid level in the receiver reaches a predetermined mini-

mum, and to reverse said valves and discharge the receiver contents when the liquid level in the receiver has reached a predetermined maximum, and means for admitting steam to the receiver during such discharge, such admission means being controlled by said valve-operating mechanism.

8. In apparatus of the character described, the combination, with a vacuum evaporator, of a closed receiving tank having an inlet connected to said evaporator for flow of liquid therefrom and provided with a discharge outlet, valves controlling said inlet and outlet, respectively, and valve-operating mechanism controlled by the height of liquid in said receiving tank, said mechanism being arranged to open the inlet valve and close the outlet valve at a predetermined minimum liquid level, and to reverse said valves at a predetermined maximum liquid level.

9. In apparatus of the character described, the combination, with a container for liquids, of a receptacle having an inlet connected to said container for flow of liquid therefrom by gravity and provided with a discharge outlet, valves controlling said inlet and outlet, respectively, a source of fluid pressure, and valve-operating mechanism controlled by the height of liquid in said receptacle, said mechanism being arranged to apply fluid pressure from said source to open the inlet valve and close the outlet valve at a predetermined minimum liquid level, and to apply fluid pressure from said source to reverse said valves at a predetermined maximum liquid level.

10. The combination, with a source of liquid supply, of a pair of receivers connected thereto and provided with discharge outlets, valves respectively controlling flow of liquid from said source to said receivers and discharge of liquid therefrom, and fluid pressure means connected to all said valves and operable by change in liquid level to actuate them simultaneously to admit liquid from said source to one receiver and to discharge liquid from the other.

11. The combination, with a source of liquid supply, of a pair of receivers connected thereto and provided with discharge outlets, diaphragm valves respectively controlling flow of liquid to and from said receivers and normally occupying positions such that one receiver is in communication with said source but is closed to discharge, while the other receiver is cut off from the receiver but open to discharge, a compressed air supply, and float controlled means arranged, upon predetermined change of liquid level in one of said receivers, to place the compressed air supply in communication with all said diaphragm valves and thereby to reverse their relative positions, and subsequently upon another predetermined change

in liquid level, to release the air pressure on said diaphragm valves, thereby restoring them to their original positions.

12. The combination, with a source of liquid supply, of a pair of receivers each having an intake connected to said source and each having a discharge outlet, valves controlling flow through said intakes and outlets, valve actuating means, including a compressed air supply, and float controlled mechanism cooperating with said valve actuating means, upon attainment of a predetermined liquid level in one of the receivers, to shift all said valves simultaneously and thereby to connect one receiver to said source and close its discharge outlet while

opening the discharge outlet of the other receiver and disconnecting it from said source, said float controlled mechanism subsequently cooperating with said valve actuating means, upon attainment of another predetermined liquid level in a receiver, to effect a reversal of said valves, whereby alternate filling and discharging of said receivers occurs.

In testimony whereof we hereunto affix our signatures.

SIDNEY T. ADAIR.
HUGH C. FYANS.

Witnesses:

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WM. BRUNNER.