July 15, 1924. 1,501,499

G. W. SWIFT, JR

WEB FOLDING MACHINE

Filed Jan. 23, 1923 5 Sheets-Sheet 1

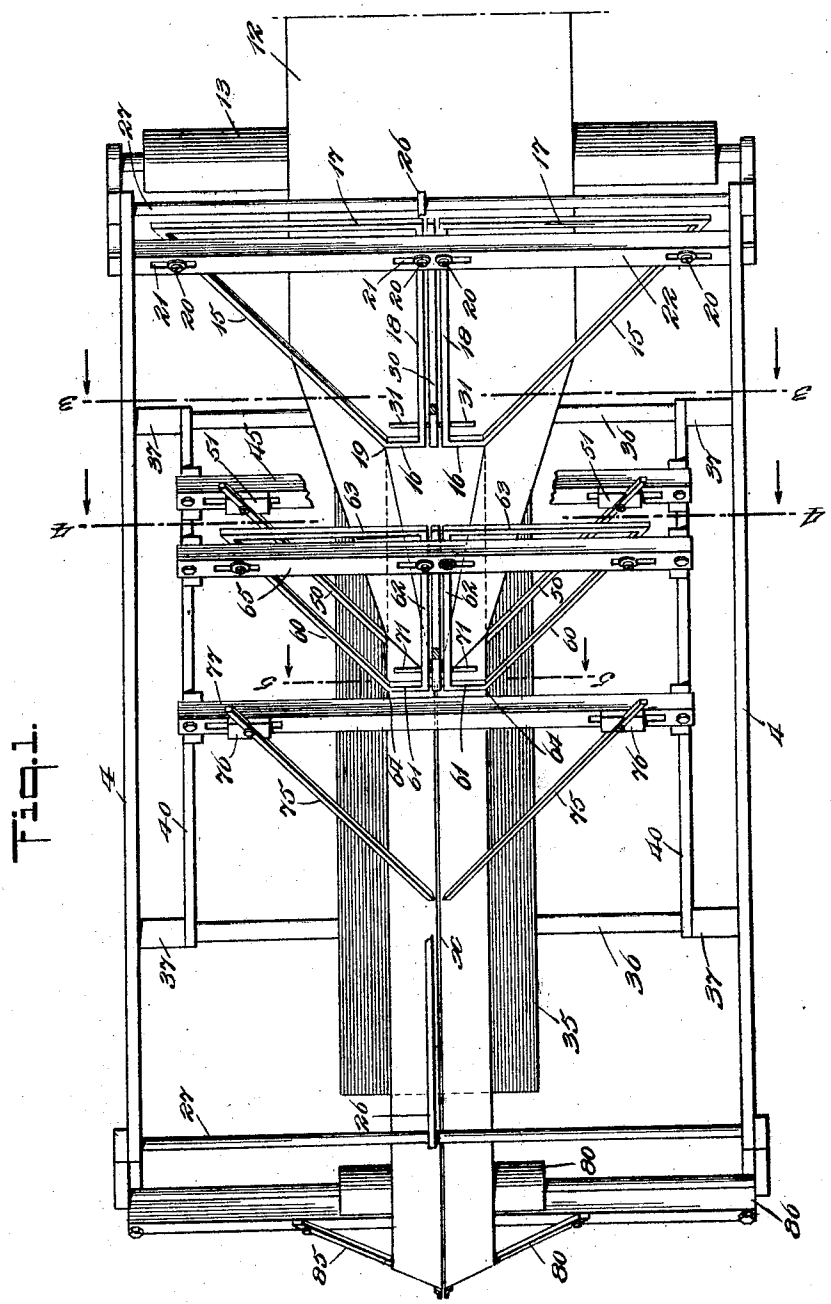


Fig. 1.

WITNESSES

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Filed Jan. 23, 1923 5 Sheets-Sheet 2

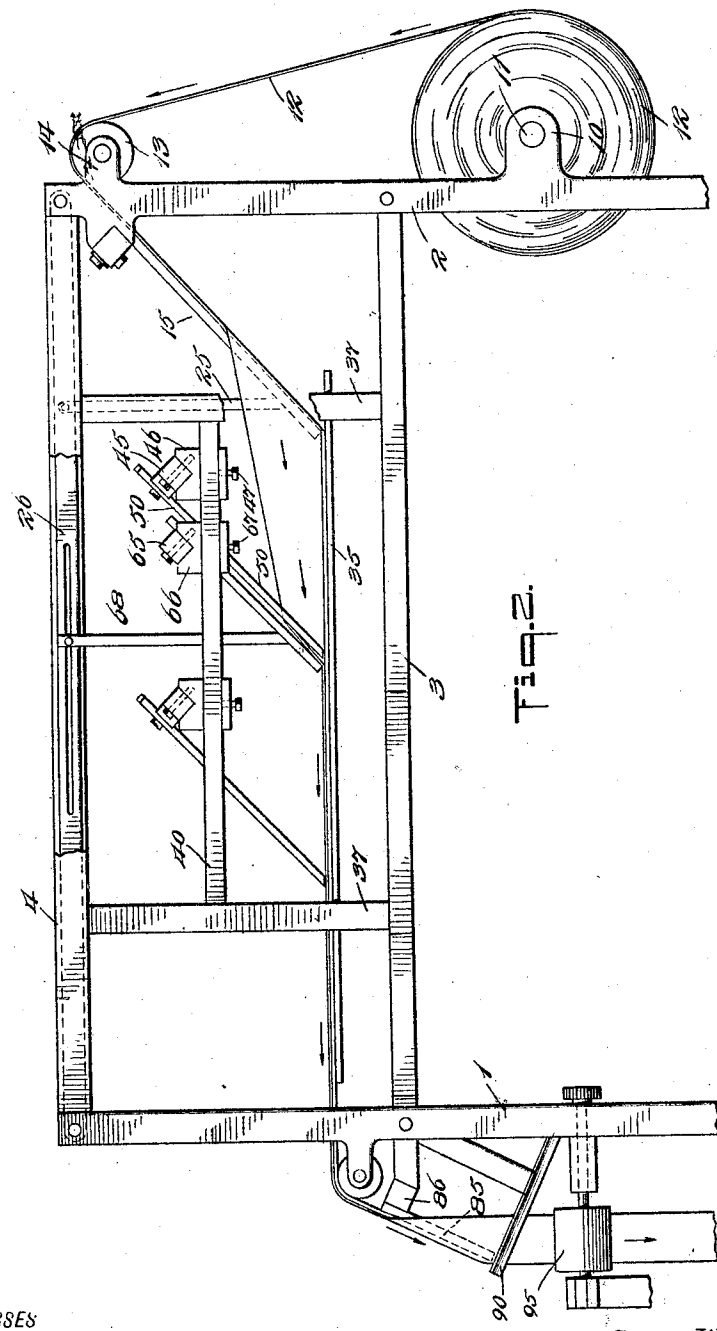


Fig. 2.

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WEB FOLDING MACHINE

Filed Jan. 23, 1923 5 Sheets-Sheet 3

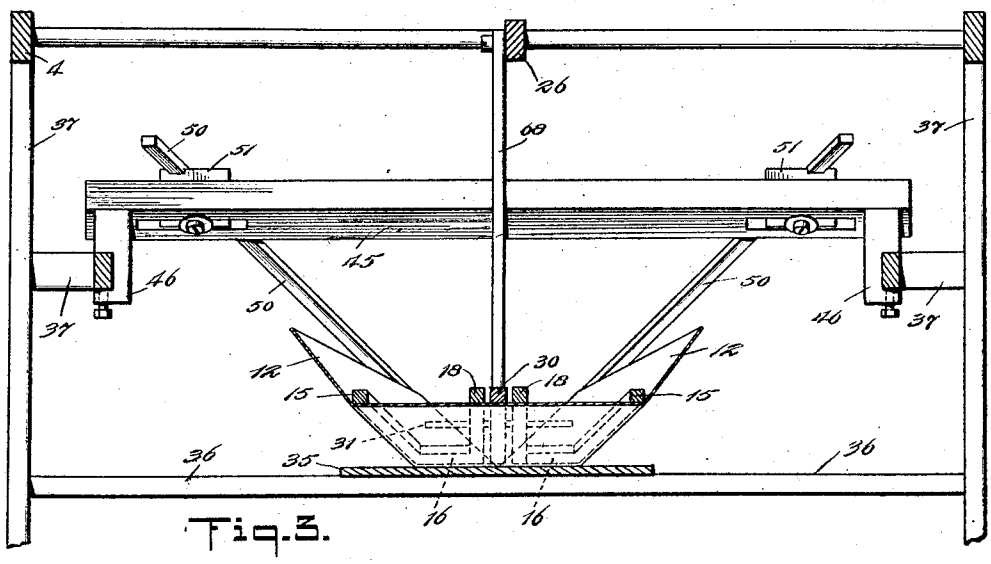


Fig.3.

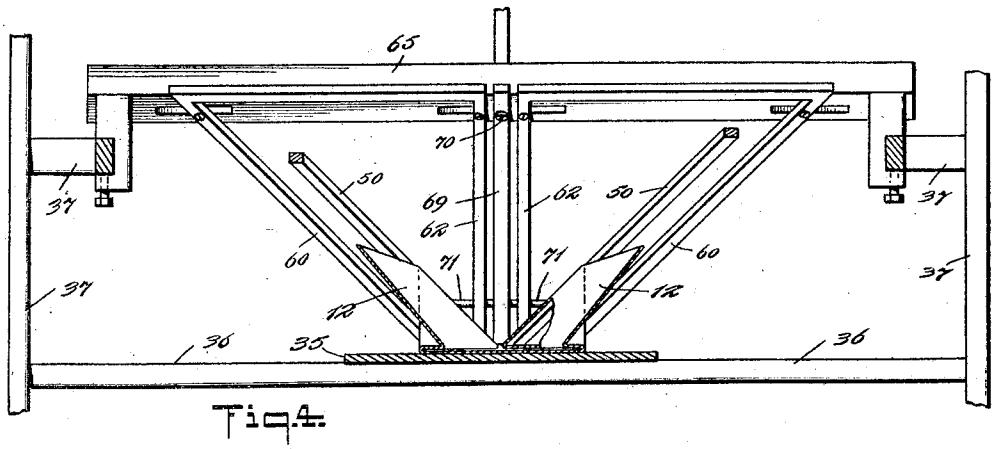


Fig.4.

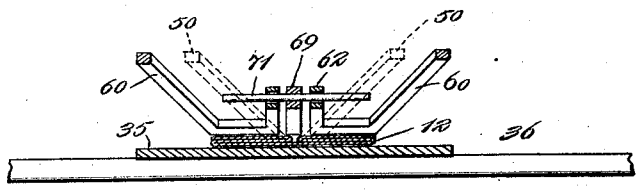


Fig.5.

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WEB FOLDING MACHINE

Filed Jan. 23, 1923 5 Sheets-Sheet 4

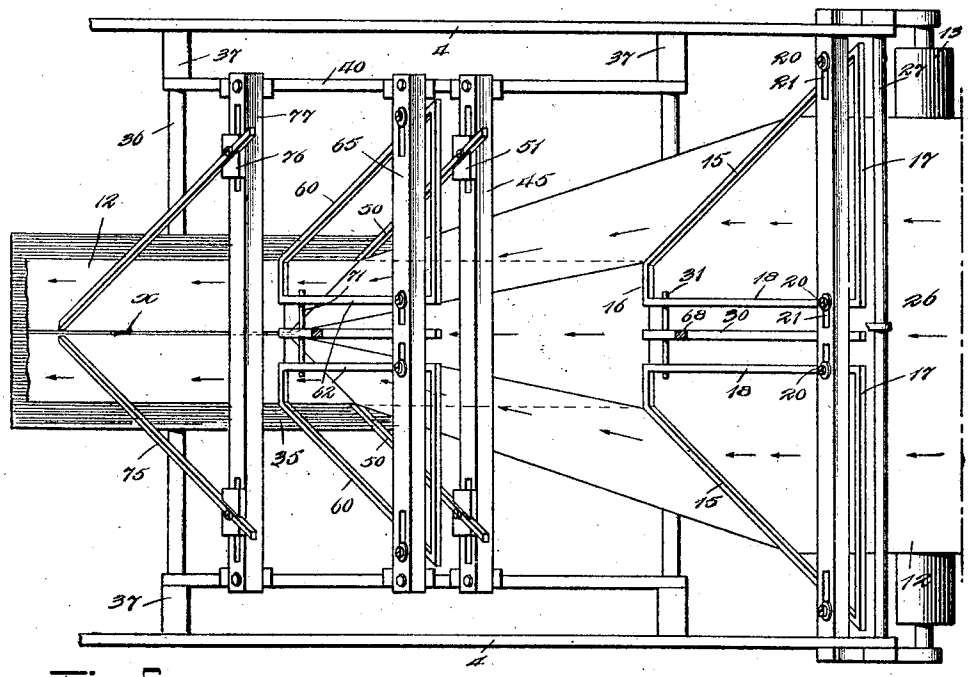


Fig. 6.

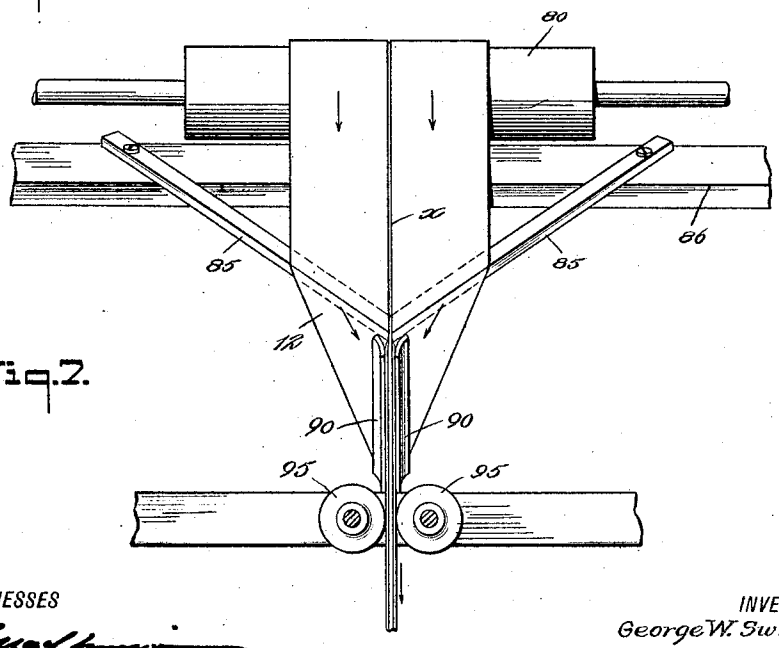


Fig. 2.

WITNESSES

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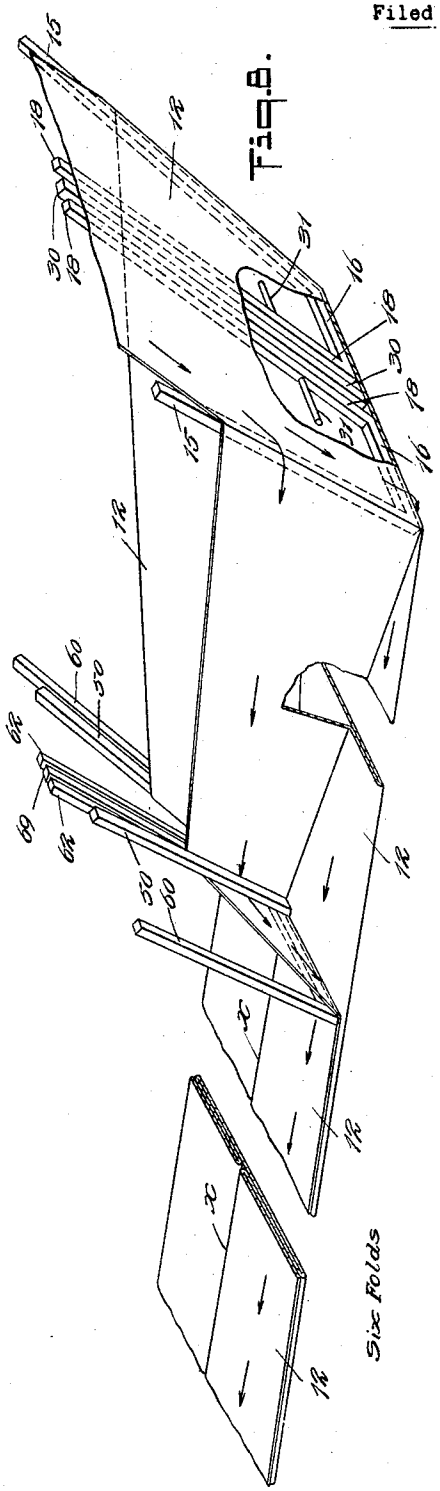
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G. W. SWIFT, JR

WEB FOLDING MACHINE

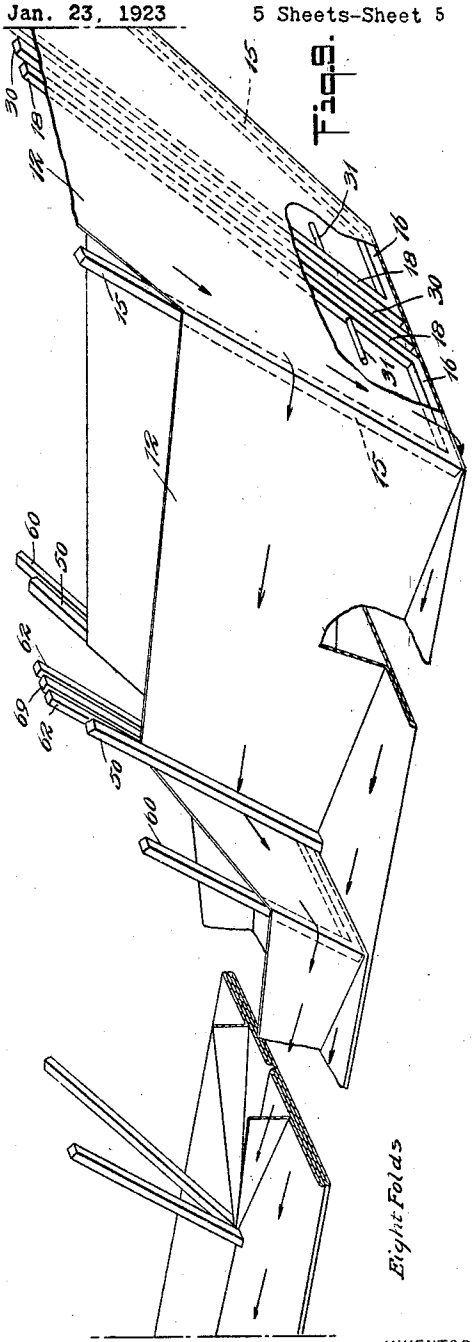
Filed Jan. 23, 1923 5 Sheets-Sheet 5

Fig. 8.



Six Folds

Fig. 9.



Eight Folds

INVENTOR

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By Knight Bros.

Attys

Patented July 15, 1924. 1,501,499

UNITED STATES PATENT OFFICE.

GEORGE W. SWIFT, JR., OF BORDENTOWN, NEW JERSEY, ASSIGNOR TO GEORGE W. SWIFT, JR., INC., OF BORDENTOWN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

WEB-FOLDING MACHINE.

Application filed January 23, 1923. Serial No. 614,477.

To all whom it may concern:

Be it known that I, GEORGE W. SWIFT, Jr., a citizen of the United States, residing in Bordentown, county of Burlington, State of New Jersey, have invented certain new and useful Improvements in Web-Folding Machines, of which the following is a specification.

The object of the present invention is to provide an effective rapidly operating machine for producing longitudinal folds in a traveling web of paper.

To this end the present invention comprises a web folding machine having a plurality of folding devices arranged to form a plurality of longitudinal folds in a traveling web upon opposite sides of a longitudinal zone or unfolded portion of the web. The web passing through the folding mechanisms is caused to be first folded inwardly upon two lines defining the central unfolded zone, and then outwardly upon two other lines parallel with the lines of first fold, and so on until the desired number of folds inwardly and outwardly have been produced. After the completion of the longitudinal folding of the web inwardly and outwardly as explained to provide superimposed web layers, the web is given a final longitudinal fold upon a line extending centrally through the unfolded central zone to produce a folded product with all of the inwardly and outwardly folded portions superimposed. This longitudinally folded web may then be cut into the desired lengths or sections to suit the purpose for which the product has been made. The completely folded sections will contain a plurality of leaves or sheets connected by zig-zag or alternate folds.

The fundamental principles of the machine are illustrated in the accompanying drawings without reference to other mechanisms with which it may be employed. The improved folding mechanism may form a part of a continuous machine, such for instance as is employed for printing, numbering and punching bills of lading or other forms, which it is desired to produce in quadruple, sextuple, or other numbers of copies.

In order that the invention may be fully understood it will first be described with reference to the accompanying drawings and afterwards pointed out more particularly in the annexed claims.

In said drawings:—

Fig. 1 is a plan view of one embodiment of the improved longitudinal web folding mechanism.

Fig. 2 is a side elevation of the same.

Fig. 3 is a vertical transverse sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is a similar view taken on the line 4—4 of Fig. 1.

Fig. 5 is a similar view taken on the line 5—5 of Fig. 1.

Fig. 6 is a partial plan view of the machine on a slightly larger scale.

Fig. 7 is a partial end view of the delivery end of the machine.

Figs. 8 and 9 are diagrammatic perspective views illustrating the operation of the machine, Fig. 8 representing the production of six longitudinal folds, while Fig. 9 represents the production of eight folds.

The improved folding mechanism may be mounted upon any suitable framework, such as illustrated in the drawings, in which the upright frame members 1 and 2 are connected and braced by the lower side bars 3 and the upper side bars 4. Suitable uprights, cross-bars and frame members are mounted in this main frame to afford rigidity and proper supports for the folding mechanisms as hereinafter specifically described.

The uprights 2 may be formed with bracket lugs 10 to support the bar 11 upon which a roll 12 of a continuous web of paper is supported. The web 12 passes upwardly from the roll over a guide roller 13 journalled at its ends in brackets 14 upon uprights 2. From the roller 13 the web 12 passes downwardly and forwardly in engagement with a pair of inclined angular folding frames, each of which is formed with an inclined bar 15 extending from its support inwardly and forwardly toward the path of the traveling web and having an inwardly projecting guide member 16, which is presented just above and parallel with the web path. Members 15 and 16 are preferably integrally connected with bars 17 and 18, respectively, members 15, 16, 17 and 18 in the preferred form constituting a rigid folding frame of approximately triangular shape, one of the angles being cut off by

the formation of the guide member 16. The angular shoulder 19 formed at the junction of bar 15 and guide member 16 constitutes the folding angle upon which the traveling web is longitudinally creased to define the first longitudinal fold at one edge of the unfolded longitudinal zone.

There are two angular folding bars 15 having inwardly presented guide bars 16, which are arranged upon opposite sides of the central vertical longitudinal plane of the machine, the width of the unfolded central zone of the web being determined by the spacing between the folding angles 19 of these folding bars. The folding bars 15 are mounted as will presently be explained to permit them to be adjusted upon their supports relative to the central plane of the machine and to each other, for the purpose of adapting the folding mechanism to the longitudinal folding of webs of different widths and to the production of folded products of different sizes and numbers of folds.

The angular folding bars 15 are supported at the top by means of screw bolts 20 passing through slots 21 of the transverse frame bar 22 and engaging folding bars 15 and connected bracing bars 17. The folding bars 15 with their guide members 16 are firmly supported adjacent to the plane of feed of the web by means of an airtight stay-bar 25 secured to and extending downwardly from the longitudinal members 26 mounted upon transverse stay-rods 27. This stay-bar 25 carries upon its lower end an inclined brace or guide 30, which is presented in the same inclined plane of the folding frames 15, 16, 17 and 18 and carries the laterally projecting guide pins 31, which pass freely through lateral openings in the forward lower ends of bars 18 of the folding frames. By this arrangement it will be observed that by loosening the screw bolts 20 the folding frames can be shifted laterally upon their supports to place their folding angles 19 in the desired location with reference to the web to be folded, after which the bolts 20 are tightened for rigidly securing the folding frames in the desired position. This adjustment is illustrated by a comparison of Figs. 1 to 6, the folding angles 19 of the folding frames being arranged relatively close in Fig. 1, while these folding angles are shown spread apart in Fig. 6.

35 is a bed or platform mounted upon cross-bars 36 supported by auxiliary uprights 37 carried by the main side frames of the machine. The traveling web passes over this bed or platform 35 in the folding operation, the folding mechanisms being mounted above and adjusted toward the platform to provide the proper spacing for the accurate operation of the mechanism. Mounted upon and extending between the uprights 37 are the horizontal supports or guide rails 40 upon which the folding devices for the second and subsequent longitudinal folds are adjustably mounted.

45 is a transverse slotted bar mounted in angular relation upon the adjustable blocks or boxes 46, which are mortised upon the guide rails 40 and secured thereon in the desired adjusted position by means of set screws 47. 50 are the inwardly and downwardly inclined folding bars mounted upon blocks 51, which are adjustable inwardly and outwardly upon the bar 45. These folding bars 50 have their lower end adjacent to the path of the web angularly shaped to properly guide the lateral portions of the web inwardly from the folding bars 15 and form the creased lines in the web upon which the second parallel longitudinal folds are made. The side portions of the web passing up over the first fold bars 15 are directed inwardly around and under the second fold bars 50.

60 indicates the third fold bars which are preferably formed integral with horizontal lower portions 61, inclined upwardly projecting portions 62 and horizontal upper portions 63. These third fold frames, including bars 60, are of substantially the same construction as the first fold frames which include bars 15. Folding angles 64 are formed at the junction of inclined bars 60 and horizontal bars 61 of each of the frames, said angles 64 defining the line of third longitudinal fold in the lateral portions of the web which pass over the folding bars 50 and under and around the bars 60, 61. These folding frames, including bars 60, are adjustably mounted upon the slotted transverse supporting bar 65, which is mounted in angular relation upon blocks 66 mortised upon the guide rails 40 and held in the desired adjusted position by set screws 67. A stay-bar 68 is adjustably mounted in the central longitudinal bar 26 and depends from the framework toward the path of the web and carries in its lower end between the third fold folding frames an inclined guide 69 secured to transverse bar 65 as shown at 70. The bar 69 carries near its lower end the lateral projecting guide pins 71 passing freely through lateral openings formed in the bar members 62. This structure is substantially the same as the first fold mechanism. The folding frames, including bars 60, can be adjusted laterally toward and away from the central vertical longitudinal plane of the machine and by adjustment of the supporting bars 65 and 68 the whole third fold folding mechanism can be adjusted longitudinally of the machine.

75 are inclined folding bars adjustably mounted upon blocks 76 carried by the transverse supporting bars 77, which are adjustably mounted upon the guide rails 40.

These folding bars 75 are of the same structure and perform the same functions as the second fold folding bars 50 above referred to. The bars 75 are employed when it is desired to define a fourth pair of longitudinal folds in the lateral portions of the traveling web.

It will be understood that with a mechanism of the general character set forth, it is possible to make any desired number of longitudinal folds inwardly and outwardly upon opposite sides of a central zone of a traveling web of paper, the limit to the number of such longitudinal folds being the width of the web, the strength of the stock and the provision of proper means for feeding the web through the required number of folding mechanisms.

The horizontal members 16 of the first fold frames and 61 of the third fold frames serve the purpose of properly guiding the central unfolded zone of the web and the folded plies of the lateral web portions in the horizontal plane of the bed or platform 35, while the lateral portions are gradually turned over and flattened against said unfolded zone of the web.

The traveling web with the inwardly and outwardly folded side portions manipulated as above described and consisting of three, four or other number of plies of stock, depending upon the number of folds, lying flat upon the central unfolded zone of the web and with a slight space between the folded portions of the two sides of the web as indicated at X in Figs. 1, 5, 6 and 7 of the drawings, is passed from the bed or platform 35 over a guide roller 80 suitably journalled in the machine frame and from said guide roller is passed downwardly over the inclined folding bars 85 mounted upon transverse frame bar 86. These inclined folding bars 85 project downwardly and forwardly toward the central longitudinal plane of the machine and cause the traveling web with its folded lateral zones to be gradually folded longitudinally upon the central line of the unfolded zone, which coincides with the longitudinal spacing X between the plural plies of the folded lateral portions of the web. The web passes from the inclined folding bars 65 into folded position between the curved spaced guide plates 90 projecting up from the machine frame 1 and from these plates the folded web passes through the geared rollers 95 and is delivered either in the form of a continuous longitudinally folded web or passed through suitable cutting mechanism to cut the folded web into the desired lengths. The rollers 95 may be employed as feed rollers and also to press and set the folds in the web, or any other suitable arrangement of feeding devices may be employed for causing the continuous web to pass through the several folding mechanisms. So far as I am aware it has never herebefore been proposed to simultaneously produce a plurality of longitudinal folds upon opposite sides of an unfolded central zone in a traveling web of paper.

It will be understood that in forming a plurality of these longitudinal folds in the traveling web, the successive folds are made in opposite directions so that the resultant folded product will be a zigzag folded sheet or web. The adjustment of the folding devices not only longitudinally of the plane of the machine, but laterally with relation to the vertical longitudinal plane, is important in adapting the machine to the longitudinal folding of webs of different widths and character and of the formation of different numbers of folds and of folds of different widths.

I claim:

1. A web folding machine having means for longitudinally folding lateral portions inwardly and outwardly upon an intermediate portion of a web, and means for imparting a final longitudinal fold to said intermediate portion of the web.

2. A web folding machine having means for simultaneously forming a plurality of longitudinal folds in the lateral portions of a web, inwardly and outwardly upon an intermediate portion of the web, and means for imparting a final longitudinal fold to said intermediate portion of the web to form a plural ply web.

3. A web folding machine having means for forming successive longitudinal folds inwardly and outwardly in the lateral portions upon opposite sides of an intermediate portion of a web, and means for imparting a final longitudinal fold to said intermediate portion of the web.

4. In a web folding machine, the combination of means for feeding a web, with a plurality of longitudinal folding devices adapted to alternately engage opposite faces of a web to form a plurality of longitudinal folds inwardly and outwardly upon opposite sides of an intermediate unfolded zone of the web.

5. In a web folding machine, the combination of means for feeding a web, with a plurality of longitudinal folding devices adapted to alternately engage opposite faces of a web to form a plurality of longitudinal folds inwardly and outwardly upon opposite sides of an intermediate unfolded zone of the web and means for imparting a final longitudinal fold in said intermediate zone of the web for imposing one longitudinally folded portion of the web upon the other.

6. A web folding machine having a succession of inclined fold formers engaging the opposite faces of a traveling web to effect the longitudinal folding of the web in-

wardly and outwardly upon an intermediate portion to form a plural ply web.

7. A web folding machine having a succession of pairs of spaced inclined fold formers engaging the opposite faces of a traveling web to effect the longitudinal folding of the lateral portions of the web inwardly and outwardly upon an intermediate portion to form a plural ply web.

8. A web folding machine having a succession of pairs of spaced inclined fold formers engaging the opposite faces of a traveling web to effect the longitudinal folding of the lateral portions of the web inwardly and outwardly upon an intermediate portion, and means for imparting a final longitudinal fold to said intermediate portion to form a plural ply web.

9. In a web folding machine, the combination of a series of pairs of spaced inclined folding bars arranged to alternately and successively engage a traveling web upon its opposite faces to effect the longitudinal folding of the web alternately inwardly and outwardly upon an intermediate portion of the web, and means for imparting a final longitudinal fold to said intermediate portion to form a plural ply web.

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