This invention relates to paper machines and has special reference to improved slice mechanism for removing the water pressed from the top of a sheet or web at the nip of two rolls.

As is well known to those skilled in the art, there are numerous places in the processes of making paper where water is squeezed out of the sheet or the felts by being passed between two rolls. Normally no difficulty is encountered in disposing of the water which flows out from the bottom of the felt or sheet, but the water that is squeezed out of the top tends to build up at the nip of the rolls, frequently assuming considerable proportions at these points and flowing off the edges of the sheet or sheet adjacent the ends of the rolls. Even in a suction roll where the object is to draw all or a large part of the water through the roll shell, in most instances the resistance of the sheet is such as to cause a pond of water to form on the top of the sheet or felt. This water must then flow back on the felt or parallel to the roll and over the edge of the felt. It is also sometimes necessary to use a board, called a slice board, which drags on the felt to keep the water from running back and soaking into the felt and sheet. Where the water flows in a direction crosswise of the sheet or felt and outwardly from the center of the machine, there is necessarily a deeper pond at the center than at the edges. This produces a lack of uniformity across the width of the sheet, particularly affecting the edges of the sheet which retain a considerable amount of moisture so that the edges of the sheet are not uniform with the center portions of the sheet. Numerous devices have been employed in an attempt to remedy this condition, but so far as I am aware, none of these have been entirely satisfactory. According to my invention, I propose to mask this water up uniformly along the nip and in close proximity to the nip.

An important object of the invention is the provision of a generally improved paper machine slice.

I have also aimed to provide a slice lip of improved structure and improved means for holding the lip.

Another object of the invention is the provision of a paper machine slice having no appreciable pressure on the felt, thus substantially eliminating wear on the felt from this source, and saving power.

A further object of the invention is the provision of a paper machine slice which picks up the water across the entire width of the sheet as soon as it is freed from the felt to maintain a uniform moisture condition across the sheet.

Another object is the provision of a paper machine slice having means for cleaning the same without disturbing the setting thereof...

A more specific object of the invention is the provision of a paper machine suction slice of a construction such as to substantially eliminate the danger associated with the proper setting thereof, and wherein the adjustment of the slice is materially simplified.

I have also aimed to provide means for removing the excess of free water at the edges of the felt beyond the edges of the slice.

Other objects and attendant advantages will become apparent to those skilled in the art from the following description and the accompanying drawings, in which—

Figure 1 is a section through a suction slice embodying my invention showing the manner of positioning the slice with respect to the rolls of a cylinder machine;

Fig. 2 is a section transversely through the suction box and slice lip;

Fig. 3 is a fragmentary top view of the suction box and slice lip, one end of the suction box being shown in section;

Figs. 4 and 5 are fragmentary cross-sections showing bona fide forms of the outer edge of the slice lip;

Fig. 6 is a fragmentary section through the slice lip taken at right angles to Fig. 2;

Fig. 7 is a fragmentary top view of the suction slice as applied to a suction roll, and

Fig. 8 is a side view of the form shown in Fig. 7.

Referring first to Figs. 1 to 6 inclusive, the numerals 11, 12, 13 and 14 designate respectively a cylinder mold, an end of the vat in which the cylinder mold rotates, a couch roll operating thereagainst, and a felt passing between the cylinder mold and the couch roll. It will be understood that this particular arrangement of parts is merely for the purpose of illustrating the invention and that the slice is adapted for use in conjunction with any pair of rolls where water tends to build up on the top of a felt or sheet passing therebetween. Such a situation frequently develops between press rolls, particularly primary press rolls, at suction rolls as shown in Figs. 7 and 8, at extractor rolls and the like. Frequently the sheet passes between the rolls with a felt on both its upper and lower sides and occasionally otherwise, and it is not intended to limit the invention to the particular
0 combination of rolls or the manner in which the sheet is passed through the rolls.

In this particular instance wherein the wholly or partially formed sheet and a felt pass between the cylinder mold 11 and couch roll 18, a large amount of water is pressed from the sheet and the felt, and tends to build up on top of the felt in the wedge-shaped area 15 adjacent the line of contact. As previously noted, this water tends to flow lengthwise of the roll and across the sheet, running off the felt at the edges. However, this does not run off rapidly enough to prevent a considerable head of water from existing just ahead of the couch roll.

In order to avoid the condition above described, I provide a lip designated generally by the numeral 16, in this instance formed of soft rubber and being in sheeted or strip form as shown in Fig. 6, the lip having a plurality of closely spaced parallelly disposed channels 17 terminating along the edges of the strip or lip. This lip extends the full width of the web and it will be understood may take a number of forms, as, for example, short sections vulcanized or otherwise fastened together. It may take the form of a plurality of tubules, or may be of a single piece depending upon the ease of manufacture or the desires of the manufacturer. It will likewise be seen that while it is convenient to make the lip of soft rubber, other materials, such as fabric, may in some instances be used, the important factors being that the lip be resilient to allow passage through the rolls without damage and that the rolls have sufficient strength to prevent collapse of the channels under the suction of which about two to three inches of mercurial is normally sufficient.

One edge of the lip is clamped in a suction box designated generally by the numeral 18, which in this instance is of tubular form having an opening 19 along its side for reception of one edge of the lip 16, the opening being defined by jaws 21 and 22. Spaced bolts 23 pass through the jaws and serve to tighten the jaws to frictionally grip the edge of the lip as shown in Fig. 2.

The suction box and lip is preferably formed by a drawing operation, the suction box being drawn in the required shape and in suitable lengths. End pieces 24 and 25 (Fig. 3) are positioned in the ends of the suction box and secured therein by means of screws 26 and 27 which pass into sleeve portions 28 and 29. The end pieces also have shoulders 31 and 32 which abut against the end of the tubular body portion of the suction box and which project outwardly as shown at 33 and 34 to close the ends of the opening 19 between the jaws. The end pieces have axially extending hub-like portions 35 and 36 adapted to function in supporting the suction box as will presently appear.

The end piece 25 has a cross piece 37 closing the end of the suction box while this cross piece is absent in the end piece 24. The outer end of the end piece 24 is threaded as shown at 38 for the attachment thereto of a pipe or other conduit connected to suitable pumps for the purpose of applying suction to the box.

In the example shown in Figure 1 the suction box is supported on the ends of the vat 12 through brackets 39 on opposite ends of the vat, these brackets having sleeves 41 within which rods 42 are slidably received, the rods being held in adjusted positions by means of set screws 43. The rods 42 carry saddles 44 which are provided with set screws 45, the saddles 44 receiving the portions 35 and 36 of the end pieces 24 and 25 of the suction box to support the same in its operative position. The set screw 45 serves to secure the suction box in a desired rotative position to regulate the elevation or angularity of the lip 16.

The suction box extends the full width of the machine so as to hold the outer edge of the lip 16 adjacent the nip of the rolls throughout the entire width of the sheet or web passing therebetween.

The outer edge 46 of the lip 16 is clamped between the jaws 21 and 22 by means of the bolts 23. These bolts are spaced longitudinally of the jaws and are screwed down until the lip 16 is firmly gripped between the jaws without materially distorting or flattening the channels 17. Cloth backing strips 47 and 48 are cemented onto the opposable surfaces of the lip adjacent the edge 46 to provide a suitable gripping medium for the jaws. This arrangement serves to hold the lip in the suction box during any normal operation of the device. The free or outer edge of the lip 16 may take a number of shapes depending upon the conditions of installation, such, for example, as the shapes shown in Figs. 2, 4 and 5. Means may also and preferably will be provided for the purpose of flushing out or cleaning the channels 17 in the lip within which pulp and other solids will sometimes build up so as to reduce the efficiency of the slice. Such means will be described in connection with Figs. 7 and 8.

In Figs. 7 and 8 I have shown a different manner of mounting the slice, such as will preferably be used with a suction roll wherein the numeral 49 designates generally the suction roll and the numeral 51 a top pressure roll operating thereagainst in bearings 52 having arms 53 through which pressure is applied to the roll 55 through rods 54 in a well known manner. In this instance brackets 55 are attached to arms 53 at opposite ends of the rolls, the brackets corresponding in function to the brackets 39, being, however, differently shaped. These brackets have sleeves 56 for the reception of the rods 52 to support the saddles 44 which in turn support the suction box as previously described. In this instance it will be noted that the brackets 55 being carried on the arms 53 cause the suction box and slice lip to move with the top pressure roll 51.

In this instance a suction is applied to the suction box through a pipe 57 attached to the rear side of the suction box which in turn is connected to a pipe 58 from the usual suction pumps through a flexible hose 59, valve 61, T 62, and conventional fittings, the flexible hose 59 permitting movement of the suction box. A pipe 63 is connected into the T 62 and serves to admit fluid for the purpose of flushing out the lip and suction box. For this purpose the valve 61 to the suction pump is closed off and the valve 64 in the line 63 is opened so that fluid such, for example, as water, may be admitted filling the suction box and causing an outward flow through the channel 17 so as to flush out the suction box and slice lip. It will be seen that this is accomplished without in any way disturbing the adjustment or setting of the slice. The water flowing out through the passages 17 in the lip or clear the passages of foreign matter, such as paper fiber, dirt and nap from the felts, which may collect and retard the action of the slice. This flushing operation may take place while the machine is in operation without any momentary loss of the advantage of the suction slice. As previously mentioned, it is contemplated that when the slice is used on a cylinder mold as shown in Figs. 1 and 3, a similar arrangement is used to permit fresh water to be
introduced into the suction box for the purpose of flushing out the same.

In operation, the slice is positioned on the paper machine in the position shown in Figure 1, and is assisted by means of the set screws 45 and 46 so that the forward edge of the lip rests in close proximity to the nip of the rolls. By use of the set screws 45 the slice may be adjusted so that either the lip is free of the felt or so that it rests lightly on the felt, depending upon the particular requirements. At all events it will be seen that the slice may be adjusted so that the forward edge of the lip is in close proximity to the point at which the liquid is expelled from the felt or sheet. The capacity of the channels 17 and of the suction device may advantageously be greater than that required to remove the water so that it is drawn in from the surrounding spaces. In this manner the fluid along the edges of the felt in the sheets is drawn up and inward, that is, slightly toward the center of the sheet, and as a result, the sheet passes through the rolls with the edges thereof of substantially the same dryness as the remainder of the sheet, thereby preventing crushed edges due to the excess of water at this point.

One of the reasons in the past for an excess of moisture along the edges of the sheet is that the forward edge of the roll is the thickness of sheet and felt combined, whereas the sheet is narrower than the felt or felts, thereby leaving a strip of lesser thickness along each edge from which the water is incompletely expressed. After the sheet and felt have passed through the rolls, the water in the edge strips rapidly works back into the edge of the sheet by capillarity. This action is substantially entirely avoided by the use of the present invention.

It will be noted that since the lip is formed of rubber or other resilient material it may be permitted to drag lightly on the felt so that it is automatically adjusted as to height, and so that the drag occasioned by the usual slice board is eliminated, thereby eliminating the power load and the wear on the felt associated therewith. Another important feature of the invention is the fact that the lip may be set very close to the nip without the danger of damage to the equipment or injury to the operator. It will be understood by those skilled in the art that in the setting of a slice where it is necessary to adjust the position of parts in close proximity to the nip of rapidly moving rolls there is always danger that the slice will be caught between the rolls and drawn through. If the slice is of rigid material when this type of accident occurs, severe damage is done to the equipment and there is grave danger that the workman in the act of adjusting the slice may be drawn into the rolls and seriously injured. With the present invention it will be seen that the lip is formed of resilient material and is clamped in the suction box. Consequently, should the forward edge of the lip catch in the nip and be drawn through the rolls, no material damage is done, since the lip itself is formed of resilient material which may readily pass through the rolls and the connection between the lip and the suction box is such that this excessive force causes the lip to be drawn out of the suction box without damage to the latter and without any danger that the workman who is holding or adjusting the suction box will be drawn into the rolls and injured. Because of this safety feature it is possible for the slice to be adjusted within much closer limits than has heretofore been possible, since the operator can afford to take much greater chances on the lip being caught between the rolls. Therefore, important structural features of the device are the use of a lip of resilient material, said lip being held in operationally or otherwise held in the suction box so that the lip will slip out of the box if caught by the rolls and will pass through the rolls without damage. Another advantage of importance is the improved quality and uniformity of the sheet caused by the uniform removal of the water therefrom.

While I have thus described and illustrated a specific embodiment of my invention, I am aware that numerous alterations and changes may be made therein, and I do not wish to be limited except as required by the prior art and the scope of the appended claims, in which:

I claim:

1. The combination in a suction slice of a suction box having means for gripping a lip to normally hold the lip in position and releasing the lip when caught by the rolls, and a resilient lip of such compressibility throughout as to be capable of passing between opposed paper machine rolls without damage thereto, said lip having a plurality of channels terminating at one end within the suction box and at the other end comprising a sheet of soft rubber having a plurality of parallelly disposed bores extending from edge to edge thereof.

2. A paper machine slice comprising in combination a suction box, and a slice lip frictionally held in the box, said lip comprising a sheet of soft rubber having a plurality of parallelly disposed bores extending from edge to edge thereof.

3. A suction slice for removing the water at the nip of paper machine rolls comprising a suction box of substantially the length of said rolls, said box having a pair of spaced jaws extending substantially the length of the box and defining a slot in said box, and a slice lip of resilient material clamped between said jaws with a force sufficient to normally retain the sheet therewith, permit withdrawal when the strip is caught between the rolls, said lip having a plurality of channels spaced longitudinally of the box terminating at one end in the box and at the other end adjacent the nip of said rolls to remove the water from the sheet necessary to adjust the means for adjusting the clamping action of the jaws on the lip to predetermined the force required to pull the lip from between the jaws.

4. A suction slice for removing the water at the nip of paper machine rolls comprising a suction box of substantially the length of said rolls, said box having a pair of spaced jaws extending substantially the length of the box and defining a slot in said box, and a slice lip comprising a sheet of soft rubber clamped along one edge between said jaws, said sheet having a plurality of channels spaced longitudinally of the sheet, one end of said channels terminating in said box and the other end terminating at the opposite edge of the sheet adjacent the nip of said rolls to remove water from the nip through said channels.

5. The combination with a paper making machine of a suction slice comprising a suction box extending transversely across said machine adjacent a pair of rolls, a slice lip carried therein releasable under an excessive pull and comprising a sheet of resilient material secured along one edge in said suction box and having a plu-
rality of channels extending from edge to edge thereof, said sheet being of such resiliency as to pass through the rolls without damage thereto, a yoke supported on each side of said machine for supporting said suction box to support the lip in close proximity to the nip of the rolls, said yokes being adjustable toward and away from said rolls to position said suction box, and means acting between said yokes and said suction box to predetermine the angular position of the latter.

6. The combination with a paper making machine having a pair of rotatable rolls and means for supporting one of said rolls for lateral movement of a suction slice comprising a suction box extending across said machine adjacent said rolls, a resilient slice lip carried therein for removing water from the nip of said rolls, means for supporting the lip on the box for release under an excessive pull, said lip comprising a sheet of resilient material secured along one edge in said suction box and having a plurality of channels extending from edge to edge thereof, said sheet being of such resiliency as to pass through the rolls without damage thereto, means for supporting said suction box on said roll supporting means for movement therewith to support the lip in close proximity to the nip of the rolls, and means for predetermining the position of the lip with respect to the nip of said rolls.

7. A suction slice lip comprising a sheet of resilient material having a plurality of parallelly disposed channels extending from edge to edge thereof, and means on opposite sides of the sheet adjacent one edge providing gripping surfaces for holding the lip.

8. A suction slice lip comprising a sheet of soft rubber having a plurality of parallelly disposed tubular channels extending from edge to edge thereof, the channels terminating in the edge of the sheet and the sheet being of sufficient strength to prevent collapse of the channels under suction.

9. In a paper machine a lip comprising a sheet of material resilient throughout the entire area thereof having a plurality of channels extending from edge to edge thereof.

LLOYD HORBOSTEL.