

July 19, 1955

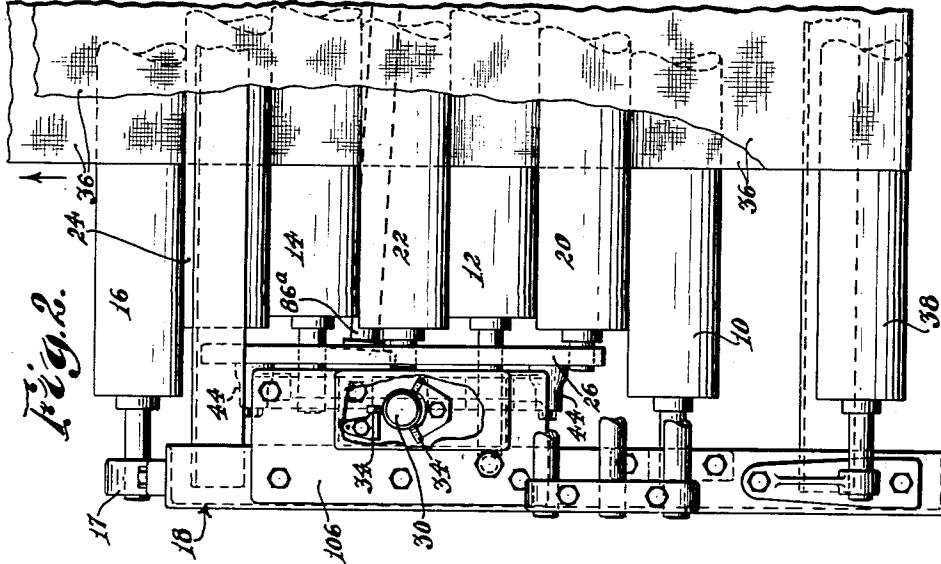
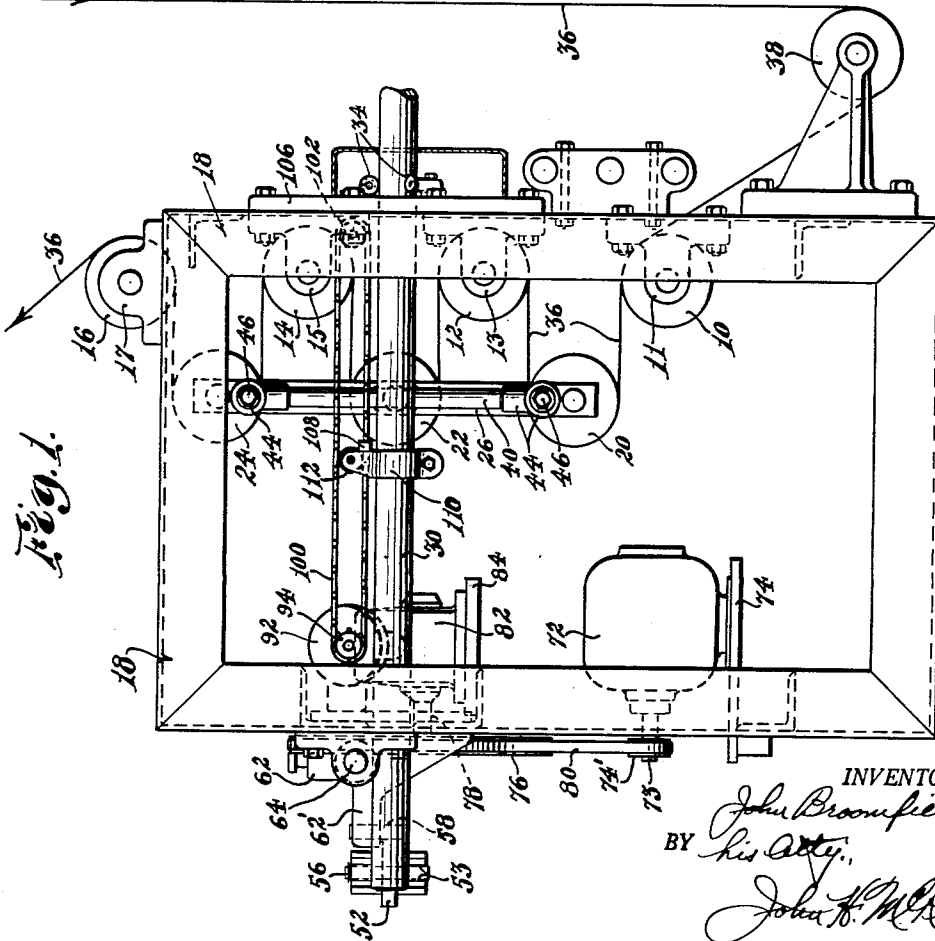
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2,713,191

WEFT-STRAIGHTENING APPARATUS

Filed Sept. 30, 1953

4 Sheets-Sheet 1



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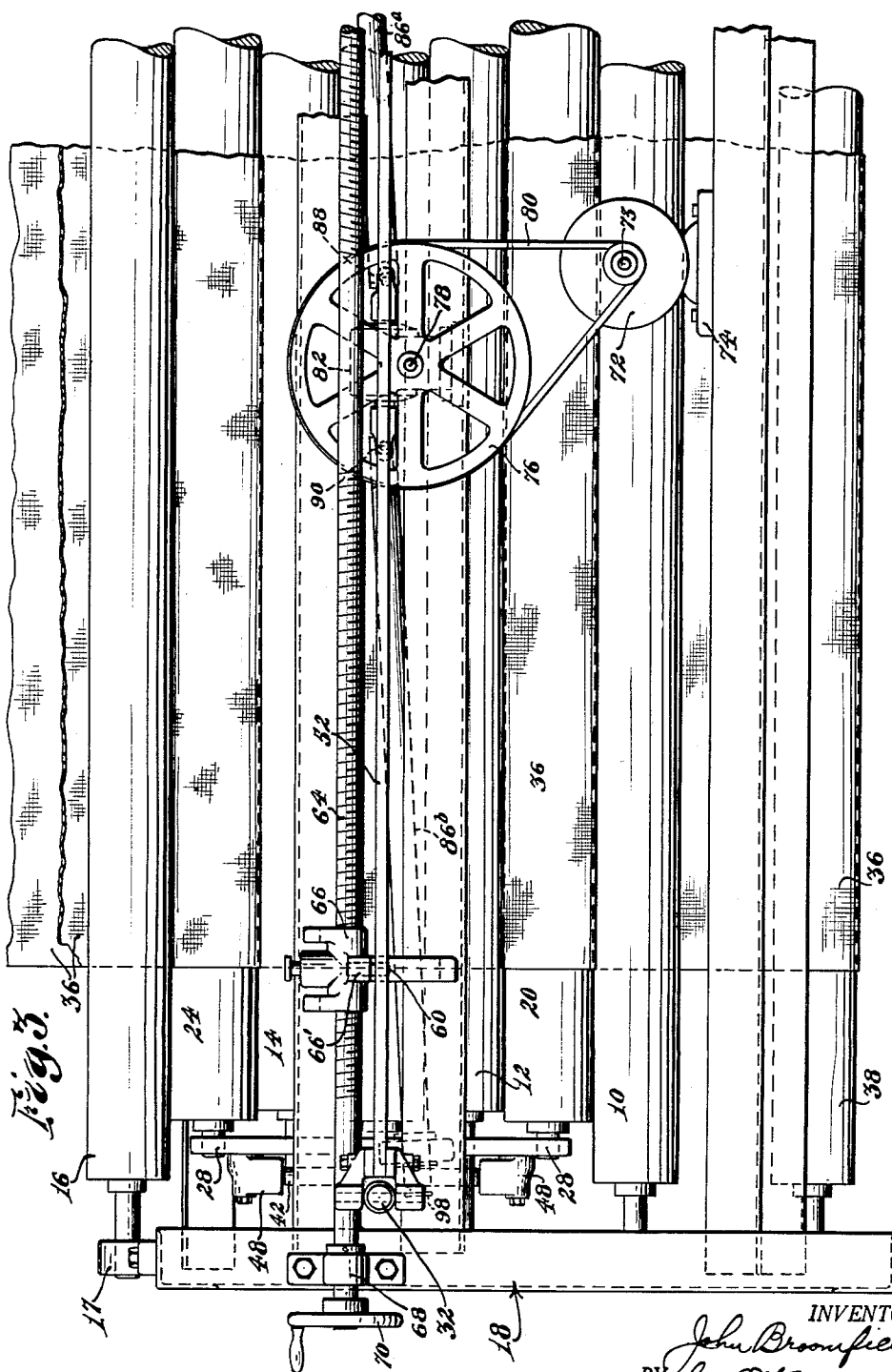
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WEFT-STRAIGHTENING APPARATUS

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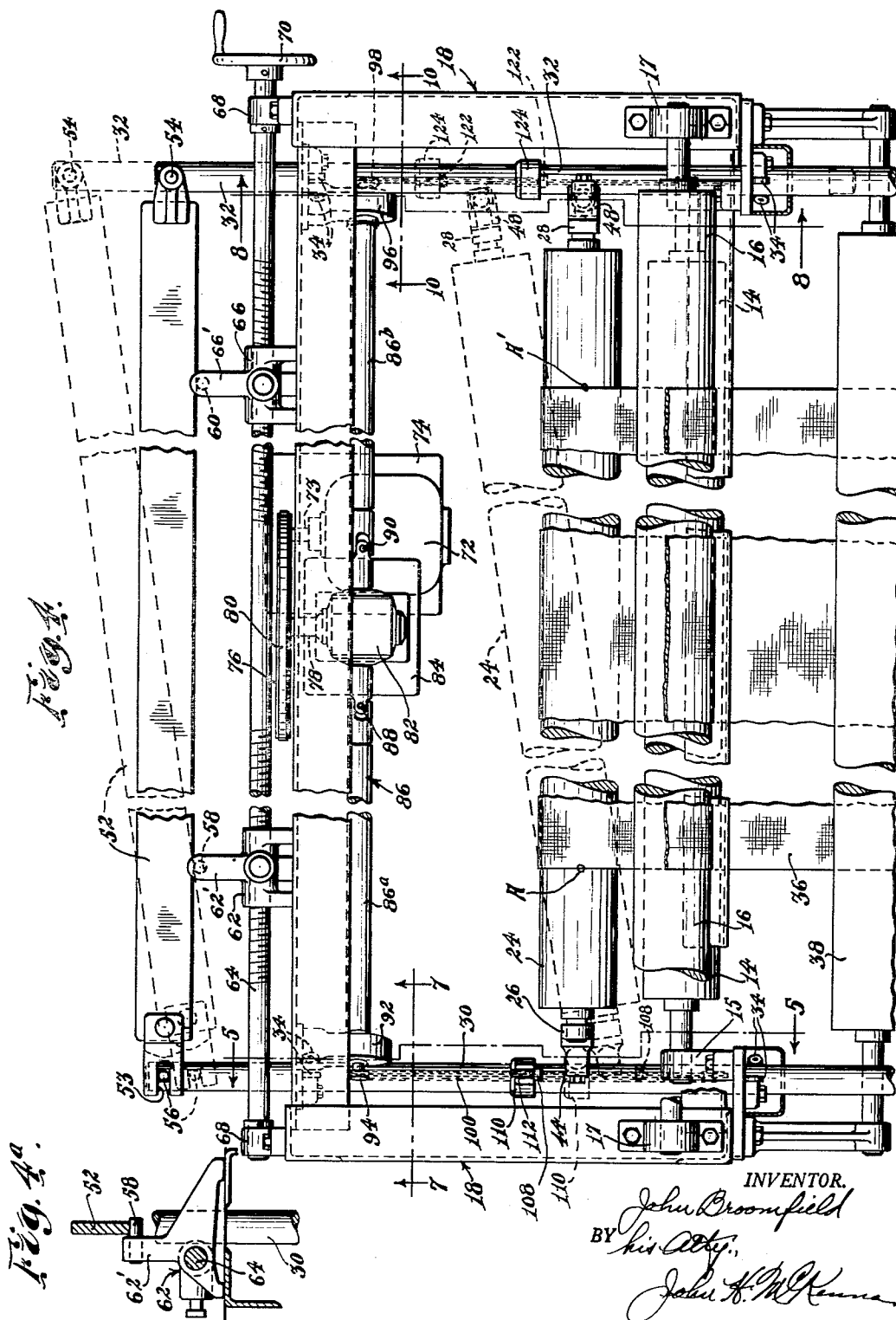
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WEFT-STRAIGHTENING APPARATUS

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4 Sheets-Sheet 3



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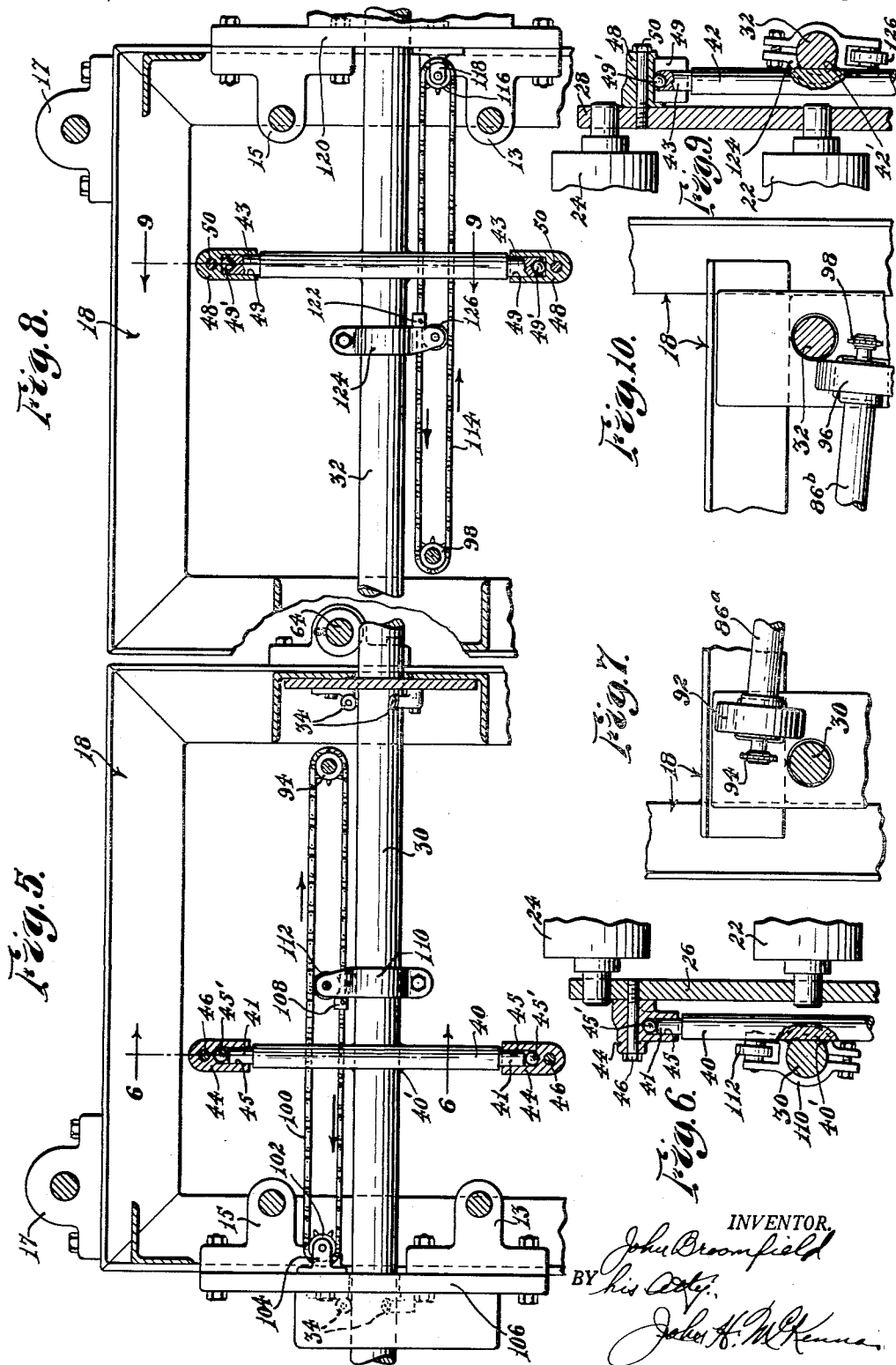
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WEFT-STRAIGHTENING APPARATUS

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4 Sheets-Sheet 4



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1

2,713,191

WEFT-STRAIGHTENING APPARATUS

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Application September 30, 1953, Serial No. 383,285

11 Claims. (Cl. 26—51.3)

This invention relates to improvements in weft-straightening apparatus. More particularly it provides improved apparatus for correcting any skewed condition of the weft or transverse elements of a travelling woven web or sheet. The invention accomplishes skew correction more effectively and more accurately than the prior comparable mechanisms and devices of which I am aware, and does it with no appreciable lateral displacement or lateral travel of the web or sheet out of its predetermined proper course or path.

In the processing of woven sheet materials, the transverse elements thereof frequently become skewed out of proper perpendicularity to the longitudinal elements. The ends of the transverse elements at one edge of any particular woven web or sheet may either lead or lag behind the ends of the transverse elements at the opposite edge of the web or sheet, and various mechanisms and devices have been available heretofore designed to correct skew, usually by means of a tiltable roll, or a plurality of tiltable rolls, which may be tilted more or less while engaging a travelling woven web or sheet to cause one edge of the web or sheet to travel through a longer path than the other edge as the web or sheet passes between two spaced and parallel fixed axis rolls or guides. However, all of the prior skew correcting mechanisms and devices, so far as I am aware, employ a tiltable roll, or tiltable rolls, whose tilting has been about fixed or movable axes located substantially inward from each of the opposite edges of the travelling web or sheet which is being acted upon by the tiltable roll or rolls. As a result, any skew correction accomplished by the prior skew correcting mechanisms and devices has been accompanied or followed by substantial lessening of longitudinal tension of a substantial part of the width of the web or sheet. In other words, any tilting of a tiltable roll in the prior weft-straightening devices reduces the longitudinal tension at and adjacent to one edge or selvage of the web or sheet while simultaneously increasing the longitudinal tension at and adjacent to the opposite edge or selvage of the web or sheet.

It is among the objects of the present invention to provide skew correcting apparatus which accomplishes skew correction without any lessening of longitudinal tension at either edge or selvage of a travelling woven web or sheet. According to the invention, tilting of a tiltable roll or rolls is about either one of two axes located substantially at the opposite edges of the travelling web or sheet, and tilting of the roll or rolls is in direction to increase the longitudinal tension at the edge or selvage which is remote from the axis of tilting, whereby the web or sheet is subjected to gradually increasing longitudinal tension from the edge or selvage at which the axis of tilting is located to the said remote edge or selvage, with no appreciable lessening of longitudinal tension at any portion of the web or sheet.

Another object of the invention is to provide skew correcting apparatus wherein one tiltable roll, or each of a plurality of tiltable rolls, is tiltable about an axis

2

which always may be located approximately at one or the other of the edges or selvages of an engaged travelling web or sheet in perpendicularity to the axis of rotation of the tiltable roll, whereby the edge or selvage of the web or sheet at the pivotal axis of the tiltable roll is not appreciably displaced when the roll tilts, and the web or sheet is guided to and from the tiltable roll, or rolls, in a manner to reduce any tendency of the web or sheet to crawl along the tilted roll or rolls.

A further object of the invention is to provide a tiltable roll weft straightening apparatus wherein a plurality of tiltable rolls coast with a plurality of relatively closely associated fixed axis rolls to correct skew in a travelling woven web or sheet when the tiltable rolls are tilted as a unit, the axes of the fixed axis rolls being in a common plane, and the axes of rotation of the tiltable rolls being in a common plane which is parallel to the common plane of the fixed axis rolls when the tiltable rolls are in neutral non-tilted positions, the said common plane of the tiltable roll axes being tiltable about an axis extending in the latter said plane perpendicular to the axes of the tiltable rolls and adjustably located in said plane between the ends of the tiltable rolls.

Yet another object of the invention is to provide a tiltable roll weft straightening apparatus wherein a plurality of fixed axis rolls have their axes in a common plane and a plurality of tiltable rolls have their axes in a common plane, the latter said rolls being tiltable as a unit about an axis parallel to the said common plane of the fixed axis rolls and located as close to the latter said plane as is practicable while providing for a predetermined substantial amount of tilting of the tiltable rolls, said fixed axis rolls and tiltable rolls being arranged to be engaged alternately by a travelling woven web or sheet with the web or sheet engaging around substantially 180° of the periphery of each of said rolls, whereby the distances travelled by the web or sheet from the fixed axis rolls to the tiltable rolls are so short, and the areas of tensioned frictional engagement of the web or sheet with the roll surfaces constantly are so large, that the web or sheet is maintained substantially in its predetermined proper path when the tilted rolls are tilted with respect to the fixed axis rolls.

It is, moreover, my purpose and object generally to improve the structure, efficiency and effectiveness of weft straightening mechanism and devices and especially tiltable roll weft straightening mechanisms and devices for restoring skewed transverse elements of woven webs or sheets into proper perpendicularity to the longitudinal elements of the webs or sheets.

In the accompanying drawings:

Fig. 1 is an end elevation of skew correcting apparatus embodying features of my invention;

Fig. 2 is a front elevation of the left hand end portion of the apparatus of Fig. 1;

Fig. 3 is a rear elevation of the apparatus of Fig. 1 with an end portion broken away;

Fig. 4 is a top plan view of the apparatus of Figs. 1-3 with the visible tiltable roll shown by full lines in neutral, non-tilted position, and shown by dotted lines in a tilted position;

Fig. 4a is a detail view of one of the adjustable fulcrum-carrying members;

Fig. 5 is a cross-sectional view approximately on line 5-5 of Fig. 4;

Fig. 6 is a detail cross-sectional view on line 6-6 of Fig. 5;

Fig. 7 is a detail cross-sectional view on line 7-7 of Fig. 4;

Fig. 8 is a cross-sectional view approximately on line 8-8 of Fig. 4;

Fig. 9 is a detail cross-sectional view on line 9—9 of Fig. 8; and

Fig. 10 is a detail cross-sectional view on line 10—10 of Fig. 4.

Referring to the drawings, the illustrated embodiment of the invention has four fixed axis rolls 10, 12, 14, 16 rotatably mounted in bearings 11, 13, 15, 17 on a suitable supporting frame 18 with their axes in spaced parallelism and with the axes of the rolls 10, 12, 14 in a common vertical plane. The axis of the upper roll 16 may be in the same said common vertical plane but, for convenience in mounting the roll 16 on the illustrated frame 18, its axis is a little to the left of the vertical plane of the axes of rolls 10, 12, 14, as represented in Fig. 1.

Three tiltable rolls 20, 22, 24 are rotatably supported by two rigid bars 26, 28, each of which is mounted on a different one of two relatively long horizontally disposed and parallel shafts 30, 32 of which one is slidably mounted at each end portion of frame 18, with anti-friction means, such as the rollers 34, minimizing resistance to sliding movements of the shafts 30, 32.

A woven web or sheet 36 travels in the direction indicated by the arrows in Fig. 1, engaging alternately around the fixed axis rolls and the tiltable rolls. As best seen in Fig. 1, the web or sheet 36 is shown passing around the exterior lead-in roll 38 whence it engages over fixed axis roll 10, around tiltable roll 20, and thence alternately around fixed axis roll 12, tiltable roll 22, fixed axis roll 14, tiltable roll 24, and finally around fixed axis roll 16 from which the web or sheet, free from skew, may go to any desired place.

The rigid bar 26 which rotatably supports one end of each of the tiltable rolls 20, 22, 24 has a rigid rod 40 rotatably mounted thereon with its axis parallel with the bar 26, as best seen in Figs. 5 and 6, and the rigid bar 28 which rotatably supports the other end of each tiltable roll 20, 22, 24 has a similar rigid rod 42 rotatably mounted thereon with its axis parallel with bar 28 as best seen in Figs. 8 and 9. Rod 40 is mounted on bar 26 by means of two oppositely disposed socket members 44 which are secured, as by screws 46, to opposite end portions of bar 26, with their sockets 45 in alignment and open toward each other. The opposite ends of the rod 40 are reduced, as at 41, for rotatably engaging in the sockets 45, and a ball 45' at the bottom of each socket serves as an end thrust bearing. Rod 40 is rigidly secured at 40' to the slidable horizontal shaft 30.

Rod 42 is mounted on its bar 28 by means of two grooved members 48 which are secured, as by screws 50, to opposite end portions of bar 28, with their grooves 49 in alignment and open toward each other. The opposite ends of rod 42 are reduced, as at 43, for rotatably and slidably engaging in the grooves 49. In the case of rod 42, an end thrust bearing ball 49' is rotatably mounted on each reduced end of rod 42 for engaging the bottom wall of one of the grooves 49. Rod 42 is rigidly secured at 42' to the adjacent slidable horizontal shaft 32.

Referring more particularly to Fig. 4, corresponding ends of the two horizontal slidable shafts 30, 32 are connected together by a fulcrum bar 52 which has one of its ends pivotally connected at 54 to the adjacent end of shaft 32. The other end of fulcrum bar 52 is grooved at 53 and is pivotally and slidably connected at 56 to the adjacent end of shaft 30.

According to the invention, the fulcrum bar 52 is adapted to rest against two fulcrum pins 58, 60, in parallelism with the fixed axis rolls 10, 12, 14, 16, when the travelling sheet 36 is free of skew, and the tiltable rolls 20, 22, 24 also then will be in parallelism with the fixed axis rolls and with fulcrum bar 52. However, if and when the transverse elements of sheet 36 are skewed, correction of the skew is attained in response to a proper tilting of the tiltable rolls 20, 22, 24 about a common axis which always is in spaced alignment with either one of the fulcrum pins 58, 60, and which, preferably, is

located at an edge or selvage of sheet 36 by adjusting the fulcrum pins 58, 60 into alignment with the opposite edges or selvages of the sheet.

As best seen in Figs. 4 and 4a, fulcrum pin 58 projects from an arm 62' of a member 62 which is mounted on the long screw 64, and fulcrum pin 60 similarly projects from an arm 66' of a member 66 which is mounted on the said screw 64. Bearings 68 rotatably support opposite ends of the screw at opposite ends of frame 18, and a hand wheel 70 is fixed on one end of the screw to facilitate manual rotations thereof. Screw 64 has right-hand and left-hand threads at opposite sides of a mid-point between its ends, and members 62, 66 are mounted on the threaded portions of the screw for movements toward and from each other when the screw is manually rotated. Hence, the fulcrum pins 58, 60 may be quickly adjusted along screw 64 into the respective planes of the opposite edges or selvages of a sheet 36 of any of various widths. In Fig. 4, the tiltable rolls are shown by dotted lines tilted about an axis indicated at A whose location is determined by the location of fulcrum pin 58 about which the fulcrum bar 52 is shown, by dotted lines, tilted to the same degree that tiltable rolls 20, 22, 24 are tilted. Tilting of the tiltable rolls in the opposite direction will be about an axis A' at the opposite edge of selvage of sheet 36 in response to tilting of fulcrum bar 52 about the fulcrum pin 60.

Horizontal shafts 30, 32 may be actuated axially in opposite directions by any suitable means in response to operations of a reversible electric motor 72, or the like, which is shown mounted on a platform 74. Motor 72 may be manually controlled, or the motor may be connected for operation in either direction in response to detection of skew by any suitable skew-detecting mechanism or device (not shown) of which several varieties are available.

In the illustrated embodiment of the invention, the motor shaft 73 has a pulley 74' thereon for belt drive of the larger diameter pulley 76 on a gear transmission shaft 78, the belt being indicated at 80. Shaft 78 extends into a transmission casing 82 which is shown mounted on platform 84 centrally between the ends of frame 18. Transmission shaft 78, through suitable gearing within transmission casing 82, drives a long shaft indicated generally at 86 which extends in opposite directions from casing 82 to regions adjacent the horizontal shafts 30, 32. However, shaft 86 has two universal joints 88, 90 therein at opposite sides of transmission casing 82, so that one substantial portion 86a of the shaft extends with slight upward inclination from the universal joint 88 and has its outer end portion rotatably supported in bearing housing 92, with its end equipped with a sprocket 94, as best seen in Fig. 7, and as seen at the left hand end of shaft portion 86a in Fig. 4. This sprocket 94 is disposed, with slight inclination, above the longitudinal sliding shaft 30. Another substantial portion 86b of shaft 86 extends from universal joint 90 with a slight downward inclination and has its outer end portion rotatably supported in bearing housing 96, with its end equipped with a sprocket 98, as best seen in Fig. 10, and as seen at the right hand end of shaft portion 86b in Fig. 4. This sprocket 98 is disposed, with slight inclination, below the longitudinal sliding shaft 32.

Sprocket 94 at the outer end of upwardly inclined shaft portion 86a has a chain 100 engaging around it and this chain extends above and along sliding shaft 30 and engages around a sprocket 102 mounted in bearing 104 on a plate member 106 which is secured forwardly on frame 18, as best seen in Fig. 5. A block element 108 is adjustably secured to chain 100 for coaction with a collar-abutment 110 which is adjustably mounted on sliding shaft 30. Block element 108 is on the lower run of chain 100 and is shown in

Fig. 5 engaging collar-abutment 110. Hence, a movement of chain 100 in direction opposite to that indicated by the arrows in Fig. 5 will move sliding shaft 30 to the right in Fig. 5 as a result of block 108 pushing collar-abutment 110 to the right. However, in Fig. 5 the arrows indicate that the chain 100 is travelling in the opposite direction to move block element 108 away from abutment 110 as when the tiltable rolls are being tilted in the direction of tilt of the roll shown by dotted lines in Fig. 4. Preferably, a relatively small roller 112 is carried by the collar-abutment 110 for idly engaging the upper run of chain 100.

Sprocket 98 at the outer end of downwardly inclined shaft portion 86b similarly has a chain 114 engaging around it and this chain extends below and along sliding shaft 32 and engages around a sprocket 116 mounted in bearing 118 on a plate member 120 which is secured forwardly on frame 18, as best seen in Fig. 8. A block element 122 is adjustably secured to chain 114 for coaction with a collar-abutment 124 which is adjustably mounted on sliding shaft 32. The block element 122 is on the upper run of chain 114 and is shown in Fig. 8 engaging collar-abutment 124. Hence, a movement of chain 114 in the direction indicated by the arrows in Fig. 8 will move sliding shaft 32 to the left in Fig. 8 as a result of block 122 pushing collar-abutment 124 to the left, thereby to effect a tilting of the tiltable rolls in the direction of tilt of the roll shown by dotted lines in Fig. 4. Preferably, a roll 126 is carried by collar-abutment 124 for idly engaging the upper run of chain 114.

Assuming that the woven web or sheet 36 has its transverse elements in proper perpendicularity to its longitudinal elements, motor 72 will be stopped. Tension in the web or sheet, under these conditions, will act on the tiltable rolls, and through slidable shafts 30, 32, will act on the fulcrum bar 52 to hold the latter in its full line position of Fig. 4 wherein it is held in engagement with both of the fulcrum pins 58, 60, with the tiltable rolls 20, 22, 24 in parallelism with the fixed axis rolls 10, 12, 14, 16. The fulcrum pins 58, 60, of course, will have been adjusted into the planes of the opposite edges or selvages of the web or sheet 36.

If and when skew of the transverse elements of web or sheet 36 is detected, motor 72 will be operated in direction to effect tilting of tiltable rolls 20, 22, 24 for correction of the skew. Assuming that skew is detected and that the right hand ends of the transverse elements are leading their left hand ends in the web or sheet 36 as viewed in Fig. 4, motor 72 will be operated in direction to tilt the tiltable rolls 20, 22, 24 about the axis A (Fig. 4) in the direction indicated by the dotted representation of the tiltable rolls in Fig. 4, which increases the length of the path of travel of the right hand edge of web or sheet 36, as viewed in Fig. 4, while leaving the length of the path of travel of the left hand edge of the web or sheet unchanged. Motor 72 drives both end portions 86a, 86b of shaft 86 in the same direction. If the skew were in the opposite direction, the motor 72 would respond in the opposite direction to effect tilting of the tiltable rolls about the axis A' (Fig. 4) in direction to increase the length of the path of travel of the left hand edge of the web or sheet while leaving the length of the path of travel of the right hand edge unchanged. Hence, there is no lessening of longitudinal tension of any portion of the web or sheet when the tiltable rolls tilt.

The pivotal axes A, A' of tilting of the tiltable rolls readily may be adjusted, by manual rotation of the hand wheel 70, to locate them at the opposite edges of a woven web or sheet 36 of any substantial width which is less than the length of the tiltable rolls 20, 22, 24. Rotation of hand wheel 70 moves the fulcrum pins 58, 60 inward or outward along screw 64 so that they may be quickly brought into the planes of

the opposite edges of the web or sheet 36 of any particular width, thereby to locate the pivotal axes A, A' at the said edges. When the tiltable rolls tilt about either of the axes A, A', the ends of the rolls which are closer to the axis swing a relatively small amount as compared with the ends of the rolls which are more remote from the axis of tilting, and there is only a negligible very small amount of endwise movement of the tilting rolls, due to the straight travel of the pivotal axis of the connection of the rolls to sliding shaft 30, at 44 in Fig. 4. Hence, the edge of selvage of sheet 36 which is at the axis of tilting is not displaced appreciably out of its predetermined proper path, nor the tension at said edge lessened, when tilting of the rolls 20, 22, 24 occurs.

In the neutral non-tilted positions of the tiltable rolls 20, 22, 24, the chain block 108 will be engaged with or closely adjacent to the collar-abutment 110, as shown in Fig. 5, and as represented by full lines in Fig. 4. Also, when the tiltable rolls are in their neutral non-tilted positions, the chain block 122 will be engaged with or closely adjacent to the collar abutment 124, as shown in Fig. 8, and as shown dotted below sliding shaft 32 in Fig. 4. Hence, an operation of motor 72 in direction to tilt rolls 20, 22, 24 in the direction shown by dotted lines in Fig. 4, will cause the chain 100 to travel in the direction indicated by the arrows in Fig. 5, with chain block 108 moving away from collar abutment 110, and will cause the chain 114 to travel in the direction indicated by the arrows in Fig. 8, with chain block 122 actuating sliding shaft 32 to the left in Fig. 8, and to its dotted line position of Fig. 4. Upon reversal of the direction of operation of motor 72, chain block 122 moves away from collar abutment 124 and the tension of web or sheet 36 swings the tiltable rolls back to their neutral full line position of Fig. 4, at which time each chain block 108, 122 will be engagement with or close to the adjacent collar abutment 110 or 124. Collar abutments 110, 124 are adjustable on their sliding shafts 30, 32, and chain blocks 108, 122 are adjustable on their carrying chains 100, 114 for properly coordinating the chain blocks and collar abutments so that when one chain block is actuating one of the sliding shafts 30 or 32, the other chain block will be substantially spaced from its collar abutment where it cannot interfere with tilting of the rolls. But, in the neutral position of the tiltable rolls, each chain block is in position to immediately actuate the adjacent sliding shaft 30 or 32 if and when motor 72 operates in direction to effect movement of chain block 108 to the right in Fig. 5, or to effect movement of chain block 122 to the left in Fig. 8.

A feature of importance resides in locating the tiltable rolls 20, 22, 24 as close to the fixed axis rolls 10, 12, 14, 16 as is feasible while providing space for adequate tilting of the tiltable rolls. This reduces the lateral components of travel of the web or sheet 36 which tend to cause lateral displacement of the web or sheet as it travels from one to another of the rolls. The fact that tilting of the tiltable rolls is about an axis which may be located at an edge or selvage of the web or sheet 36, rather than inward at or close to a point centrally between the ends of the rolls, as in the prior comparable mechanisms, permits location of the axis of tilting of the rolls substantially closer to the fixed axis rolls than has been possible with the prior mechanisms. Actually, the rolls may be so close that the tiltable rolls, when tilted to their positions of maximum tilt, may have end portions entering a little between the fixed axis rolls. This close relation of the two sets of rolls, in conjunction with the described 180° constant full-width tensioned engagement of web or sheet 36 around all of the tiltable rolls and around the fixed axis rolls 12, 14 avoids lateral crawling of the web or sheet out of its proper path.

It will be apparent from the foregoing description

in connection with the drawings, that we have provided a skew-correcting apparatus which maintains substantial longitudinal tension on a travelling woven web or sheet, throughout its width, during the process of skew correction, and substantially eliminates lateral displacement of a travelling woven web or sheet due to the action of a tilted skew-correcting roll, or of a plurality of skew-correcting rolls, thereon. Also, it will be apparent that various changes in the details of the disclosed apparatus may be made without departing from the spirit and scope of the invention as defined in the appended claims. Hence, it is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

I claim as my invention:

1. In a weft-straightening apparatus, a pair of generally parallel guide elements arranged in spaced relation and adapted to guide a longitudinally tensioned travelling woven sheet on a course leading from one to the other of said elements, a skew-correcting member mounted for tilting about a predetermined axis and arranged transversely of and engaging that portion of the sheet which is passing from one to the other of said guide elements, and means for tilting said member about the said axis of tilting to increase the length of the path of travel between said elements of one edge of the sheet relative to the length of the path of travel between said elements of the opposite edge of the sheet, said axis of tilting of said member being located relative to said opposite edge of the sheet for maintaining the longitudinal tension at said opposite edge substantially uniform before and after tilting of said member.

2. In a weft-straightening apparatus, a pair of generally parallel guide elements arranged in spaced relation and adapted to guide a longitudinally tensioned travelling woven sheet on a course leading from one to the other of said elements, a tiltable roll disposed transversely of said sheet and engaging the portion of said sheet which is travelling between said guide elements, means supporting said tiltable roll for tilting movements thereof in direction to increase the length of the path of travel between said guide elements of one edge of the sheet relative to the length of the path of travel between said guide elements of the opposite edge of the sheet, and manually operable means for adjusting the axis of tilting of said tiltable roll to a location in which tilting of the roll about said axis increases the said longitudinal tension of the sheet substantially throughout the entire width of the sheet.

3. In a weft-straightening apparatus, a plurality of spaced and parallel fixed axis rolls, and a tiltable roll mounted for tilting in a plane between and parallel with the axes of the fixed axis rolls about an axis of tilting at right angles to the axis of the tiltable roll, all of said rolls being adapted to engage a longitudinally tensioned travelling woven sheet which engages around one of said fixed axis rolls and travels thence to and around said tiltable roll and thence to and around another of said fixed axis rolls, said axis of tilting of the tiltable roll being located a distance from the fixed axis rolls approximating the maximum distance of travel of that end of the tiltable roll which travels the lesser distance when the latter said roll is tilted from its neutral position to its position of maximum tilt, and means for adjusting the said axis of tilting of the tiltable roll in directions along the tiltable roll thereby to locate it approximately at an edge of the said travelling sheet, whereby the longitudinal tension at said edge of the sheet continues substantially the same before and after said tiltable roll is tilted about said axis of tilting.

4. In a weft-straightening apparatus, a movable roll adapted to be engaged by a travelling sheet, means supporting said roll for tilting movements thereof in a predetermined plane about either of two parallel pivotal axes which are perpendicular to said plane, means for ad-

justing said pivotal axes of the roll to locate different ones of said pivotal axes approximately at each of the opposite longitudinal edges of said travelling sheet, and mechanism for actuating said roll to tilt it about either of said adjustable pivotal axes.

5. In a weft-straightening apparatus, a movable roll arranged to be engaged by a travelling sheet with the sheet engaging around a substantial portion of the periphery of the roll, means supporting said roll for tilting movements thereof in a predetermined plane about either of two parallel axes which are perpendicular to said plane, a rigid bar substantially parallel with said roll and having its opposite ends connected to opposite end portions of said roll, a pair of members adapted to engage said rigid bar at spaced locations therealong for constituting spaced fulcrums about either of which said bar may be tilted thereby to correspondingly tilt said roll about one of said parallel pivotal axes of the roll, means for adjusting said fulcrum members along said rigid bar thereby to adjust the locations of said parallel pivotal axes of said roll relative to the opposite longitudinal edges of said travelling sheet, and mechanism for effecting tilting movements of said bar about either one of said adjustable fulcrum members with corresponding tilting of said roll about one of said parallel pivotal axes of the roll.

6. In a weft-straightening apparatus, a plurality of fixed-axis rolls and a plurality of movable rolls, the axes of rotation of all of said rolls being parallel with the axes of the fixed-axis-rolls in one common plane and with the axes of the movable rolls in another common plane, said rolls being relatively arranged in spaced relation for engaging a travelling sheet which engages alternately around substantial peripheral portions of the fixed axis rolls and the movable rolls, means supporting said movable rolls for tilting movements thereof as a unit to bring one end of each movable roll toward the fixed axis rolls and to move the opposite end of each movable roll away from the fixed axis rolls, fulcrum means for predetermining the location of the pivotal axis of a said tilting of the movable rolls, and mechanism for adjusting said fulcrum means to selectively locate the pivotal axis of a said tilting of the movable rolls approximately at one of the longitudinal edges of said travelling sheet.

7. In a weft-straightening apparatus, a roll around a substantial portion of the periphery of which a travelling sheet is adapted to engage, a pair of rigid linear elements arranged in parallelism at opposite end portions of said roll, means supporting said pair of elements for sliding movements thereof in the directions of their extents, means pivotally connecting the opposite ends of said roll to said linear elements, at least one of said pivotal connections providing for axial movement of the roll relative to at least one of said linear elements, a rigid member in spaced parallelism with said roll and pivotally connected to each of said linear elements, at least one of the latter said connections providing for axial movement of the rigid member relative to at least one of said linear elements, a pair of fulcrum supports mounted for engaging said rigid member at spaced locations therealong, whereby said rigid member may be tilted about either of said fulcrum supports in response to sliding movements of said linear elements thereby to tilt said roll about either of two pivotal axes whose locations are determined by the locations of said fulcrum supports, means for adjusting said fulcrum supports selectively along said rigid member thereby to adjust the locations of said pivotal axes of said roll relative to the longitudinal edges of said travelling sheet, and means for sliding said linear elements in opposite directions to effect a tilting of said roll about a predetermined one of said pivotal axes of tilting thereof.

8. In a weft-straightening apparatus, a roll for engaging a travelling sheet with the sheet engaging around a substantial portion of the roll periphery, actuating means for moving the opposite ends of said roll in opposite directions thereby to tilt the roll, fulcrum means modifying

9

the action of said actuating means and determining the location of a pivotal axis of a said tilting of said roll, said fulcrum means comprising a fulcrum bar and a fulcrum therefor about which said fulcrum bar tilts when one end of said roll is moved in one direction by said actuating means, said fulcrum being adjustable along said fulcrum bar to adjust the location of said pivotal axis of tilting of said roll relative to an edge of said travelling sheet.

9. In a weft-straightening apparatus, a roll for engaging a travelling sheet with the sheet engaging around a substantial portion of the roll periphery, actuating means engaging said roll and operative to move the opposite ends of the roll in opposite directions thereby to tilt the roll in a plane to increase the tension at one edge of said sheet, fulcrum means modifying the action of said actuating means and determining the location of a pivotal axis of a said tilting of the roll, said fulcrum means comprising a fulcrum bar and two spaced fulcrums therefor about one of which said fulcrum bar tilts when one end of said roll is moved in one direction by said actuating means and about the other of which said fulcrum bar tilts when said one end of the roll is moved in the opposite direction by said actuating means, said two fulcrums being adjustable along said fulcrum bar to locate the pivotal axis of tilting of the roll in one direction approximately at one edge of said sheet and to locate the pivotal axis of tilting of the roll in the opposite direction approximately at the opposite edge of said sheet.

10. In a weft-straightening apparatus, a plurality of rolls movably supported for unitary movements with their axes of rotation in spaced parallelism, a plurality of fixed axis rolls in staggered relation to said movable rolls and having their axes of rotation in a common plane, whereby a travelling sheet may engage alternately around the fixed axis rolls and the movable rolls with the sheet in substantially 180° surface engagement with each movable roll and with at least two of the fixed axis rolls, actuating means for moving one end of each of said movable rolls generally toward the fixed axis rolls thereby to tilt the movable rolls relative to the fixed axis rolls, fulcrum means modifying the action of said actuating means and

10

controlling the tilting of said movable rolls, said fulcrum means comprising a fulcrum bar and two spaced fulcrums about either of which said bar may tilt in response to an actuation of said actuating means, the locations of said fulcrums predetermining the locations of two pivotal axes of tilting of the movable rolls, and means for adjusting said fulcrums along said fulcrum bar to adjust the locations of said pivotal axes of tilting of the movable rolls relative to the opposite edges of said travelling sheet.

11. Weft-straightening apparatus comprising a plurality of parallel fixed axis rolls and a plurality of tiltable rolls arranged in staggered relation with the axes of rotation of the fixed axis rolls in one common plane and with the axes of rotation of the tiltable rolls in another parallel common plane relatively close to the first mentioned common plane, said rolls being adapted to be engaged by a longitudinally tensioned travelling woven sheet which engages around one of said fixed axis rolls and passes thence to and around one of the tiltable rolls and thence to and around the other fixed axis rolls and tiltable rolls in alternating succession, with the sheet in 180° engagement around each tiltable roll and around at least two of the fixed axis rolls and in engagement around sufficient surface portions of any other fixed axis rolls to provide substantial resistance to lateral slip of the sheet thereon, means supporting said tiltable rolls for tilting as a unit in a plane parallel to the axes of all of said rolls about either of two axes of tilting which are perpendicular to the axes of rotation of the tiltable rolls, and means for adjusting said axes of tilting in directions along the tiltable rolls thereby to locate them approximately at the opposite edges of said sheet.

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