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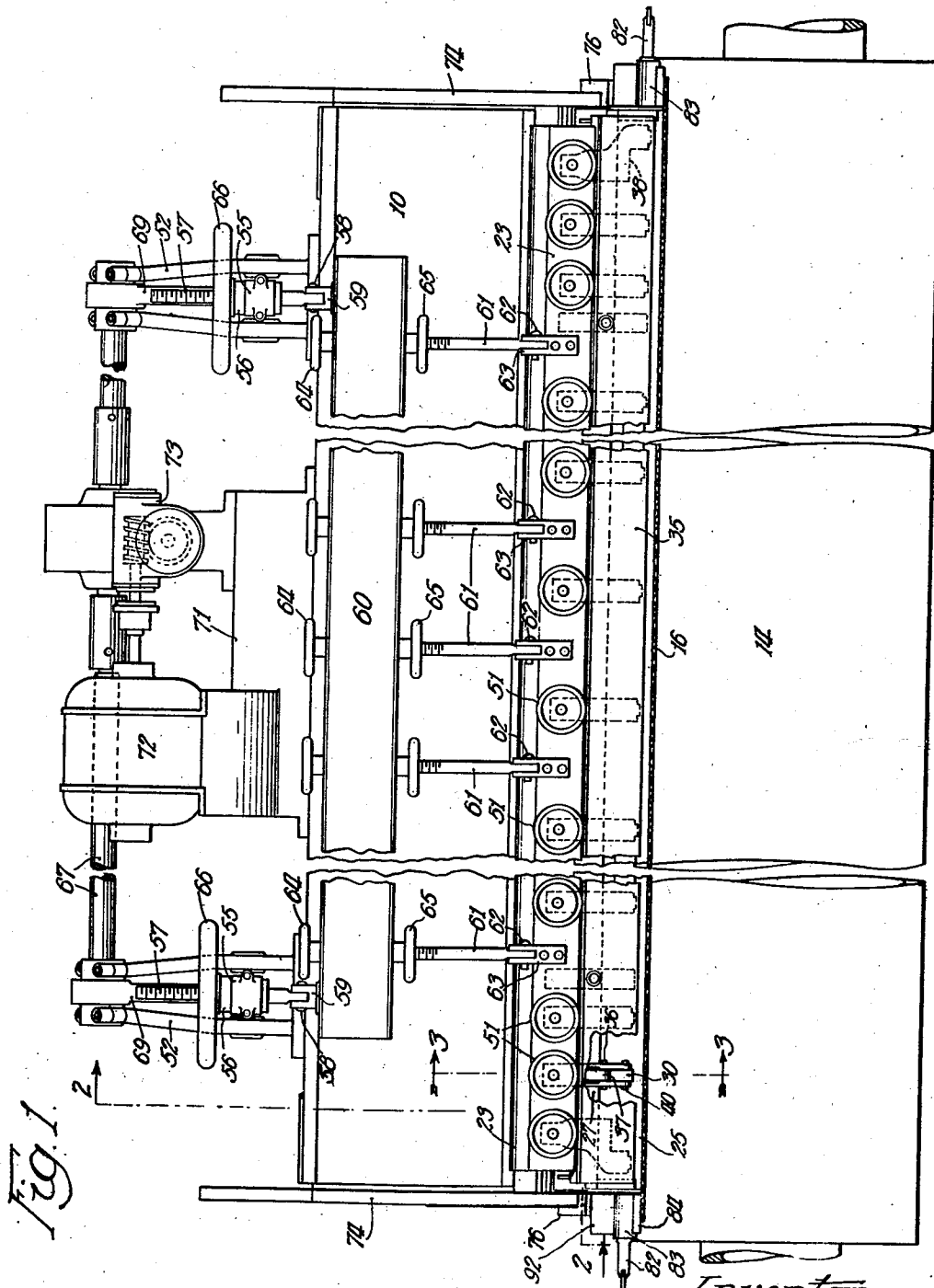
W. R. KELLETT ET AL

2,264,941

SLICE CONSTRUCTION FOR PAPERMAKING MACHINES

Filed March 10, 1939

4 Sheets-Sheet 1



Inventor:
William R. Kellett and
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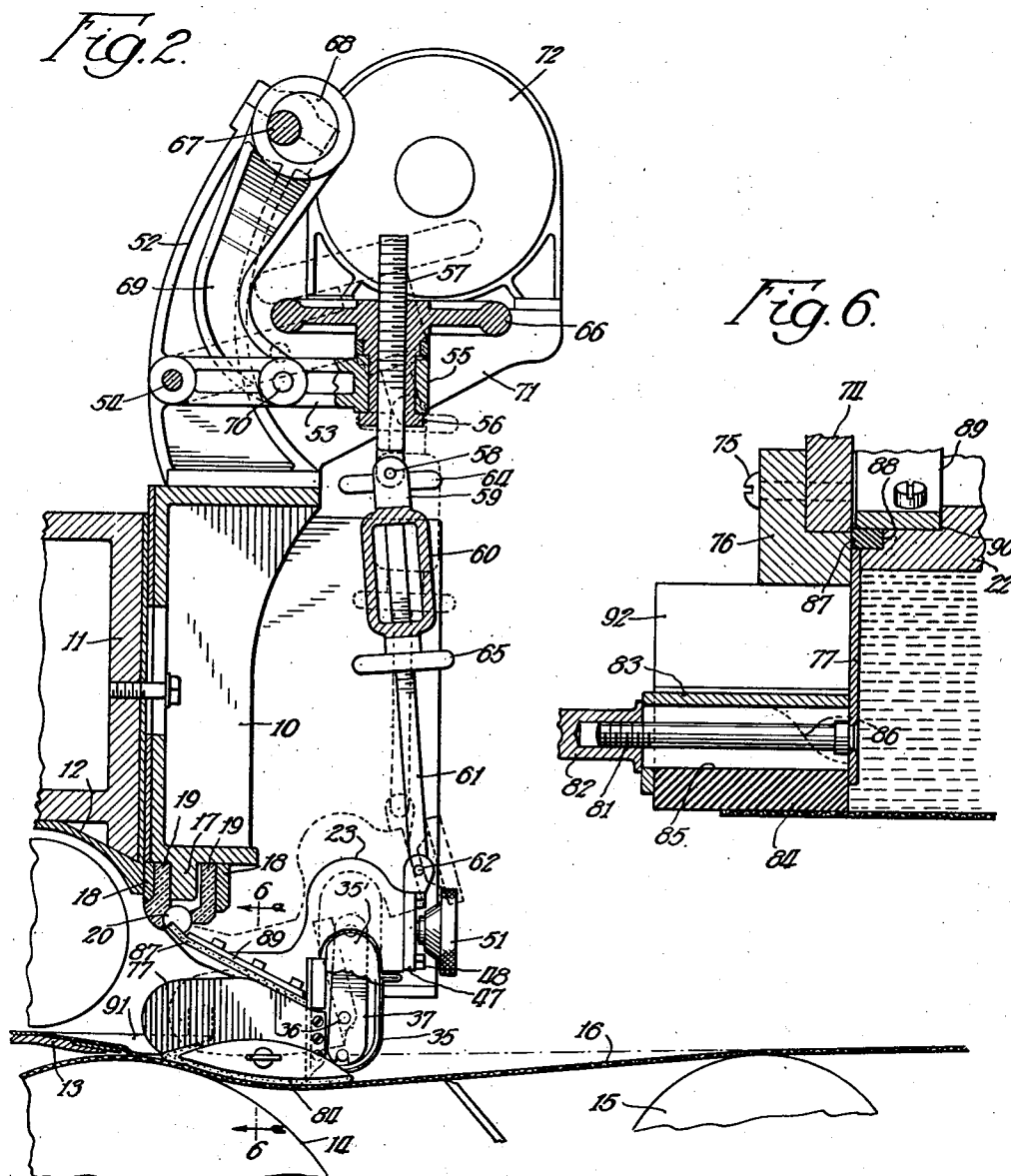
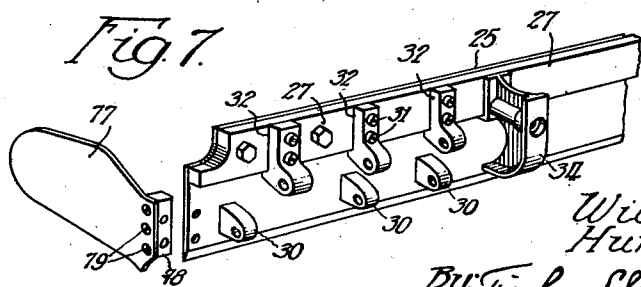
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4 Sheets-Sheet 2



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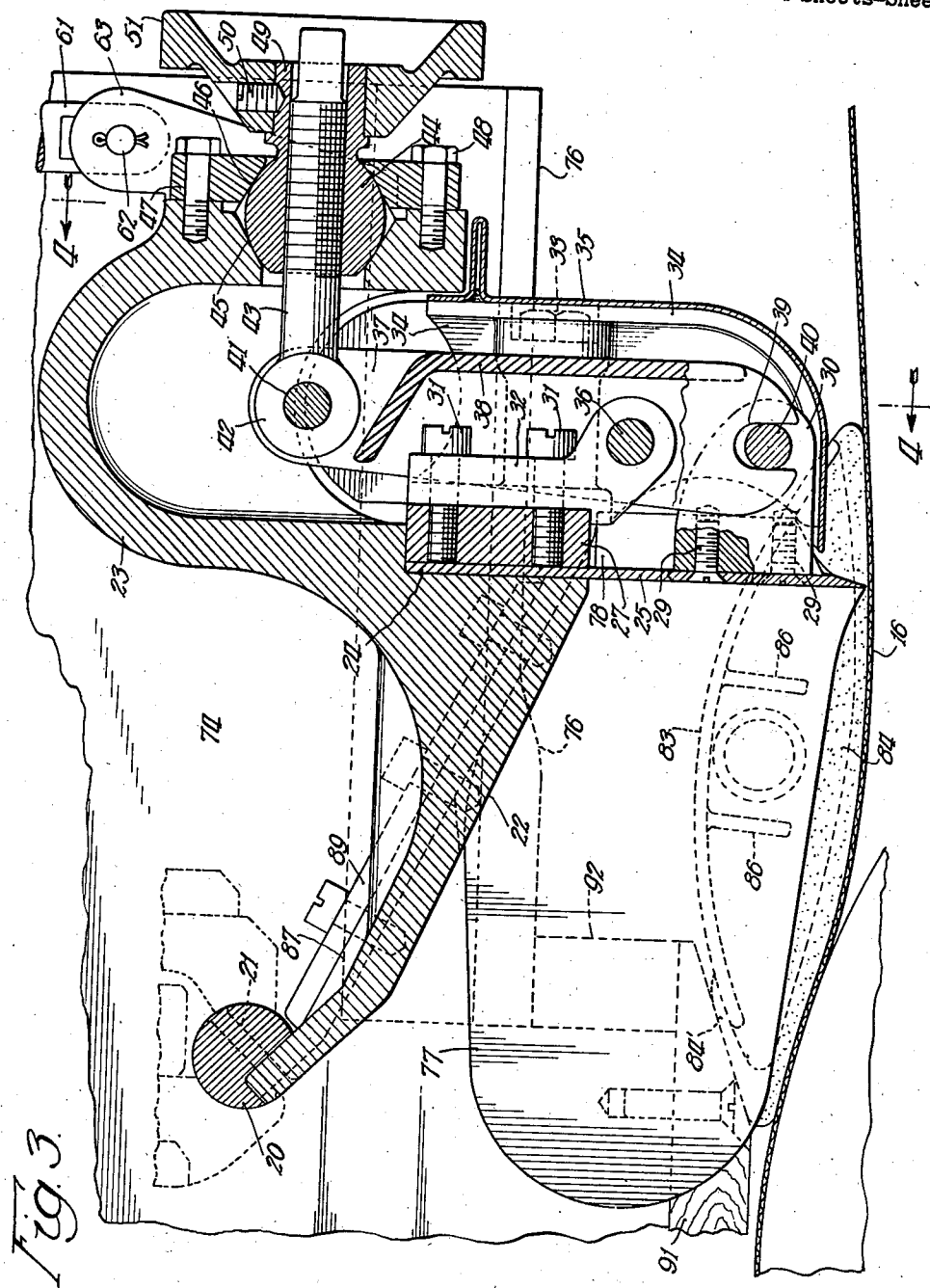
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4 Sheets-Sheet 3



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4 Sheets-Sheet 4

Fig. 4

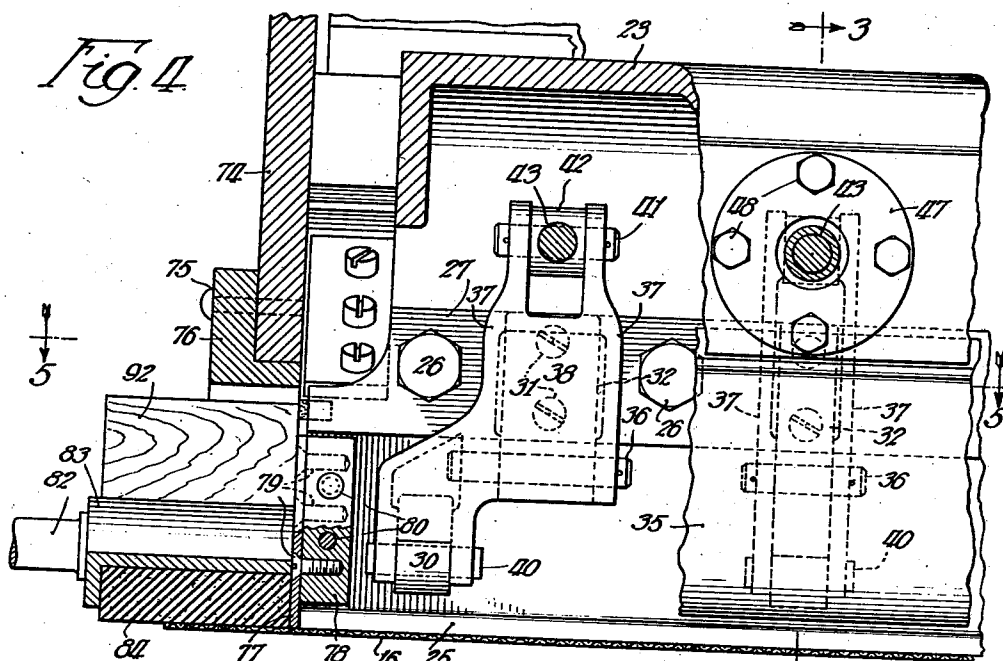
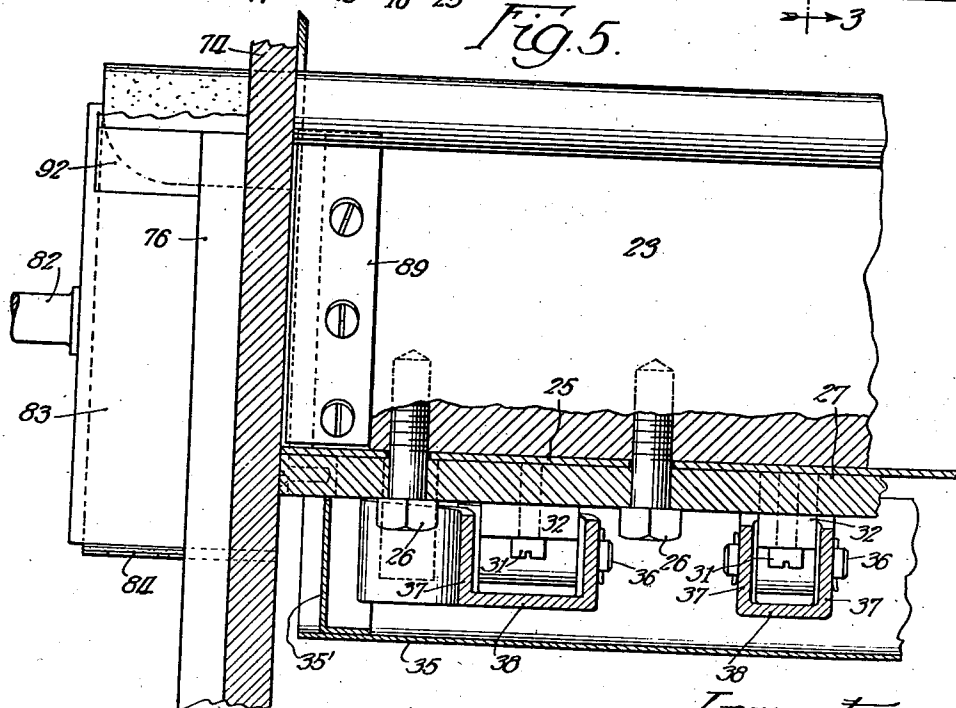


Fig. 5



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UNITED STATES PATENT OFFICE

2,264,941

SLICE CONSTRUCTION FOR PAPERMAKING MACHINES

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Application March 10, 1939, Serial No. 260,956

5 Claims. (Cl. 92-44)

This invention relates to the art of paper making machines of the Fourdrinier type, and has reference more particularly to the slice that controls the flow and distribution of the stock onto the wire. The invention is of especial value in high speed machines for making very thin paper such as tissue paper, crepe wadding, and the like.

The general object of the present invention has been to provide an improved hydraulic inlet system that will produce an equal rate of flow across the width of the paper machine and will compensate for the slightly varying inequalities of flow that characterize inlet systems which afford an approximately uniform rate of flow. This has in a measure been heretofore accomplished by the use of a flexible inclined slice the lower edge of which is adjustable vertically at many points along its length. In accordance with the present invention the slice is a flexible vertical member which is not flexed vertically, but means are provided to warp the slice in a horizontal or machine direction. Such adjustment longitudinally of the machine serves to vary the forming area and hence the weight of sheet deposited on any given area of the wire. It also tends to deflect the stock in such a way as to compensate for any inequalities in flow distribution. By utilizing these characteristics it is possible to obtain a paper sheet of equal basis weight across its entire width.

Other objects of the invention have been to provide, in combination with a flexible slice as above described, a manually adjustable means for finely adjusting the height of the lower edge of the slice from the wire and preventing or correcting any sag of the slice or deflection due to hydraulic pressure, and a power means for effecting a quick raising of the slice to prevent injury to the same and the wire when the stock flow is shut off; and also to provide an improved means for effectively sealing the side edges of the slice and slice carrier against lateral escape of stock.

A practical and approved embodiment of the invention is illustrated in the accompanying drawings, in which—

Fig. 1 is a front elevation of the stock inlet of a paper making machine equipped with our improved slice, the same being broken out between its sides.

Fig. 2 is a vertical transverse section taken on the offset line 2—2 of Fig. 1.

Fig. 3 is an enlarged vertical transverse section through the slice carrier and slice and the means for warping the latter horizontally in the ma-

chine direction, taken on the line 3—3 of Fig. 4.

Fig. 4 is an enlarged fragmentary front elevation, partly broken out and in vertical section on the offset line 4—4 of Fig. 3.

Fig. 5 is a fragmentary horizontal section taken on the line 5—5 of Fig. 4.

Fig. 6 is a vertical transverse section enlarged taken on the line 6—6 of Fig. 2.

Fig. 7 is a perspective view of the flexible slice and associated parts.

Our present improvements are herein shown applied to a paper making machine substantially like that forming the subject matter of the pending application of William R. Kellett and Harry M. Ostertag, Serial No. 94,516, filed August 6, 1936; but they are, of course, applicable to any paper making machines of the Fourdrinier type.

Referring to Fig. 2, 10 designates a vertically adjustable bracket that is attached to the front wall 11 of a horizontally adjustable inlet structure that includes parallel vertical side walls and a goose-neck spout between and in part formed by said side walls, a fragment of the top and bottom walls of said spout being indicated at 12 and 13 respectively. 14 designates the breast roll, 15 the first table roll, and 16 the Fourdrinier wire.

On the lower edge of the bracket 10 is a rib 17, to the opposite sides of which are secured, as by clamp strips 18, a pair of fiber strips 19 that extend below the rib 17 and are formed in their opposed faces with bearings for a brass pintle rod 20. Referring to Fig. 3, attached to the pintle rod 20 as by rivets 21 is the rear narrow end or shank of a slice carrier casting that has the cross-sectional form illustrated in Fig. 3, said casting having a downwardly and forwardly extending flat portion 22 constituting an upper nozzle plate and a relatively high hollow forward extension 23 of inverted U-shape. The rear wall of the extension 23 is formed with a countersunk seat 24 in which is seated the upper portion of a flexible vertically disposed thin steel slice 25, that is secured to its seat by a number of machine screws 26 (Fig. 5) that extend through a fastening strip 27 (see also Fig. 7), the slice 25, and into tapped holes in the casting 23. Also attached by screws 29 to the front face of the slice 25 below and extending parallel with the strip 27, is a row of laterally spaced forwardly projecting bearing brackets 30 (Fig. 7). Secured to the front face of the strip 27 as by screw bolts 31 (Fig. 3) are a corresponding group of bearing brackets 32. Also attached to the front face of the strip 27 as by countersunk machine

screws 33 are a plurality of brackets 34 that serve as a support and backing for a sheet metal shield 35, having side wings 35' (Fig. 5). This shield 35 is attached to the brackets 34 as by soldering, spot welding, or otherwise, and serves to prevent the slice adjusting mechanism from becoming clogged or plugged with stock.

Pivoted in the lower ends of the brackets 32 as by pivot pins 36 (Figs. 4 and 5) are a group of levers, each comprising parallel spaced side limbs 37 and a connecting web 38, the cross-sectional form of the latter being shown in Fig. 3, where it will be seen that the web 38 terminates at its upper end below the upper ends of the side limbs 37. The lower ends of the side limbs 37 are vertically slotted, as shown at 39 in Fig. 3, to form forks that straddle pivot pins 40 that are mounted in the lower bearings 30. Journaled on a pin 41 mounted in the upper end of each lever is the head 42 of an eye-bolt 43, the threaded stem of which is engaged by a ball nut 44 (Fig. 3) that is rotatably mounted on a bearing in the front wall of the casting portion 23. This bearing is conveniently formed by a conical seat 45 in the wall itself and an opposed conical seat 46 in a cap or cover member 47 that is detachably secured to the casting wall by machine screws 48 (Fig. 4). The ball nut 44 has a forwardly projecting neck 49, keyed on which by a set screw 50 is an operating handle preferably in the form of a hand wheel 51.

The above described means for rocking the levers affords a micrometer slice adjustment by flexing the lower portion of the slice below the bottom of the slice carrier locally and horizontally in the machine direction; the considerable number of independent adjusting devices located side by side for the full width of the slice making it possible to warp the slice in the manner and to the small extent required to very evenly and uniformly distribute the stock over the wire as the latter travels beneath the lower edge of the slice, and preventing the formation of relatively thick and thin areas in the deposited fiber mat on the wire.

The invention also includes manually operated vertical adjustments at various points along the carrier to correct for sagging and for hydraulic pressure deflection, and for raising and lowering the slice and its carrier as a unit. It also preferably includes a power operated means for quickly raising the slice to prevent injuring the wire and the lower edge of the slice when the stock is shut off and the hydraulic pressure relieved. As a result of the fact that, in the machine illustrated herein, the slice operates with the lower edge of the slice almost in contact with the wire, and the further fact that the high stock pressure employed (equivalent to approximately a seventy-five inch head) bends the wire downwardly so that the lower edge of the slice is below a line tangent to the top of the breast roll and the first table roll, as shown in Fig. 2, it has been found necessary to provide a quick acting means for raising the slice to prevent injuring the wire and lower edge of the slice when the stock is shut off and the hydraulic pressure relieved, with the resultant tendency of the wire to resume the straight line position between these rolls.

Describing first the manual adjusting means, which closely follows that shown in the Kellett and Ostertag application above identified, 52 designates each of a pair of forked brackets that are mounted near the sides of the machine on the top wall of the bracket 10, and 53 designates

each of a pair of arms that are pivoted at 54 to the brackets 52 and are formed at their free ends with collars 55 that embrace sleeve nuts 56. Extending through each of the sleeve nuts 56 is a threaded rod 57, the lower end of which is pivoted at 58 to a forked lug 59 on the upper edge of a hollow horizontally extending bar 60. Extending crosswise through the bar 60 are a plurality of depending rods 61 (Fig. 1), the lower ends of which are pivoted at 62 to forked brackets 63 attached to the front face of the slice carrier casting 23. The upper portions of the rods 61 are threaded to receive upper and lower adjusting and clamping nuts 64 and 65, by manipulation of which each rod 61 may be independently adjusted up or down as required. Fast with each of the sleeve nuts 56 is a hand wheel 66 through which vertical adjustment of the slice as a whole is effected by raising or lowering the bar 60. A considerable number of the adjusting rods 61, quite closely spaced, are employed to effect local vertical adjustments of the slice and take out any sag therein. It may be noted that the rigidity of the U-type beam forming the body of the slice carrier precludes any but very minute local vertical adjustments. Nevertheless, in wide machines a slight sag may occur, even with this U-type beam, and such local adjustments are therefore desirable.

The sleeve nuts 56 are normally held rigid by mechanism constituting part of the quick adjusting means, which will next be described.

Journaled in and between the upper ends of the brackets 52 is a shaft 67, fast on each end of which, between the two limbs of each bracket 52, is an eccentric 68. Mounted on and suspended from the eccentric 68 is a link 69, the lower end of which is pivoted at 70 to the arm 53 approximately mid-length of the latter. The links 69 thus normally maintain the arms 53 in a substantially horizontal position, as shown in Fig. 2. Mounted on a pillow block 71 in turn supported on the bracket 10 is a quick release electric motor 72, which, through a speed reducer 73, operates a gear fast on shaft 67. In practice, the motor 72 is wired to a push button or other switch within convenient reach of the attendant of the machine so that, when the stock is shut off, the motor 72 is energized for a sufficient period to turn shaft 67 and rock the eccentrics 68 upwardly through approximately ninety degrees, and this effects a quick raising of the slice carrier and its slice and manual operating mechanism to substantially the dotted line position indicated in Fig. 2, wherein the lower free edge of the slice 25 is free of tensional drag thereon by the wire 16.

As a result of operating under a high stock pressure with the result of a sag in the wire under the slice, it is necessary to have effective seals at the side edges of the slice carrier and its flexible slice to prevent the stock squirting out at these points when the wire is under pressure, and to exert equal pressure on the edge portions of the wire outside the inlet. These seals, which are generally similar to the seals disclosed in the Kellett and Ostertag application above identified, are in the general nature of rubber shod shoes that, in the present case, are connected to the ends of the flexible slice 25 and, of course, partake of the movements of the latter.

Describing these seals, as shown in Figs. 1 and 3, the vertical side walls of the inlet extend forwardly opposite the ends of the slice carrier and the upper attached portion of the slice, such ex-

tensions being designated 74, and to the lower edge of each side wall extension is attached, as by screws 75 (Fig. 6) an angle bar stiffening strip 76. Attached to each end edge of the flexible slice 25 is a flat metal plate 77, the attaching means consisting of a block 78 (Fig. 7) fastened to the inner side of the forward end of plate 77 as by screws 79 (Figs. 4 and 7), and itself attached to the slice as by screws 80 (Fig. 4). The rear portion of plate 77 extends across the inner edge of the stiffening bar 76 and a portion of the wall 74, as shown in Fig. 3. Mounted in and extending on the outer side of plate 77 is a threaded stud 81 (Fig. 6) which, by means of a wing nut 82, clamps to the outer side of plate 77 a cast metal shoe housing 83 open at its bottom and containing a vulcanized rubber pad 84, that projects below the bottom of the housing and the lower surface of which conforms to the bend of the wire 16, as shown in Fig. 3. The pad 84 is formed with a transverse hole 85 through which the stud 81 extends. The wire, of course, exerts a forward drag on the sole of the pad, and to prevent displacement of the latter from its metal housing 83 the latter is formed with one or more internal cross ribs 86 (Fig. 3) that occupy slots in the pad, and the latter is also preferably formed on its rear end with a tail hook 84' (Fig. 3) that overlaps the rear end of the top wall of the housing. The pad may be strongly adhered to the housing during the vulcanizing process. The joint between the plate 77 and the longitudinal edge of the upper nozzle plate 22 (Fig. 6) is also sealed by a rubber strip 87 fitted in a groove 88 formed in the upper side of the nozzle plate and overlying the joint, and secured in place by a clamp strip 89 fitted in a wider groove 90 formed in the upper side of the nozzle plate. Between the rear end of the angle strip 76 and a guard rail 91, which flanks a side edge of the stationary bottom spout wall 13 is secured a wooden block 92 that backs the rear portion of plate 77 against the side pressure of the stock.

The above described seal has been found very effective to prevent lateral escape of the flowing stock as it is discharged onto the wire at and beyond the breast roll, and as it extends but slightly beyond the lower edge of the slice it avoids the formation of ripples of water on the wire such as is caused by deckle straps that injure the wet surface web formation.

Some of the advantages obtained by this type of slice are the following: When web formation takes place within the inlet, as in this machine and that of the Kellett Patent No. 2,134,408, it is possible to shorten considerably the length of the Fourdrinier wire. If an inclined slice is used in connection with this system, the adjustment to obtain an equal basis weight across the entire width of the machine involves raising or lowering various sections of the inclined slice. This means that a greater or less amount of stock is spouted out of the inlet onto the wire, and this in a sense defeats the object of formation within the inlet. It causes a wet streak of stock to be carried down the wire, and increases the time required to complete formation of the sheet.

The above noted Patent No. 2,134,408 explains the theory of formation within the inlet, and mentions that the ideal condition is to spout just enough stock onto the wire out of the inlet to lubricate the already formed layer of stock. This ideal condition is somewhat defeated by the use of an inclined slice. The theory of varying the

forming area to equalize the basis weight of the sheet across the width of the machine avoids this difficulty. It is not necessary to flow a heavier volume of stock out of the inlet at various points across its width in order to equalize the basis weight.

It is evident that changes in the structural details may be made without departing from the operative principle or sacrificing any of the advantages of the invention. Hence, we reserve all such variations, modifications, and mechanical equivalents as fall within the spirit and purview of the claims.

We claim:

1. In a hydraulic inlet for Fourdrinier paper making machines, the combination with an inlet structure, of a slice carrier pivotally mounted on the forward end of said structure and disposed forwardly of the top tangent point of the wire on the breast roll of the machine, a substantially vertical thin flexible steel slice mounted on and projecting below the lower edge of said slice carrier, a strip mounted on and lengthwise of the front side of the upper portion of said slice, and a plurality of independently operable laterally spaced devices for locally flexing the projecting portion of said slice in the machine direction, each of said devices comprising upper and lower bearing brackets secured respectively to said strip and the downwardly projecting portion of the slice, a pin mounted in said lower bracket, an upright lever fulcrumed between its ends on said upper bracket and having a slotted lower end straddling said pin, and a micrometer adjusting means connected to the upper end of said lever.

2. In a hydraulic inlet for Fourdrinier paper making machines, the combination with an inlet structure, of a slice carrier pivotally mounted on the forward end of said structure and disposed forwardly of the top tangent point of the wire on the breast roll of the machine, said slice carrier having a relatively high hollow forward extension of inverted U-shape, a substantially vertical thin flexible steel slice mounted on and projecting below the lower edge of said slice carrier, and a plurality of independently operable laterally spaced devices for locally flexing the projecting portion of said slice in the machine direction, each of said devices comprising upper and lower bearing brackets secured respectively to said slice carrier and the downwardly projecting portion of said slice, an upright lever fulcrumed between its ends on said upper bearing bracket, a pin and slot connection of the lower end of said lever to said lower bracket, and micrometer adjusting means for said lever comprising a pin mounted in the upper end of said lever, a ball nut mounted in the front wall of said extension and having a forwardly projecting neck extending beyond said front wall, a threaded eye-bolt pivoted on said last named pin and engaged with said nut, an handle fast on said neck.

3. In a hydraulic inlet for Fourdrinier paper making machines, the combination with an inlet structure, of a downwardly and forwardly inclined slice carrier forming an upper nozzle plate pivoted on the forward end of said structure and projecting forwardly of the top tangent point of the wire on the breast roll of the machine, said slice carrier having a relatively high hollow forward extension of inverted U-shape, a substantially vertical flexible slice having its upper portion mounted on the forward end of the nozzle plate portion of said slice carrier and its lower

portion extending downwardly into close proximity to the wire, and means for warping said lower portion of said slice, said means comprising a strip mounted on and lengthwise of the front side of said upper portion of the slice, and a plurality of laterally spaced devices for locally flexing the lower portion of said slice in the machine direction, each of said devices comprising upper and lower bearing brackets secured respectively to said strip and said lower portion of the slice, a pin mounted in said lower bracket, an upright lever fulcrumed between its ends on said upper bracket and having a slotted lower end straddling said pin, a pin mounted in the upper end of said lever, a ball nut mounted in the front wall of said extension and having a neck extending beyond said front wall, a threaded eye-bolt pivoted on said last named pin and engaged with said nut, and a handle fast on said neck.

4. In a hydraulic inlet for Fourdrinier paper making machines, the combination with an inlet structure, of a slice carrier pivotally mounted on the forward end of said structure and disposed forwardly of the top tangent point of the wire on the breast roll of the machine, a substantially vertical thin flexible steel slice mounted on and projecting below the lower end of said slice carrier, means for preventing the discharge of stock laterally of the slice carrier and slice comprising plates attached to the ends of the slice and extending rearwardly and overlapping the side edges of the slice carrier and the side walls of the inlet structure, and rubber shod shoes respectively mounted on said plates in sliding engagement with the side margins of the wire, each of said shoes comprising a metal housing open at the bottom and having a trans-

verse internal rib and a vulcanized rubber pad filling said housing and having a transverse groove engaged with said rib and a wire-engaging bottom surface disposed below the bottom of said housing; and the mounting means for said shoe comprising a threaded stud mounted in said plate and extending through said pad and its housing, and a clamp nut on the outer end of said stud.

5. In a hydraulic inlet for Fourdrinier paper making machines, the combination with an inlet structure, of a slice carrier pivotally mounted on the forward end of said structure and disposed forwardly of the top tangent point of the wire on the breast roll of the machine, a substantially vertical thin flexible steel slice mounted on and projecting below the lower end of said slice carrier, means for preventing the discharge of stock laterally of the slice carrier and slice comprising plates attached to the ends of the slice and extending rearwardly and overlapping the side edges of the slice carrier and the side walls of the inlet structure, and rubber shod shoes respectively mounted on said plates in sliding engagement with the side margins of the wire, each of said shoes comprising a metal housing open at bottom and a vulcanized rubber pad filling said housing and having an upwardly and forwardly extending tail piece hooked over the rear end of said housing and a wire-engaging bottom surface disposed below the bottom of said housing; and the mounting means for said shoe comprising a threaded stud mounted in said pad and its housing, and a clamp nut on the outer end of said stud.

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