No. 758,704. PATENTED MAY 3, 1904.

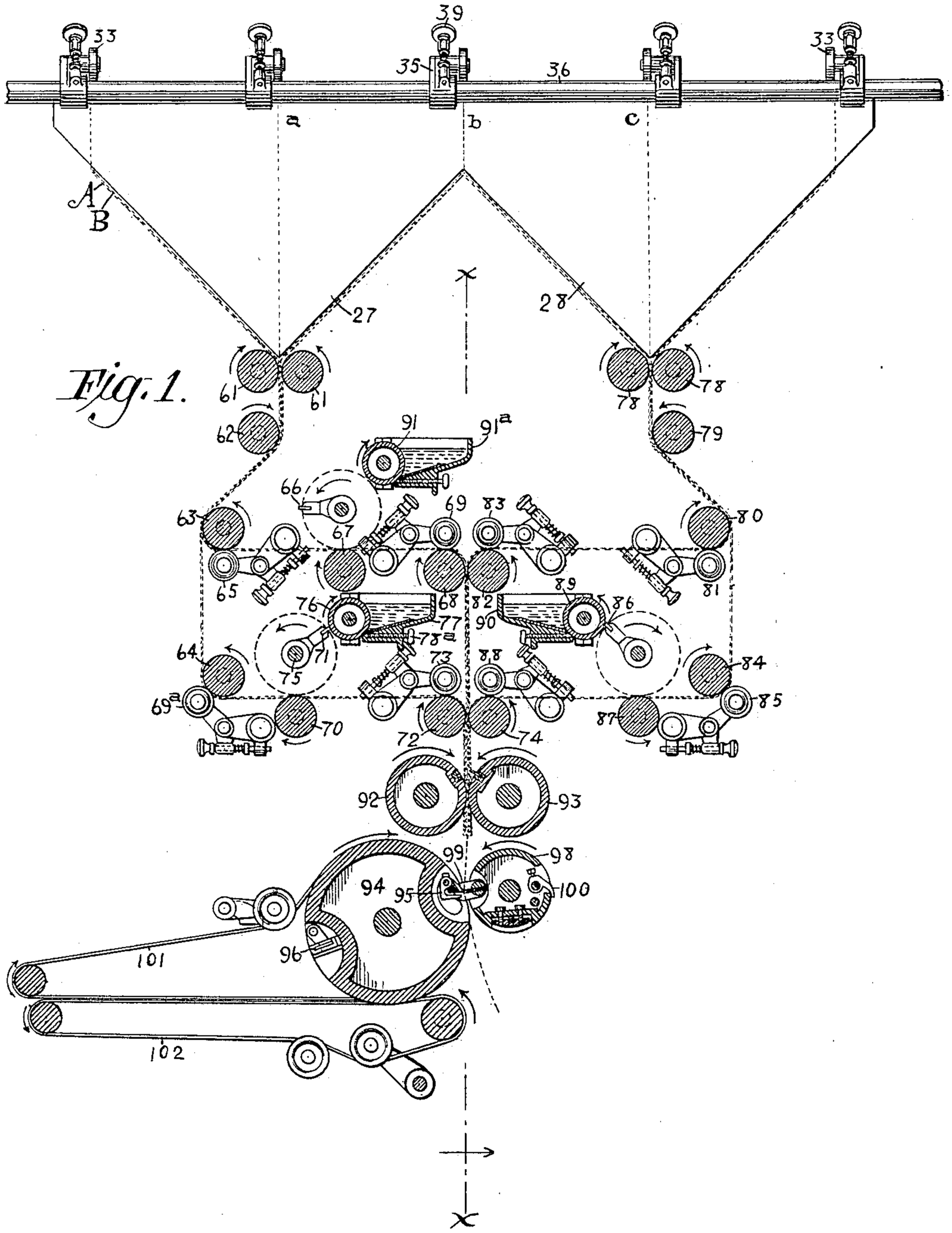
R. C. SEYMOUR.

FOLDING MACHINE.

APPLICATION FILED OCT. 22, 1900.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

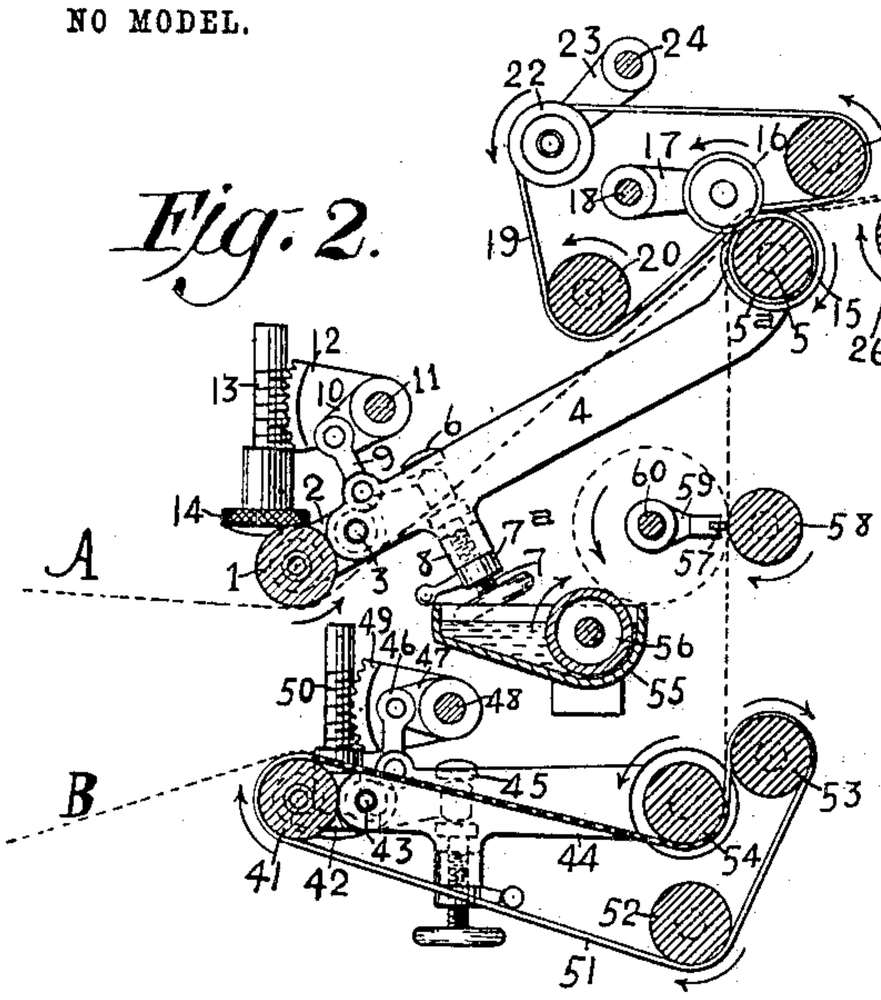


Fig. 3.

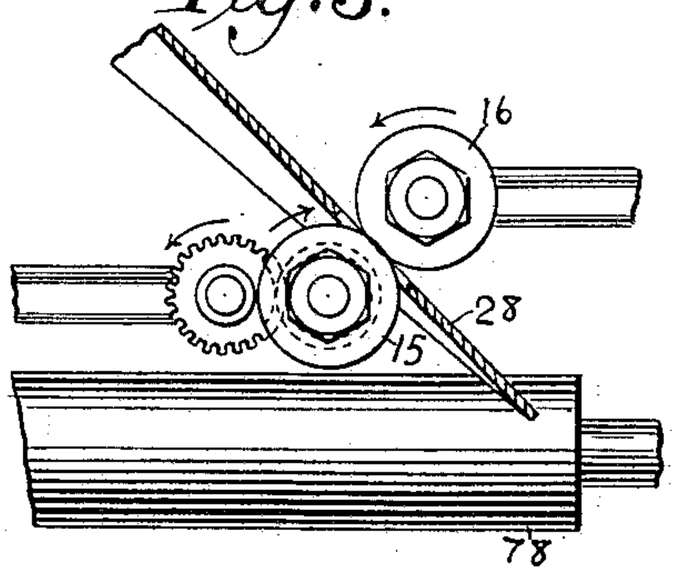
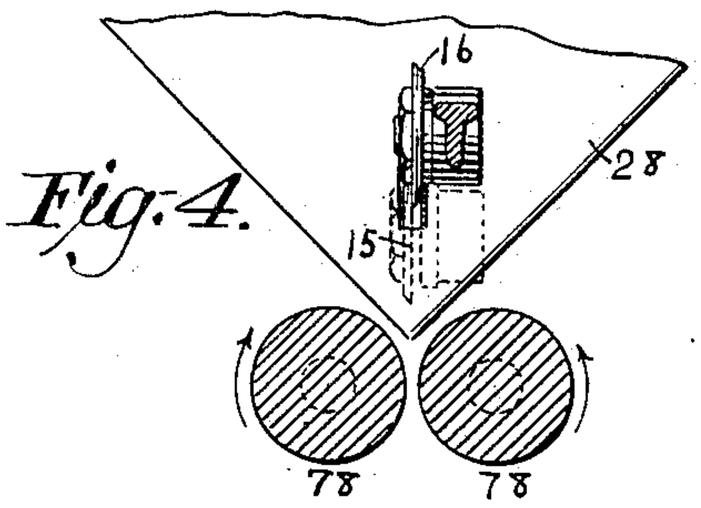
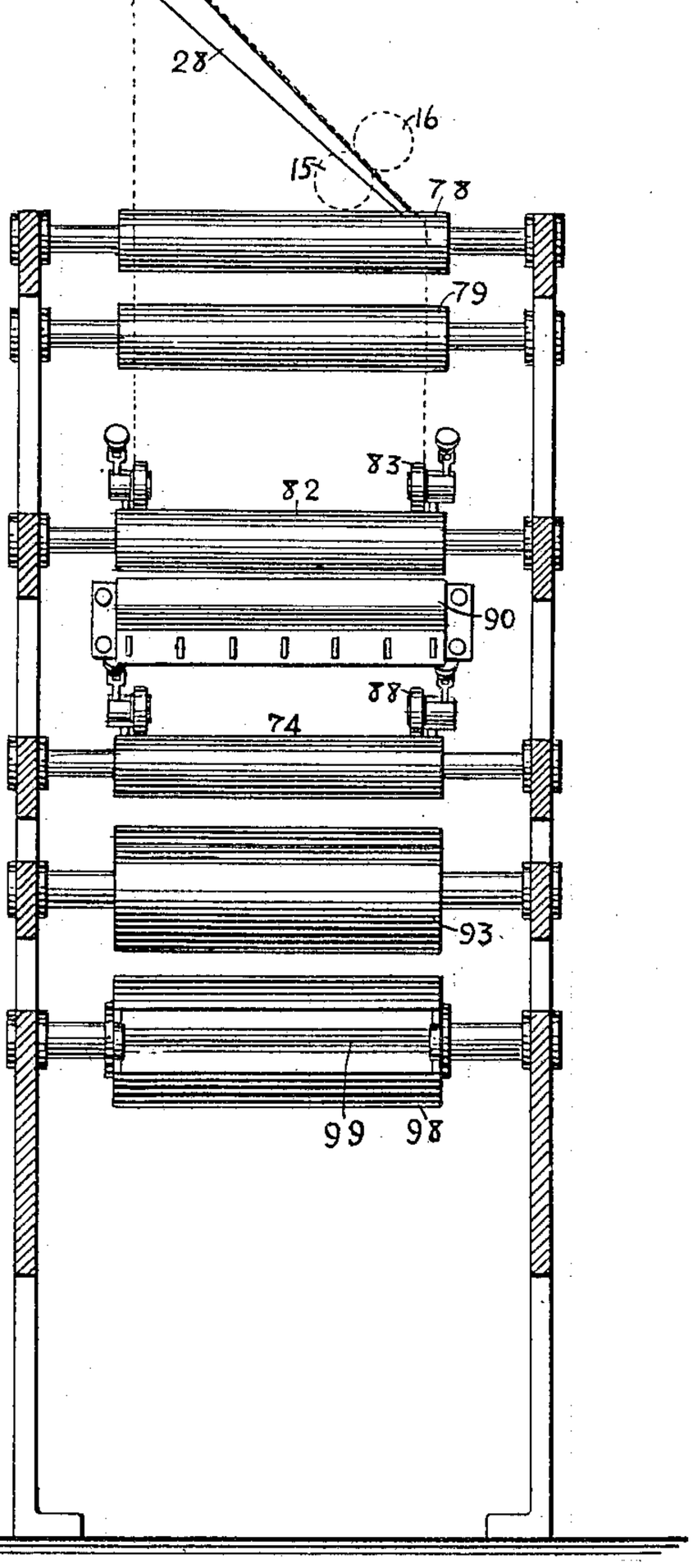


Fig. 4.





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No. 758,704. Patented May 3, 1904.

UNITED STATES PATENT OFFICE.

RALPH C. SEYMOUR, OF SOUTH ORANGE, NEW JERSEY, ASSIGNOR TO C. B. COTTRELL & SONS COMPANY, OF JERSEY CITY, NEW JERSEY; WESTERLY, RHODE ISLAND; STONINGTON, CONNECTICUT, AND NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

FOLDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 758,704, dated May 3, 1904.

Application filed October 22, 1900. Serial No. 33,882. (No model.)

To all whom it may concern:

Be it known that I, RALPH C. SEYMOUR, a citizen of the United States, and a resident of South Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Folding-Machines, of which the following is a specification.

This invention relates to machinery for folding and pasting webs of paper, especially adapted for use in connection with web-printing machines; and it consists in the various features of construction and combinations and arrangements of devices hereinafter more fully described, and particularly pointed out in the appended claims.

The objects and advantages of my novel construction will appear hereinafter in connection with the description of the machine and its mode of operation.

In the accompanying drawings, Figure 1 is a front elevation, partly in section and showing diagrammatically a folding-machine embodying my various improvements. Fig. 2 is a central vertical section taken on the line X of Fig. 1 and looking in the direction of the arrow thereat. Fig. 3 is an enlarged detail side elevation showing the slitting mechanism at near the point of the former. Fig. 4 is a front sectional detail view of the same.

In the various views the same part will be found designated by the same reference character.

Much of the framework and practically all of the gearing have been omitted in order to simplify the drawings and conduce to brevity of description and clearness of illustration; but these parts may of course be supplied readily by the mechanic skilled in the art of constructing folding-machines.

As organized the machine in practice is adapted to act on two double-width webs of paper as they come from the printing-press; paste one of the webs transversely in alternate margins between pages; associate the two webs together and cause them to adhere at said pasted margins; divide the double-width now two-ply web longitudinally into four two-ply webs of equal width and fold or associate the same together in couples over folders or formers, so as to produce a four-ply web on each side of the machine; then separate each four-ply product into two two-ply web portions; then on each side of the machine paste one of such portions in alternate margins between pages; then reassociate said two two-ply portions to cause them to adhere together at the pasted margins; then associate and paste together the four plies produced on each side of the machine; then present the eight-ply product to a transversely-acting severing mechanism and cut off the associated and transversely-pasted portions at alternate unpasted marginal portions of the compound web; but, as will hereinafter more fully appear, the machine may be adjusted or arranged or run so as to associate and paste together only four plies of web.

When the duplex folder is operating, as shown at Fig. 1, it will be understood that the plate-cylinders of the printing-press are each four plates wide and four plates around and with the column-rules extending longitudinally of the cylinders. As there are four plate-cylinders, there are sixty-four plates on said cylinders, representing sixty-four pages. Two plate-cylinders with coöperating impression-cylinders operate on one of the double-width webs, and two plate-cylinders, in conjunction with impression-cylinders, operate on the other, so as to print said webs on both sides. The double-width web A comes from the upper pair of plate-cylinders in the printing-press and the double-width web B from the lower pair of plate-cylinders therein. The web A is led up under a roller 1, that extends entirely across the machine and which is mounted at one end in the outer end of a lever 2, pivoted at 3 on one of two arms 4, which are pivotally supported at their inner and upper ends upon bosses on the side frames, and which also support a cross-shaft 5. The opposite end of the roller 1 is supported directly

in one of the arms 4, and the inner end of the lever 2 is embraced by the forked or bifurcated end 6 of a screw 7, that works in a nut-like portion 8, formed in one of the arms 4. The screws are provided with hand-wheels by which the forks may be moved up or down, so as to vibrate the lever 2, and thereby adjust the roll 1 to the desired position or angle. The adjusting mechanism for the roller is arranged at one side only of the machine and so that the roller may be set either in a horizontal plane or at an angle thereto, as may be necessary and according as the paper is running loose or tight on one or the other edge. When adjusted, the screw is locked by a nut 7^a, having a handle for conveniently operating the same. Besides the independent adjustment of the roller 1 within the supporting-arms 4 or frame formed by said arms the roll is adapted to be raised and lowered bodily with said arms or frame by means of links 9, pivotally connected at their lower ends to said arms and at their upper ends to crank-arms 10 on a cross-shaft 11, provided with a toothed sector 12, with which engages a screw 13, having a hand-wheel 14 for turning said screw and, through the sector and links, raising or lowering the arms 4 and the roller 1, as may be required.

On the shaft 5 are fixed three similar cutting-disks 15, preferably set into circumferential grooves formed in a roll 5^a on said shaft, which coöperate with companion cutting-disks 16, rotatably mounted in arms 17 on a cross-shaft 18, and these three sets of cutting-disks are so spaced as to divide the webs A and B into four equal longitudinal portions or subwebs, the dotted lines *a b c* illustrating the places at which the webs are severed.

Arranged to operate on the outside margins of the web A are pulling or drawing tapes 19, which run around two pulleys 20 and 21, mounted on shafts that extend across the machine, and around third pulleys 22, that are mounted on adjustable arms 23, fixed at the ends of a cross-shaft 24.

25 is a cross-shaft mounted in bearings in the opposite side frames of the machine, and upon said shaft is mounted a roller 26, over which the webs A and B both pass to the formers 27 and 28, which are arranged adjacent each other and in the same plane. Each former is preferably independent of the other and is preferably made V-shaped or triangular, as usual. At the rear end of each former is secured at suitable points transversely two brackets 29, provided with eyes 30, and through all of the brackets of both formers passes a shaft or pivot 31, that is supported at its ends in arms 32, which are pivotally supported on bosses at the side frames of the machine and concentric with the bearings of the shaft 25. By swinging the arms up or down the formers may be adjusted in the same directions about the shaft 25 as a center; but the formers may also be independently adjusted about the shaft 31, so as to get the desired pitch and also the proper relationship between the points of the formers and the drawing-off rollers. By means of the brackets 29 the folders may be adjusted crosswise on the shaft 31, so as to get the points of the folders centrally of the bite of the drawing-off rollers.

Above the roller 26 are arranged five small pressure-rolls 33, preferably rubber-faced, and mounted each on a bent lever 34, pivoted on an arm 35, which is fast to a cross-shaft 36. The roller 33 may be held against the roller 26 or the paper thereon with the desired friction and in a yielding manner by means of a spring 37 acting on one arm of the lever 34. The tension of this spring may be adjusted by means of a nut 38 on the threaded end of a screw 39, that enters a tapped hole in a lug 40, projecting from the arm 35. The upper end of the screw is provided with a knob by which the screw may be turned, and when the screw is turned down the friction-roller 33 may be raised clear of the roller 26. The screw may also be turned to limit the action of the spring on the roller 33, so that the latter may be adjusted to run in contact with the paper at any desired pressure.

The web B is led over a roller 41, extending across the machine, and the said roller is mounted at one end in a lever 42, pivoted at 43 in an arm 44, mounted on a boss at one side of the frame, and the other end of the roller 41 is mounted in a similar arm 44, similarly mounted at the opposite side of the frame. The rear end of the lever 42 is embraced by a forked screw 45 for adjusting the roller 41 in exactly the manner above described with reference to the roller 1, and for the purpose of adjusting the arms 44 similarly to the arms 4 there is provided mechanism exactly like that above described—that is to say, links 46 are pivotally connected at their lower ends to the arms 44 and at their upper ends to cranks 47 on a cross-shaft 48, bearing also toothed sectors 49, adapted to be turned by screws or worms 50.

At each side of the machine and for working on the extreme side margins of the web B there is a tape mechanism comprising a tape 51, which passes around the roller 41 and rollers 52 53 54. These tapes and rollers coöperate to assist in drawing and pulling the web B. If desired, there may be similar tape mechanisms at the center margins of both the webs A and B.

As will be seen at Fig. 2, the web A after passing under the roller 1 passes over the roller 5^a and between the slitters, and the web B after passing over the roller 41 and between the rollers 53 and 54 passes vertically upward under the web A and over the roller 5^a and between the slitters. The web B is run in such directions as to provide for the ar-

rangement between it and the web A of a pasting mechanism for applying lines of paste transversely to the web B at alternate or second margins.

55 designates a paste-receptacle containing a pasting-roller 56, with which coöperates a pasting-blade 57. The receptacle, roller, and blade all extend for the full width of the machine; but the blade is cut away at portions registering with the longitudinal margins of the web, so as not to take paste from the roller 56 at these points, and thus leave the said longitudinal margins unpasted. The remaining portions of the blade strike the roller 56 at each revolution of the blade, take paste therefrom, and apply it to the inner side of the web B at every second transverse marginal portion, such application taking place at the backing-roller 58. The pasting-blade is mounted at the free end of an arm 59, suitably supported upon a cross-shaft 60. When the transversely-pasted portions of the web B are assembled or associated with the web A at the roller 5^a, the two webs become pasted together at registering margins for the full width of both webs and before they are slitted longitudinally and before they are associated or folded. After the slitting of the webs into four narrower webs of equal width two of such webs are folded around the former 27 and are brought together side by side or in parallelism, and the other two of such webs are also folded or associated around the former 28 and brought into parallelism. By these operations there will be four plies of paper folding or associating on each former—that is to say, two two-ply web portions; but immediately after such folding or associating the said two two-ply transversely-pasted products are separated and one of said two-ply portions is passed around a pasting mechanism, whereby its inner ply is pasted transversely and coincident with the previous transverse pasting by which the webs A and B were united together. Then the said two two-ply webs are run together or reassembled and are caused to adhere together, thus forming a four-ply folded and pasted product which subsequently passes to cutting mechanism that severs the web transversely on the unpasted margins. The four plies associated and pasted together transversely on each side of the machine are brought together or associated centrally of the machine and are pasted together so as to produce an eight-ply web with the alternating transverse margins all pasted together. The folded or associated pasted portions coming from the folder 27 pass down between the drawing-off rollers 61, thence to a roller 62, and thence obliquely to another roller 63, at which latter the longitudinally-associated two two-ply webs are separated, one portion running horizontally to the right partially around the roller 63 and the other portion running vertically downward to and around a roller 64, and thence horizontally inward parallel with the upper portion. The latter after passing between the roller 63 and a coacting friction-roller 65 (mounted and operating precisely like those marked 33 and above described) passes between a pasting-blade 66 and an opposing roller 67, whereby alternate margins of the outer ply of the two-ply web are pasted transversely for a purpose presently to appear. The said upper web portion passes thence between a roller 68 and friction-rollers 69 and thence vertically downward to meet the lower horizontally-running companion two-ply portion of the previously-assembled and then separated webs. The said lower portion after passing around the roller 64, which coöperates with a friction-roller 69^a, is directed horizontally over a roller 70, that cooperates with a pasting-blade 71, and, as before, every alternate transverse margin is pasted by said device, and the web portion is then led over a roller 72 (with which coöperates a marginal pressure-roller 73, that is geared thereto) and caused to meet the vertically-descending upper web portion and to associate therewith and become pasted thereto at the said roller 72 and a companion roller 74, alongside thereof, all as indicated plainly at Fig. 1. The pasting-blade 71, that applies paste transversely to the alternate margins of the inner ply of the lower section, is mounted on an arm fixed on a constantly-revolving shaft 75, and said blade takes paste from a roller 76, that rotates in a fountain or receptacle 77, which may be supplied with regulating means 78^a, all of about the usual construction. It will be observed that the transverse lines of paste applied to the lower two-ply section by the blade 71 causes said section to be united to the upper two-ply section when the two sections meet at the rollers 72 and 74. The plies that are folded or associated at the former 28 pass down between the drawing-off rollers 78 to a roller 79 and thence laterally to a roller 80, at which the two two-ply web portions are separated, as before explained with reference to the left-hand side of the machine—that is to say, one section travels horizontally inward and then vertically downward and the other travels first vertically downward and then horizontally inward to meet the upper section and be pasted thereto. There is a pressure or friction roller 81 coöperating with the roller 80 to feed the upper section inwardly, and said section passes between a roller 82 and a friction-roller 83 and thence down over said roller 82. The lower section passes between a roller 84 and a coöperating friction-roller 85 and thence between a pasting-blade 86 and a coöperating rotary abutment or roller 87 therefor, by which paste is applied transversely to the alternate margins of the inner ply of said lower section. From said pasting apparatus the said lower section then passes under a friction-roller 88 and over

a coöperating roller 74, at which it meets the said upper section and becomes pasted thereto. The pasting-blade 86 is mounted on a rotating arm as before and takes paste from the surface of a roller 89, that turns in a paste-receptacle 90.

It will be seen from the foregoing that after the association of the two two-ply webs at the former 27 the said webs are separated and that after pasting one of them transversely on its inner ply at alternate margins said two duplex webs are then reassembled and pasted together at alternate margins and so as to produce a four-ply transversely-pasted product before the web portions have been severed transversely into sheet portions. It will also be observed that the two two-ply associated portions formed or associated at the folder 28 are likewise separated, pasted, and reassembled to produce a four-ply transversely-pasted product before severance into sheet lengths, and it will also be observed that the said two opposite four-ply portions may be at once associated and united together, so as to produce an eight-ply web with the second or alternate margins all pasted together. The pasting together of the four-ply webs is effected by the pasting-blade 66 and its coöperating roller 67 and the coöperating rollers 68 and 82. The blade 66 in applying paste to alternate transverse margins of the outside web, ply, or fold of the upper two-ply web on the left-hand side of the machine causes said two-ply web to be pasted to registering margins of the two-ply upper web-section on the right-hand side of the machine when the said two two-ply portions meet at the pressure-rollers 68 and 82. Hence it will be understood that the four plies or webs shown as descending vertically between the rollers 68 and 82 and rollers 72 and 74 are all pasted together. To this four-ply product is pasted on the left-hand side that two-ply lower section coming from the folder 27 and on the right-hand side that two-ply lower section coming from the folder 28, and hence there issues from between the rollers 72 and 74 a compound web of eight plies, all of which are pasted together. but it frequently happens that only one-half of the printing-machine and folder are employed, and in that case the pasting-blade 66 and its coöperating device 67 and roller 91 and paste-receptacle 91ª are not used. If the folder or former 27 alone be used, the half-width webs A B will be pasted transversely and associated together and split longitudinally at said folder and folded or associated together into two parallel two-ply portions, which will then be separated and one portion passed around to be acted on by the pasting-blade 71 and then caused to be reassociated with and pasted to the other portion at the pressure-rollers 72 and 74, all as before explained, and if the former 28 alone be used one of the half-width webs A B will be supplied with paste transversely and the webs caused to adhere. Then they will be folded or associated around said folder into two two-ply products, and then they will be separated and one of said two-ply portions pasted transversely in alternate margins by the paster-blade 86, so as to cause the said two two-ply portions when brought together again at the rollers 72 and 74 to adhere to each other and produce a four-ply transversely-pasted product, as before explained. The folded or associated plies, whatever may be their number, after passing the rollers 72 74 enter between a pair of cutting-cylinders 92 and 93, having, preferably, shearing knives or cutters, generally known as the "Cottrell" cutters, by which the web is cut off at each unpasted transverse margin into sheet lengths and which severed portions may be delivered or disposed of in any suitable or desired manner.

I have shown herein a delivery and collecting mechanism which I have in practice applied to or used in connection with a folding-machine constructed in accordance with my present improvements; but this mechanism will not be described in detail or claimed herein, as the same is reserved for another application. The said mechanism comprises generally a cylinder 94, containing on one side a pair of folding-jaws 95 and on the diametrically opposite side a pasting-blade 96, adapted to take paste from a suitable roller. (Not shown.) Coöperating with said cylinder 94 is a cylinder 98, provided with a folding-blade 99 and a set of grippers 100. In connection with the cylinder 94 is a tape system 101 and a coöperating tape system 102 for carrying off the folded products. When collecting is not being done, the paster 96 is replaced by a duplicate of folding-jaws 95. The compound transversely-pasted web descending from the cutting-cylinders 92 93 passes down between the cylinders 94 and 98 if collecting is not to be done, and at the proper time the folding-blade tucks a previously-pasted margin into the folding-jaws 95, and these jaws after the leading portion of the web has been cut off by the cylinders 92 93 carry the folded portion around and deliver it to the tape mechanisms 101 102, from which the transversely-folded product may run either to a fly, table, packer, or other device. When collecting is to be done, the grippers 100 seize the leading end of the compound web, carry it around the cylinder 98 one and one-half revolutions after a section has been cut off and while the leading end of the web passes loosely down between the cylinders 94 and 98, and when two pasted margins of the portion on the cylinder 98 and the portion still integral with the web come into register the folding-blade tucks the two portions into the folding-jaws, the cutters sever the web as before, and the folding-jaw cylinder carries the collected or superposed product to the tape-pathway for

deliverance, as before. If the collected portions are to be pasted together, the paste-blade 96 applies paste to that portion which travels around with the cylinder 98, so that during the second revolution of the latter and the tucking operation the two portions of the web are not only folded, but are pasted together.

When the folder is running to its full capacity, an eight-ply compound web issues from between the cutting-cylinders 92 and 93, and if no collecting is being done the machine will deliver pasted and folded products of thirty-two pages each; but if the machine be adjusted and run for collecting then pasted and folded products of sixty-four pages each will be delivered. If only one-half of the printing-press and folder be used and the folder is not collecting, then a four-ply compound web issues from between the cutting-cylinders 92 and 93, and the machine will deliver pasted and folded products of sixteen pages each; but if the folder be arranged for collecting then pasted and folded products of thirty-two pages each will be delivered. One of the main purposes of my invention is to provide a folder so constructed that it may be arranged to deliver transversely pasted and folded products of either eight, twelve, sixteen, twenty, twenty-four, twenty-eight, thirty-two, forty, forty-eight, fifty-six, or sixty-four pages each, dependent upon the number of plates used in the press and upon the width and number of webs.

In the machines which I have constructed I have placed the slitters, as 15 and 16, for slitting the webs A B longitudinally after association, just back of the former, as indicated by the full lines at Fig. 2, and also in the same machine at or substantially at the point of the former, as indicated by the dotted lines at Fig. 2 and by the full lines at Figs. 3 and 4, so that either set might be employed, as desired, by the user. Of course those cutters which divide the webs A B centrally or which cut on the dotted line *b* of Fig. 1 must be arranged at the upper portion of the formers or at about the locality shown at Fig. 2; but the cutters which subdivide the half-web or split the same longitudinally on the lines *a* and *c* may be employed at any locality between the point of the former and the place where they are shown in full lines at Fig. 2. The cutters arranged at the point of the former may be driven by any suitable gearing, as shown and as common in the art.

The various arrows show the directions of travel of the various rolls and other devices to which they are applied, and the dotted circles around the pasting-blades show the paths of travel of the latter.

For convenience of illustration I have reduced the thickness of the eight-ply web below the cutting-cylinders 92 and 93 to a single line; but this line may be taken as representing eight thicknesses of paper. The lower end of the web hanging down loosely indicates that the machine is not running to superpose or collect and the folding-blade and the folding-jaws are indicated in positions which they assume when the cross-fold is about to be made and which is just prior to the cutting off of the sheet lengths by the cylinders 92 and 93.

While I have thus far constructed folding-machines adapted to act on double-width webs, my improvements are of course equally adapted to machines of single width or narrower webs, and hence I do not wish to be considered as limited to the duplex folder shown. As before explained, this folder may be run with only half-width webs, and it is apparent that if folders for half-width webs only are desired such folders may be made in place of the folder of double width or of the duplex capacity herein illustrated.

Any desired forms of cutting, pasting, feeding, and delivering mechanisms may be employed, and these may be driven or operated by any suitable means without departing from the gist of my improvements.

The operation of the machine has perhaps been sufficiently described hereinbefore; but the following brief description may be added, and this will be confined more particularly to the right-hand side of the machine. The webs A and B coming from the printing mechanisms are assembled as they pass over the former 28; but before they come together the paster 57 applies a line of paste to the margins of web B and transversely of the web, so that as these webs come down over the former they are pasted together transversely. The webs thus pasted together are slitted longitudinally as they pass the former and before they enter between the rolls 78 78, through which at least four thicknesses of paper pass. After passing between these rolls the folds of the slitted and pasted webs are separated, those folds of the web which passed over the left-hand edge of the former being led directly under the roll 80 and thence over the rolls 82 and 74 to the cutting-cylinders, while those folds of the web which passed over the right-hand edge of the former are led under the roller 84 and over the roller 74 and thence to the cutting-cylinders, the latter fold being thus looped around the second pasting mechanism, by which a second line of paste is applied transversely to the separated portion of the web intermediate the rolls 84 and 74. The separated folds of the web are again reunited at roller 74 prior to passing between the cutting-cylinders, so that the final pasting operation is completed before the webs reach the cutting-cylinders. Thus the four thicknesses of the web will be securely and properly pasted together, and as they pass through the cutting-cylinders the webs are severed into sheet lengths, the sheets being all pasted together, however, so that

the machine will deliver sixteen-page newspapers, for example, all properly pasted and folded. Thus by the present invention I am enabled to apply the paste to the web transversely thereof and transversely to the line of movement thereof both before and after the webs pass the former, thus enabling me to employ an angle-bar or cow-catcher folder.

The narrow pressure-rolls 33 63 69 69[a] 73 80 83 85 88 all operate on the longitudinal margins of the webs only.

That the practical applications of the invention are numerous will be readily comprehended by those skilled in the art, and for the essential features and combinations thereof, for which protection is desired, reference is to be had to the following claims.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of means for assembling two webs and folding the same longitudinally, and means for applying paste transversely to one of the webs before the same are assembled and folded, with means for applying paste a second time to the webs and transversely thereof after the webs have received their first fold, means for thereafter severing the webs, collecting mechanism arranged to collect the sheets, and means for pasting together the collected sheets.

2. In web folding and pasting mechanism, the combination of means for assembling two webs and folding the same longitudinally, and means for thereafter severing the webs into sheet lengths; with means for applying paste transversely to one of the webs before the same are assembled and folded, means for applying paste to an inner fold of the webs after the same have received their first fold, collecting mechanism arranged to collect the sheets, and means for pasting together the collected sheets.

3. The combination of means for assembling and imparting a longitudinal fold to webs of paper, means for separating the folds of the web, mechanism for applying a line of paste to the separated folds of the web, means for thereafter reuniting the separated folds of the webs, collecting mechanism arranged to collect the sheets, and means for pasting together the collected sheets.

4. The combination of means for assembling and imparting a longitudinal fold to webs of paper, mechanism for separating the longitudinal folds of the webs, means for applying a line of paste to one of the separated folds of the webs transversely to the length or line of movement thereof, means for reuniting the separated folds of the webs, means for severing the same into sheet lengths, collecting mechanism arranged to collect the sheets, and means for pasting together the collected sheets.

5. The combination of the former and a pair of rolls coacting therewith, means for directing a pair of webs to said former, mechanism for applying paste to one of the webs prior to its passage over the former, mechanism for slitting the folded webs longitudinally, means for dividing or separating the folds of the slitted web, means for applying paste to one portion of the slitted and separated webs, cutting-cylinders for severing the reunited portions of the webs into sheet lengths, collecting mechanism arranged to collect the sheets, and means for pasting together the collected sheets.

Signed in the borough of Manhattan, city of New York, in the county of New York and State of New York, this 20th day of October, A. D. 1900.

RALPH C. SEYMOUR.

Witnesses:

K. V. DONOVAN,

E. M. WELLS.