

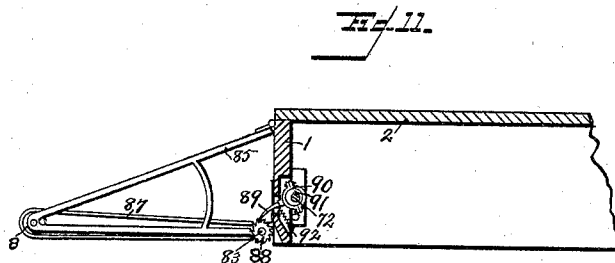
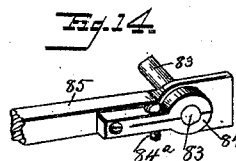
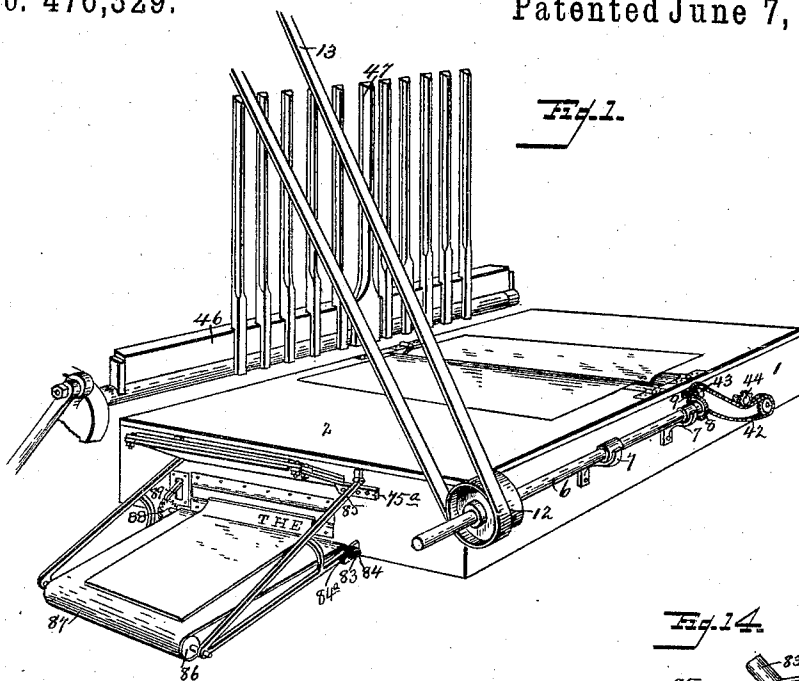
(No Model.)

6 Sheets—Sheet 1.

W. A. THOLEN & W. J. MURRAY.
FOLDING MACHINE.

No. 476,329.

Patented June 7, 1892.



Witnesses

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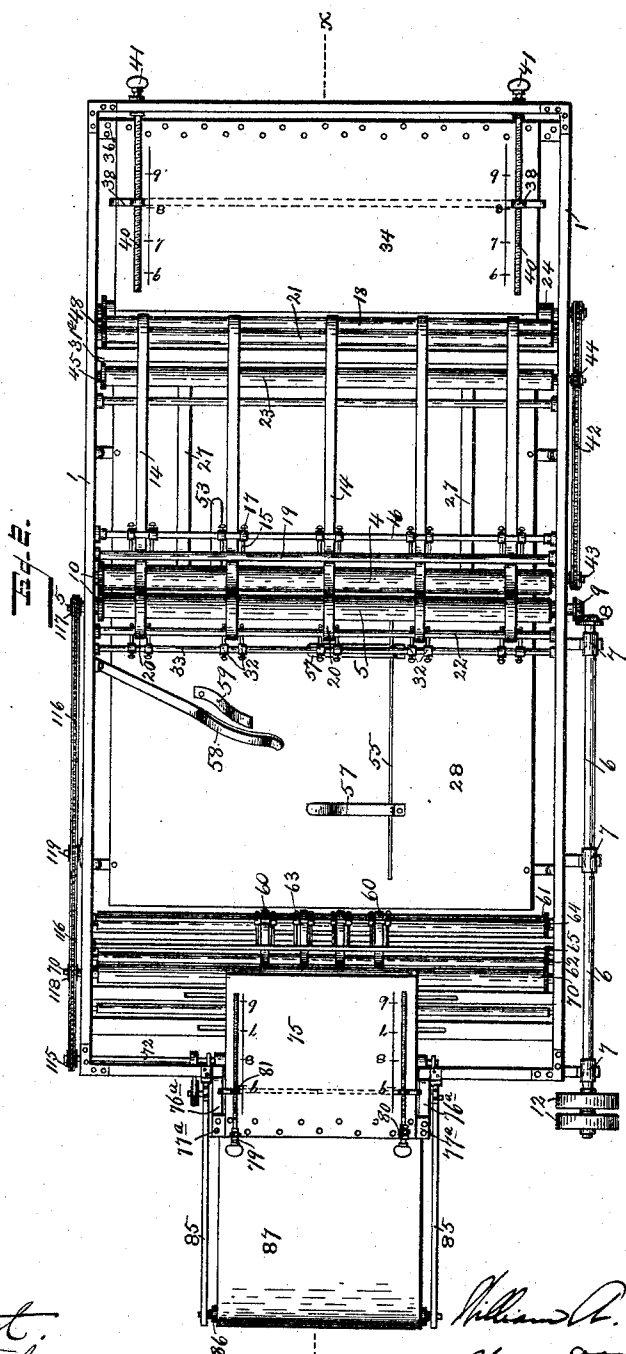
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6 Sheets—Sheet 2.

W. A. THOLEN & W. J. MURRAY.
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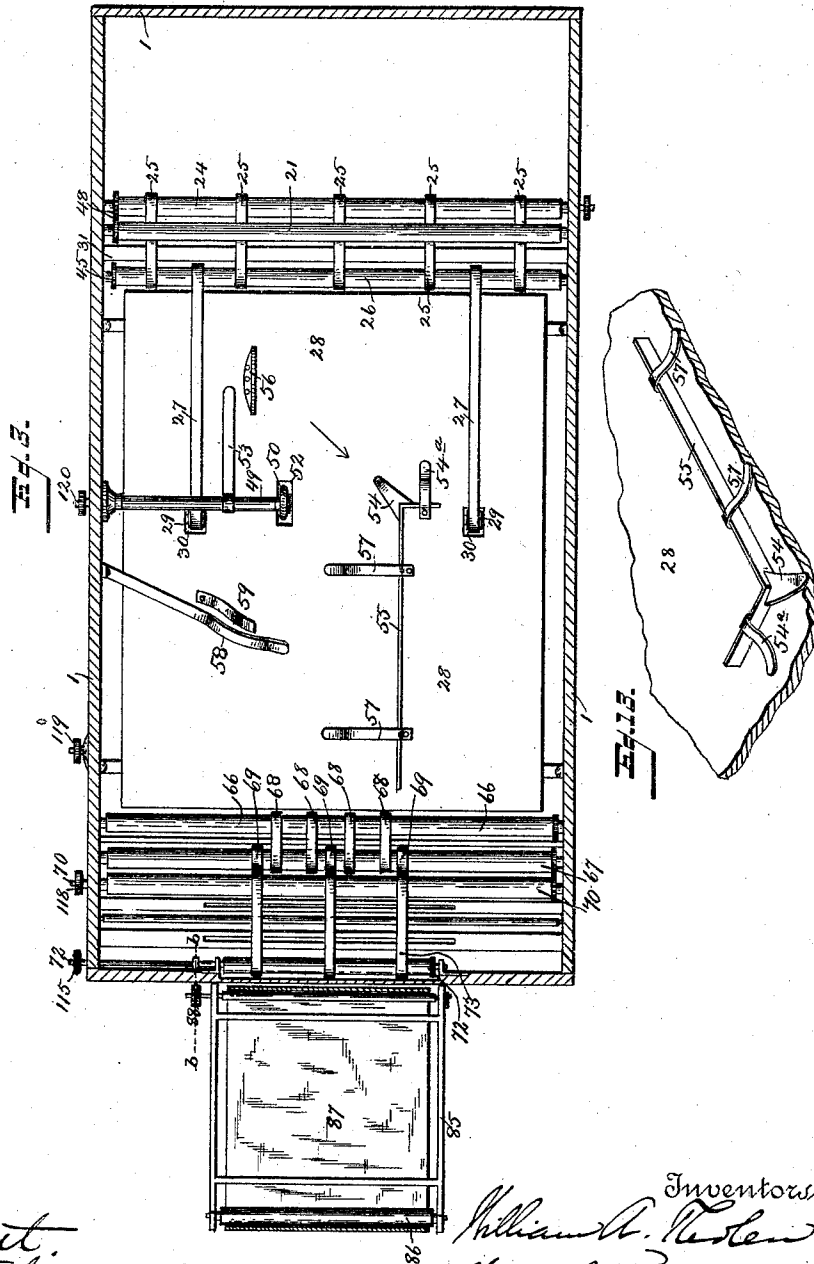
(No Model.)

6 Sheets—Sheet 3.

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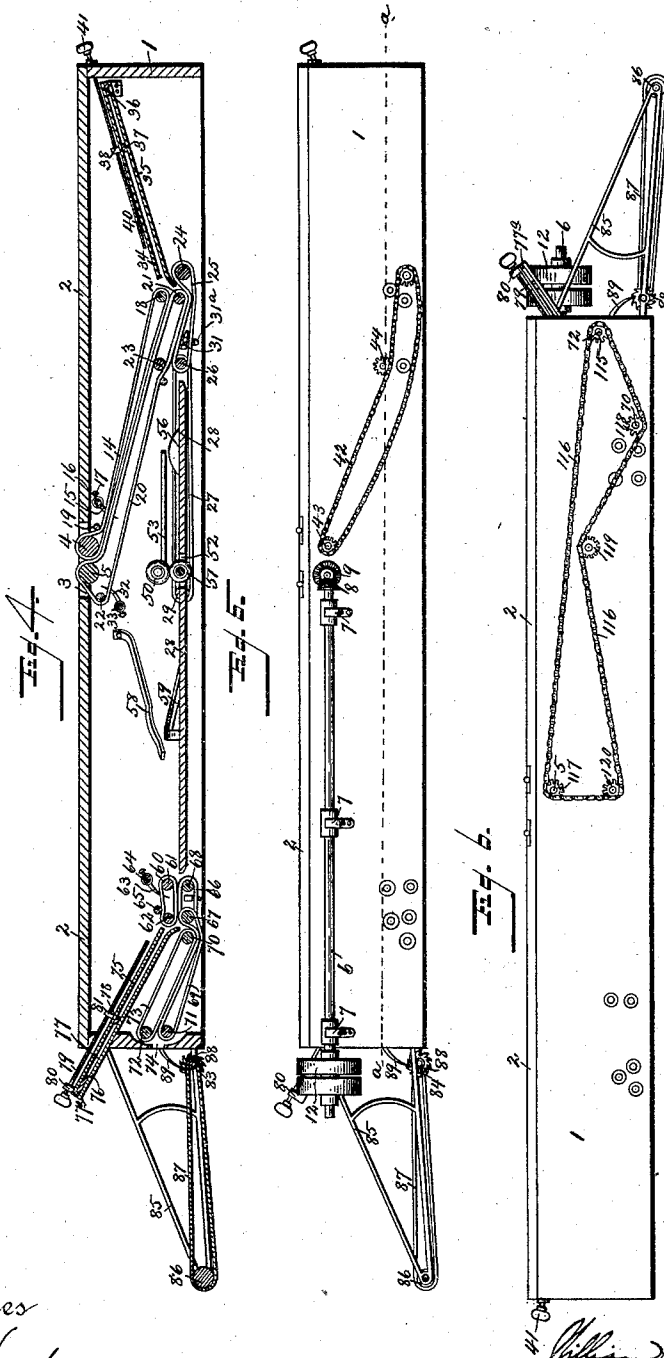
(No Model.)

6 Sheets—Sheet 4.

W. A. THOLEN & W. J. MURRAY.
FOLDING MACHINE.

No. 476,329.

Patented June 7, 1892.



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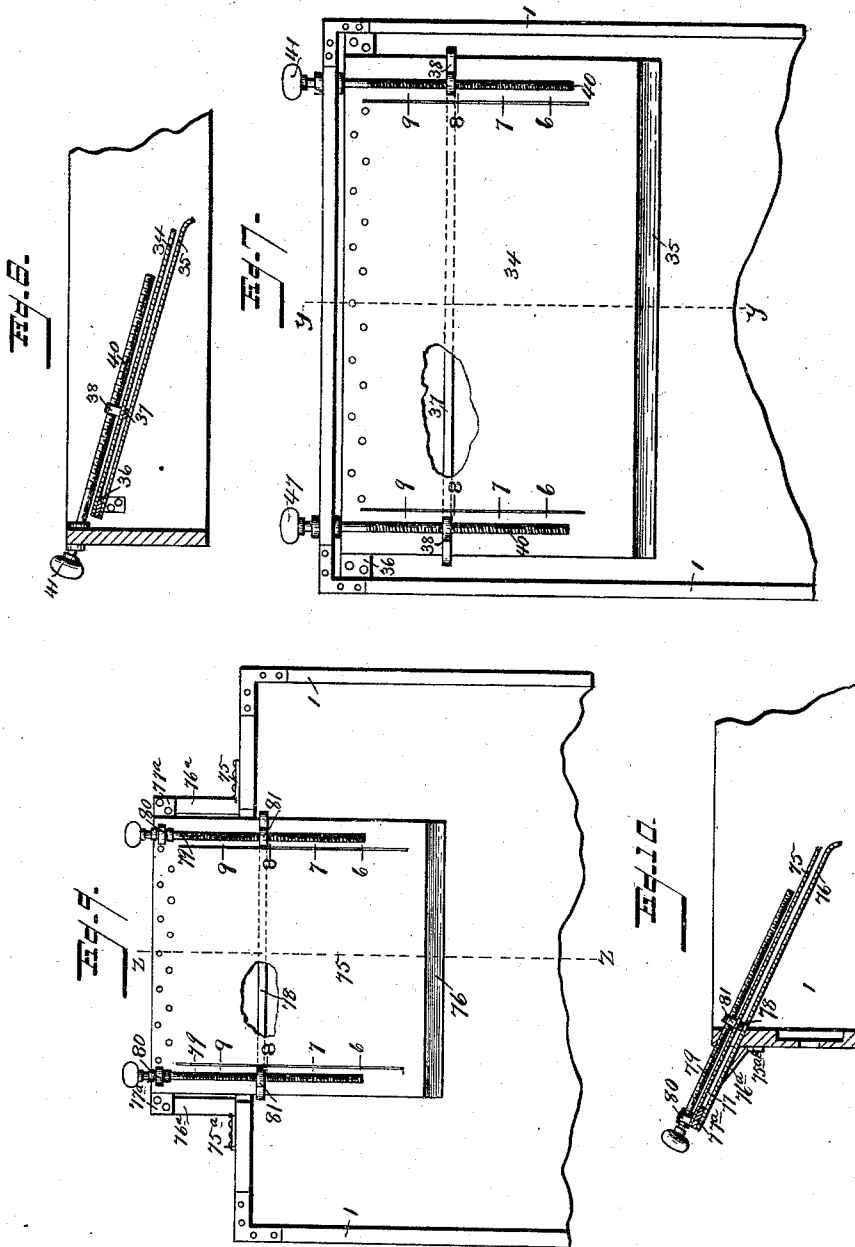
(No Model.)

6 Sheets—Sheet 5.

W. A. THOLEN & W. J. MURRAY.
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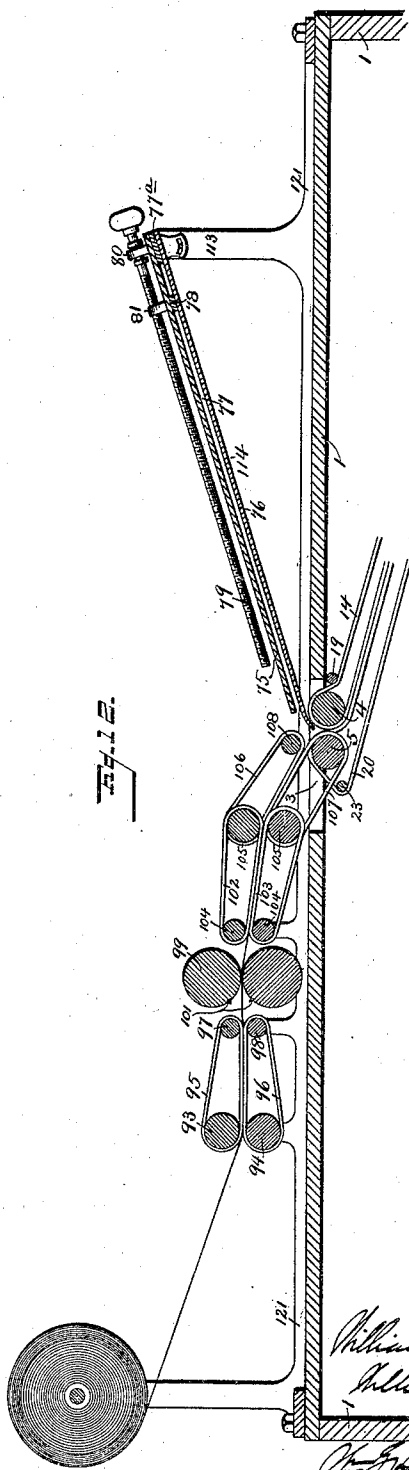
(No Model.)

6 Sheets—Sheet 6.

W. A. THOLEN & W. J. MURRAY.
FOLDING MACHINE.

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Patented June 7, 1892.



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UNITED STATES PATENT OFFICE.

WILLIAM ALBERT THOLEN AND WILLIAM JOHN MURRAY, OF LEAVENWORTH, KANSAS.

FOLDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 476,329, dated June 7, 1892.

Application filed June 6, 1891. Serial No. 395,330. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM ALBERT THOLEN and WILLIAM JOHN MURRAY, citizens of the United States, residing at Leavenworth, in the county of Leavenworth and State of Kansas, have invented certain new and useful Improvements in Folding-Machines; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

The invention relates to that type or class of folding-machines ordinarily used in connection with perfecting-presses.

It is the purpose of the invention to provide a folding-machine which may be used either with a web-perfecting press or with a single-sheet delivery, whereby two parallel folds shall be given to the paper successively, followed by a central fold at right angles to the parallel folds.

It is a further purpose of the invention to combine with a folding-machine of the type specified means whereby the several successive folds shall be located at the proper points should the folder be used in connection with a press printing sheets of large, small, or medium size, as the case may be, the mechanism being thus capable of adaptation to presses of varying size and construction.

It is the purpose, also, to combine with a parallel-roll folding-machine means whereby a thrice-folded sheet shall be turned as it passes from the second pair of folding-rolls until it lies at right angles with its former position and is brought into alignment with guides, between which it is advanced to an adjustable stop, by which a central transverse fold is gaged and formed by the co-operation of suitable feed-rolls and tapes and a third pair of folding-rolls.

It is one object of the invention, also, to combine with a parallel-roll folding-machine a removable and replaceable attachment whereby the folder shall be capable of use with a perfecting-press operating upon a con-

tinuous web or with a single-sheet fly-delivery press, the attachment and folder being each capable of adjustment to presses having forms of different size.

It is our principal object to provide a folding-machine in which one, two, or more folds parallel with each other may be successively formed in a sheet of paper, followed by one or more transverse folds, the parallel folds being located and formed, the folded sheet being turned to bring its length and the lines of parallel fold into substantial parallelism with the line of movement or travel, and the transverse fold or folds being located and formed automatically and upon the run and by successive sets of rolls having their axes parallel one with another and at right angles to the line of movement of the paper sheet.

The invention also contemplates other improvements in folding-machines; and it consists in the several novel features of construction and new combinations of parts hereinafter fully set forth, and then more particularly pointed out and defined in the claims which conclude this specification.

To enable others skilled in the art to which the invention pertains to make, construct, and use the same, we will proceed to describe said invention in detail, reference being had for that purpose to the accompanying drawings, in which—

Figure 1 is a perspective view showing a folding-machine embodying our improvements and showing, also, the fly of a single-sheet-delivery press, the mechanism of the folder being inclosed within a housing or casing having the folder-delivery supported upon one end. Fig. 2 is a plan view of the folder, the casing being opened to show the interior mechanism. Fig. 3 is a longitudinal horizontal section of the folder, the first pair of folding-rolls and the tape-carrying rolls being removed to show the turning devices and guides, taken on line *a a* of Fig. 5. Fig. 4 is a longitudinal vertical section of the machine upon the line *x x*, Fig. 2. Fig. 5 is a side elevation of the folder. Fig. 6 is an elevation taken from the side opposite to that shown in Fig. 5. Fig. 7 is a plan view showing the stop and guide-bed, together with its

means of adjustment, whereby the second fold is located, on an enlarged scale. Fig. 8 is a vertical section of the parts shown in Fig. 7 upon the line $y y$ on a similar scale to Fig. 7. Fig. 9 is a plan view of the stop and guide-bed at the delivery end of the machine, together with the means of giving it adjustment for sheets of different sizes, whereby the transverse and final fold is located, on a similar scale to Fig. 7. Fig. 10 is a vertical section of the parts shown in Fig. 9, the section being taken at the line $z z$ on a similar scale to Fig. 9. Fig. 11 is an enlarged detail vertical section taken on line $b b$, Fig. 3, showing the delivery apparatus and the devices for imparting a step-feed to the delivery-apron. Fig. 12 is a vertical longitudinal section on an enlarged scale as compared with the other figures, showing a detachable and attachable auxiliary apparatus by which the machine may be adapted to co-operate with a single-sheet fly-delivery press or with a continuous-web-perfecting press. Fig. 13 is a sectional perspective view looking in direction of arrow, Fig. 3, a portion of the floor being broken away, showing in detail guides 54, 54^a, and 57 on an enlarged scale compared with Fig. 3. Fig. 14 is a detail perspective, on an enlarged scale, of the bearing upon the bracket-frame 85 for the roll 83.

In the said drawings the reference-numeral 1 indicates the casing or housing of the folder, consisting of a substantially rectangular structure having its length in the direction of the travel of the paper. This casing is usually made from wood of any suitable kind and is provided with lids or hinged leaves 2, by which access is afforded to its interior. These leaves or lids are hinged by their adjacent edges to the sides of the casing, a transverse space 3 being left between said edges for the entrance of the sheet. The transverse space is arranged in the central part of the casing or not far from said point, as shown in Figs. 4, 5, and 6. Within the casing, immediately beneath the transverse space 3, we arrange the rolls governing the first fold. The rolls (indicated, respectively, by numerals 4 and 5) have their axes in a plane substantially parallel with the top of the casing, their journals being supported in bearings or boxes mounted in the sides of the casing. Their arrangement is such that their line of peripheral contact would, if the rolls were brought close together, lie between the edges of the transverse opening 3 and in or nearly in the central longitudinal line thereof. Said rolls are driven by a counter-shaft 6, journaled in brackets 7 upon one side of the casing and provided with a miter-gear 8 upon one end, meshing with a similar gear 9 upon the shaft of one of the rolls—as, for example, the roll 5, which is prolonged sufficiently to project through the side wall. The motion thus imparted is communicated to the other roll, but in an opposite direction, by means of spur-gear 10. (Shown in Fig. 2.) The counter-

shaft 6 is provided with suitable belt-pulleys 12, one of which is a loose pulley and is driven from any conveniently-located power-shaft (not shown in the drawings) by means of a belt 13. (Seen in Fig. 1.) Over the roll 4 and partly around the same is led a series of tapes 14, arranged at suitable intervals and held at the several points desired by spacing-fingers 15, adjustably mounted upon a rod 16, lying parallel with the axis of the roll, whereby the spacing-fingers may be arranged to vary the intervals or spaces separating the tapes from each other, as circumstances may require, the spacing-fingers being fastened by set-screws 17, which are tapped through the sleeves supporting or forming part of said fingers. The tapes 14, which are endless, are carried around a guide-roll 18 upon a lower plane than the roll 4 and located between the latter and the end of the casing opposite the delivery. A tension-roll 19 rests upon the tapes immediately behind the roll 4. In a similar manner a series of tapes 20 have peripheral contact with the roll 5, upon which they are so arranged that they have contact with the tapes 14 along the line of nearest surface approach of the folding-rolls. The series of tapes 20 is carried beneath the roll 4 and beneath the tapes 14, with which they engage, to a guide-roll 21, arranged under the guide-roll 18. The tapes 20 are also carried over a tension-roll 22, placed a little behind the roll 5, and between the upper and lower portions of the said tapes is inserted a guide-roll 23, by which the upper portions are slightly deflected toward the under portions of the tapes 14, in order to insure surface contact at every point and to render the inclination of the contacting surfaces somewhat greater, as seen in Fig. 4.

Immediately behind the guide-roll 21, upon the side next to the adjacent end of the casing, is journaled a roll 24, around which a series of tapes 25 is carried, said tapes being so arranged as to run beneath and in contact with the tapes 20. The tapes 25, which are comparatively short, are carried over a roll 26, arranged beneath the guide-roll 23, the arrangement being such that the upper surfaces of the short tapes 25 are in contact with the lower surfaces of the tapes 20 at all points between the guide-roll 26 and the rear of the roll 21. The roll 26 is journaled at such a point that its axis is between the plane of the inner and upper surface of the floor of the casing, as seen in Fig. 4. Over the roll 26, between the tapes 25 nearest the ends, are led two somewhat longer tapes 27, which run above and beneath a section 28 of the floor or bottom and over small pulleys 29, journaled in openings 30 in the floor. The short tapes 25 are held in their proper places by space guides or loops 31, formed on the cross-strip 31^a, and a like function is performed by spacing-fingers 32, arranged upon a rod or bar 33, the points of said fingers lying upon each side of the tape 20.

Supported upon the end of the casing next the guide-rolls 21 and 24 is a guide-bed consisting of two plates 34 and 35, of brass or other suitable metal or material. These plates are arranged as nearly as possible in parallelism, one above the other, with an intervening space between the parallel surfaces sufficient to permit the entrance and passage of the once-folded sheet without impediment. The width of the plates from side to side is usually very nearly the interior width of the casing, as seen in Fig. 7. Said plates are inclined at such an angle that the edge of the lower plate, which projects somewhat beyond that of the upper, may be slightly curved downward and partly enter between the rolls 21 and 24, as shown in Fig. 4. The plates are connected at their upper ends by rivets, bolts, or other fastenings, a strip 36 being interposed between these ends to give the necessary interval of separation. Within the space thus formed is arranged a movable bar or strip 37, of wood, metal, or other suitable material, lying parallel with the axis of the guide-rolls 21 and 24 and substantially filling the space in which it lies, but moving therein without impediment. The ends of this bar are curved or bent over the edges of the upper plate 34. Near the edges of the plate are screw-rods 40, the ends of which are swiveled in the end wall of the casing, as shown in Figs. 7 and 8, while the threaded portions of said rods engage with threaded openings in the ends 38 of the stop-bar. A head 41 or other equivalent device is mounted or formed upon each rod to enable the operator to rotate it. A scale is arranged beside and parallel with each edge, so laid off as to guide the operator in making the adjustments.

The guide-roll 23 is driven by a chain belt 42, carried by a sprocket 43 on the prolonged projecting end of the roll 4. This chain belt passes under and meshes with a sprocket 44 on the projecting extremity of the shaft of the guide-roll 23, the other end of which is geared by a spur-pinion 45 with a similar pinion on the end of the shaft 26.

Before proceeding further with the description of parts we will explain the operation of that portion of the mechanism already described, which will materially aid in obtaining a clear understanding of the function and purpose of the several features of construction and arrangement already set forth. For this purpose we will refer to Fig. 1 of the drawings, in which we have shown the folder arranged in relation to a single-sheet delivery, the fly of the perfecting-press, of whatever type it may be, being indicated by the numeral 46. This fly, which is constructed and driven in any well-known manner, is provided with a stick 47, having an edge higher than that of the others and so located that the center of the perfected sheet as it comes from the press will lie on or substantially on this higher edge, the folder also being so arranged that at each stroke of the fly the stick

47 will fall between the first folding-rolls 4 and 5. The center of the sheet which lies upon this higher edge is carried into the tapes and between their contacting surfaces, being instantly caught thereby. The sheet, with a central fold formed therein, is drawn into the machine, passing between the tapes 14 and 20 and above the guide 23 until its folded edge emerges between the guide-rolls 18 and 21. This edge, directed by the curved edge of the lower plate 35 of the guide-bed, enters between said plate and the upper plate 34 and is driven up in the narrow intermediate space until it is arrested by the adjustable stop-bar 37, which has previously been so placed as to stop the advance of the folded edge when the center of the once-folded sheet lies directly over the narrow space between the two guide-rolls 21 and 24. The roll 24 being geared with the roll 21 by spur-gearing 48 (see Fig. 2) and the guide-roll 18 being in like manner geared with the spur-gear on the end of roll 21 in such manner as to have equal surface speed, it will readily be seen that the half of the once-folded sheet lying between the tapes 14 and 20 must advance with the motion of the tapes, and as the latter have a downward inclination from the guide-roll 23 at an angle substantially the same as the downward inclination of the guide-bed 34 35 the double sheet will naturally bend and form a second line of fold along the line lying between the two inclining surfaces or spaces within which the two halves of the sheet lie. The second fold, therefore, will be formed parallel with the first in a line drawn between and just above the line of contacting points between the tapes 14 and 20 as they pass down between the two guide-rolls 21 and 24. The second fold, being thus formed, is caught almost instantly after its formation, and, passing downward between the rolls 21 and 24, it is carried between the short tapes 25 and the lower surfaces of the tapes 20, withdrawing the one half of the twice-folded sheet from the guide-bed, while the other half continues its travel in contact with the tapes 20 until the sheet emerges between the rolls 23 and 26. The two lines of fold being parallel and being formed, respectively and consecutively, in the centers of the open and once-folded sheet, the paper will be delivered from between the rolls 23 and 26 with the length of the folded sheet transverse to the casing. At this point of emergence it is received upon the two tapes 27, which travel toward the other or delivery end of the casing and just above the bottom or floor thereof. The next and last fold being made at right angles to the first and second lines of fold, it is now necessary to turn the twice-folded sheet and bring its length parallel, or substantially so, with the line of travel, and to accomplish this result by automatic means we have provided the following devices: Projecting from one of the side walls of the casing is a tubular or sleeve bearing 49, having a shaft, upon the

end of which is mounted a friction-roll 50, arranged directly over and in peripheral contact with a friction-roll 51, journaled in a bracket so as to lie in a slot or opening 52 in the floor of the casing. These wheels revolve in a vertical plane between the central longitudinal line of the casing and one of the tapes 27, their point of contact being in the plane of said tapes and the point of contact between the two rolls 50 and 51 being so arranged that they will engage the edge of the twice-folded sheet just before said edge passes off the tapes 27. Upon the sleeve-bearing 49 is mounted a guide strip or plate 53, extending toward the roll 26 and lying a little above the floor to pass above the advancing sheet and hold it down. The friction-rolls 50 and 51 are driven by the means described hereinafter at a surface speed substantially the same as that of the tapes 27. As the twice-folded sheet travels forward on the tapes 27 its edge passes under a guard-plate 54, projecting over the angular end of a linear guide-strip 55, said end lying in or nearly in the same transverse line with the friction-rolls 50 and 51 and upon the other side of the longitudinal center of the casing, the main portion of the guide-strip being parallel with the line of travel, while the angular end is transverse to said line. From the angular end of said strip projects a guard-plate 54^a parallel with the line of travel of the paper, which serves to direct the twice-folded sheet downward. The portion of the folded sheet which lies upon one side of the central longitudinal line of the paper will be arrested by the angular end of said strip, while the part lying upon the other side of said line will be advanced by the friction-rolls 50 and 51, the latter portion being swung under the impulse of the friction-rolls in the arc of a circle forward and laterally toward the linear guide-strip 55, while the other portion swings inward or toward the central line of the casing until its edge comes in contact with a guide-strip 56, parallel with the linear guide 55, but upon the other side of the longitudinal central line. At or about the same time that the one edge of the paper strikes this guide-stop the other edge engages the linear guide, and the action of the friction-rolls 50 and 51 advances the twice-folded sheet, which has thus been turned at right angles to its former position, the natural tendency of the friction-rolls being to slightly crowd the paper toward and keep it in close contact with the linear guide. To prevent it from riding over the edge thereof, guard-plates 57 are arranged to project over the same and over the traveling sheet at suitable intervals. We have shown two of these guard-plates; but we may use more or less of the same, as circumstances require. A guard-strip 58 is also arranged to project from the side wall, its downwardly-inclined end overhanging the paper between the guard-plates 57 and about in line with the friction rolls 50 51. Immediately behind the

point of the elastic guard-strip 58 a lift 59 rises from the floor, the purpose being to raise the swinging and laterally-turning edge of the twice-folded sheet and immediately bend the same downward, so that it may pass under the ends of the guard-plates 57. After being turned automatically in the manner described the advancing end of the twice-folded sheet is received beneath an upper series of short tapes 60, running upon rolls 61 and 62 and at comparatively close intervals, said tapes being guided by spacing-fingers 63, adjustably mounted upon a rod 64, arranged a little above the roll 61. A tension-roll 65 rests upon these tapes near the roll 62. Immediately below the two rolls 61 and 62 are rolls 66 and 67, carrying short tapes 68, which have surface contact with the tapes 60. Over the roll 67, beside the two outer and between the two inner tapes 68, carried thereby, are led tapes 69, which are carried under a roll 70, which has rotation in a direction opposite to that of the roll 67. After passing beneath the roll 70, which is journaled with its axis in substantially the same plane with the roll 67, both having their tops in or about in the same plane with the upper surface of the floor of the casing, the tapes 69 are led over a parallel roll 71, arranged upon a higher level and lying partly in a shallow recess cut in the end wall of the casing. Directly above the roll 71 is a roll 72, having a series of tapes 73, which also pass around the roll 70 and which travel in contact with the tapes 69. A delivery-opening 74 is formed in the end wall of the casing in line with the space between the two rolls 71 and 72. Upon the edge of the end wall of the casing 1, said edge being usually lowered somewhat for the purpose, is mounted a guide-bed consisting of two parallel inclined plates 75 and 76, separated by an intermediate space 77 of such depth that the end of the twice-folded sheet may enter without resistance. This guide-bed is of considerably less width than that at the other end of the casing, but wide enough to admit a twice-folded sheet of more than the maximum width. The guide-bed is arranged above and nearly parallel with the series of tape 73, the edge of the lower plate being curved downwardly both to facilitate the entrance of the paper between the two parallel members of the guide-bed and to prevent it from passing beneath said plate. The guide-bed may be conveniently attached to the end wall of the casing by brackets 75^a, having inclined arms 76^a, which are bolted to the projecting ends of the interposed strip 77^a, to which the upper edges of the plates 75 and 76 are connected. This guide-bed, like that at the other end of the machine, is provided with an adjustable stop-bar 78, having adjustment by means of screw-rods 79, swiveled in lugs 80 on the upper end of the top plate and engaging threaded openings in lugs 81, which rise from the stop-bar. Scales on the plate near each edge guide the adjustment in the manner already set forth.

The stop-bar 78 being so adjusted that the end of the twice-folded sheet will abut thereon at the moment that its central transverse line is above the space between the rolls 67 and 70, the resistance to its forward movement and the forward pressure of the tapes 60 and 68 upon the other half will cause the sheet to bend downward in the transverse line mentioned. In fact, this bend in the sheet is formed and maintained at a point immediately above the contacting points of the tapes 68 and 69 by the relative inclination of the two parts of the sheet, one of which must conform to the inclination of the guide-bed 75 76 and the other to the plane of the tapes 60 and 68. The bend being thus formed, the resistance of the stop-bar 78 and the forward impulse of the tapes 60 and 68 produce a fold in the sheet at the point and along the transverse line described, and the folded edge is immediately caught between the tapes 69 and 73 and is carried downward between the rolls 67 and 70, and thence between the two series of tapes 69 and 73 until its folded edge emerges from between the rolls 71 and 72 and passes through the delivery-opening 74. Upon the outer end of the casing 1, beneath the delivery-opening, is a roll 83, journaled in bracket-frames 85 of substantially triangular form. Upon one side of the bracket-frame is secured a split bearing-bracket 84, in which one end of the journal of roll 83 bears. The two parts of this bearing-bracket are adjusted by means of a screw 84^a, so that they may be adjusted to increase or diminish the friction on the shaft of the roll 83. The bracket-frames 85 are hinged or pivoted at their upper ends next to the delivery end of the machine to the casing 1, so that when the machine is not in use the bracket-frames may be thrown back upon the top of the casing to economize space. On the end of triangular frame, on each side, is supported the journal of a roll 86, upon which, in conjunction with the roll 83, is stretched a delivery-apron 87 of any desired length. Upon one end of the shaft of the roll 83 is a ratchet-wheel 88, meshing with which is a pawl 89. This pawl is carried (see Fig. 11) by a ring 90, surrounding an eccentric 91, rigid upon the shaft 72. The pawl projects through a small opening in the end wall and is held in mesh by a spring 92. As the shaft 72 revolves the eccentric 91 vibrates or reciprocates the pawl and gives a slow step-feed to the delivery-apron.

The mechanism thus described may be used without material change to fold from a web-perfecting press or from a continuously-wound web delivered to the machine from any suitable source. For this purpose the folder should be placed so that its length will be in line with the travel of the web as it is delivered from the press. Upon the top of the casing is mounted an attachment consisting of an upper and lower feed-roll 93 and 94, over each of which runs a series of tapes 95 and 96, stretched by rolls 97 and 98 and hav-

ing surface contact. Adjacent to the latter rolls are the measuring and severing rolls 99 and 100, having knives 101, which sever the web at stated intervals, the diameter of the rolls 99 and 100 being varied to cause the circumference of each to correspond with the length of the sheet to be cut. From the measuring and severing rolls the cut sheet passes between an upper and a lower series of tapes 102 and 103, carried by rolls 104 and 105, respectively, and thence between downwardly-inclined upper and lower series of tapes 106 and 107. The tape 106 is carried by the roll 105 and by a roll 108, arranged a little above the rolls 4 and 5, constituting the first pair of folding-rolls, the tape 107 being carried by the other roll 105 and the roll 5 of the first folding-rolls. Near the other or delivery end of the casing are standards or uprights 113, supporting the upper end of an inclined guide-bed 114, corresponding in all material respects with the guide-bed 34 35. These parts form the first central fold and introduce the folded edge of the sheet between the rolls 4 and 5, whence it follows the course already described.

The shaft of the roll 72 is prolonged at one end to extend through the side wall of the casing and receive a sprocket-gear 115. The shaft is driven by a sprocket-chain 116 on a sprocket 117 on the extended end of the shaft 5 opposite that carrying the miter-gear 9. From the sprocket-gear 115 the chain is carried over a sprocket 118 on one end of the shaft 70, thence over an idler 119, and finally over a sprocket 120 on the end of the shaft carrying the friction-roll 50. From this sprocket 120 the chain returns to the sprocket-gear 115, which is directly above. The other rolls at the delivery end of the folder are geared together in any suitable manner to give them revolution in the proper direction and secure the necessary surface speed of the several rolls.

The rolls forming part of the attachment shown in Fig. 12 are preferably supported in bearings mounted in a rigid bracket-frame 121, of which the standards or uprights 113 form part, whereby the whole apparatus may be lifted off to enable the folder to be used with a fly, as shown in Fig. 1. When connected with the folder, the frame 121 is adjusted to bring the space between the roll 108 and the curved edge of the lower plate 76 of the slide directly over the space between the rolls 4 and 5, and said frame is then clamped, bolted, screwed, or otherwise fastened in place.

The friction-rolls 50 and 51 are usually faced with rubber or some other suitable material adapted to take hold of the paper, and the shafts of said rolls may be positively driven by any ordinary and suitable means other than those shown. In the drawings we have illustrated the shaft of the roll 50 only as being driven, the roll 51 revolving by contact only; but it will readily be understood that

both rolls may be positively rotated, if desired.

The guide-beds 34 35 and 75 76 may be formed of metal, wood, or any other suitable material. In the folder which we have in use these guide-beds are formed of brass; but it is evident that a considerable variety of other suitable material may be employed for the purpose. The same liberty of choice, also, may be exercised regarding the rolls, which may be of any suitable material, their shafts or shaft-journals being preferably of metal. We may also use our preference or exercise our judgment in selecting and arranging the devices whereby revolution is given to the rolls of the folder and to the delivery-apron, employing for this purpose any known or novel construction and arrangement of parts without departing in any essential particular from our invention.

Having thus described our invention, what we claim is—

1. In a folding-machine, the combination, with folding-rolls making a first central fold, of a guide-bed consisting of two substantially parallel members between which the edge of the once-folded sheet may enter, two series of tapes carrying said sheet from the first folding-rolls to said guide-bed, and a second pair of folding-rolls receiving the second folded edge of the sheet and completing and advancing the sheet, the several parts being arranged to operate substantially as described.

2. In a folding-machine, the combination, with rolls making a first central fold, of a guide-bed consisting, substantially, of two parallel members between which the edge of the once-folded sheet may enter and pass as far as a stop lying between the two parallel members of the guide-bed, two separate series of tapes having surface contact with each other and delivering the once-folded sheet to the guide-bed, and a pair of rolls effecting the second fold, the guide-bed and the tapes being so arranged as to form and maintain a bend in the paper between said tapes and the mouth of the guide-bed, the several parts being arranged to operate substantially as described.

3. In a folding-machine, the combination, with a pair of rolls making a first central fold, of a guide-bed consisting of two parallel members between which the edge of the once-folded sheet may enter, an adjustable stop-bar arranged to check the advance of the sheet within the guide-bed, rolls forming a second fold parallel to the first, and two separate series of tapes carrying the once-folded sheet between them to the guide-bed, said tapes and guide-bed being so arranged relatively to each other that the parts of the once-folded sheet lying at the same time in each shall be in different planes, the angle between the two being in line with the space between the second set of folding-rolls, the several parts being arranged to operate substantially as described.

4. In a folding-machine, the combination,

with a pair of rolls between which the centrally-folded edge of the paper is inserted, of a pair of rolls forming a second and parallel fold, means for directing the sheet through the second set of rolls, a guide-bed consisting of two parallel members between which the once-folded sheet partly enters as far as a stop, two or more separate series of tapes carrying the once-folded sheet to the guide-bed, means, substantially as described, for turning the twice-folded sheet as it is fed forward to lie at right angles with its original position, and a third pair of folding-rolls forming a final and transverse fold, the several parts being arranged to operate substantially as and for the purposes described.

5. In a folding-machine, the combination, with a first and second pair of folding-rolls to form a central first fold and a second parallel fold in the center of the double sheet, of means, substantially as described, for locating and forming the second fold and for turning the twice-folded sheet to bring its longitudinal line and parallel lines of fold into parallelism with the line of travel, a third pair of folding-rolls forming a final transverse fold, the whole being accomplished upon the run, and means for directing the sheet between the second and the subsequent folding-rolls, substantially as described.

6. In a folding-machine, the combination, with separate sets of parallel folding-rolls for forming one or more parallel folds successively, followed by a transverse fold, of tapes between which the once-folded sheet is carried to the second set of folding-rolls, a guide-bed consisting of two parallel plates of such width as to admit the edge of the once-folded sheet between them, the entrance being adjacent to the point where the sheet emerges from the carrying-tapes, an adjustable stop-bar movable between said plates, screw-rods engaging ends of the said bar to move the same, a scale to guide the adjustment, and means, substantially as described, for turning the folded sheet to bring its width into line with the direction of travel, substantially as described.

7. In a folding-machine, the combination, with the separate sets of folding-rolls, of tapes between which the once-folded sheet is carried to the second set, means, substantially as described, for locating and forming the second fold parallel with the first, tapes upon which the twice-folded sheet is delivered and by which it is carried toward the third set of rolls, a pair of friction-rolls having peripheral contact at a point on one side of the central line of travel, a linear guide arranged on the other side and parallel with said line, the end of said guide being in the same transverse line with the friction-rolls, or thereabout, tapes between which the turned twice-folded sheet is received, means, substantially as described, for locating and forming the transverse fold, and a third set of folding-rolls, substantially as described.

8. In a folding-machine, the combination with a pair of folding-rolls receiving the folded edge of the sheet, of tapes carried by said rolls and by a pair of rolls parallel therewith, one of which forms one of the second pair of folding-rolls, a guide-bed, substantially as described, an adjustable stop, a second set of folding-rolls, tapes between which the twice-folded sheet is carried from the second set, tapes upon which the twice-folded sheet is carried toward the third set of folding-rolls, a pair of friction-rolls having peripheral contact upon one side of the central line of travel, a linear guide parallel with and on the other side of said line, the angular end of said guide being in the same transverse line with the friction-rolls, or thereabout, a third set of folding-rolls, a guide-bed, substantially as described, an adjustable stop, tapes between which the twice folded and turned sheet is received, tapes between which the transversely-folded sheet is received, a delivery-apron upon which said sheet is dropped, and means for imparting a step-feed to said apron, substantially as described.

9. In a folding-machine, a guide-bed for locating and forming the line of fold, the same consisting of two substantially parallel members having an intermediate space adapted to receive the sheet, a stop-bar lying in said space, screw-rods engaging threaded openings in the ends of said bar, said rods being swiveled in suitable supports, means for feeding paper to said guide-bed, and means for folding the paper and discharging it from said guide-bed, substantially as described.

10. In a folding-machine, the combination, with a pair of folding-rolls and with tapes to carry the sheet, of a guide-bed for gaging and locating the line of fold, said guide-bed consisting of two parallel members having an intermediate space, an adjustable stop-bar, the parts being so arranged that the plane of movement of the paper in approaching said guide-bed shall be at a different angle from the plane of movement of the paper passing into said guide-bed, and means for folding the sheet and discharging it from said guide-bed, substantially as described.

11. The combination, with a folding-ma-

chine, of an attachment consisting of tapes carried by rolls between which the paper is received, a pair of measuring and severing rolls having knives to which the sheet or web is fed, tapes carried by rolls receiving the severed sheet, a guide-bed consisting of two parallel inclined members between which the edge of the severed sheet enters, the entrance being adjacent to the point where the sheet emerges from the carrying-tapes, said tapes and guide-bed being so arranged relatively to each other that parts of the sheet lying at the same time in each shall be in different planes, a stop-bar to arrest said edge, and a first pair of folding-rolls arranged beneath the space between the entrance to the guide-bed and the exit from the tapes carrying the severed sheet, substantially as described.

12. An attachment for a folding-machine, consisting of a frame having a series of tapes carried by rolls and adapted to receive and feed a continuous web of paper, a pair of measuring and severing rolls having suitable knives, a series of feeding-tapes between which the severed sheet is carried from the severing-rolls, a guide-bed composed of two substantially parallel inclined members having an intermediate space to receive the edge and part of the body of the severed sheet, and an adjustable stop-bar arranged between said members, said attachment being adapted to operate in connection with a folding-machine upon a continuous web of paper to sever the sheet and to locate, form, and introduce the first fold between the first pair of folding-rolls of the folding-machine, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

WILLIAM ALBERT THOLEN.
WILLIAM JOHN MURRAY.

Witnesses to the signature of William Albert Tholen:

HENRY FLYNN,
JOHN T. JONES.

Witnesses to the signature of William John Murray:

LYMAN M. DRAKE,
Mrs. J. N. MURREY.