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SUCTION REGULATING MEANS

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3 Sheets-Sheet 1

Fig. 1

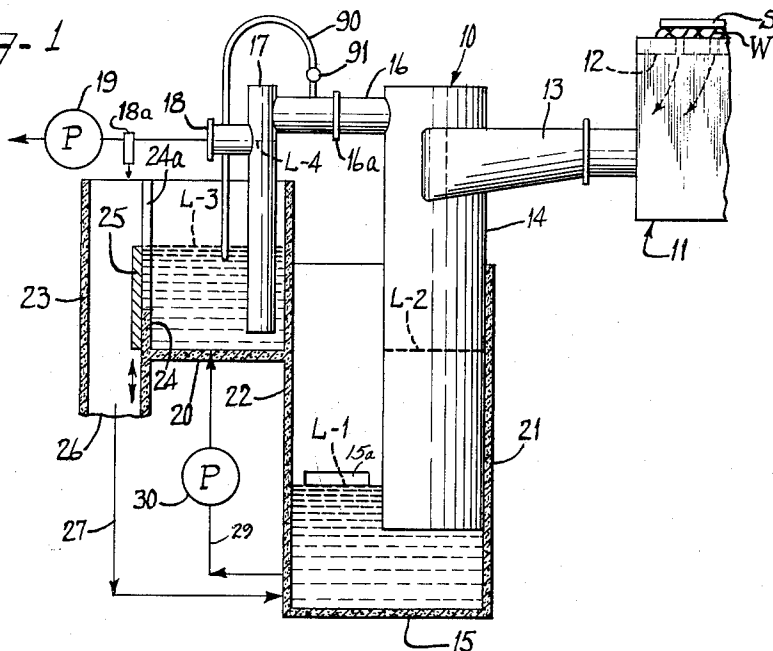
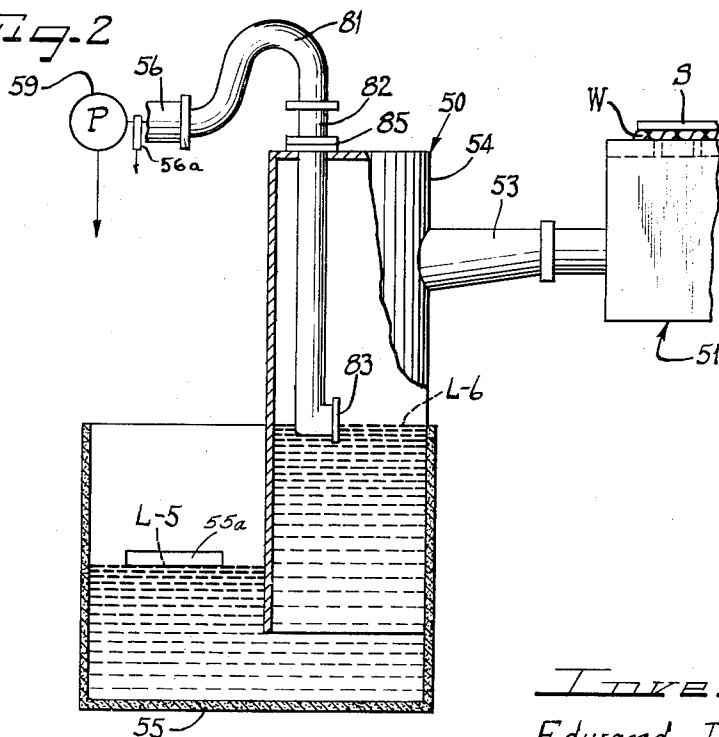


Fig. 2



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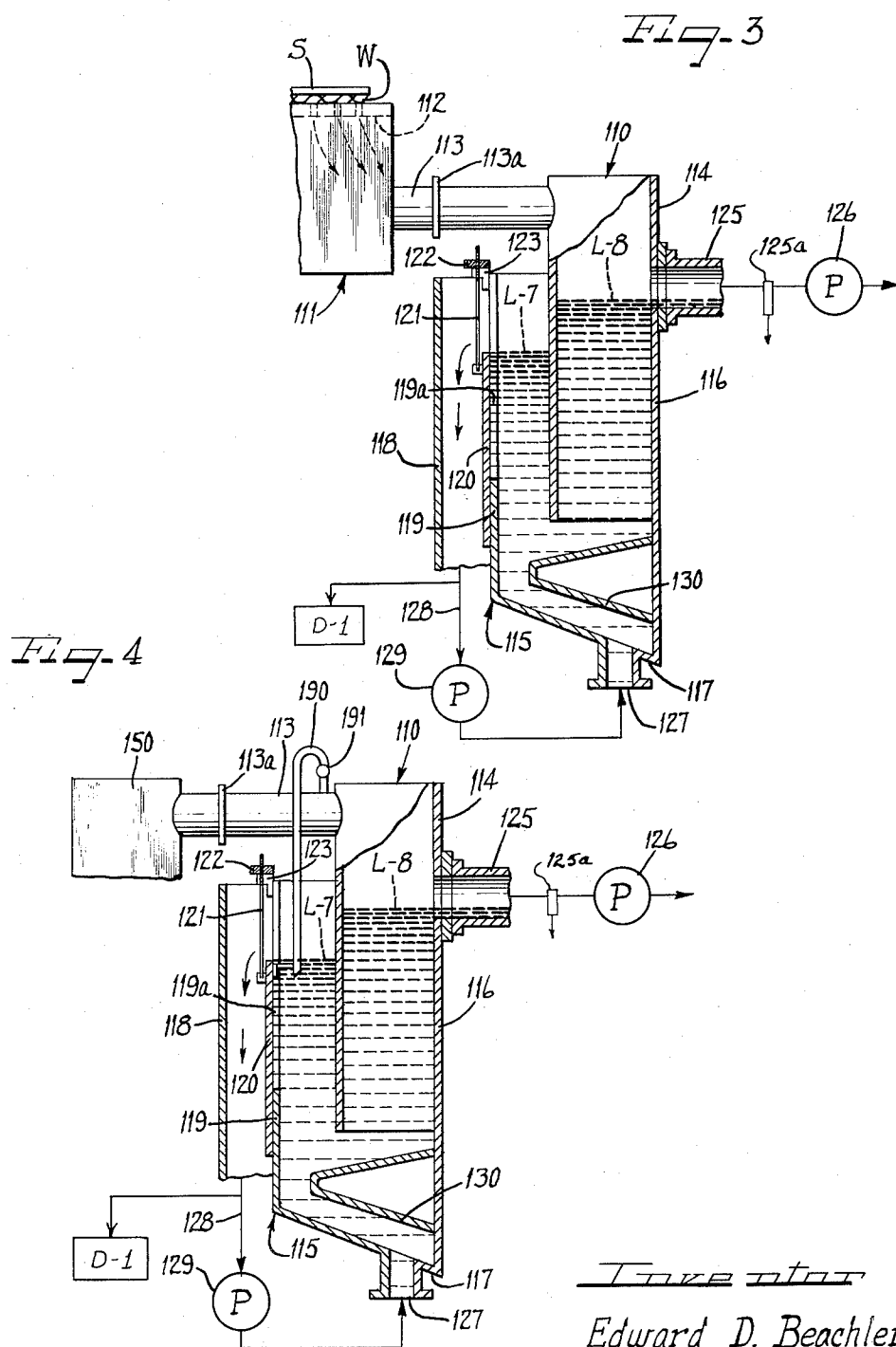
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Take note

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3 Sheets-Sheet 3

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3,024,839

SUCTION REGULATING MEANS

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This invention relates to suction regulating means, and more particularly, to an arrangement for maintaining stable conditions in a suction chamber in a device such as a paper machine.

Although the instant invention may have use in a number of fields, it is particularly useful in the art of paper making. The invention relates to the regulation of pressure in a suction chamber having a perforate wall offering restricted flow to a liquid exposed thereto, such as a suction flat box operating beneath the forming wire of a paper machine, or a suction gland in a suction press roll or a suction couch roll in a paper machine. The instant invention is primarily concerned with obtaining the advantages of regulating pressure in a suction flat box. As will be appreciated, conditions in the stock passing over a suction flat box will vary. Some present-day devices are known which attempt to compensate for such variation, but these devices are extremely complicated and not always completely reliable.

In the conventional paper machine structure, there is provided a seal pit having a liquid level therein substantially below the suction flat box, a drop leg extending below the seal pit level and communicating with the suction chamber in the flat box to transfer liquid therefrom to the seal pit, and a source of suction connected to the top of the drop leg, which maintains a reduced pressure in the suction box by continually drawing off a predetermined quantity of air. The "source of suction" is actually an air exhausting device usually with substantially constant volume performance. If the stock becomes very dilute over the suction flat boxes, less resistance to the flow of water and air through the top of the flat box occurs, and the pressure within the flat box chamber increases slightly thus causing a decrease in the "suction" effected therein. This does not create any problem and the only change in the operation of the device is that the water "leg" or head in the primary drop leg decreases somewhat, because of the resulting reduction in pressure differential between the level of water in the drop leg and the level of water in the seal pit. If, however, in the operation of the paper machine a substantial increase in the consistency or slowness of stock should take place, greater resistance to the flow of air and water into the flat box suction chamber occurs. The substantially constant volume air exhausting device which provides the source of suction thus creates a substantial reduction in pressure within the suction chamber of the flat box. The water level in the drop leg consequently will rise. The serious problem here is that the wire is increasingly forced down against the flat box tops by this increased pressure differential across the wire and excessive wear or even seizure of the wire and the suction flat box tops takes place. The instant invention avoids this difficulty.

In the instant invention simplified means are provided for compensating instantly for an increase of the suction in the suction chamber so as to partially or substantially nullify the rate of air exhaustion via the source of suction. In other words, a sharp increase in the suction within the suction chamber is anticipated and prevented by the instant invention. At the first moderate increase in the suction chamber, the instant device acts to compensate therefor. In the instant device there is provided a seal pit with a drop extending below the seal pit level and communicating with a suction chamber sub-

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stantially above the seal pit level, and there is further provided a conduit connected to a source of suction opening into the drop leg beneath the suction chamber and above the seal pit level and maintaining a water leg in the drop leg of substantially the level of the opening of said conduit (or slightly below). In this arrangement, a slight increase in the suction within the suction chamber will cause the water leg to rise to the level of the conduit opening, either partially closing the opening (with the flow of water therethrough) so as to reduce the air exhausting effect thereof, or completely closing the opening temporarily so as to permit the pressure to revert to normal in the suction chamber. Means are further provided for adjusting either the level in the seal pit (hence to adjust the hydrostatic head of the water leg) and/or the level of the conduit opening (hence to adjust the hydrostatic head of the water leg).

It is, therefore, an important object of the instant invention to provide an improved device for regulating pressure in a suction chamber in a paper machine.

It is another object of the instant invention to provide an improved device for regulating pressure in a suction chamber having a perforate wall offering restricted flow to a liquid exposed thereto, which comprises a primary seal pit having a liquid level therein beneath the suction chamber, a primary drop leg extending below the seal pit level and communicating with the suction chamber to transfer liquid therefrom to the seal pit, a source of suction, and a conduit connected to said source of suction and opening into said drop leg beneath the suction chamber and above the seal pit level for maintaining a suction in the suction chamber equivalent to the liquid head between the conduit opening in the drop leg and the liquid level in the seal pit.

Other and further objects, features and advantages of the present invention will become apparent to those skilled in the art from the following detailed description thereof and the drawings attached hereto.

On the drawings:

FIGURE 1 is a side elevational view, with parts shown in section and parts shown diagrammatically of an embodiment of the instant invention;

FIGURE 2 is a side elevational view, with parts broken away, parts shown in section and parts shown diagrammatically of still another embodiment of the instant invention;

FIGURE 3 is an elevational view of yet another embodiment of the instant invention with parts shown in section and parts broken away and parts shown diagrammatically;

FIGURE 4 is an elevational view of a further embodiment of the instant invention, with parts shown in section, parts shown diagrammatically and parts broken away;

FIGURE 5 is an elevational view of another embodiment of the instant invention with parts shown in section, parts shown diagrammatically and parts broken away; and

FIGURE 6 is a fragmentary view illustrating a suspension mechanism of FIGURE 5 in detail.

As shown on the drawings:

In FIGURE 1, a device 10 for regulating pressure in a suction chamber 11 is shown. The suction chamber 11 here shown is a suction flat box with a traveling forming wire W carrying stock S traveling thereover. In the suction box 11 there is a flat perforate top 12 through which air and water pass as indicated in arrows in dotted lines into the interior of the suction box 11. The air and water then pass through a drawoff line 13 into a primary drop leg 14. The water, of course, falls downwardly in the drop leg 14 into a seal 15, the level L-1 of which is maintained by an overflow 15a. The drop leg 14, of course, extends below the level L-1 in the seal pit 15 and

because of the predetermined suction pressure within the drop leg 14 under ordinary operating conditions a higher level L-2 is maintained therein. Air is drawn off from the top of the drop leg 14 through a primary suction header 16 which, in turn, communicates with the top of a secondary drop leg 17. Slightly below the primary suction duct or header 16 entering into the secondary drop leg 17, there is a secondary suction header 18 which, in turn, communicates with a source of suction such as the intake of a suction pump 19. A separator or trap 18a is connected to the header 18 ahead of the pump 19. Considering this much of the device 10, it will be seen that, if there is a decrease in the consistency or slowness of stock S flowing over the flat box 11, more air enters into the system and the suction drops. This causes a drop in the level L-2 in the drop leg 14. In the instant device the level L-1 in the seal pit remains substantially constant because of a substantial volume of water therein and an unrestricted overflow therefrom. If, however, there is an increase in the consistency or slowness or the like of stock S flowing over the flat box 11, the exhaust means 19 will continue to pull air out of the top of the drop leg 14 (in spite of the increased resistance to the flow of air through the stock S of greater consistency) and the suction in the suction box 11 will increase, thus drawing the level L-2 upwardly. This increase in suction within the flat box 11, causes the wire W to pull down against the flat top 12 and cause excessive wear therebetween. The instant invention avoids this difficulty.

It will be noted that the primary suction header 16 communicates with the secondary drop leg 17 above the opening at which the secondary suction header 18 removes air from the upper portion of the drop leg 17. The drop leg 17 extends downwardly into a secondary seal pit 20 which maintains a liquid level L-3 therein of predetermined height and this results in a liquid level L-4 of the water leg within the secondary drop leg 17. The level of the water leg within the secondary drop leg 17 is approximately at the opening for the secondary suction header 18. If there is an increase in consistency of the stock S, suction within the system 11, 13, 14, 16, 17 and 18 will commence to increase. This results in drawing the secondary water leg level L-4 upward and partially or completely closing off the secondary suction header 18. Immediately, the air exhausting effect via the secondary suction header 18 is reduced or nullified and a sharp increase in the suction within the flat box 11 does not take place.

Referring to the seal pits 15 and 20, it will be seen that the seal pit 15 is defined by an inside concrete wall 21 and an outside concrete wall 22 which continues upwardly to form the inside wall of the secondary seal pit 20. The secondary seal pit 20 is also provided with an outside wall 23 and a partition wall 24 between the inside and outside walls 22, 23. The partition wall 24 is provided with an aperture 24a in the upper portion thereof and this aperture is closed by a dam 25, which is adjustable vertically to control the level L-3 within the secondary seal pit 20. In practice, water flows over the dam 25 and down a duct 26 formed by the outside wall 23 and the partition wall 24, and into the primary seal pit 15 via the line 27 shown diagrammatically.

If no water is fed into the secondary seal pit 20, then this level L-3 will remain fairly constant and there will be no overflow of water over the dam 25. As soon as there is an initial surge or increase in the suction in the system, however, water will be drawn out of the secondary seal pit 20 and out through the secondary suction header 18. Any sustained surge of this type would drain the secondary seal pit 20 quickly and thus expose the bottom of the secondary drop leg 17 to ambient atmosphere, which would result in atmospheric pressure, or substantially so, throughout the suction system including the suction box 11. The system 10 can thus be used as described so far with the secondary drop leg 17 being used

as a safety device to prevent a single upsurge in the suction, merely by sucking the secondary seal pit 20 dry. However, it is more desirable to maintain a slight flow of water into the secondary seal pit 20 and this is done by pumping water from the seal pit 15 into the secondary seal pit 20 via a line 29 and pump 30 (shown diagrammatically). This results in a continuous overflow of water at the dam 25 and a continuous maintenance of the level L-3. The dam 25 is adjustable so that the level L-3 can be raised or lowered as desired. The head between the levels L-3 and L-4 is representative of the vacuum in the system and this head will, of course, be the same as the head between the levels L-1 and L-2. By a continuous slight flow of water into the secondary seal pit 20, the level L-3 is maintained constant, in spite of continuous or repeated withdrawals of water at the level L-4 by the secondary suction header 18. Preferably the secondary drop leg 17 is much smaller in size than the primary drop leg 14, so that there will be a quick response in the level L-4 to variations in suction in the system. If the pump 30 does not flow water into the secondary seal pit too rapidly, then the secondary drop leg 17 may pull the secondary seal pit dry if an abrupt change of suction takes place in the system. This, of course, is a safety factor which is desirable in certain instances, because excessive dragging of the wire W over the suction box tops 12 must be avoided. On the other hand, it may not be desirable to permit a complete loss of suction at relatively slight increases by pulling the secondary seal pit dry, so the pump 30 may be operated at a slightly greater speed so as to continuously supply a substantial amount of water to the secondary seal pit 20. This is an operating convenience which the recycle system 27, 29 and 30 affords. The pump 30 affords control of the rate of recycle.

It will be understood that the primary barometric drop leg is not required to produce suction, although it may contribute. This invention permits raising the seal pit level to a height sufficient to allow it to overflow to the conventional wire pit, thus eliminating the need for pumping. This yields an important saving in initial cost as well as in operating cost.

Referring now to FIGURE 2, it will be seen that the device indicated generally by the reference numeral 50 shown in FIGURE 2 is also adapted for use with a suction flat box 51 having a wire traveling thereover covered by stock S in the same manner that the suction flat box 11 operates. Air and water are drawn from the flat box 51 through a conduit 53 and fed into the top of the drop leg 54 which extends downwardly below a level L-5 in a seal pit 55 maintained by an overflow 55a. A source of suction in the form of an exhaust pump 59 (shown diagrammatically) is provided and this is connected to a suction header 56, which in turn is connected through a flexible pipe 81 to a vertical pipe section 82 extending downwardly through the top of the drop leg 54 and having an opening 83 substantially at or just above the level L-6 of the water leg within the drop leg 54. A separator or trap 56a is connected to the suction header 56 ahead of the pump 59. Suitable adjusting means 85 are provided for vertically adjusting the pipe section 82 and such means may be in the form of a threaded collar and lock nut 85 (shown diagrammatically) or any other suitable means which will also seal off the top of the drop leg 54. The pipe opening 83 serves to define the height of the water leg level L-6 in the same manner that the secondary suction header 18 defined the level L-4 in the device 10 of FIGURE 1. The difference here is that the opening 83 for the exhaust header or suction header 56 is vertically adjustable and it is mounted within the primary drop leg 54. Otherwise, the function is the same as that already described. The opening 83 is clearly below the drop leg inlet 53. In this way, both air and water will move downwardly initially and the air is not merely drawn off the top of the drop leg, as in the conventional drop leg ar-

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rangement. It may be noted that the system 13, 14, 15 and 16 of FIGURE 1 shows a conventional drop leg arrangement, with the exhaust or suction header 16 pulling off air above the inlet 13. In the device 50, the difference is that the exhaust outlet 83 must be mounted below the drop leg inlet 53.

It will be appreciated that the use of the large primary drop leg in the device 50 for control means will result in a slower response. In some instances this may be desirable, so that sharp changes in suction will not take place by abruptly opening the system to ambient atmosphere, such as may be done by pulling the secondary seal pit 20 empty in the device of FIGURE 1. On the other hand, it may sometimes be desirable to have even more rapid action in responding to an upward surge in suction. This additional embodiment is brought out in the device 10 of FIGURE 1, in the form of a duct 90 that is connected to the primary suction header 16 and thus communicates with the interior of the suction box 11. The duct 90 is equipped with a valve 91 and it extends downwardly to just below the level L-3 in the secondary seal pit 20. The duct 90 is thus exposed to ambient atmosphere as soon as the water in the seal pit 20 drops slightly below the desired level L-3. This causes ambient atmosphere to flow into the system and immediately reduce the suction effect. The valve 91 is used to control this rate of flow, so that it is not necessary to completely lose vacuum in the system. On the other hand, this affords a very rapid response to an upsurge in the suction caused by an upsurge in the concentration of stock. Of course, the valve 91 can be closed so as to nullify the action of the duct 90, or the valve 91 may be opened slightly so as to obtain only slight effect from the duct 90. This affords an additional control device for the instant invention.

Referring now to FIGURE 3, it will be seen that there is shown still another device, indicated generally by the reference numeral 110 embodying the instant invention. In this device there is provided a suction flat box 111, again with a wire W carrying stock S traveling thereover and a flat box top 112 with perforations therein for withdrawing air and water from the stock S into the interior of the suction box 111 as indicated by arrows in dotted lines. The water and air then travel through a duct 113 into the top of a drop leg 114. The drop leg 114 extends downwardly into a seal pit 115 and beneath the level L-7 maintained therein. As here shown, the outside wall 116 of the drop leg 114 and the seal pit 115 extends downwardly to connect with a bottom wall 117 for the seal pit 115. The seal pit 115 is also provided with an inside wall 118 and a partition wall 119 having an aperture 119a therein in which is mounted a vertically adjustable dam 120 (which is vertically adjustable by means such as a threaded rod 121, and a threaded nut 122 mounted on a bracket 123). It will thus be seen that in this arrangement the level in the seal pit 115 is controlled by vertical adjustment of the dam 120. A main suction drawoff 125 connected to suitable exhaust means 126 opens into the drop leg 114 beneath the suction box 111 and, of course, the drawoff opening 113 at the top of the drop leg 114. A separator or trap 125a is located between the drop leg 114 and the suction drawoff 125. The suction drawoff 125 serves to maintain the water leg level L-8 in the drop leg 114 in the manner hereinbefore described. In the arrangement 110, control of the water head between the levels L-7 and L-8 is maintained primarily by adjustment of the dam 120. Increases in the suction within the flat box 111 will cause the level L-8 to increase and partially block off or completely block off the suction drawoff 125.

The arrangement 110 is comparable in some respects in function to the arrangement 50, because it is associated with the primary drop leg wherein a substantial amount of water is received. In this respect, a continuous flow of water over the dam 120 is contemplated and it may even

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be necessary to permit water to flow through an opening 127 in the bottom wall 117 of the seal pit. Preferably, however, the water flows substantially entirely over the dam 120 and into drainage system D-1, and a small amount of water is recirculated through the recirculating line 128 and pump 129 back into the opening 127 in the bottom of the seal pit 115. For this purpose a baffle wall 130 is provided within the seal pit 115, so that flow of water directly into the bottom of the drop leg 114 is avoided. In this way the level L-7 is maintained constant, by recirculation of at least a small amount of water, in the event that there is a temporary lapse in withdrawal of water from the withdrawal line 113.

It will also be appreciated that the unit 110 up to the flange 113a in the drawoff line 113 could be used to replace the assembly 17, 18, 20 of FIGURE 1, by connecting the flange 113a to the flange 16a shown in the unit 10 of FIGURE 1. This arrangement is thus shown generally in FIGURE 4.

In FIGURE 4, it will be noted that each of the elements that is the same as one of the elements of FIGURE 3 in function is designated by the same reference numeral. The overall function of the unit 110 is the same; but the inlet 113 to the drop leg 114 is connected to the top of a primary drop leg 150 (shown partially) at the flange 113a. This corresponds to a connection at the flange 16a of FIGURE 1; and the instant device 110 functions in the manner in which the device 17, 18, 20 functions in FIGURE 1. In addition, a duct 190, with valve 191 in the device 110 functions in the same manner as the device 90, 91 functions in FIGURE 1.

In FIGURE 5, a suction chamber 200 is a suction flat box with a traveling forming wire W carrying the stock S traveling thereover and including a flat perforate top 201 through which air and water pass as indicated in arrows in the dotted lines into the interior of the suction box 200. The air and water pass through a draw line 202 into a primary drop leg 203. The water falls downwardly in the drop leg 203 into a seal pit 205, with the drop leg extending into a portion 205. The seal pit is formed by concrete walls 204. The water rises to a level L-10 in the primary drop leg 203 during operation.

The primary drop leg 203 is supported from fixed framework 207 by members 208, permitting limited substantially horizontal motion, so accommodating the customary oscillation of the suction box while eliminating any need for troublesome flexible or hose connectors. As shown generally in FIGURE 5, and in detail in FIGURE 6, the member 208 is suspended on a rod 222 supported at the top by a constant height bar 223, which in turn is pivotally connected and supported at one end by a link 224 extending upwardly and pivotally connected to a bracket 225 on the framework 207. The bar 223 is pivotally connected to and supported at the other end by a downwardly extending link 226 pivotally mounted on the lower end of a J-shaped bracket 227 on the framework 207. Other primary drop legs for other suction boxes (not shown) may be supported by similar mechanism 228.

Other primary drop legs may be provided (not shown) for other suction boxes and these will be connected to individual secondary drop legs. Each of these will connect to individual suction headers such as 219 each having valves 220. These secondary suction headers may be connected at different elevations such as illustrated by the secondary suction headers 212 and 219 with the secondary drop legs each projecting down into the seal pit 205. The seal pit is provided with flow means (not shown) for its overflow to flow into a wire pit 221.

In operation, the secondary suction header 212 removes air from the upper portion of the secondary drop leg 211 and the level of the water L-11 in the leg is approximately at the location of the connection of the secondary header 212 to the leg. With increased consistency of the stock S the suction in the system will in-

crease drawing the secondary water level L-11 upward and partially or completely closing off the secondary suction header 212 thus automatically regulating the suction pressure. The height of the connection of the secondary header 212 above the level L-12 of the liquid in the seal pit 205 can be controlled by regulating the length of the adjustable support 216 which is connected to a hook 217 mounted on the frame 207.

It will be understood that modifications and variations may be effected without departing from the spirit and scope of the novel concepts of the present invention.

I claim as my invention:

1. A device for regulating pressure in a suction chamber having a perforate wall offering restricted flow to a liquid exposed thereto, which comprises a primary seal pit having a liquid level therein beneath the suction chamber, a primary drop leg extending into the seal pit to below the seal pit level and communicating with the suction chamber to transfer liquid therefrom to the seal pit, a source of suction, and a conduit connected to said source of suction and having an end opening into said drop leg beneath the suction chamber and above the seal pit level for maintaining a suction in the suction chamber equivalent to the liquid head between the conduit end in the drop leg and the liquid level in the seal pit.

2. A device for regulating pressure in a suction chamber having a perforate wall offering restricted flow to a liquid exposed thereto, which comprises a primary seal pit having a liquid level therein beneath the suction chamber, a primary drop leg extending into the seal pit below the seal pit level and communicating with the suction chamber to transfer liquid therefrom to the seal pit, a source of suction communicating with said primary drop leg, a secondary seal pit, adjustable means maintaining a selected liquid level in the secondary seal pit, a secondary drop leg extending below the secondary seal pit level and having an inlet communicating with the suction chamber, and a conduit communicating with said source of suction and having an end opening into the secondary drop leg below its inlet and above the secondary seal pit level for maintaining suction in the suction chamber and at the top portions of said drop legs, said conduit cooperating with said adjustable means to maintain a column of liquid in said secondary drop leg at a level between the conduit end in said secondary drop leg and the secondary seal pit level and also insuring that suction in the suction chamber will not exceed the suction equivalent to said column of liquid.

3. A device for regulating pressure in a suction chamber having a perforate wall offering restricted flow to a liquid exposed thereto, which comprises a primary seal pit having a liquid level therein beneath the suction chamber, a primary drop leg extending into the seal pit to below the seal pit level and communicating with the suction chamber to transfer liquid therefrom to the seal pit, a source of suction, a conduit connected to said source of suction and having one end opening into said drop leg beneath the suction chamber and above the seal pit level for maintaining a suction in the suction chamber equivalent to the liquid head between the conduit opening in the drop leg and the liquid level in the seal pit, and means mounted for vertical adjustment of said conduit end.

4. A device for regulating pressure in a suction chamber having a perforate wall offering restricted flow to a liquid exposed thereto, which comprises a primary seal pit having a liquid level therein beneath the suction chamber, means mounted for vertical adjustment of the liquid level in the primary seal pit, a primary drop leg extending into the seal pit below the seal pit level and communicating with the suction chamber to transfer liquid therefrom to the seal pit, a source of suction, and a conduit connected to said source of suction and having an end opening into said drop leg beneath the suction chamber and above the seal pit level for maintaining a suction in

the suction chamber equivalent to the liquid head between the conduit end in the drop leg and the liquid level in the seal pit.

5. A device for regulating pressure in a suction chamber having a perforate wall offering restricted flow to a liquid exposed thereto, which comprises a primary seal pit having a liquid level therein beneath the suction chamber, a vertically adjustable dam controlling the liquid level in the primary seal pit, a primary drop leg extending into the seal pit to below the seal pit level and communicating with the suction chamber to transfer liquid therefrom to the seal pit, a source of suction, and a conduit connected to said source of suction and opening in said drop leg beneath the suction chamber and above the seal pit level for maintaining a suction in the suction chamber equivalent to the liquid head between the conduit opening in the drop leg and the liquid level in the seal pit.

6. A device for regulating pressure in a suction chamber having a perforate wall offering restricted flow to a liquid exposed thereto, which comprises a primary seal pit having a liquid level therein beneath the suction chamber, a primary drop leg extending below the seal pit liquid level and communicating with the suction chamber to transfer liquid therefrom to the seal pit, a source of suction, a conduit connected to said source of suction and having an end opening into said drop leg beneath the suction chamber and above the seal pit liquid level for maintaining a suction in the suction chamber that does not exceed suction equivalent to the liquid head between the conduit end in the drop leg and the liquid level in the seal pit, and a duct affording communication between said chamber and just below the liquid level in said primary seal pit whereby lowering of the liquid level in the primary seal pit by an increase in suction will expose the duct to ambient atmosphere.

7. A device for regulating pressure in a suction chamber having a perforate wall offering restricted flow to a liquid exposed thereto, which comprises a primary seal pit having a liquid level therein beneath the suction chamber, means mounted for vertical adjustment of the liquid level in the primary seal pit, a primary drop leg extending below the seal pit level and communicating with the suction chamber to transfer liquid therefrom to the seal pit, a source of suction, a conduit connected to said source of suction and having an end opening into said drop leg beneath the suction chamber and above the seal pit level for maintaining a suction in the suction chamber that does not exceed suction equivalent to the liquid head between the conduit end in the drop leg and liquid level in the seal pit, and a duct affording communication between said chamber and just below the level in said primary seal pit whereby lowering of the level in the primary seal pit by an increase in suction will expose the duct to ambient atmosphere.

8. A device for regulating pressure in a suction chamber having a perforate wall offering restricted flow to a liquid exposed thereto, which comprises a primary seal pit having a liquid level therein beneath the suction chamber, a primary drop leg extending into the seal pit to below the seal pit level and communicating with the suction chamber to transfer liquid therefrom to the seal pit, a source of suction, a secondary seal pit maintaining a liquid level therein, a secondary drop leg extending below the secondary seal pit level and having an inlet communicating with the suction chamber, and a conduit communicating with said source of suction and having an end opening into the secondary drop leg below its inlet and above the secondary seal pit level for maintaining suction in the suction chamber and at the top portions of said drop legs, thereby maintaining a column of liquid in said secondary drop leg extending from the conduit end in said secondary drop leg to the secondary seal pit level.

9. A device for regulating pressure in a suction chamber having a perforate wall offering restricted flow to a

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liquid exposed thereto, which comprises a primary seal pit having a liquid level therein beneath the suction chamber, a primary drop leg extending into the seal pit to below the seal pit level and communicating with the suction chamber to transfer liquid therefrom to the seal pit, a source of suction, a secondary seal pit, overflow means maintaining a selected liquid level in the secondary seal pit, a recycle line flowing liquid from said primary seal pit into the secondary seal pit, a secondary drop leg extending below the secondary seal pit level and having an inlet communicating with the suction chamber, and a conduit communicating with said source of suction and having an end opening into the secondary drop leg below its inlet and above the secondary seal pit level for maintaining suction in the suction chamber and at the top portions of said drop legs, said conduit cooperating with said overflow means to maintain a column of liquid in said secondary drop leg between the conduit end and the secondary seal pit level.

10. A device for regulating pressure in a suction chamber having a perforate wall offering restricted flow to a liquid exposed thereto, which comprises a primary seal pit having a liquid level therein beneath the suction chamber, a primary drop leg extending into the seal pit to below the seal pit level and communicating with the suction chamber to transfer liquid therefrom to the seal pit, a source of suction, a conduit connected to said source of suction and opening into said drop leg for maintaining a suction in the suction chamber, means providing a secondary seal pit with a liquid level therein, a secondary drop leg therein communicating with the suction chamber, and a duct affording communication between the suction chamber and a location just below the level in the secondary seal pit with an end at said location, whereby increases in suction in the suction chamber will lower the level in the secondary seal pit and expose the duct end to ambient atmosphere.

11. A device for regulating pressure in a suction chamber having a perforate wall offering restricted flow to a liquid exposed thereto, which comprises a seal pit having a liquid level therein beneath the suction chamber, a primary drop leg extending below the seal pit liquid level and communicating with the suction chamber to transfer liquid therefrom to the seal pit, a secondary drop leg extending below said seal pit liquid level and having an outlet adjustably fixed in height above said liquid level, means affording communication between said secondary drop leg

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and the suction chamber, a source of suction, and conduit means connecting said outlet to said source of suction.

12. A device for regulating pressure in a suction chamber having a perforate wall offering restricted flow to a liquid exposed thereto, which comprises a seal pit having a liquid level therein beneath the suction chamber, a primary drop leg extending into the seal pit below the seal pit liquid level and communicating with the suction chamber to transfer liquid therefrom to the seal pit, a secondary drop leg extending below said seal pit liquid level and having an outlet adjustably fixed in height above said liquid level, means affording communication between said secondary drop leg and the suction chamber, a source of suction, conduit means connecting outlet to said source of suction, and means affording direct communication between the suction chamber and the ambient atmosphere whenever the amount of suction in the suction chamber exceeds a preset value.

13. A device for removing water from a suction chamber which comprises, a source of vacuum, a draw line rigidly connected to said chamber, a drop leg connected to said draw line to receive water therefrom, a seal pit submerging one end of said drop leg, a connection, including control means, connecting the other end of said drop leg to the vacuum source, and suspension means supporting said device for limited substantially horizontal motion.

14. A device for removing water from a suction chamber which comprises in combination means defining a suction chamber, means providing a source of vacuum, a draw line rigidly connected to said suction chamber means, a drop leg connected to said draw line to receive water therefrom, a seal pit receiving the lower end of said drop leg, means connecting the other end of said drop leg to said vacuum source means, and suspension means supportingly connected to said draw line and drop leg and structurally accommodating limited horizontal motion thereof at a substantially constant horizontal level.

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